FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO

User Interface Variations in Search Engine Results Pages Across Types of Search Queries and Search Engines

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Mestrado em Engenharia Informática e Computação

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Resumo

No atual ambiente rico em informação, os motores de pesquisa na web desempenham um papel crucial ao fornecer aos utilizadores a informação que procuram da forma mais rápida e intuitiva possível. As interfaces dos motores de pesquisa funcionam como a porta de entrada através da qual este processo ocorre. A composição destas interfaces é o foco desta tese, que analisa e compara os componentes das páginas de resultados dos seis mais usados motores de pesquisa: Google, Microsoft Bing, Yandex, Yahoo!, Baidu e DuckDuckGo.

Os utilizadores interagem com os motores de pesquisa ao formularem interrogações que exprimem as suas necessidades de informação subjacentes. Estas necessidades podem ser classificadas de acordo com a intenção da interrogação. Por exemplo, uma interrogação como *richard gere está morto* indica uma intenção informativa, na qual o utilizador procura obter uma informação factual. Por outro lado, uma interrogação como *banco do oregon oriental* sugere uma intenção navegacional, cujo objetivo é aceder a um website específico. Além disso, uma interrogação como *aplicação de controle remoto vizio tv* demonstra uma intenção transacional, em que o utilizador pretende realizar uma ação, neste caso descarregar uma aplicação. Assim, os motores de pesquisa devem considerar a intenção da interrogação ao gerar e estruturar a respetiva página de resultados. Este estudo investiga, por isso, de que forma a intenção da interrogação influencia a composição das interfaces das páginas de resultados dos motores de pesquisa.

Utilizando um conjunto de dados composto por mil interrogações de pesquisa previamente classificadas por intenção, foram geradas as respetivas páginas de resultados e guardado o seu código-fonte. Para garantir uma avaliação abrangente e consistente entre todas as plataformas, foi criado um catálogo de elementos de páginas de resultados e normalizada a sua classificação. Adicionalmente, para cada motor de pesquisa, foram extraídos os identificadores dos atributos HTML associados a cada elemento. Estes identificadores foram utilizados para detetar automaticamente os elementos nas páginas de resultados guardadas e registar o número de vezes que cada elemento apareceu em cada página.

Os resultados revelam que o Yahoo! apresenta a maior frequência de resultados patrocinados, o Yandex lidera nos resultados orgânicos e o Bing destaca-se como o motor de busca com maior diversidade de componentes na interface. A análise mostra também que tanto o Baidu como o Yandex apresentam uma variedade significativamente superior de elementos quando as interrogação são feitas nas suas línguas principais (chinês no caso do Baidu e russo no caso do Yandex). No que diz respeito à intenção da interrogação, os elementos informativos são mais prevalentes nas páginas de resultados informativas; as funcionalidades de refinamento de pesquisa e os recursos locais aparecem com maior frequência nas páginas de resultados navegacionais; e os botões de chamada para ação são mais proeminentes nas páginas de resultados transacionais.

Este trabalho contribui para o estudo das interfaces de recuperação de informação, sendo que os dados de investigação disponibilizados poderão constituir um recurso valioso para futuros estudos especializados nesta área.

Abstract

In today's information-rich environment, web search engines play a crucial role in providing users with the information they seek in the fastest and most intuitive way. Web search engine interfaces serve as the gateway through which this process occurs. The composition of these interfaces is the focus of this dissertation, which analyzes and compares the components of the results pages of the six leading search engines: Google, Bing, Yandex, Yahoo!, Baidu, and DuckDuckGo.

Users interact with search engines by formulating search queries that express their underlying information needs. These needs can be classified according to the intent. For instance, a query like *is richard gere dead* indicates an informational intent, where the user seeks factual information. In contrast, a query such as *bank of eastern oregon* suggests a navigational intent, where the goal is to access a specific website. Additionally, a query such as *vizio remote tv app* demonstrates a transactional intent, where the user intends to perform an action, in this case downloading an app. Consequently, search engines should consider the intent of the search query when generating and structuring their results page. This study, therefore, investigates how query intent influences the composition of search engine results page interfaces.

Using a dataset of one thousand search queries previously classified by query intent, we generated the corresponding results pages and saved their source code. To support a comprehensive and consistent evaluation across all platforms, we created a catalog of SERP elements and standardized their classification. Additionally, for every search engine, we extracted the identifiers from the HTML attributes associated with each element. These identifiers were used to automatically detect the elements in the saved results pages and record the number of times each element appeared on each page.

The findings reveal that Yahoo! exhibits the highest frequency of sponsored results, Yandex leads in organic results, and Bing stands out as the most diverse search engine in terms of interface components. Additionally, the analysis shows that both Baidu and Yandex present a significantly greater variety of elements when queries are submitted in their primary languages (Chinese for Baidu and Russian for Yandex). With respect to query intent, informational elements are more prevalent in informational results pages; search refinement and local features appear more frequently in navigational results pages; and call-to-action buttons are more prominent in transactional results pages.

This work contributes to the study field of information retrieval interfaces, and the research data provided may serve as a valuable resource for future specialized studies in this area.

UN Sustainable Development Goals

The Sustainable Development Goals (SDGs) are a set of 17 objectives established by the United Nations in 2015, each accompanied by specific targets to be achieved by 2030. These goals aim to address global challenges such as poverty, hunger, health, education, and climate change, among others.

This dissertation aligns with Goal 17: **"Partnerships for the Goals"**, specifically with Target 17.6: **"Knowledge sharing and cooperation for access to science, technology and innovation"**. By making this dissertation and all associated data outputs publicly available, the work contributes to facilitating knowledge exchange and supporting future research in this field.

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Adelaide

"Formosa e segura.
Venha quem vier
Finalmente livre
Sem nada a temer"

Ana Bacalhau

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List of Acronyms

ANOVA	Analysis of Variance
AI	Artificial Intelligence
ATM	Automated Teller Machine
CAPTCHA	Completely Automated Public Turing tests to tell Computers and Humans Apart
XML	Extensible Markup Language
FAQ	Frequently Asked Question
GUI	Graphical User Interface
HTML	Hypertext Markup Language
IR	Information Retrieval
IQE	Interactive Query Expansion
PDF	Portable Document Format
Q&A	Question and Answer
SEO	Search Engine Optimization
SERP	Search Engine Results Page
SUI	Search User Interface
SDG	Sustainable Development Goal
UML	Unified Modeling Language
URL	Uniform Resource Locator

Chapter 1

Introduction

In this opening chapter, we present an overview of the context and motivation underlying the research conducted in this thesis. We then define the problem addressed and delineate the objectives of the study through three key research questions. Finally, we provide a roadmap of the document's structure, summarizing the content and organization of the following chapters.

1.1 Context and Motivation

In December 2024, approximately 5.9 million Google searches were conducted every minute, making it the sixth most popular online activity [20]. These statistics highlight the near-universal role of web search engines in the digital environment, where they serve as essential tools for quickly and efficiently providing users with relevant information from the vast collection of online content.

The success of web search engines depends primarily on their ability to effectively meet users' needs by helping them satisfy their information needs to accomplish goals and complete tasks. Accordingly, search engines must be structured to support users' tasks in an efficient manner [42, 35]. With this in mind, search engine results pages (SERPs) have evolved significantly from the traditional "list of 10 blue links" to more sophisticated and diversified interfaces, offering users a variety of features designed to facilitate the search process. For example, a recent study [82] demonstrated that the presence of answer modules reduces the time users spend consulting the results list, as the information is often already presented within the SERP itself. This allows users to complete search tasks faster and with less effort.

In information seeking, search queries serve as the primary tool through which users express their information needs, offering valuable evidence of how the search process is conducted and providing insights into users' underlying goals. In the literature, some studies focus on the user search process and the query intent to evaluate the effectiveness of search engines in generating lists of relevant results. Others examine the composition and size of search engine interfaces,

analyzing their influence on user behaviour and comprehension of the presented results. However, few studies have investigated the search query itself as a factor influencing SERP interface composition.

Focusing on the world-leading web search engines, described in Section 3.1.1, we observed differences in SERP composition between search engines while identifying which elements are currently present on the results pages. To the best of our knowledge, no prior work has comprehensively compared how the world's most popular search engines differ regarding SERP composition. Such an analysis could serve as a foundation for future research, offering insights into the practices adopted by successful search engines and how their SERP interfaces vary.

Furthermore, recognizing that Baidu and Yandex dominate their respective markets, holding market shares of approximately 70% in China [12] and 72% in Russia [77], we observed that, particularly for Baidu, which operates solely in Chinese, the language of the search query appears to influence SERP composition. This observation suggests that language may significantly affect how search engines are tailored to their primary user.

1.2 Problem Statement and Objectives

While numerous studies have examined user behavior in relation to search engine interfaces, and others have investigated search queries and their attributes to enhance result relevance, there remains a lack of research on how the interfaces of leading web search engines are influenced by and vary according to different types of search queries. This dissertation aims to contribute to the existing literature by exploring the influence of the query intent on the composition of SERPs.

In addition, to the best of our knowledge, no prior study has systematically compared the SERP interfaces of the world's most widely used search engines. This research, therefore, aims to fill that gap by providing a comparative analysis, focusing on the frequency of interface components and the differences across search engines.

Finally, given the regional usage of Baidu and Yandex, this study also examines whether the language of the search query impacts the SERP composition on these search engines, offering further insight into language-specific variations.

The following research questions summarize the objectives described above:

RQ1: Does query intent influence the occurrence of elements in the SERPs?

RQ2: How does element occurrence differ among search engines?

RQ3: Does query language influence the SERP interface composition on Baidu and Yandex?

1.3 Document Structure

Following this introductory chapter, the document is organized into five additional chapters. Chapter 2 presents the background and state of the art, focusing on task-based information seeking and

reviewing how the features and elements of modern search engines are addressed in the existing literature. Chapter 3 describes the methodology used in this study. Chapter 4 introduces the SERP element catalog developed to standardize the classification of SERP elements across different search engines. Chapter 5 provides a comparative analysis of the SERP interface composition across query intent, search engine, and language. Finally, Chapter 6 summarizes the main conclusions of this work and traces potential directions for future research.

Chapter 2

Background and State of the Art

This chapter is organized into three sections. Section 2.1 provides context on task-based information seeking within the field of information retrieval and describes how search tasks and queries have been characterized in the literature. Section 2.2 traces the development of early search user interfaces and examines modern web search engine interfaces, focusing on how their elements are discussed in existing literature. Finally, Section 2.3 presents an overview of works that correlate search tasks and web search engine interfaces.

2.1 Task-based Information Seeking within Information Retrieval

Information retrieval (IR) is a field within computer science primarily concerned with facilitating users' access to information relevant to their interests. It involves managing the representation, storage, organization, and access of various information items, including documents, web pages, online catalogs, structured and semi-structured records, and multimedia objects, with the underlying goal of facilitating users' access to the information they seek [34].

From a research perspective, the field of information retrieval can be examined from two distinct yet complementary viewpoints: a computer-centered approach and a human-centered approach. In the computer-centered view, IR primarily involves constructing efficient indexes, processing user queries with high performance, and refining ranking algorithms to enhance search results. In contrast, the human-centered view of IR focuses on studying user behavior, understanding their information needs, and evaluating how this understanding influences the design and operation of retrieval systems, to which the concept of information seeking is central [34].

The classic concept of information seeking proposed by Sutcliffe and Ennis [67] is a cyclical process composed of four main activities: problem identification, articulation of information need(s), query formulation, and results evaluation. This process operates under the assumption that the user's information need remains static, and the search process involves iteratively refining a query until all and only the documents relevant to the original need are retrieved. However, more recent models highlight the dynamic nature of the search process, acknowledging that users learn and adapt as they interact with search results [34]. Consequently, modern search systems

go beyond optimizing query-document matching to adopting contextual approaches that support users in their tasks [69, 71]. In this context, the concept of *task* has become a fundamental factor in information seeking.

According to the Cambridge Dictionary, a *task* is "a piece of work to be done". In the context of information seeking, the concept of *task* has multiple interpretations as highlighted by Toms et al. [71]. Bystrom and Hansen [7] define it as "a particular item of work" with a defined beginning and end, characterized by specific requirements, a goal or result, and an underlying purpose. Gill and Hicks [22] describe a *task* as a set of goals to achieve, a series of instructions to follow, or a combination of both. Gwizdka and Spence[32] characterize a task as "a sequence of actions performed by the searcher in the process of looking for information to satisfy the current information need." Toms [69] emphasizes that tasks consist of concrete actions that vary in specificity and depend on goals and constraints, such as time. More specifically, in search tasks, the key activities include choosing a database, formulating a query, analyzing results, refining the search, and reiterating.

Tasks can be categorized as either prescriptive or non-prescriptive. **Prescriptive** tasks follow a defined sequence of actions with a clear starting and ending point, where there is a single best way to complete them, such as withdrawing cash from an ATM or finding a specific journal article. In contrast, **non-prescriptive** tasks allow for multiple acceptable approaches, requiring individuals to gather and assess information iteratively before reaching a satisfactory conclusion or abandoning the task. Examples include writing a thesis proposal or evaluating the relevance of a journal article. In the context of search tasks, actions like entering a query into a search box and submitting it are prescriptive, while selecting among results, refining the search, and iterating are non-prescriptive [69].

Studying search tasks is crucial in information seeking research, as they serve as the gateway to various studies in the field. They are used in two main ways: "as a vehicle to conduct the research" or "as the object of the research". In the first case, search tasks are employed to evaluate the effectiveness of a search system. In the second, different task characteristics are experimentally compared, such as assessing whether a system better supports fact-finding or problem-solving tasks [69].

In the search process, users start by articulating specific terms or phrases, denoted as *queries*, which are seen as an expression of the searcher's information need [70, 75]. Furthermore, they represent the fundamental method by which users have to perform search tasks, providing valuable information on how search tasks are executed [71]. A search task goal or query intent delineates the particular objectives a user intends to accomplish upon entering a query into an information retrieval system. Thus, the concepts of query intention and search task goal are in the literature classified in a similar way.

2.1.1 Categorization of Search Tasks and Queries

Following the approach where the task is the object of search, in the forthcoming paragraphs of this subsection, diverse forms of categorization of search tasks and queries are presented.

Toms et al. [71] divided search tasks into two categories: **task type** and **task structure**. Task type, specifically associated with the task goal, encompasses three distinct categories: **fact-finding**, involving the retrieval of specific information; **information gathering**, centered on accumulating comprehensive information about a particular subject; and **decision-making**, centered on choosing the most favorable option among multiple available alternatives. Furthermore, task structures can be categorized as either **parallel** or **hierarchical**. A parallel structure characterizes searches involving multiple concepts existing at equivalent levels within a conceptual hierarchy. For instance, an individual seeking a suitable car type based on various constraints like price and speed exemplifies a parallel task structure. Contrarily, a hierarchical task structure involves a more in-depth exploration of a singular topic. For example, an individual seeking the specific price of a particular car model on a precise date illustrates a hierarchical task structure.

Another similar approach of categorizing search tasks based on the task goal was made by Aula [3], who categorized the search tasks into **fact-finding**, **exploratory**, and **comprehensive**. As Navarro-Pietro et al. [49] also stated, fact-finding tasks aim to find specific information, and the source of information is not a concern for the user. Moreover, exploratory search tasks aim to get a general understanding of the search topic, and comprehensive tasks involve encountering as many documents as possible. Furthermore, in the same study, Aula [3] categorizes the search queries into **broad** and **precise**. A query is considered precise if it is aimed at quickly discovering relevant documents, avoiding the need for navigation, maximizing the retrieved documents' relevance, and where all the principal aspects of the task must be contained in the query terms. On the other hand, broad queries typically require users to browse the results or refine the query to locate an answer to their question or enhance the relevance of the retrieved documents. Additionally, if only half or less than half of the aspects of a multi-aspect task are included in the query, it is considered a broad query. To better understand this concept, Aula gives the following example: for the task "How much blood on average goes through the heart in one minute?" the query "heart structure" is considered a broad query.

Broder's taxonomy of web search [6] proposes a categorization for search queries based on the query intent. He divided them into three categories: **informational**, **navigational**, and **transactional**. Informational tasks aim to locate information believed to exist on the web. Moreover, transactional tasks aim to reach a website where further interaction is expected. Broder gives examples of activities like shopping, downloading files, and accessing specific databases. At last, navigational tasks focus on accessing particular websites that the user either visited previously or assumes existing.

In his study on web search strategies, Thatcher [68] categorized search tasks into **directed** search tasks and **general-purpose browsing** tasks. As the name indicates, a directed search task is a fact-finding information task. A general-purpose browsing task is an exploratory search to find all the information on a topic.

When studying the correlation between perceived task difficulty and its influence on information-searching interactions, Kim [42] classified search tasks into **factual**, **interpretive**, and **exploratory**. Factual tasks primarily involve seeking specific pieces of information. In contrast, interpretive

tasks, as exemplified by Kim, involve scenarios where users aim to acquire information on a general topic to address a specific concern or issue, such as educating someone about the consequences of smoking. Meanwhile, exploratory tasks encompass a broader objective where users seek general knowledge and information about a particular topic without a specific central point.

Kellar et al. [40] introduced a task taxonomy based on browser data from twenty-one participants, delineating three main categories: **information seeking**, **information exchange**, and **information maintenance**. Information seeking tasks consist of fact-finding, aimed at specific information acquisition; information gathering, involving multiple source collection; and browsing, focusing on exploratory searches. Information exchange tasks involve transactions or communications, while information maintenance tasks involve "housekeeping" tasks to maintain web resources.

After collecting several studies that categorize search tasks, Toms [69] concluded that many existing classifications essentially encapsulate identical concepts, even under varying labels or names. Consequently, she stated the existence of two core types of search tasks: those **focused on specific items or information objects** and those **oriented toward general topical search**.

Recently, Alexander et al. [1] introduced a revised taxonomy of user intent, building upon Broder's [6] well-known categorization of navigational, transactional, and informational queries. Additionally, they identified three subcategories within informational queries: **instrumental**, **factual**, and **abstain**. An instrumental query seeks guidance on what to do or accomplish something, while a factual query targets specific facts or information. Abstain queries refer to all informational queries not classified as factual or instrumental. This work led to the creation of ORCAS-I-gold, a dataset of English search queries labeled with query intent.

Table 2.1 resumes all the collected forms of categorization of search tasks and queries according to its goal and intent. In the "Examples" column, expressions in italics denote an example query for the corresponding task, while those not in italics serve as an example of the task itself.

2.2 Interfaces in Information Retrieval

Search User Interfaces (SUIs) act as the platforms through which users interact with search systems [46], and their goal is to assist searchers in comprehending and articulating their information needs, by helping them formulate queries, choose from available information sources, interpret search results, and monitor the progression of their search [34].

This section examines the composition of early search user interfaces and explores the constitution of modern interfaces, describing the composition of the SERPs.

2.2.1 Early Search User Interfaces

The roots of SUIs can be found in libraries, where books are typically indexed by a subject-oriented classification schema [46, 80]. The first IR systems, motivated by the development of the computers in the 1950s, could automatically perform what librarians do: retrieve a document or a

Table 2.1: Overview of Search Task Categorization

Authors	**Categories of search tasks**	**Definition**	**Examples**
Broder (2002)	informational	acquire some information assumed to be present on the web	*how many years does the earth have?*
	navigational	reach a particular website	*facebook*
	transactional	perform some web-mediated activity	*nike shoes*
Aula (2003)	fact-finding	find specific information	*who is Anna Frey?*
	exploratory	obtain a general idea of the search topic	*how does how a vpn work?*
	comprehensive	find as many documents as possible on a given topic	find information to make a literature review on information retrieval systems
Kim (2006)	factual	seek specific piece of information	find the name of the restaurant you went yesterday
	interpretive	acquire information on a general topic to address a specific concern or issue	find information to educate someone about the consequences of smoking
	exploratory	seek general knowledge and information about a particular topic without a specific central point	find information to learn about lead paint and housing
Kellar et al. (2006)	information seeking	include the fact-finding, information gathering and browsing subcategories	what is the weather like today? / how was the weather in the past month in Porto? / check the prices of houses for sale in Paranhos
	information exchange	involve transactions or communications	buy a new coat / send an email
	information maintenance	involve "housekeeping" tasks to maintain web resources	update an website content
Thatcher (2007)	directed	fact-finding	find Bill Clinton's mother's maiden name
	general-purpose	exploratory search to find all the information on a topic	find all information on the relationship between carbon monoxide and desertification
Toms et al. (2008)	fact-finding	retrieval of specific information	*how many countries exist on Europe?*
	decision-making	accumulating comprehensive information about a particular subject	decide who was the best impressionist artist
	information gathering	choosing the most favorable option among multiple available alternatives	identify some issues that need to be considered in deciding between more conventional methods of home heating and solar panels
Toms (2011)	specific items or information objects	find of specific information or known-item	*who is the prime minister of Canada?*
	general topical search	find information on a topic	*is solar energy more cost-effective than wind or tidal energy in the Portugal?*
Alexander et al. (2022)	navigational	reach a particular website	*bank of eastern oregon*
	transactional	locate a website with the goal to obtain some product	*vizio tv remote app*
	factual	locate specific facts or pieces of information	*is richard gere dead*
	instrumental	the aim is to find out what to do or how to do something	*cooking boneless chicken breasts*
	abstain	everything inside the informational category that is not classified as factual or instrumental	*best reads*

book. However, even driven by the model of a librarian, the systems were limited by technology and interaction methods, where only a limited set of known documents and books were available. Also, given the interface limitations and the influence of the physical model of a library and a librarian, some initial SUIs were modeled around conversations or dialogues [52]. An example of such systems was the DIALOG system, characterized by an interface structured as a question-answer negotiation process that involved an iterative exchange between the user and the system to refine a search query or retrieve more relevant information. It provided a command input feature designed to address specific information requirements and incorporated a browsing function, denoted as the "expand" function in the interface. Activation of this function showcased terms closely related alphabetically to the search term in the query. Its purpose was to help searchers achieve a more precise understanding of their information needs [46].

According to Liu [46], four different types of interface interaction styles appeared chronologically in the early years before modern search interfaces for web search engines emerged. These four interaction styles are command-language interaction, form fill-in interaction, menu-driven interaction, and direct manipulation interaction styles. The command-language interaction demanded searchers to formulate phrases or sentences within a specific structure of system files and commands, where systems described in the previous paragraph are included.

In form fill-in interaction, users had the ability to interact with the system by entering simple statements. The THOMAS system was one of the first examples that included this type of interaction in its user interface. It directly involved users through text and centered user-system interaction on feedback.

The menu-driven interaction style provided selections from multiple but limited number of commands, being more appropriate for novice searchers. An example of this style is the RABBIT system [72].

A graphical user interface (GUI) is a type of user interface that enables users to interact with electronic devices using graphic icons and visual cues, including secondary notation [78]. Its appearance in the late 1980s significantly improved the interactivity of search interfaces since that period, with the direct manipulation style as a consequence of it. In this style, users can interact with virtual objects or elements on the screen [46]. It allows users to perform actions (such as selecting, dragging, dropping) visibly and immediately, simulating real-world physical actions. An illustration of this approach is exemplified by Pejtersen's fiction retrieval system, named BookHouse [57]. It operates on an icon-based interface specifically tailored to assist casual, inexperienced users in their exploration for fiction books.

2.2.2 Web Search Engine Interfaces

Search Engine Results Pages (SERPs) are a crucial element of web search engines, exhibiting retrieved results as vertical lists that initially began as simple "10 blue links" pages. While search engines have consistently presented results in a relatively uniform format, SERPs have evolved, incorporating additional information [55].

Table 2.2: Description of Input Features

Input features	**Descriptions**
Auto Complete [80, 75, 34]	Predicts and suggests possible search queries or completions as a user begins typing into a search bar or query field. It helps users formulate useful queries that are more likely to produce valuable results.
Operators and Advanced Keywords [80]	They are special characters, phrases, or commands used to refine and customize search queries and assist in guiding users toward formulating more specific queries within the search box.
Query-by-Example [80]	Search feature that allows users to initiate a search by providing an example or template of the desired information, being the Similar Images' button in Google's image search an example.

This subsection describes the structure of the SERPs and the interaction features present on them, aligning with Wilson's classification [80] in his study on modern search user interfaces. Wilson categorized search features into four groups: input, control, informational, and personalizable features.

2.2.2.1 Input features

The main input component in search user interfaces is the familiar "small white text field to spill their search terms into," also known as the search box [80]. While typically considered as an input feature, it can also be classified as an informational feature, given its function in informing users what is currently being searched for. Additionally, it serves as a control feature due to its constant visibility, an aspect adopted by Google in 2019 [54], which allows users to refine or modify their queries at any time. Other input features are summarised in Table 2.2.

2.2.2.2 Control features

Control features hold particular importance as they enable and regulate how the search progresses, improving the interactive experience. Subsequent paragraphs will delineate and explore the various control features within this context.

A primary method of ongoing interaction with a query involves modifying and refining a search, known as Interactive Query Expansion (IQE) [80, 75]. IQE aims to propose supplementary or alternative words to the searcher, aiming later to assist the system in delivering more precise results. When a user inputs a particular query, SUIs frequently provide a set of extensions to that query, aiming to refine and specify the user's search intent [80]. An example of this is the Related Searches feature presented by Google, appearing at the bottom of the SERP [54], possibly assuming that searchers might intend to adjust their query only if they do not find what they seek within the initial ten results [80]. Figure 2.1 illustrates an example of this feature on Google.

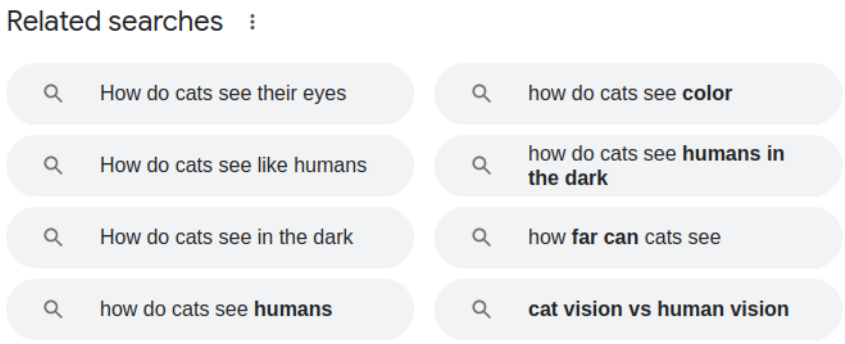


Figure 2.1: Related Searches feature of Google

A crucial control feature within modern SUIs involve spelling corrections made by the system to the formulated search query. Frequently, users misspell queries, prompting SUIs to attempt to rectify these errors [80, 75, 34]. These systems inform users about the auto-correction and provide an option to revert to the original version of the query, as shown in Figure 2.2.

Empowering users to maintain control over their search involves granting them the authority to determine the order of search results. Web search engines usually arrange results based on their relevance to a query and allow searchers to filter them accordingly. However, in specialized domains, it's typical to offer the option of altering the results' order based on factors like price, allowing users to arrange them from most expensive to least expensive or vice versa [80].

Another essential feature in the control features of SUIs that is often provided is filtering the results. Google, for example, enables searchers to filter results into various groups, including results containing images, news, videos, and numerous other categories [80], as shown in Figure 2.3. This reduces the space for users to browse, aligning with research suggesting that individuals often feel more satisfied when making decisions within a smaller set of options [56].

Search systems deliver items, frequently in ordered lists, to be examined by users. The item selection is also another control feature present in SUIs. White [75] identified two click types: hyperlink and non-hyperlink clicks. Hyperlink clicks encompass interactions with result items or other search engine functionalities, while non-hyperlink clicks refer to interactions with non-active interface components. Non-hyperlink clicks may be intentional, such as to recover focus on a document, or accidental, such as when expecting an interface item to be clickable when it is

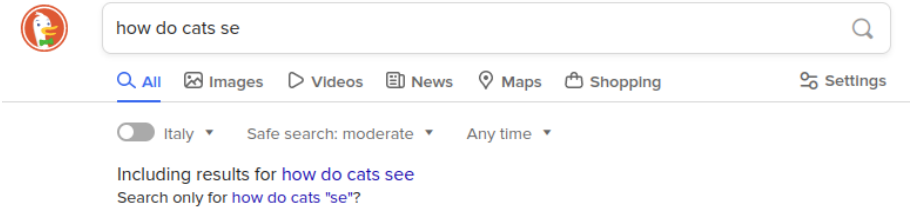


Figure 2.2: Automatic spelling correction on DuckDuckGo

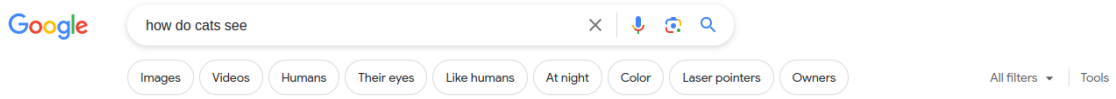


Figure 2.3: Google's search filters

not. Additionally, within hyperlink clicks, White [75] differentiated between result and advertising clicks, leading users to content linked from the results page, and functional clicks prompting user actions, such as selecting recommended related searches or retrieving subsequent result pages.

2.2.2.3 Informational features

Informational features primarily focus on the structuring and presentation of search results. The standard results list is a fundamental informational feature within SUIs [80]. Despite their apparent simplicity, how individual results are displayed in a SERP holds significance and is an active area of research and experiment [54].

The listed results can be categorized into organic or sponsored results. Organic results, in turn, can be further classified as regular or enriched [18, 54]. Regular results typically consist of a title, a snippet extracted from the content, and an associated URL [80, 34]. Enriched results, however, are modified versions of regular results, offering additional elements below the title, snippet, and URL, providing users with supplementary information [54]. These elements, also termed "quicklinks", aim to efficiently guide users directly to the desired content, leading to increased visibility and click-through rates [9]. Figures 2.4 and 2.5 illustrate a regular and an enriched result, respectively.

Sponsored results, on the other hand, encompass textual ads or shopping ads. As exemplified on Figure 2.6, textual ads are concise advertisements displayed alongside organic results. These results underline commercial intent, incorporating relevance with revenue generation [18]. Meanwhile, shopping ads include product images, details, and prices triggered by commercial queries, usually occupying prominent positions at the top of the search results [54], as observed in Figure 4.5.

More informational features are summarised in Table 2.3. Some of these features (images, featured snippets, top stories and local pack) appear in the SERPs due to a technique known as "blended" or "universal search", where the search system directly identifies that the information need is satisfied by placing them on the results list [34].

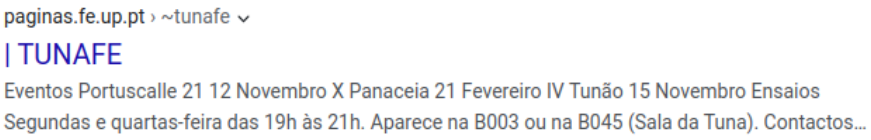


Figure 2.4: Regular result on Yahoo!

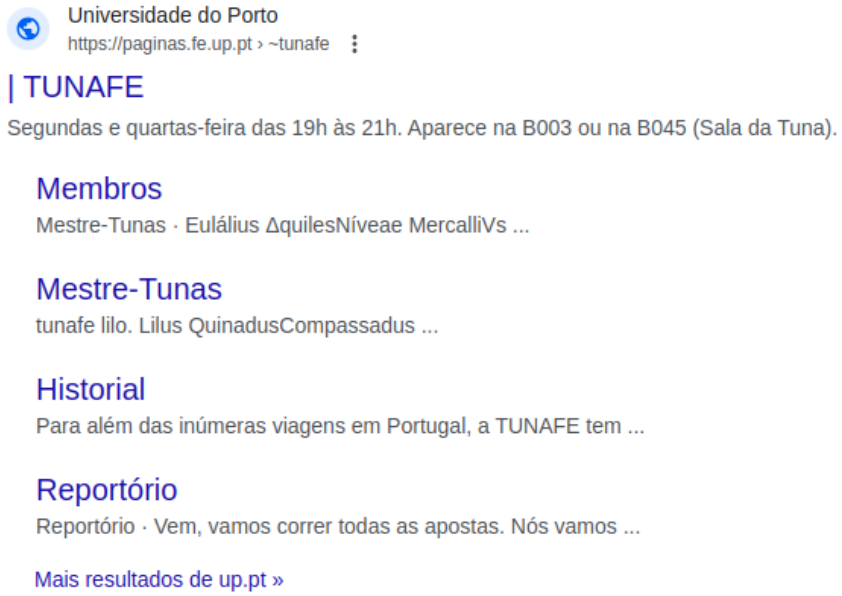


Figure 2.5: Enriched result on Google



Figure 2.6: Textual ad on Microsoft Bing

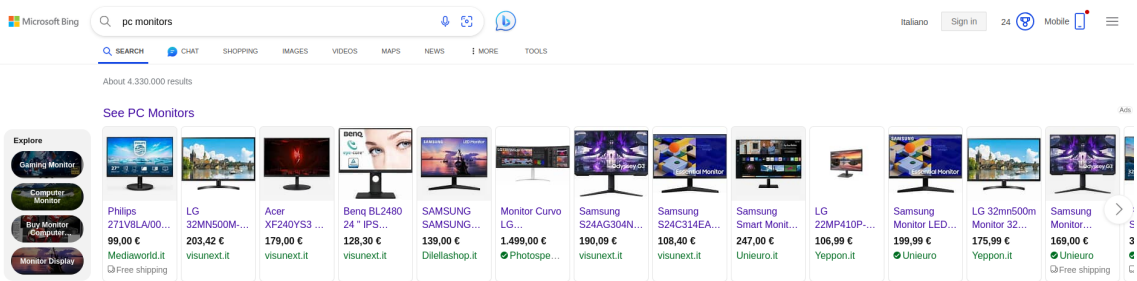


Figure 2.7: Shopping ads on Microsoft Bing

Table 2.3: Description of informational features

Informational features	**Description**
Images [80] or Image Pack [61]	A collection of images, illustrated on Figure 4.16, sourced from various sources, particularly triggered in searches where visual content holds significant value.
Guiding Numbers [80]	Incorporating numbers can help users. For example, Google result pages provides the number of results found, providing insight into the size of the space the user is exploring.
Zero-Click Information [80] or Featured Snippets [73]	Search engine elements that directly provide relevant information on the SERP without requiring the user to click through to an external website. This feature aims to quickly fulfill user queries by displaying concise, immediate answers such as definitions, facts, or summaries, reducing the need for additional clicks for basic information retrieval. This feature is shown on Figure 4.9.
Signposting [80]	It assists users by offering clear and structured markers within search interfaces, varying from headings to labels or visual indicators. They allow users to navigate the information hierarchy more effectively, making it easier to locate pertinent content within search results or interfaces.
Pagination [80]	Practice of dividing search results into multiple pages, typically displaying a limited number of items or results per page. This feature offers feedback on the progress searchers have made through the results and indicates how much further they can explore.
Social Information [80]	This feature incorporates social aspects like user profiles, connections, preferences, and shared content to improve the relevance and context of search results. For example, the reviews and ratings on products provide information that affects users' search experience.
Knowledge Panel [61]	A dynamic feature that delivers direct information in multiple formats within a unified panel, shown on Figure 4.14, directing users to related content.
Top stories [61]	A set of three or more cards presenting trending topics or breaking news that are deemed relevant to a search query, as is illustrated on Figure 4.21.
Local Pack [61]	Map usually placed at the top of the SERP when the search query suggests finding a place. This feature is exemplified on Figure 4.15.

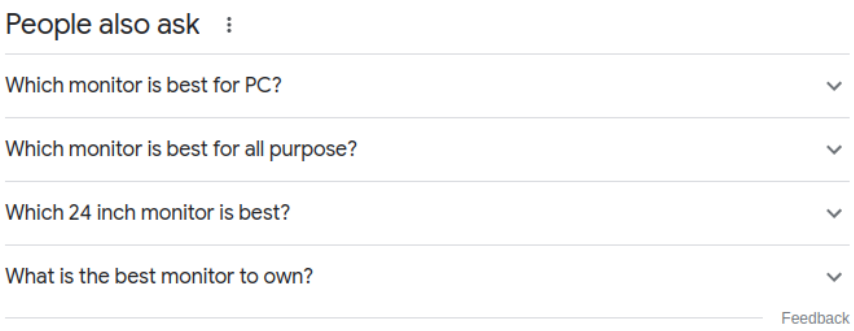


Figure 2.8: People also ask section on Google

2.2.2.4 Personalisable features

The last category of SUI features to address is personalisable features. These features customize the search experience based on the searcher's activities or the activities of other individuals in their personal social network. Typically, these features influence the content shown in informational features or even how this information is presented.

An illustration of this type of feature is the inclusion of a list showcasing recent searches and recently viewed results [80]. This functionality enables users to revisit a prior SERP they found helpful.

Another example of a SERP element that uses search data to improve the search experience is the "People Also Ask" section [61] illustrated on Figure 2.8, that allow to visit a related result if they could not find a better alternative [80].

2.3 Related Work on the Influence of Search Tasks on Web Search Engine Interfaces

Numerous works associate the composition and size of the web search engine interfaces with the user's behavior and comprehension of the results [87, 45, 39, 41, 82, 86, 38]. Other works focus on the user search process and evaluate the effectiveness of search engines in generating useful result lists [10, 2, 74, 11]. This section, however, provides an overview of the relevant literature that specifically explores the relationship between SERP interface composition and the influence of different search tasks and queries on it.

Höchstötter and Lewandowski [37] conducted an analysis of the composition of the SERPs, counting the occurrences of various elements. To the best of our knowledge, this was the first study to systematically examine the whole structure of the SERP. The authors analyzed the retrieved results, sources and types (e.g., organic results, advertisements). However, at the time of their study, advanced SERP features were not yet widely implemented. The authors observed that some elements of SERPs depend on the search query, such as activating spelling correction features in

response to misspellings. However, they did not investigate the relationship between the intent of the query and the SERP elements.

Cutrell and Guan [17] used eye-tracking methodologies to investigate the impact of alterations in the presentation of search results that affect navigational and informational tasks. Their findings indicated that adding information within the contextual snippet improved the performance of informational tasks. However, this addition had a negative effect on the performance of navigational tasks.

Huurdeman et al. [36] explored the usefulness of search interface features across different macro-level stages of complex search tasks, namely the pre-focus, focus formulation, and post-focus stages. Using Wilson's framework [80], the authors found that informational features remain consistently valuable throughout all stages of the search process. In contrast, the usefulness of input and control features declines after the pre-focus stage, while personalizable features become increasingly relevant following the pre-focus stage.

Oliveira and Teixeira Lopes [54, 55] extensively examined the evolution of search engine results pages, comprehensively analyzing each SERP feature and its evolution within Google and Bing over time. However, despite their detailed investigation, they acknowledged their inability to analyze the variation in SERP elements based on the query type.

Based on our research, this is a short set of related work that provides strong motivation to develop this study, aiming to complement and update the existing literature.

Chapter 3

Methodology

To analyze the user interface variations of the SERP across different types of search queries, we followed the methodology summarized in Figure 3.1.

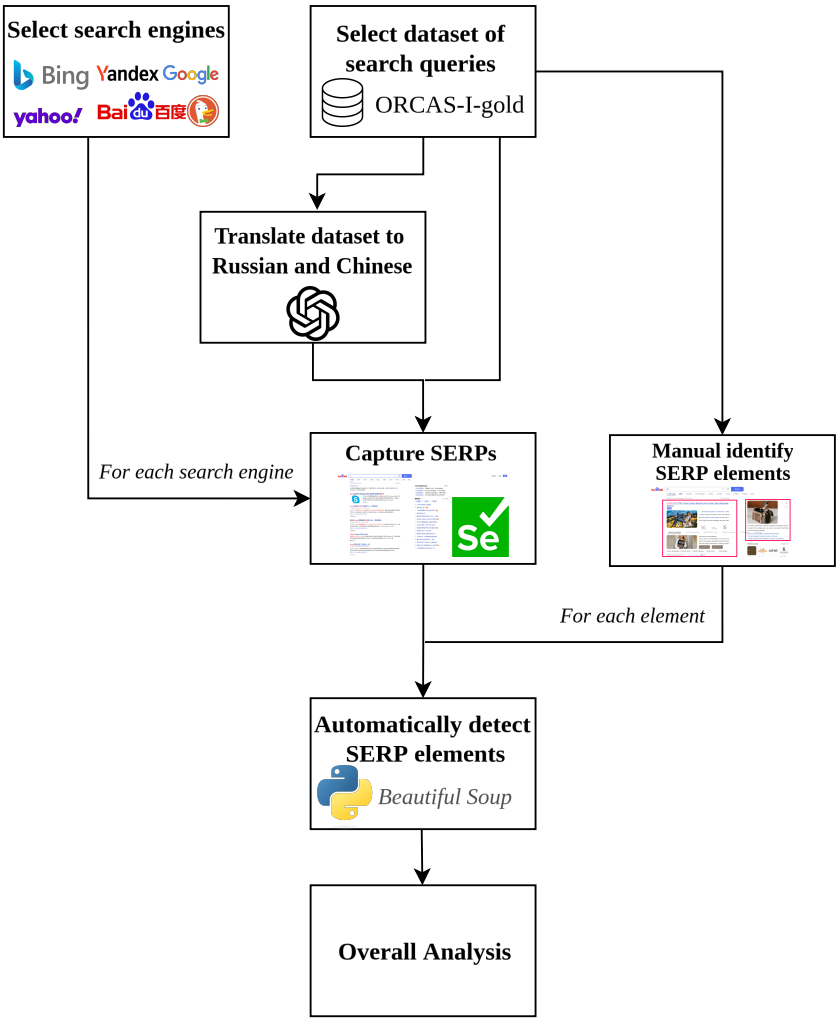


Figure 3.1: Methodology summary

The process begins with selecting the SERPs to be analyzed, as described in Section 3.1. Once the SERPs were selected, the next phase involved determining the methodology for their analysis, which is detailed in Section 3.2.

3.1 What SERP Were Used?

Since generating a results page requires both a search engine and a search query, the first phase of this work focused on **selecting the search engines** to be analyzed and **choosing an appropriate dataset of search queries**. Following this, **all the results pages of each search query were systematically captured** across the selected search engines, and their respective source code was collected for subsequent analysis. This procedure was conducted exclusively in desktop mode and followed a methodology similar to that used in previous studies [54, 55]. The following sections provide a more detailed explanation of the methodology and its implementation.

3.1.1 Selected Search Engines

In February 2025, **Google** was the most popular search engine in the world, with a market share of 89.74% [13]. Following Google, the second most popular search engine is **Microsoft Bing**, which holds a market share of 3.97%. Other major search engines included **Yandex** and **Yahoo!**, each with a share of 2.34%, while **Baidu** and **DuckDuckGo** have 0.81% and 0.69%, respectively. Other search engines also rank among the top 10 most used worldwide, including Ask.com, Ecosia, AOL.com, and the Internet Archive. However, each has a market share of less than 0.5% [13].

Google processes more than 8.5 billion searches per day, with an index containing hundreds of terabytes of information [13] and its market share consistently exceeding 90% for more than a decade. Microsoft Bing's market share is constantly low compared to Google's, even though Bing is the default search engine on Windows. In 2023, Bing released Bing Chat, an AI chatbot, before Google, but its market presence remained relatively low. Furthermore, Yandex is the leading search engine in Russia, having approximately 65% of the local market [13]. Similarly, Baidu dominates China's search market and is often called the "Google of China", and although it is accessible worldwide, it is only available in Chinese. Yahoo! remains a prominent player, serving as the default search engine for Firefox users in the United States since 2014 [13]. Regarding DuckDuckGo, it stands out for its clean interface, free of excessive ads and user tracking, in accordance with its commitment to user privacy [13].

Given the presented statistics and factors, such as the regional user distribution, we selected the six most widely used global search engines for our analysis to ensure representative and meaningful data in the results.

3.1.2 Dataset

The selected dataset was the **ORCAS-I-gold** dataset [43], a set of 1,000 English search queries randomly selected from the ORCAS dataset. The ORCAS dataset [16], part of the MS MARCO

datasets (Microsoft), was designed for non-commercial research. It is composed of 18.8 million clicked query-URL pairs and 10.4 million unique search queries, aggregated from a 26-month Bing log subsample up to January 2020. Additionally, this dataset includes only search queries from English-speaking located in the United States.

In ORCAS-I-gold, each search query was manually classified into specific intent categories by two information retrieval specialists. This dataset was primarily chosen for its manual classification process, which ensures a higher level of precision in intent categorization. Additional reasons for its selection include its recent publication, the use of a language familiar to the authors of the current study, and for being an extension of the "widely used classification of queries" proposed by Broder.

In ORCAS-I-gold, search queries are classified into five intent categories: **instrumental, factual, abstain, navigational, and transactional**, as outlined in Section 2.1.1. In addition, each search query is accompanied by the URL of the website visited within the search session and its query ID. This dataset was compiled to serve as the test set for creating the ORCAS-I-2M and ORCAS-I-18M datasets, which are expanded versions of the ORCAS dataset by incorporating user intent annotations through weak supervision techniques [43].

Although we selected the ORCAS-I-gold dataset, we quickly identified potential limitations in using it as-is. As previously mentioned, Baidu is a Chinese-language search engine, while all ORCAS-I-gold search queries are in English. Thus, we **translated the search queries into simplified Chinese** using ChatGPT-4o to compare SERP interfaces based on language. A similar process was applied to Yandex, where the search queries were instead **translated into Russian**. To ensure the accuracy of these translations, a sample was reviewed by native speakers of Chinese and Russian, who confirmed the adequacy and fidelity of the translations. This approach allowed us to analyze not only SERP differences across search engines but also variations between SERP with English search queries and those in the search engine's predominant language.

In summary, the final dataset consists of a total of 1,000 English search queries, along with their translations into simplified Chinese and Russian.

3.1.3 How Have We Captured The SERP?

After selecting the search engines and dataset, the next step involved capturing the SERP. This process was carried out using Python and Selenium WebDriver in combination with the Mozilla Firefox browser. Each results page was systematically generated, and its corresponding HTML code was automatically stored for further analysis. To ensure that previous search queries did not influence the results page, each search query was executed in a new Firefox session. This process, summarized in Figure 3.2 was repeated for all six selected search engines, with variations in the approach depending on the search engine. The data collection took place between the 7th and 25th of November 2024 in the city of Porto.

For Google, Microsoft Bing, Yahoo!, and DuckDuckGo, the SERPs were generated by directly accessing the results page of each search query. This was achieved by encoding the search

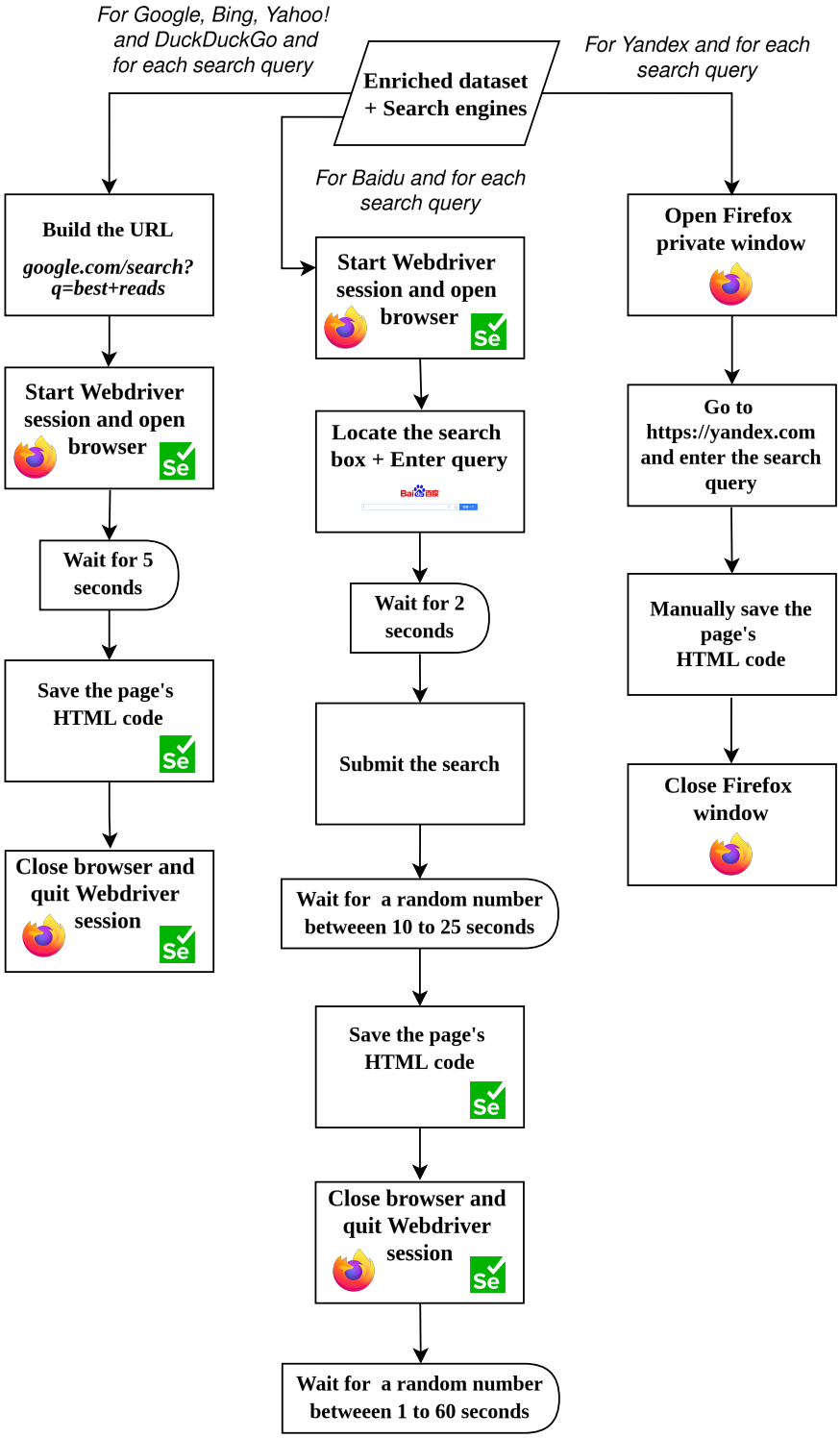


Figure 3.2: Summary of the SERP Capturing Process

query and inserting it into the appropriate search query parameter of the URL, following the specifications of each search engine. For example, for the search query *best reads* on Google, the WebDriver directly accessed the URL *https://www.google.com/search?q=best+reads*. Following this, the system waited five seconds to allow the page to load completely, after which the HTML content was saved, and the WebDriver session was terminated.

In the case of Baidu, the process described above faced significant challenges due to the presence of Completely Automated Public Turing tests to tell Computers and Humans Apart (CAPTCHAs). Therefore, the scraping methodology was adjusted to mitigate this issue and simulate human-like behaviour more effectively. Instead of directly opening the browser in the results page of each search query, the WebDriver first located the search box, entered the search query, and then submitted the search. Furthermore, delays were introduced to reduce the possibility of triggering CAPTCHA mechanisms. A two-second wait was implemented after entering the search query and before submitting it, followed by a randomly generated delay ranging from ten to twenty-five seconds after the results page was generated. Additionally, before proceeding to the next iteration and launching a new WebDriver session, the program introduced an additional randomized wait period, varying between one and sixty seconds.

For Yandex, CAPTCHA challenges persisted, and unlike Baidu, no automated workaround was found. Consequently, automating the SERP extraction for this search engine was not viable. Instead, the data collection process was conducted manually following a similar procedure to the automated approach. Each search query was executed in a private Firefox window, where the query was entered manually, and the resulting HTML code was subsequently saved. This manual procedure was applied to all 1,000 English search queries as well as the 1,000 Russian search queries.

At the end of this process, a total of 7,999 SERPs were collected. This number includes 6,000 SERPs obtained from the 1,000 English search queries across the six selected search engines, 1,000 SERPs collected from the Russian search queries, and 999 SERPs obtained from the Chinese search queries. The discrepancy in Baidu is due to the fact that the search queries *currency convertor* and *currency converters* were both translated into the same Chinese search query (货币转换器), resulting in one unique search query for this language.

3.2 How Have We Analyzed The SERP?

The next phase of the study involved determining how to analyze the captured SERPs. Initially, we **identified the SERP elements** present in the results pages, a process detailed in Section 3.2.1. Then, following a methodology similar to that proposed by Oliveira and Teixeira [54, 55], we developed a program to **automatically detect these elements** across all collected SERP, as described in Section 3.2.2.

3.2.1 Identification of SERP Elements

As no comprehensive catalog of SERP elements existed for all six search engines under analysis, it was necessary to create one to ensure a complete evaluation across all platforms and standardize the identification and classification of SERP elements, facilitating a comparative analysis of their presence. Figure 3.3 provides an overview of the process used to develop this catalog, which is further detailed in the following paragraphs.

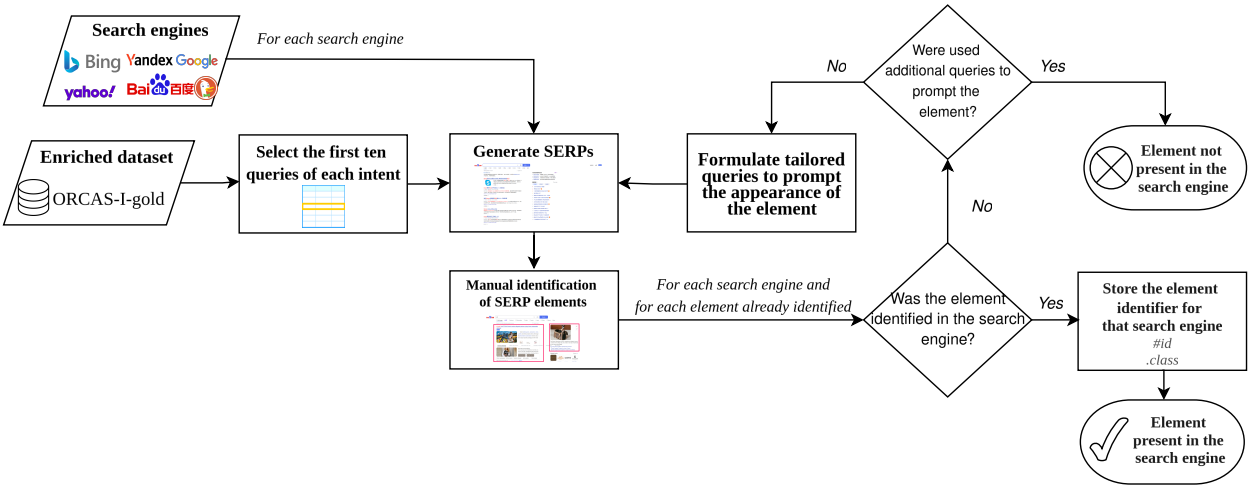


Figure 3.3: Summary of the SERP Elements Identification Process

Given the substantial volume of nearly 8,000 collected SERPs, manually analyzing every instance was impractical. Therefore, the identification process began by examining the SERP elements present in the results pages for the first ten search queries of each intent category across all six search engines.

During the analysis, we observed that certain elements present in one search engine could also appear in others if additional, more targeted search queries were used. For example, the Advertise Here ad, described in Section 4.3.9, was initially identified on Baidu's results page for the query *custom gifts*. Subsequently, we discovered that a similar element appears on DuckDuckGo when using a more specific query, *how to advertise on duckduckgo*, as illustrated in Figure 4.30. Thus, we formulated additional search queries for each identified element, particularly for those not yet observed in a given search engine, to intentionally trigger their appearance. If, after using these targeted queries, an element still did not appear in a particular search engine, we concluded that the element was not present in that engine. This approach ensured a more complete analysis of SERP elements across all platforms.

To standardize the naming of the identified SERP elements, we consulted existing literature on the subject, search engine optimization (SEO) websites and official search engine documentation, which provided existing terminology for most of the elements. During this process, we also identified further SERP elements that had been previously documented by these sources, which we subsequently incorporated into our analysis.

Chapter 4 provides a detailed description of all the elements identified during this analysis.

3.2.2 Automated Detection of SERP Elements

During the manual identification of SERP elements, an identifier of each element was collected by examining the source code of the captured pages. These identifiers consisted of HTML attributes such as classes, IDs, tags, and other relevant attributes that uniquely distinguished each SERP element. This enabled the automatic identification of the SERP elements across the captured SERPs. All identifiers encountered are listed in Appendix A. It is still important to note that for each search engine an element can have multiple identifiers due to factors like its position on the page. However, they are unique, i.e., an identifier always corresponds to just one element.

The automated detection process involved iterating through all captured SERPs and identifying occurrences of the previously cataloged elements. To achieve this, we used Beautiful Soup, a Python library designed for parsing HTML and XML documents. The program analyzed each SERP, counted the occurrences of each element in it, and stored these values for further analysis.

To systematically record the frequency of each element in a SERP, we built a relational database[1], whose UML diagram is shown in Figure 3.4. The main table contains entries linking each SERP element and its identifier to a specific results page and storing the number of times each element was identified on that specific results page. To optimize storage efficiency, additional tables were created to manage IDs for elements, identifiers, search engines and intent categories. These tables, allowed us to store only numerical references in the main results table, reducing its size. Table 3.1 demonstrates an example of one row of the main table. In this entry, the element with ID *0* (corresponding to a regular result) was identified using the identifier ID *106* in the search engine *5* (corresponding to Yandex) in Russian. The search query ID associated with this SERP is *8081610*, and its intent is *4*, corresponding to the *transactional* intent. The count for this element on the given SERP was ten occurrences.

Table 3.1: Example of a row from the main table

ElementID	IdentifierID	Search EngineID	Language	IntentionID	QueryID	NumberOf Occurrences
0	106	5	ru	4	8081610	10

[1] Available at: https://bit.ly/3ThZVsz

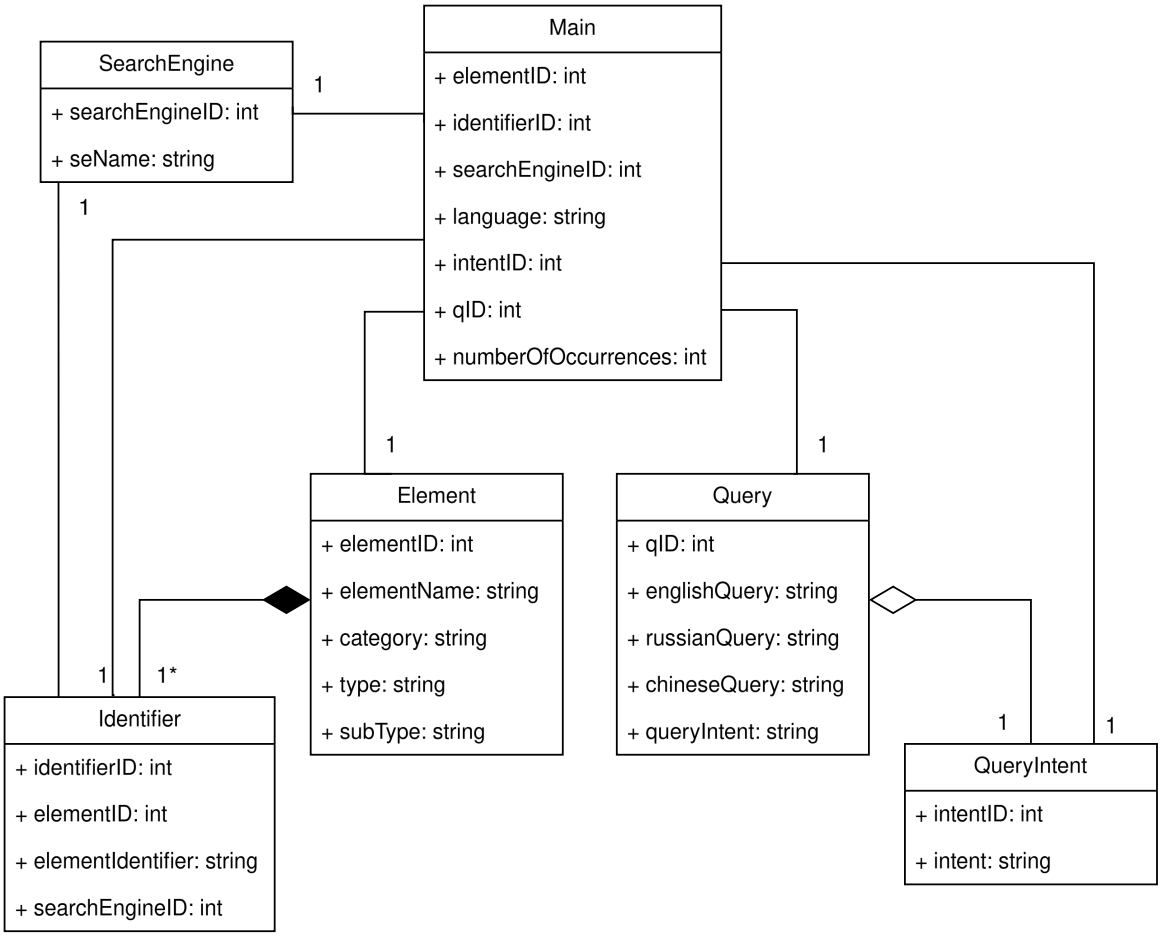


Figure 3.4: Relational Database UML Diagram

Chapter 4

SERP Elements Catalog

This chapter classifies the SERP elements observed during the manual identification phase into three main categories: **organic results**, **sponsored results**, and **features**. Figures 4.1 and 4.2 outline the subcategories within each main category.

The following sections describe each element in detail, with illustrative images to provide visual examples. In some cases, red squares are used within the images to highlight the precise location of the element. When sources are cited, the names of the elements follow the terminology used in those references. In the other cases, we assigned them names. The search engines in which each element was observed are also specified.

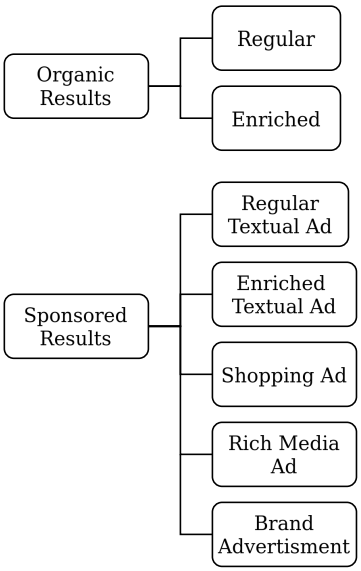


Figure 4.1: Categorization of organic and sponsored SERP elements

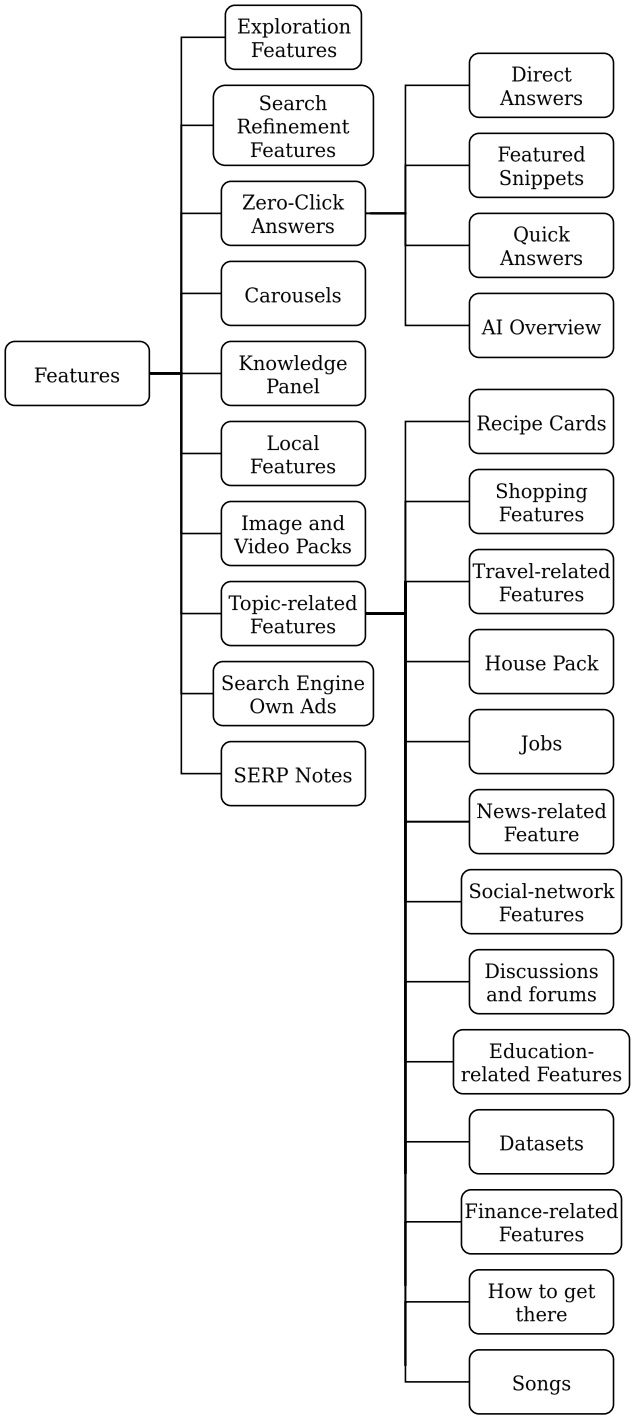


Figure 4.2: Categorization of feature SERP elements

4.1 Organic Results

Organic results are unpaid textual listings ranked by the search engine's algorithms based on their relevance to the search query [18]. These results can be of two types: **regular** or **enriched** [54].

4.1.1 Regular Results

Regular results are the elemental structure of an organic result. They are composed of a clickable title, a small website icon, a brief description or snippet, and the URL of the website, as illustrated in Figure 4.3. The URL can appear in two formats: either the full URL or, more commonly, a combination of the domain name and a breadcrumb trail, which indicates the page's position within the website's hierarchy. Regular results are observed in the six search engines studied, with some variations in the positioning of each component.

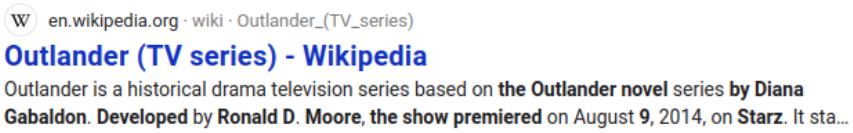


Figure 4.3: Yahoo!'s organic regular result

4.1.2 Enriched Results

Enriched results, also known as enhanced results, surpass the standard format of regular results by including additional information or features [54, 61]. These elements provide more context, enhancing the user's ability to quickly assess the relevance and visibility of a result, leading to a higher click rate [33, 9].

Table 4.1 summarizes the elements that enhance organic results into enriched results. Each element is accompanied by a description, an example image, and an indication of the search engines where the element is present.

Table 4.1: Organic enriched results' elements

Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Image thumbnail [58]	An website's image that can appear alongside the snippet.	X	X		X		X	
Video thumbnail [58]	A video from the website that can appear alongside the snippet.	X	X		X		X	

Table 4.1: Organic enriched results' elements

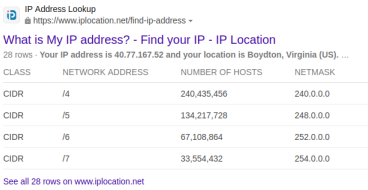
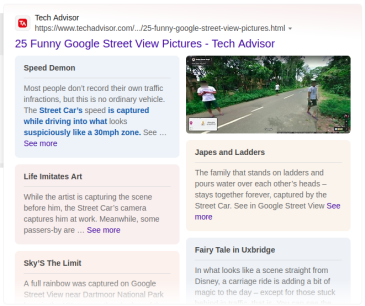
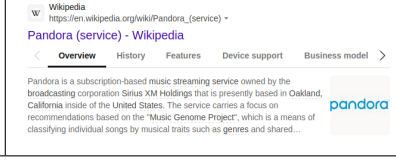
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Image pack	A set of images from the website that can appear before of after the snippet.		X			X		
Translate this page link	A clickable link to translate the web-page to the browser's language.				X		X	
Unordered list snippet	The snippet is presented using bullet points.		X			X	X	
Numbered list snippet [65]	The snippet appears as a numbered list.		X					
Table snippet	The snippet is a table.		X			X		
Cards snippet	The snippet is a set of text cards that organize the information on topics.		X			X		
Organic tab snippet [81]	The snippet is divided into the different sections of the website.		X			X		

Table 4.1: Organic enriched results' elements

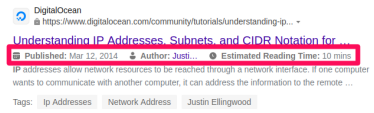
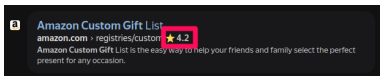
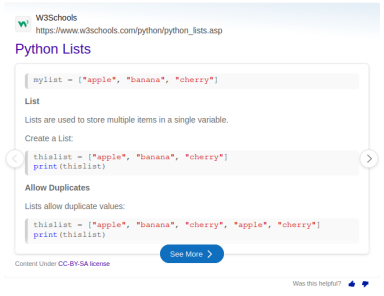
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Structured Snippet [58]	It appears in search results when a website includes schema markup data. The types of Structured Snippets that can appear include How-to, Event, FAQ, Recipe, Video, Article, Product, and many more.	X	X		X	X	X	
Rating stars [61]	Displays the average rating of a product, service, or business based on user reviews. This rating is retrieved from the website's structured data.	X	X		X		X	
Search tag filters [62]	Keywords associated with the result that allow to filter the results based on them.		X					
Widget snippet	The snippet's format can adopt different, topic-specific interfaces beyond the traditional ones discussed so far. These formats enhance accessibility by presenting information in a more structured and user-friendly way, making it easier for users to get key details from the webpage quickly.	X	X	X				

Table 4.1: Organic enriched results' elements

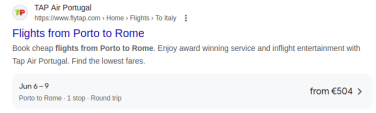
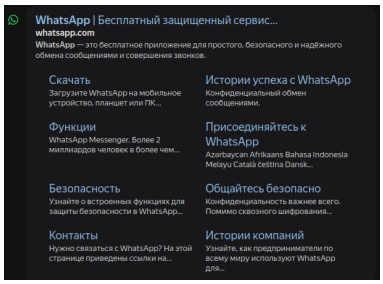
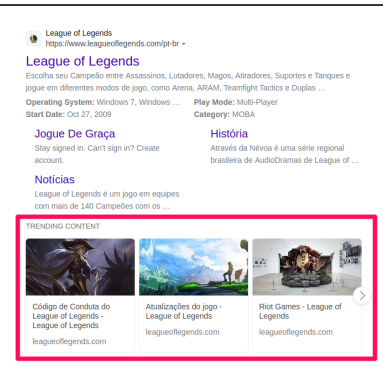
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Extra widget	Apart from the text snippet, a widget is presented.	X	X		X		X	
Sitelinks [61] or Quick-links [54]	Links from the same domain are presented together under the text result.	X	X	X	X	X	X	
Card sitelinks	Sitelinks whose format is a box with an image and a title. Additional information like prices or timestamps can also be included.		X		X	X	X	
Trending content cards	Card sitelinks that are presented as trending content.		X					

Table 4.1: Organic enriched results' elements

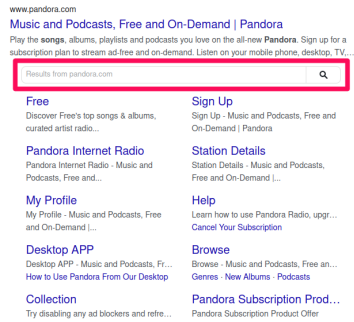
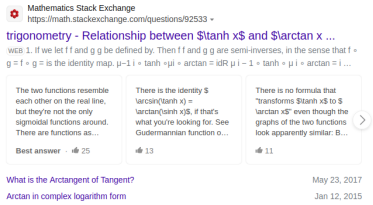
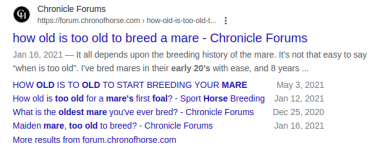
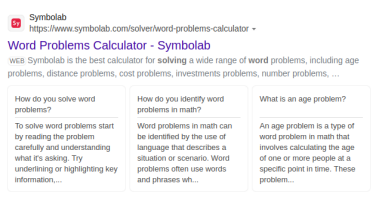
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Search box [61]	Box where users can search for content present on the website domain.		X		X	X		
PDF indicator	An icon that indicates that the webpage leads to a pdf file.	X	X	X	X		X	
Byline date [24]	Temporal information of when the web page was updated or published.	X	X	X	X	X	X	
Q&A [26]	The top-ranked responses to answer a question are presented. In addition, links to related questions can appear.	X	X		X	X	X	
Forum multi-results [60]	Links to online discussions from forum-style websites.	X			X			
FAQ [60]	List of frequently asked question and their answers.	X	X		X			

Table 4.1: Organic enriched results' elements

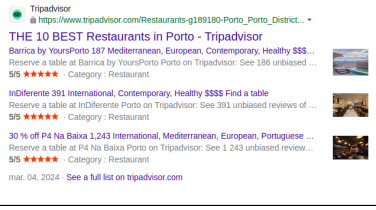
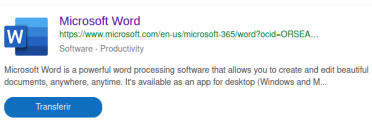
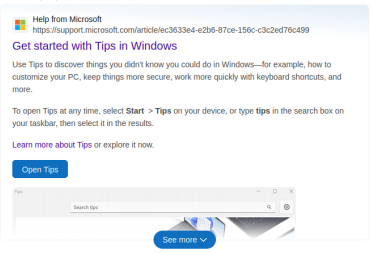
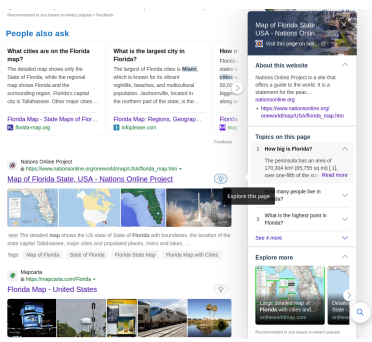
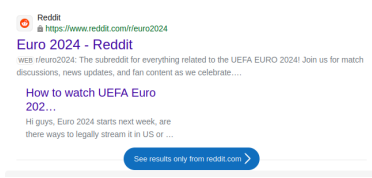
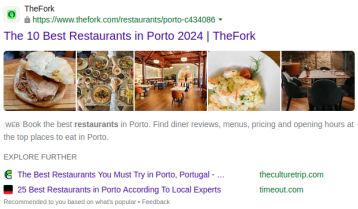
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
List of products or places as snippet	Links to products or places and their ratings.	X	X					
Official site tag [44]	An icon that indicates that the website is verified as an official site.	X					X	
Call to action button [48]	A button that allows the user to perform an action from the SERP.	X	X				X	
Outstanding background	The background of the result is different from the SERP's background colour or has an emboss that the other results do not have.		X					
Explore this page button	A button that, when hovered, is a section that sums up the webpage's content.		X					
Results from the same domain	Button that when clicked opens a new results page where the results are all from the same domain.	X	X		X			

Table 4.1: Organic enriched results' elements

Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Game rich snippet [44]	It can include a download link, a "click to claim benefits" link, different guides and video links related to the game.		X					
Book rich snippet [44]	Apart from the snippet that describes the book, some buttons allow to read the book or to download it.		X					
Exploration feature	Section that contains links to similar webpages or similar search queries.	X	X			X		

In summary, a total of thirty-one elements that enrich the search results were identified. Of these, seventeen were present on Baidu, twenty-nine on Bing, four on DuckDuckGo, fifteen on Google, twelve on Yahoo!, and fourteen on Yandex.

4.2 Sponsored Results

Sponsored results are paid advertisements, often located above or to the right of organic results. Unlike organic results, they focus on commercial intent, ranked according to relevance and revenue [18]. Typically, they operate on a pay-per-click model, where advertisers are charged only when users click the ads [23, 76].

The following sections present the types of sponsored results identified during the analysis phase: **regular** and **enriched textual ads**, which follow a textual listing format similar to organic results, **shopping ads**, **rich media ads**, and **brand advertisements**. Moreover, it is also worth

noting that while DuckDuckGo does include sponsored results [21], none were observed during this analysis.

4.2.1 Regular and Enriched Textual Ads

Regular textual ads share the same structural elements as organic regular results, with the only distinction being their labeling with terms such as "sponsored" or "ad", as illustrated in Figure 4.4. Furthermore, similar to organic enriched results, enriched textual ads are an extension of regular textual ads, incorporating additional elements. Some of these elements are shared between enriched textual ads and organic enriched results, while others are unique to enriched textual ads. Table 4.2 provides a summary of all the identified elements present in the enriched textual ads.

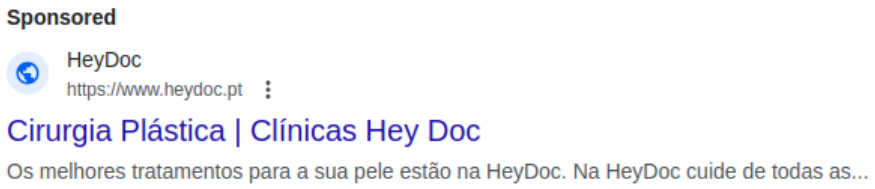


Figure 4.4: Google's regular textual ad

Table 4.2: Enriched textual ads' elements

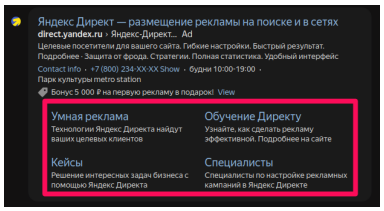
Name	Description	Baidu	Bing	Google	Yahoo!	Yandex	Example Image
Image thumbnail	An image from the website that can appear along with the snippet.	X		X	X		
Sitelinks [61] or Quicklinks [54]	Links from the same domain are grouped beneath the text result.	X	X	X	X	X	
Sitelinks per category	Sitelinks are grouped into categories.	X	X				

Table 4.2: Enriched textual ads' elements

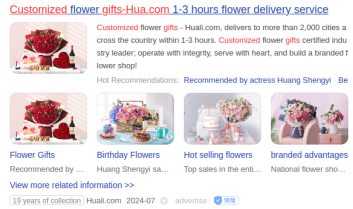
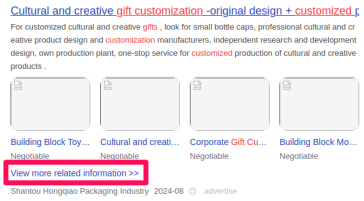
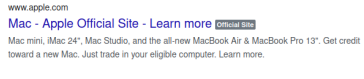
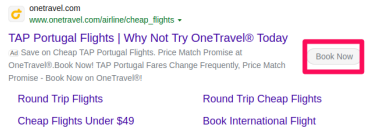
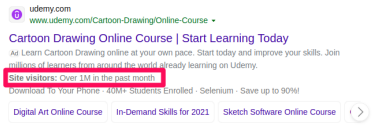
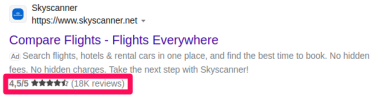
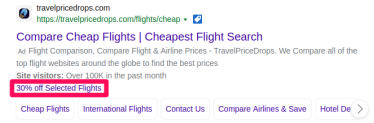
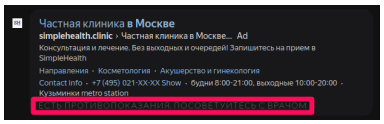
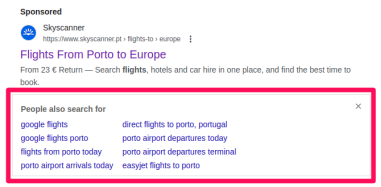
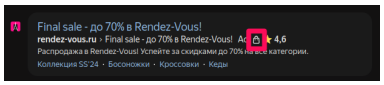
Name	Description	Baidu	Bing	Google	Yahoo!	Yandex	Example Image
Thumbnail sitelinks	Sitelinks whose format contain an image and a small snippet beyond the link itself.	X					
View more information link	Link at the bottom of the result that redirects to the result's website.	X					
Official site tag	An icon indicating the website is verified as an official source.				X		
Call to action button [48]	A button facilitating users to perform specific actions directly from the SERP.		X	X	X		
Structured snippet [58]	It appears in search results when a website includes schema markup data. The types of Structured Snippets that can appear include How-to, Event, FAQ, Recipe, Video, Article, Product, and many more.		X	X		X	
Rating stars [61]	Displays the average rating of a product, service, or business based on user reviews. This rating is retrieved from the website's structured data.		X		X	X	

Table 4.2: Enriched textual ads' elements

Name	Description	Baidu	Bing	Google	Yahoo!	Yandex	Example Image
Promotional offer	Link that redirects to a promotional offer.		X	X	X	X	
Activity tag	Tag that informs that someone has recently interacted with the service.	X					
Medical warning	Message that says "There are contradictions, consult your doctor".					X	
Exploration feature	Box appearing at the bottom of the result after it has been visited that provides links to related searches.	X	X	X	X		
Shopping icon	Icon that when hovered indicates that the objective of the result is to sell products/services.					X	

4.2.2 Shopping Ads

Shopping ads are advertisements presented in a card format that typically include a product photo, price, store, ratings, and available offers [54]. Similarly to textual results, these ads are identified with labels such as "sponsored" or "ad". They were observed on Baidu, Bing, Google, Yahoo!, and Yandex, with an example shown in Figure 4.5.

4.2.3 Rich Media Ads

Rich media ads [44], also referred to as Banners on search [83], are advertisements typically positioned at the top-right of the SERP, identified on Baidu, Bing, Yahoo! and Yandex. Their format includes a prominent image and text links, as illustrated in Figure 4.6. The primary purpose of this format is to capture increased user attention [83]. On Baidu, these ads are often triggered by broad product categories or branded searches [44].

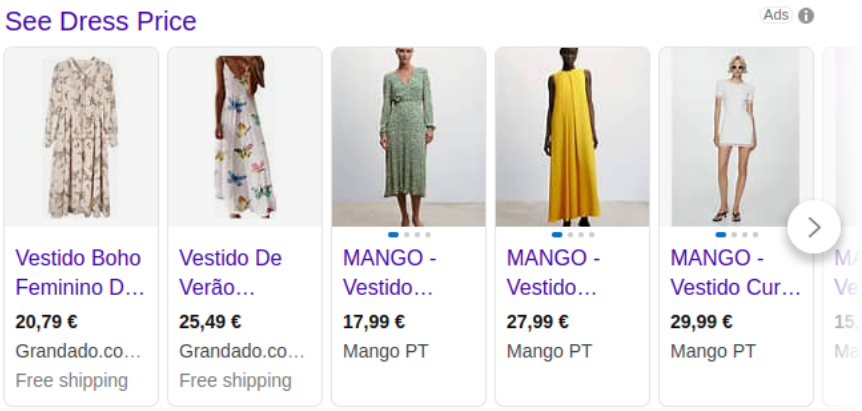


Figure 4.5: Yahoo! shopping ads

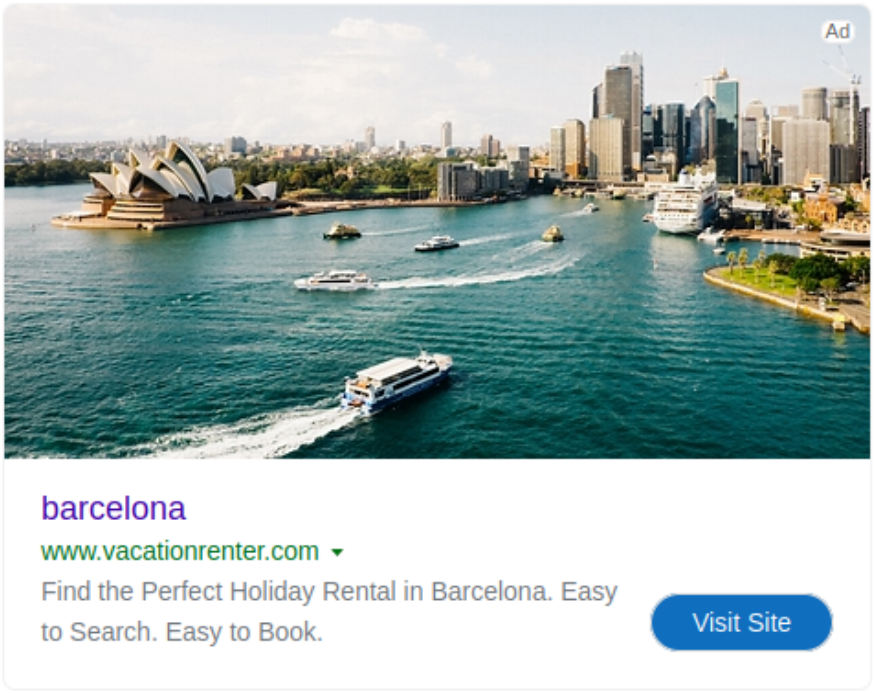


Figure 4.6: Bing rich media ad

4.2.4 Brand Advertisements

In addition to the sponsored results presented so far, there is another type of ad on Baidu known as brand advertisements, which are categorized into two distinct types: Top banners and Brand zone ads.

The **Top banner** [44] appears as a banner that spans the entire top of the page, creating a prominent visual impact, as illustrated in Figure 4.7.

On the other hand, **Brand zone ads** are customizable and interactive advertisements for brand

term search queries. These ads are placed on the top center and right columns, as shown in Figure 4.8. Unlike pay-per-click ads, brand zone ads operate on a fixed-cost model for a predetermined duration, ensuring their visibility for the specified search query. Notably, only brand terms are available to be purchased, and they can only be bought by the respective brand owners themselves [44].

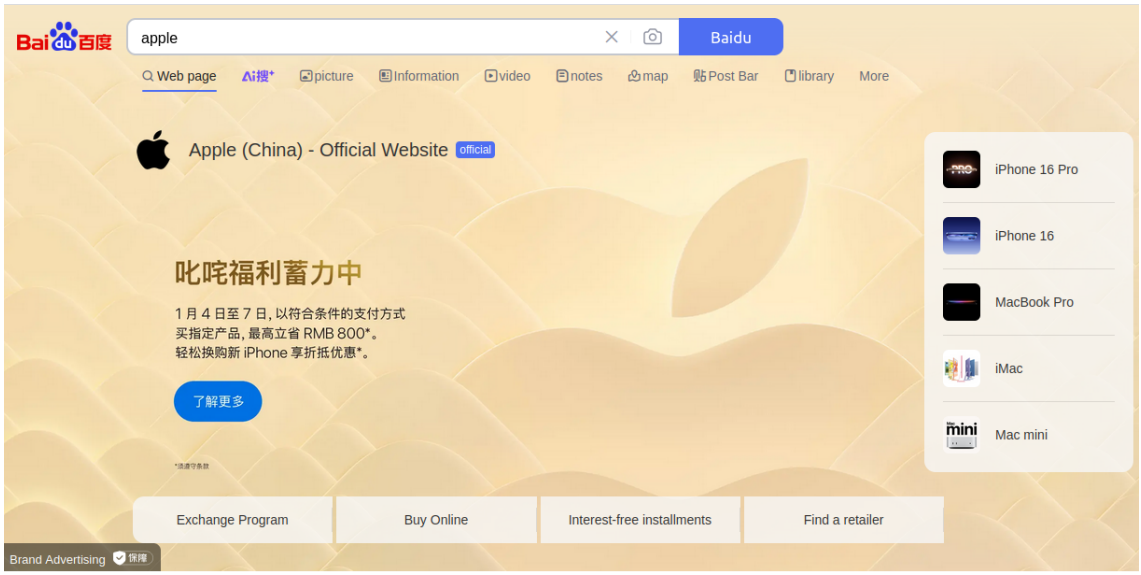


Figure 4.7: Apple's Top Banner

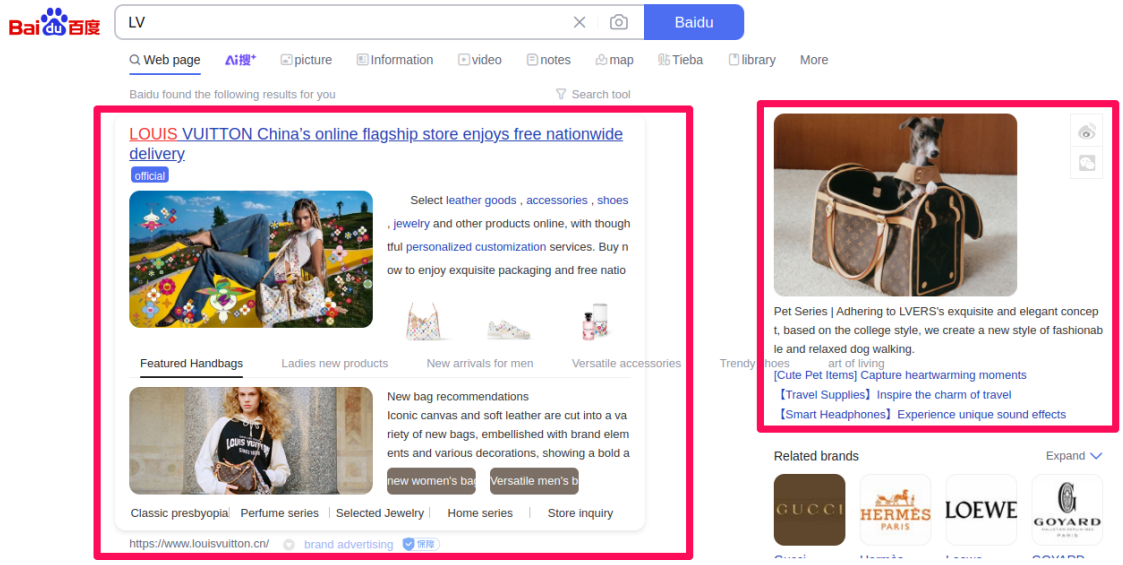


Figure 4.8: Baidu Brand Zones

4.3 Features

Several elements, known as SERP features, have been incorporated into the SERP to enhance its functionality. These features attempt to deliver answers to the search query and assist users in the search process rather than just linking to websites that may contain the desired information, as textual results do [55].

Although the enriched elements presented in previous sections can also be considered features according to Google's documentation on this topic [25], this work adopts a classification approach aligned with the existing literature [54, 55]. Specifically, we define SERP features as unpaid enhancements the search engine provides to improve the search experience, whose formats are different from the textual listing format.

The following subsections present the features identified during this analysis phase, divided into different categories according to the purpose of the feature.

4.3.1 Exploration Features

Exploration features are a category of SERP features that help users explore more questions, searches, or topics related to their original search query [29]. Table 4.3 summarizes all the identified features categorized as exploration features.

Table 4.3: Exploration Features

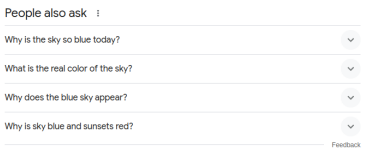
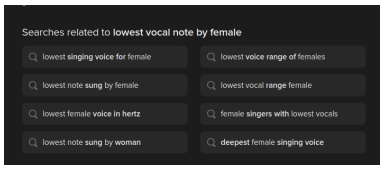
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
People also ask [61] or Related questions group [27]	A set of questions related to the user's original search query.		X		X	X	X	
Related searches [28]	A list of related searches automatically generated based on the initial query and other searches done by other people. Clicking one redirects the user to a new search results page.	X	X	X	X	X	X	

Table 4.3: Exploration Features

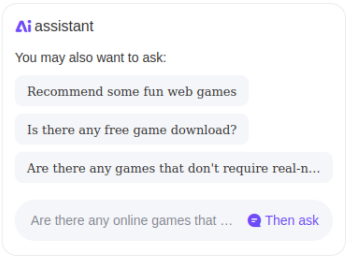
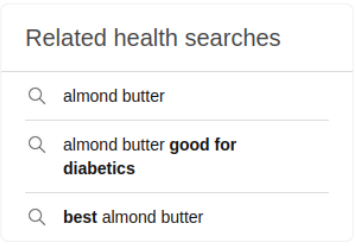
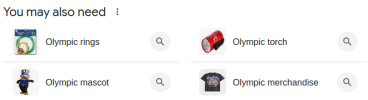
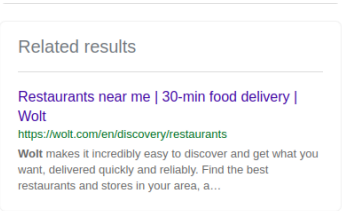
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Ask chatbot	Similar to the related searches feature with queries related to the search terms, but the chatbot provides the answer.	X	X					
Category related searches	Related searches focused on a particular category.	X	X					
You may also need	Information that Google gathered about products available to buy and related to the search query.				X			
Related results	Related results are shown on the right side of the page.		X					

Table 4.3: Exploration Features

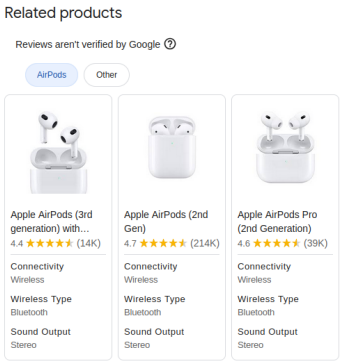
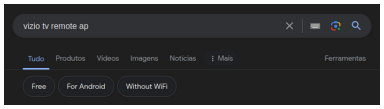
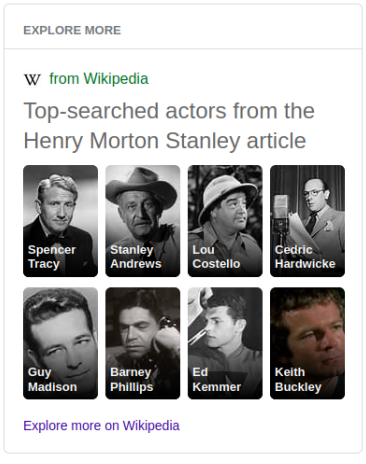
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Related products	Products related to the product initially searched.				X			
Query complements	Additional word tags that, when clicked, generate a new results page whose search query is composed of the original search query and the extra word tags clicked on.	X	X		X	X		
Explore more [81]	A section typically composed of image thumbnails and links, providing content related to the user's search query.		X			X		

Table 4.3: Exploration Features

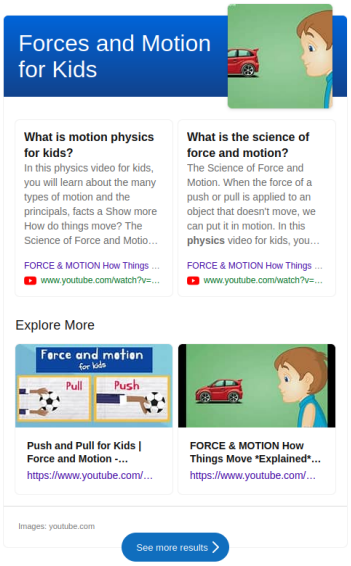
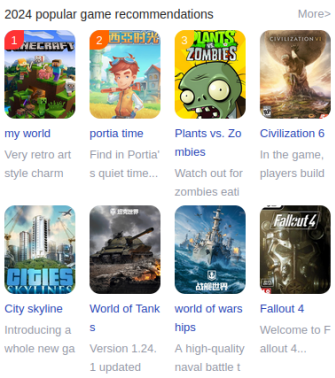
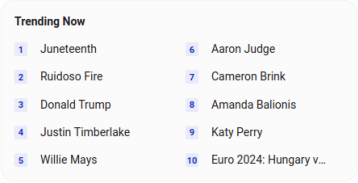
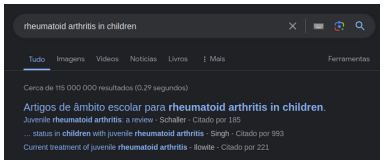
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Topic exploration wrap	Side section that gathers information from various websites on a certain topic.		X					
Trending recommendations	A section composed of image thumbnails and text descriptions of items, such as games, that are currently trending.	X						
Trending now	A list displaying the most searched search queries at the moment.	X				X		

Table 4.3: Exploration Features

Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Scholarly Articles [60]	Links that direct users to the search engine's academic pages or directly to scientific documents related to the search query.	X			X			

4.3.2 Search Refinement Features

Search refinement features assist the user in refining their search in order to find more suitable results. Table 4.4 presents the search refinement features identified during this analysis.

Table 4.4: Search Refinement Features

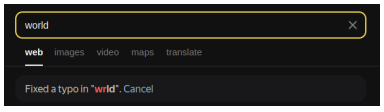
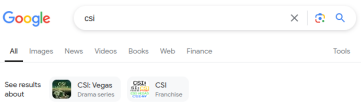
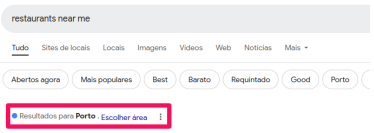
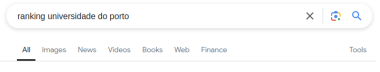
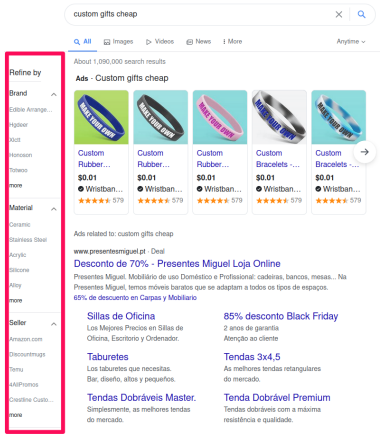
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Automatic spelling correction	Search engines detect spelling errors in search queries, automatically correct them, and allow users to revert the correction if needed.	X	X	X	X	X	X	
Disam-biguation box [51]	Helps users navigate to additional content or the content they originally wanted in case the search query is ambiguous or has multiple meanings.				X	X		

Table 4.4: Search Refinement Features

Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Results location	This feature allows users to select a specific location to which the search results displayed are associated.				X			
Results language	Google recommends users to limit the search results to a language.				X			
Shopping filter side bar	Allows the filter of results based on the product's properties, such as its material.					X		

4.3.3 Zero-Click Answers

Zero-Click Answers [80], also referred to as Answer Modules [82], are features designed to provide brief and informative responses to a user's search query, delivering immediate answers without requiring users to click on any search results. This analysis identified multiple features of this category, described in the following paragraphs.

Direct Answers, also known as Answer Boxes, are a type of Zero-Click SERP feature designed to provide concise, instant responses to search queries. These answers are often displayed in a widget format, sometimes allowing user interaction. The information presented in Direct Answers may be originated from the search engine's knowledge graph or from trusted data partners [61]. Table 4.5 summarises the direct answers identified.

Table 4.5: Direct Answers

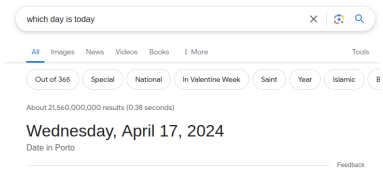
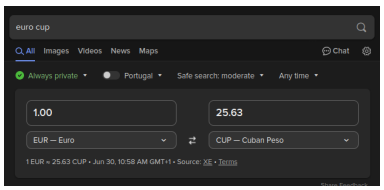
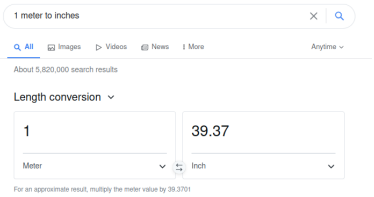
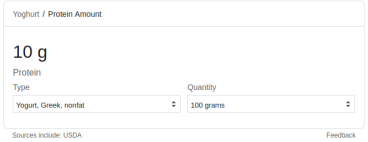
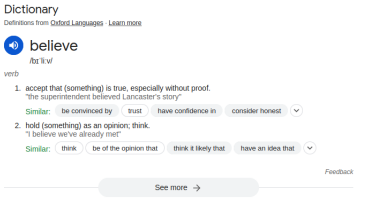
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
WhenIs box [61]	Also known as Brief Answer, this feature provides quick answers on topics such as past or upcoming holidays and events, famous people, movies, sports, or places.		X	X	X	X	X	
Currency converter [61]	For currency conversion queries, search engines display a built-in currency converter directly on the results page.	X	X	X	X	X	X	
General converter [58]	It enables conversion between different units and measurement systems.	X	X	X	X	X		
Nutrition box [61]	It helps assess the nutritional values of food, including calorie count, based on different portion sizes.		X		X	X		
Dictionary box [61]	It displays word definitions, along with their form, phonetic pronunciation, and sometimes an audio clip for pronunciation.	X	X	X	X	X		

Table 4.5: Direct Answers

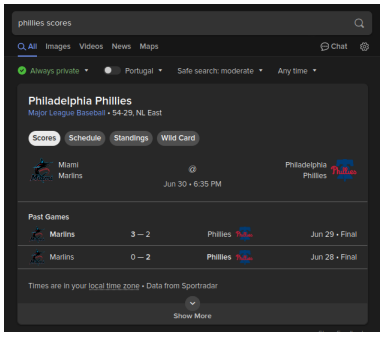
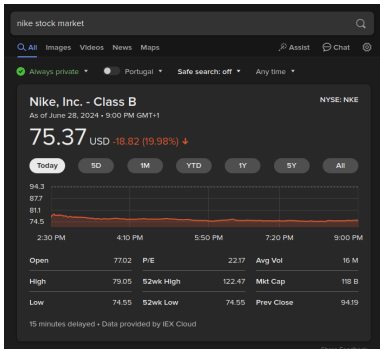
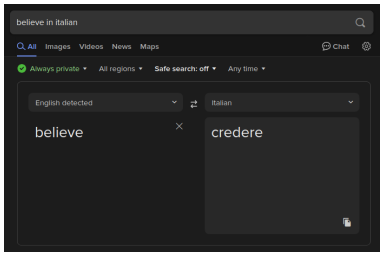
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Sports box [61]	Presents a sports team's, player's, or championship's upcoming schedule, recent performance, highlights, standings, and overall record in multiple formats.	X	X	X	X	X		
Stock box [61]	Displays the stock's current price along with a line chart tracking its price fluctuations every 5 minutes throughout the trading day.	X	X	X	X	X	X	
Weather box [61]	It shows information about the current weather and upcoming weather forecast for a specific location.	X	X	X	X	X	X	
Translation box [61]	It shows an automatic translation of a word or short phrase, allowing users to switch between languages and often includes an audio clip for pronunciation.	X	X	X	X	X	X	

Table 4.5: Direct Answers

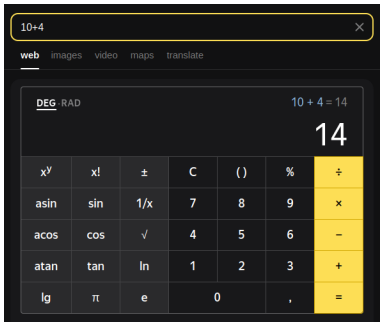
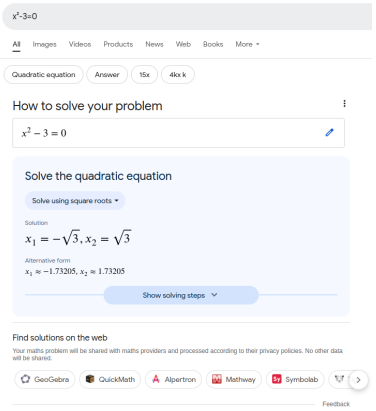
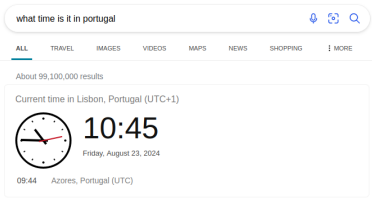
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Math calculator [61]	A basic calculator the user can interact with.	X	X	X	X	X	X	
Math solver	Presents the solution for a mathematical problem and a list of websites where the user can find solutions for the problem.				X			
Date and time [65]	Shows the current time and date for a specific location.	X	X	X	X	X	X	

Table 4.5: Direct Answers

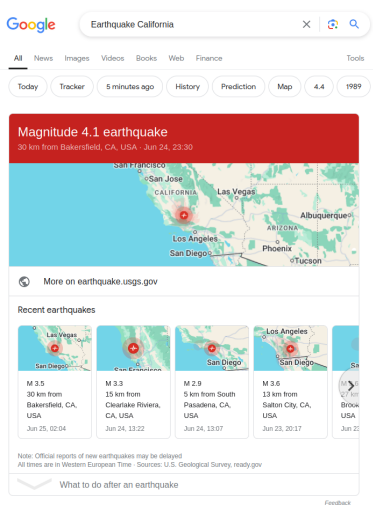
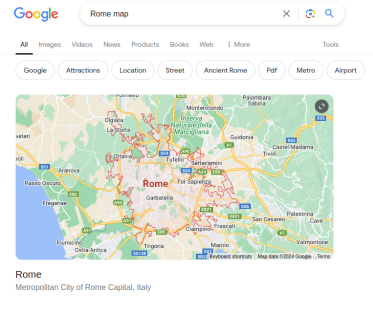
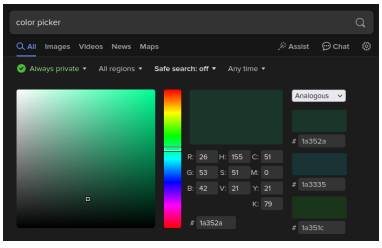
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
SOS alert [58]	For search queries about recent crises, it offers important information to assist those in the affected area.				X			
Population chart	Provides a chart with the population for a specific location.	X			X			
Map [58]	A map of a specific location is shown.	X	X	X	X		X	
Colour picker	A colour picker tool is displayed, allowing users to select and explore different colours.			X	X			

Table 4.5: Direct Answers

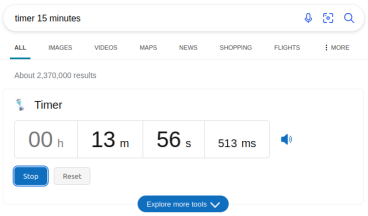
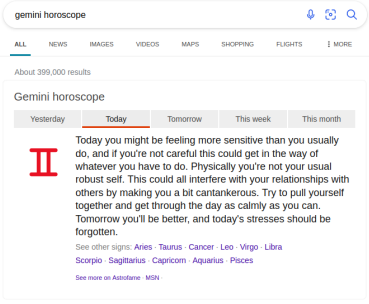
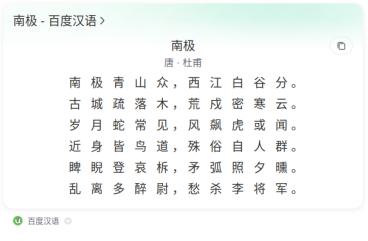
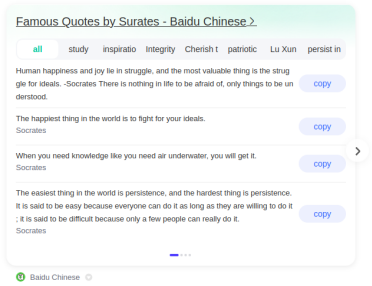
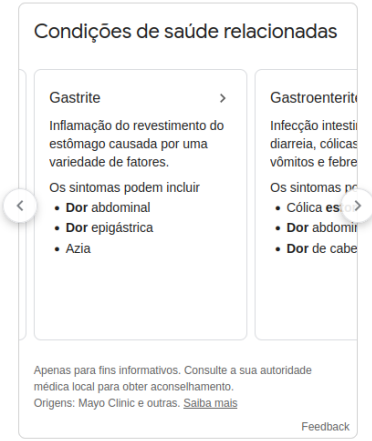
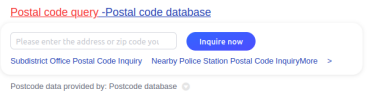
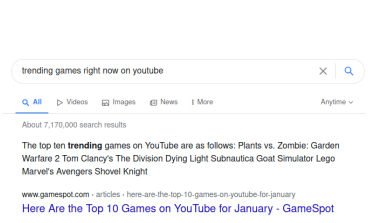
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Timer	A timer is displayed, providing users with a countdown function.		X	X	X			
Calendar	A calendar for a specific month is displayed, highlighting the holidays within that month.	X						
Horoscope	Horoscope predictions are displayed for different time periods.	X	X			X		
Poem [44]	A Chinese poem is displayed directly on Baidu's results page.	X						

Table 4.5: Direct Answers

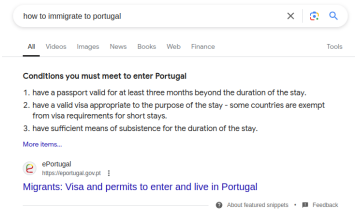
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Quotes [44]	Searching for classic quotes from famous philosophers will trigger a widget that displays their most well-known quotes.	X						
Health Panel [44]	Provides users with quick access to medical information, including a brief summary of the condition, along with details of symptoms, treatments, and medications.	X	X	X	X			
Zip Code Enquiry [44]	A zip code lookup feature that utilizes an API from the China Postal Data Media Center to retrieve postal code information.	X						

Another Zero-Click feature observed during this analysis is the **Feature Snippet**. This feature presents a short summary extracted from a website that the search engine considers to be the most contextually relevant to the search query. It is made up of a snippet of the actual content of the selected website along with its URL and is displayed at the top of the results page [61, 51].

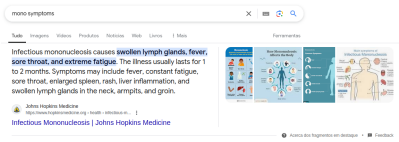
Featured snippets can appear in various formats. Some display information as a **list or bullet points**, while others utilize **tables** or provide a short **paragraph**. Additionally, some Featured Snippets include **videos**, and others include **images** alongside the text [51]. Figure 4.9 illustrates these various formats. On Google, every Featured Snippet includes a link labeled “About Featured Snippets,” which directs users to a page explaining its purpose and confirming its classification.



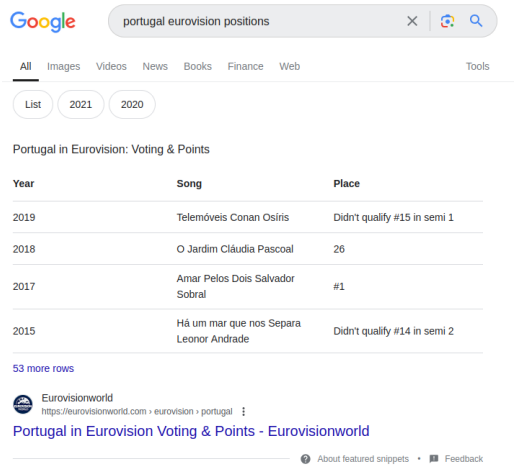
(a) Paragraph Featured Snippet



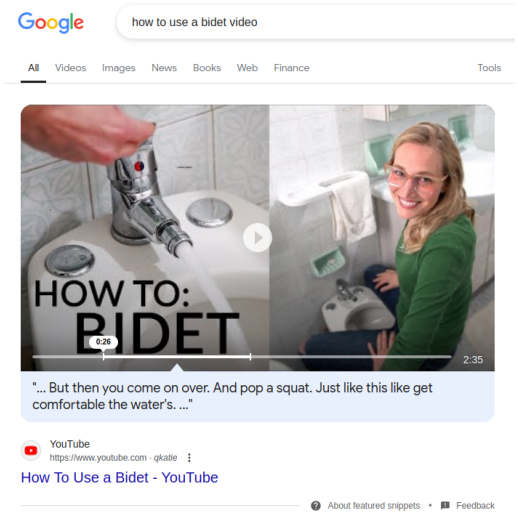
(b) List Featured Snippet



(c) Featured Snippet With Images



(d) Table Featured Snippet



(e) Video Featured Snippet

Figure 4.9: Different Formats Of Featured Snippets

Regarding their presence across the analyzed search engines, all Featured Snippet formats were identified on Google. On Bing and Yandex, the paragraph Featured Snippets and the list or bullet point formats were observed. On DuckDuckGo and Yahoo!, only the paragraph featured snippet was identified, and on Baidu, this feature was not found.

Furthermore, **Quick Answers**, another Zero-Click SERP feature, shares a similar structure as Feature Snippets, often showing a paragraph snippet associated with a URL and sometimes accompanied by images. However, in addition to the snippet, Quick Answers have a larger heading at the top that directly answers the search query, as seen in Figure 4.10. In this study, we adopted the terminology used by Yandex [84] to name this feature. Quick Answers were identified on Google, Yandex, Bing, and Yahoo!.

Finally, **AI Overview**, the term adopted by Google [59], is another Zero-Click feature in which search engines use artificial intelligence (AI) to generate structured responses for users. AI compiles relevant information from multiple sources to provide a comprehensive response, and in most cases, the website sources are listed in the results. This feature typically appears below the sponsored results if there are any present or at the top of the SERP. It is usually displayed in a container with a background colour distinct from the SERP's default background colour.

In addition, another approach exists in which the response is provided only by the AI chatbot

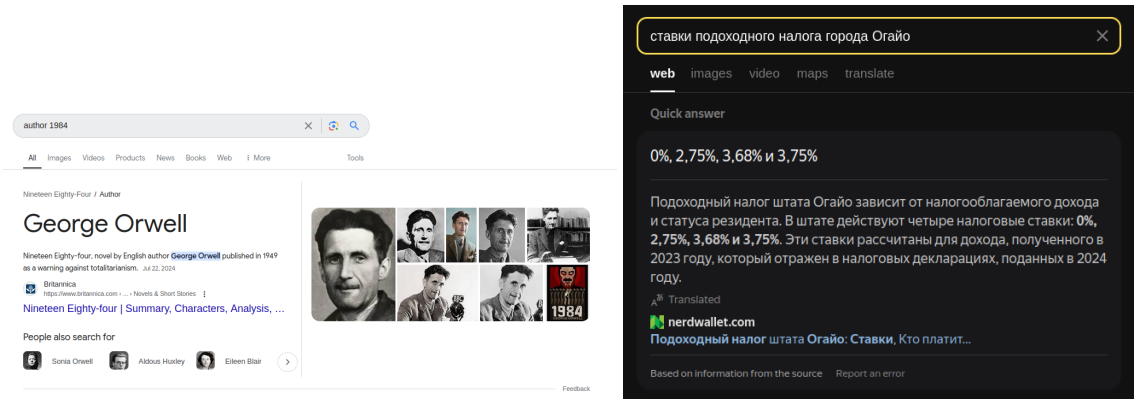


Figure 4.10: Google's (left) and Yandex's (right) Quick Answers

knowledge. In this case, aside from providing the requested information, the search engine can provide custom responses, such as helping plan meals for the week and offering step-by-step instructions for a specific task.

The AI Overview feature is present in all six search engines analyzed. However, at the time this analysis was conducted, this feature was not yet available for Google in Portugal, and in Yandex it is only available in Russia [84]. Figure 4.11 illustrates examples of this feature.

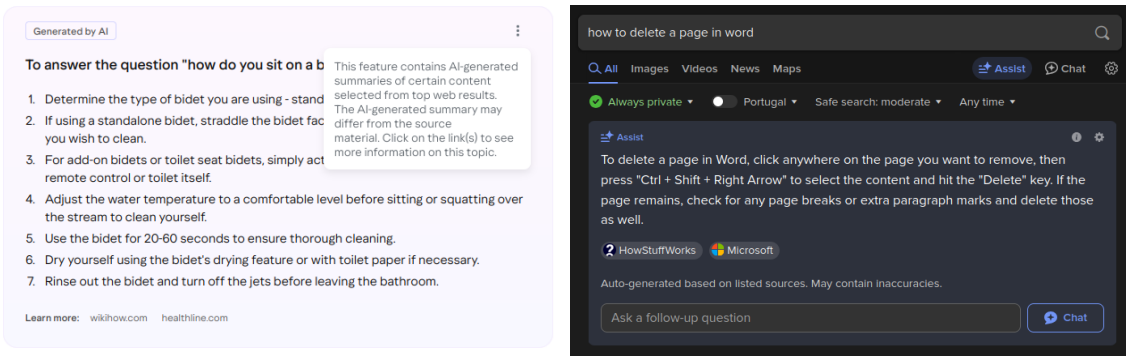


Figure 4.11: Yahoo!'s (left) and DuckDuckGo's (right) AI Overviews

4.3.4 Carousels

The **Carousel** feature typically appears above organic results at the top of the results page. It consists of a horizontal row of results from the same category, sometimes navigable via left and right arrows. Each carousel item is usually composed of an image and a corresponding label [55]. Clicking on an item triggers a new search results page, with the search query being the selected item. This feature was identified across all six search engines analyzed.

Furthermore, a variation of the Carousel feature exists, referred to as **Carousel Grid** [55], Large Carousel [65], or Found on the Web [19]. Unlike the standard Carousel, this version presents smaller and simpler cards arranged in a matrix rather than a single row. Each card may or may

not include an image thumbnail. This feature was observed on Google and Bing, consistently positioned below the search query bar and above the textual results.

Figure 4.12 provides an example of this feature and their two versions. On the right, there is an example of a Carousel Grid from Google, showing that some cards include a dropdown icon. When clicked, this icon reveals a list of URLs and snippets containing relevant information about the selected card. Additionally, similar to the standard Carousel, clicking the card title triggers a new search results page, updating the search query to match the selected item.

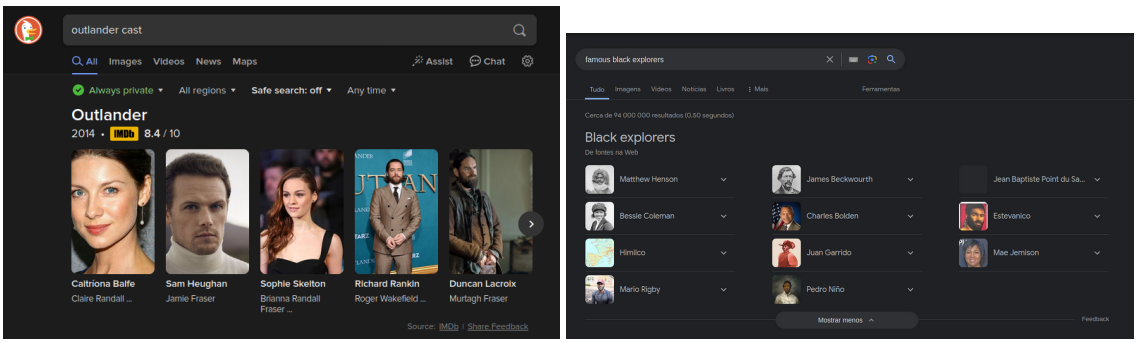


Figure 4.12: Carousel (left) and Carousel Grid (right)

Another variation of the Carousel feature available on Google is known as **Compare Sites**. This feature allows users to compare sites via a carousel. For example, when searching for a hotel in addition to traditional results and a hotel pack, Google displays a carousel of sites alongside traditional results, helping users easily explore and compare options [19]. Figure 4.13 shows an example of this feature.

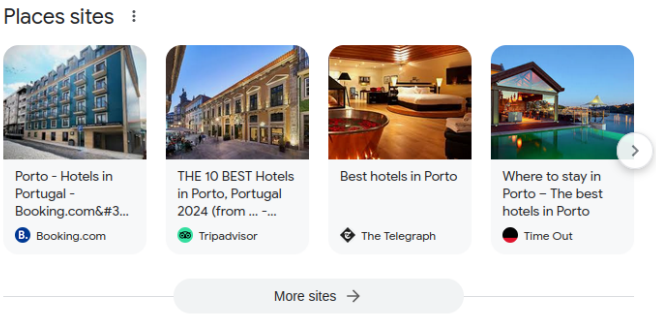


Figure 4.13: Compare Sites

4.3.5 Knowledge Panel

Knowledge Panels are information boxes that appear on the SERP when searching for entities like people, places, organizations, or things featured in the search engine's knowledge graph. These panels provide a concise topic overview based on the search engine's understanding of the content. The information displayed comes from various online sources, including publicly available data

and licensed content, offering users quick access to key facts without navigating away from the results page.

This feature typically appear in two distinct formats, as illustrated in Figure 4.14. The original format consists of a panel on the right side of the results page that is made up of the title, images of the subject, a URL if applicable, a summary paragraph, often sourced from Wikipedia, and a structured list of direct information [55]. Depending on the search engine, more information can be included, such as related searches. Additionally, a newer format positions the knowledge panel at the top of the SERP. In this layout, information is divided into colored boxes, and a related-subtopics menu allows users to filter the displayed information based on the selected subtopic. The classic right-side format is present across the six search engines analyzed, although Baidu's version differs slightly because it integrates the panel within the SERP results and is powered by Baidu's version of Wikipedia [44]. The top-panel format was identified on Bing, Google, Yahoo! and Yandex.

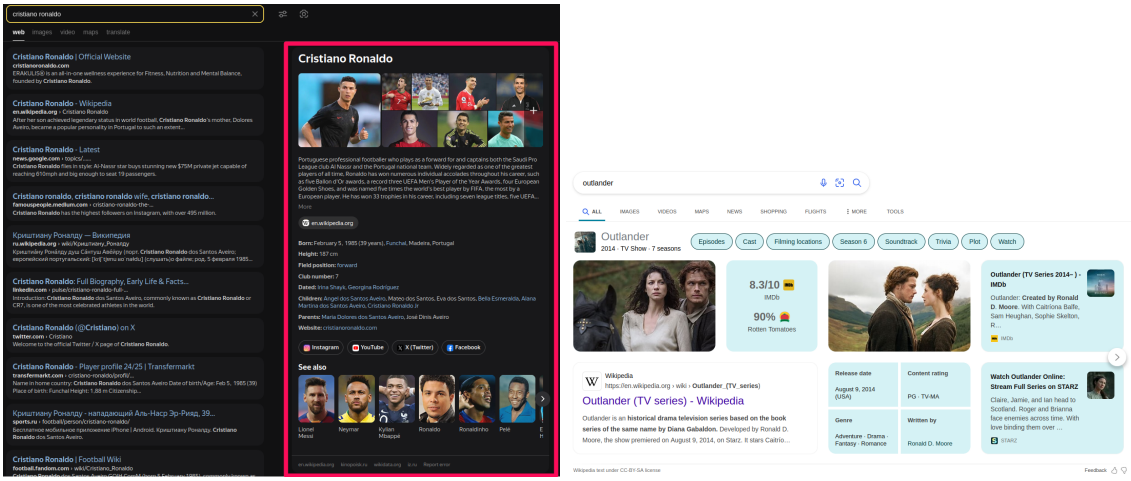


Figure 4.14: Right Side (left) and Top (right) Knowledge Panels

4.3.6 Local Features

During this analysis, two Local Features were identified: the Local Knowledge Panel and the Local Pack, with examples of each illustrated in Figure 4.15.

The **Local Knowledge Panel** [51], or the Local Business Knowledge Panel [8], is similar to the standard Knowledge Panel but specifically tailored for local businesses. It appears on the right side of the SERP, and instead of displaying a paragraph snippet, it presents detailed business information such as opening and closing hours, reviews, and ratings. Additionally, it may include call-to-action buttons, enabling users to get directions, call the business, or visit the website directly from the panel. This feature was identified on Bing, DuckDuckGo, Google and Yahoo!.

A **Local Pack** consists of a map with a list of three local establishments displayed below it. They typically appear when the search query suggests an intent to find a nearby business or service

[61]. The map in the Local Pack includes pins marking the locations of the relevant establishments, while the listings underneath display key information such as the business name, physical address, phone number, and website link. Clicking on any of these listings brings up a complete business panel with more detailed information. This feature was identified across all six analyzed search engines.

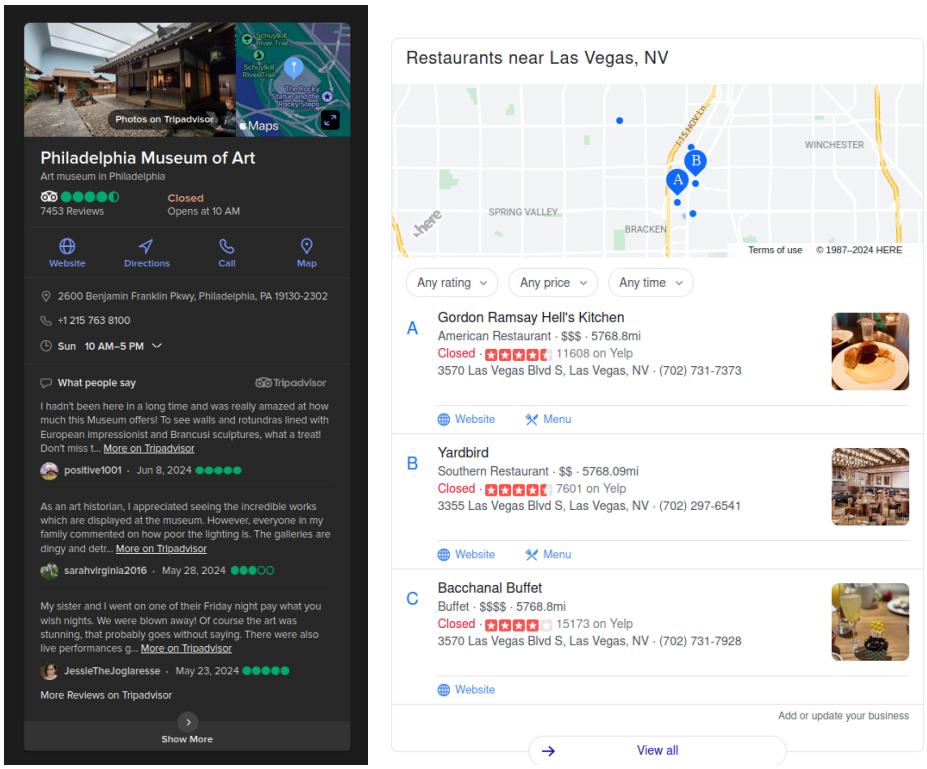


Figure 4.15: Local Knowledge Panel (left) and Local Pack (right)

4.3.7 Image and Video Packs

The Image Pack and the Video Pack are two SERP features designed to present sets of images and videos, respectively. Examples of each of these features are shown in Figure 4.16. Both features are present in the six search engines analyzed.

The **Image Pack** typically appears for search queries where visual content is relevant and beneficial to the user [61]. It displays a collection of images related to the search query, often accompanied by a button to see all images, which redirects users to a dedicated image search results page.

The **Video Pack** can take on various formats, including a carousel, a vertical list of videos, or a grid layout. Each video item includes a thumbnail, the video's duration, title, source website, and upload date. Like the Image Pack, the Video Pack includes a "See all videos" button leading to additional video content. Furthermore, Google and Yandex offer an advanced feature within the Video Pack that allows users to preview and navigate to the most important moments of a video

before watching it. This functionality lets users start watching the video directly in the relevant sections.

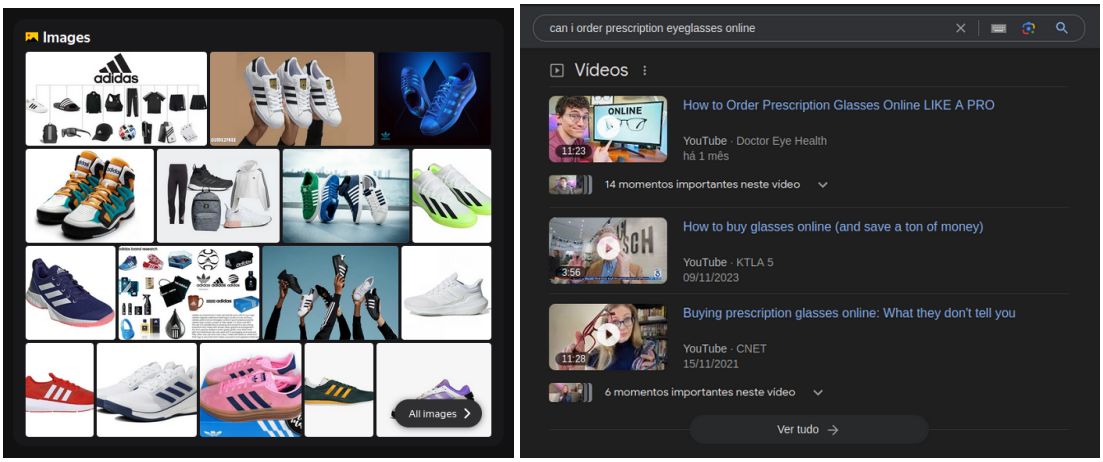


Figure 4.16: Image Pack (left) and Video Pack (right)

4.3.8 Topic-related Features

This section presents the SERP features associated with specific topics, which are described in the following paragraphs. Additionally, some of these features are grouped into types as they belong to the same topic.

Recipe Cards are a collection of recipes, where each recipe card is linked to the source website. These cards often include elements such as a thumbnail image or video, the name of the hosting blog, a rating score, total cooking and preparation time, calories per serving, and a brief list of ingredients [61]. Similar to the image and video packs, this feature also has a "see more" button and was identified in Bing, DuckDuckGo, Google and Yahoo!. Figure 4.17 illustrates an example of this feature.

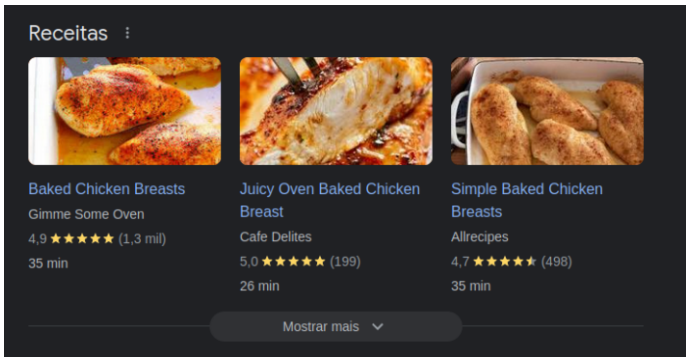


Figure 4.17: Recipe Cards

In the SERP, there are non-sponsored features designed to assist users in purchasing products, called the **shopping features**. One example is **Popular Products**, a feature from Google, with a similar version identified on Bing during this analysis. This feature displays products related to a

user's search query when relevant, including images, prices, ratings, and links to the corresponding product pages. It typically appears when users search for a specific product category or brand [14]. Another feature identified in this category is the **Car Shopping Widget** feature found on Baidu. When the search query is related to a specific car model, this feature is triggered, providing detailed information about the car, such as average fuel consumption, tank capacity, and other specifications [44]. Figure 4.18 illustrates examples of these features.

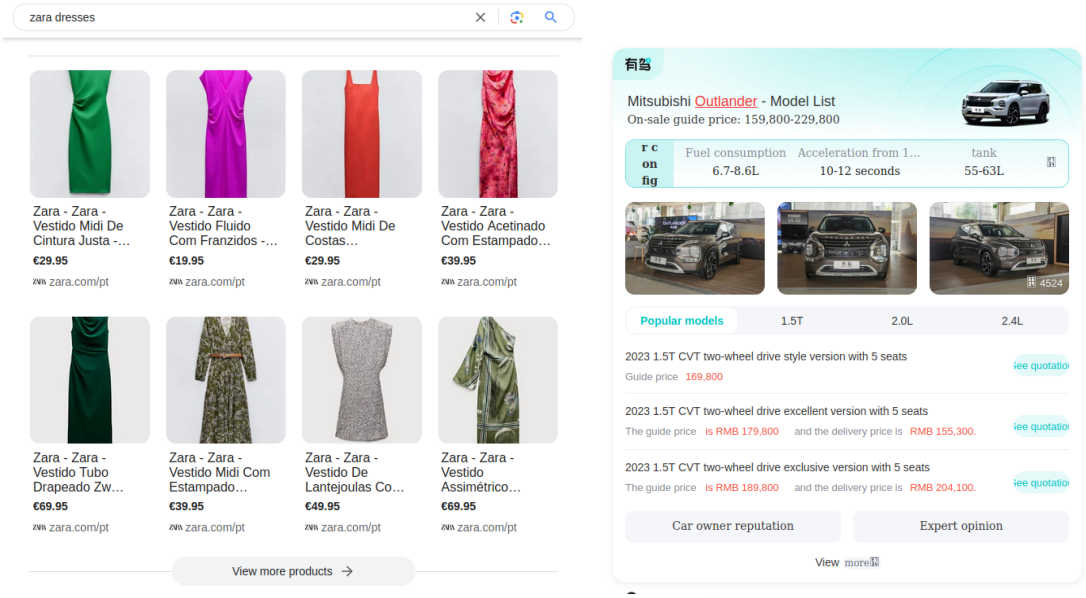


Figure 4.18: Popular Products (left) and Car Shopping Widget (right)

Furthermore, the SERP helps users find information related to travel, such as accommodation options, tourist attractions, places to visit and flight options with the **travel-related features**. These features simplify the search process by presenting relevant travel information directly in the results page. Table 4.6 summarizes the travel-related features identified during this analysis.

Table 4.6: Travel-related Features

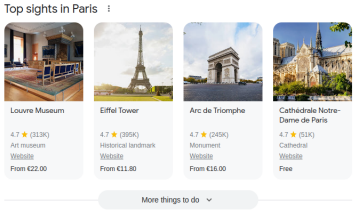
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Top Sights or Plan a Trip [85]	A list of places to visit within a specific location. This feature may include details such as entry prices, ratings, and a link to the source website.	X	X		X			

Table 4.6: Travel-related Features

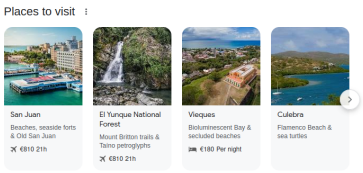
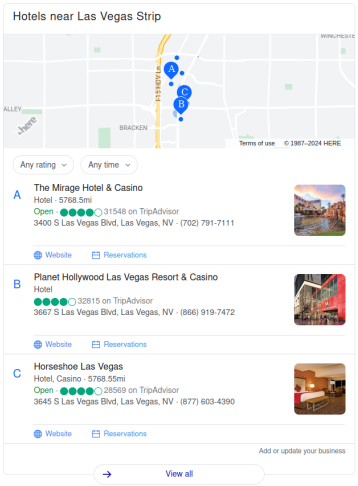
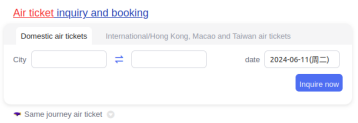
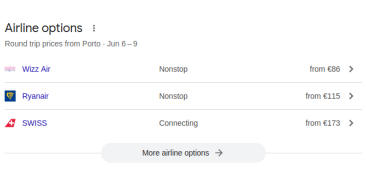
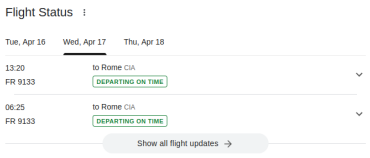
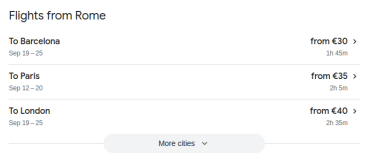
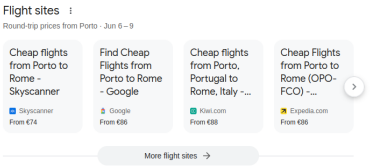
Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Places to Visit or Destinations [85]	A list of destinations within a specific region. This feature may include details such as the price and duration of the trip from the current location, as well as the cost of accommodation per night.		X		X			
Hotel Pack [85]	Similar to the Local Pack, but specifically for hotels. It may include photos, ratings, and prices per night.	X	X	X	X	X	X	
Find Flight Form	Allows the user to see the available flights for a specific departure and destination on a certain date.	X				X		
Airline Options List	Shows the available airline companies operating on specific dates and their ticket prices.		X		X			

Table 4.6: Travel-related Features

Name	Description	Baidu	Bing	DuckDuckGo	Google	Yahoo!	Yandex	Example Image
Flights Status Panel	Shows the status of flights departing from a specific location.				X			
Flights From City	Presents a list of flights departing from a specific city, including their prices and duration.				X			
Flight Sites	A list of websites where the flights for a specific range of dates and locations are for purchase. Their prices are included in each card.				X			

Another Topic-Related feature is the **House Pack**, seen in Figure 4.19. It is a SERP feature that presents a list of houses for sale in a specific location, along with details such as the number of bedrooms, bathrooms, and the total property size. Similar to the Local Pack, it includes a map below the listings with pinned locations, displaying property prices. Additionally, users can filter results based on price, number of bedrooms and bathrooms, and house type. This feature was identified exclusively on Bing.

The **Jobs** SERP feature provides job listings related to the search query, aiming to help users efficiently explore job opportunities directly from the search results [64]. Figure 4.20 provides examples of the Jobs feature identified on Google and Bing. On Google, users can save job postings, revisit them later, and follow specific searches to receive notifications. Additionally, Google may automatically extract and present details like benefits, contract type, and health insurance from the website descriptions. Furthermore, on Bing, the Jobs SERP feature includes filters for posting time and job type, allowing users to refine their search by criteria such as part-time or full-time positions.

This analysis identified three **news-related features**: Top Stories, Latest From Boxes and Article Boxes. Figure 4.21 provides examples of these features.

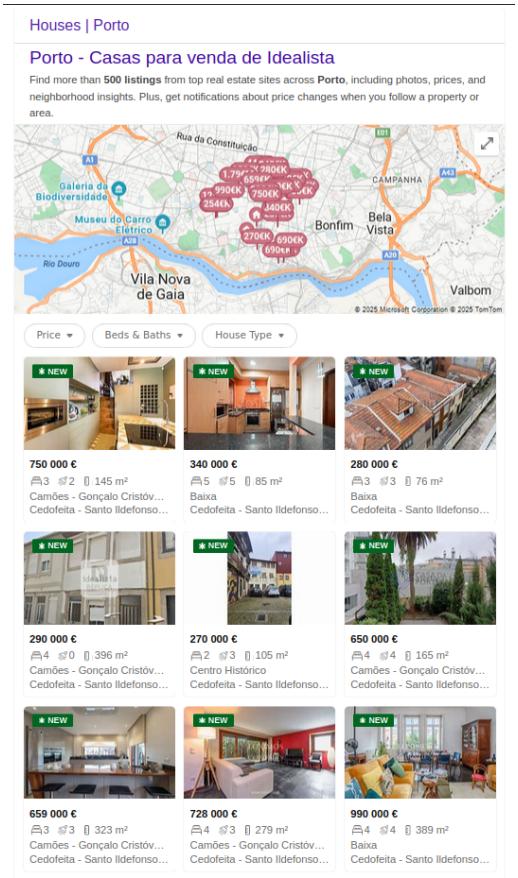


Figure 4.19: Recipe Cards

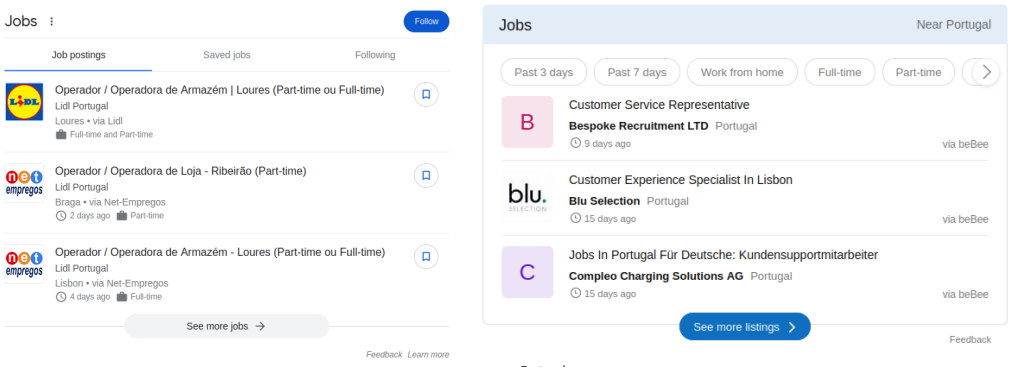


Figure 4.20: Google's (left) and Bing's (right) Jobs Features

Top Stories is a common feature identified in all analyzed search engines except Yandex. It presents three or more news articles covering trending topics or breaking news relevant to the search query [61]. Each card includes a thumbnail image or video from the featured article, the publisher, a timestamp and the news title.

The **Latest From Boxes** feature functions similarly to the Top Stories feature by displaying recent news articles. However, this feature is specific to a single brand, company, or person, making it more common in brand-related searches [5]. This feature was just identified on Google.

Finally, the **Article Boxes** feature consists of a set of articles related to the search query, authored by specific authors, and from recognized and authoritative websites [4]. Visually, this feature appears in a three-block format on the SERP. Each block displays the article title, the recognized source website, the author's name, the publication date. Additionally, this feature is designed as a carousel, allowing users to navigate through articles using arrows. This feature was found on Google and Baidu.

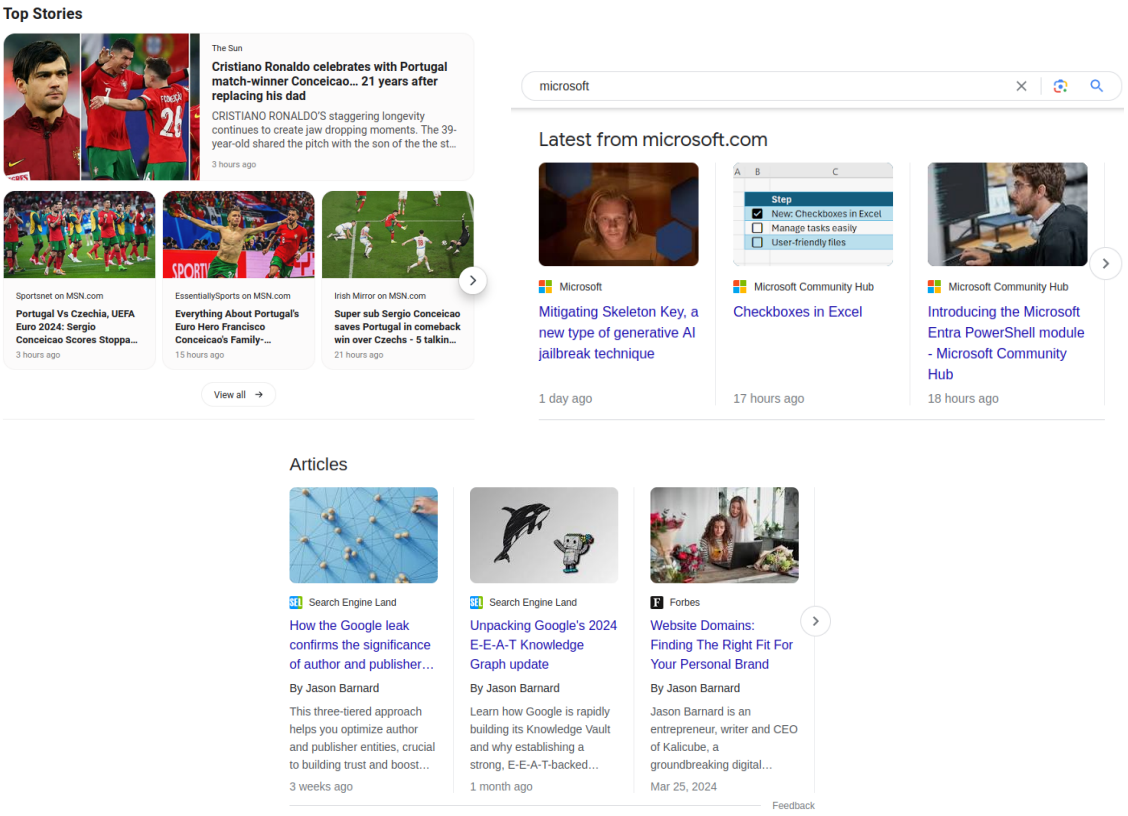


Figure 4.21: Top Stories (left), Latest From Boxes (right) and Article Boxes (bottom)

Another type of Topic-related identified during this analysis are the **Social network-related** features. In its results pages, Google presents what people are saying on social networks about the searched topic. This is achieved through the X Pack (ex-Twitter Pack) and the Perspectives feature, as illustrated in Figure 4.22.

The **X Pack** appears as a carousel displaying the most recent posts on X related to the search query [61]. The X logo and profile name are shown above the carousel, and each card includes a text snippet of the post, an image or video thumbnail if included in the post, and information about how long the post was published.

The **Perspectives** feature is a carousel collection of videos, images, and written posts that people have shared on discussion boards, question and answer (Q&A) sites and social media platforms [15]. In addition to the shared content, this feature may display details about the content creators, such as their name, profile picture, or indicators of their content's popularity.

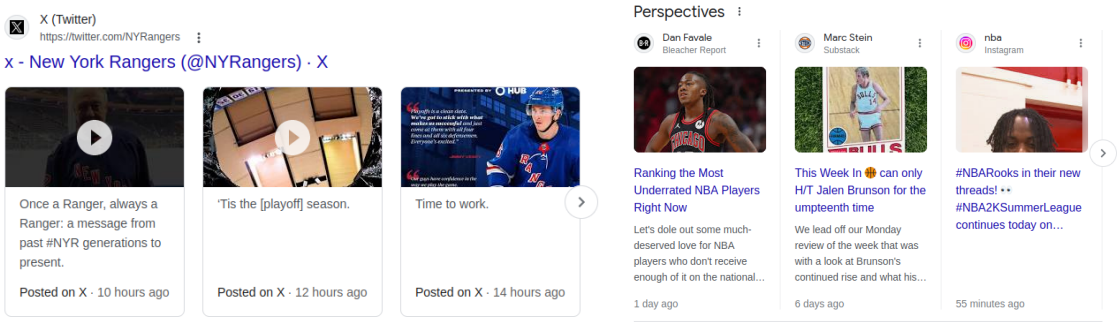


Figure 4.22: X Pack (left) and Perspectives (right) Features

In the SERP, certain features assist users in finding answers to educational queries. These are referred to as **Education-related features**. Three features within this category were identified in this analysis, as described in the following paragraphs and illustrated in Figure 4.23.

The first feature, **Education Q&A**, presents a collection of educational questions and their corresponding answers [30]. This feature appears in a carousel format, with each card displaying a question, an answer, and the number of votes the answer has received. It was identified on Google and Bing.

The second feature, **Practice Problems**, provides users with interactive exercises that they can solve directly on the SERP. This feature is limited to math and science topics and supports multiple-choice and checkbox question formats [31]. It was exclusively identified on Google.

Lastly, Baidu includes an educational feature named **Related Compositions**, which lists three written compositions relevant to the search query. Users can filter this list by school grade, word count, and composition genre. Although detailed information on this feature is limited, it appears to serve as a resource for students seeking examples of compositions to improve their writing.

Furthermore, the **Discussions and Forums**, another Topic-related feature, highlights relevant discussions related to the search query from forum platforms such as Quora and Reddit. It typically appears for search queries that seek advice, recommendations, or personal experiences, such as "best training shoes for wide feet" [14]. This feature was identified only on Google during this analysis and is illustrated in Figure 4.24.

Datasets, shown in Figure 4.25, is a Google SERP feature designed to help users find publicly available datasets for research or analysis. This feature retrieves and lists the results of Google's dataset search, which indexes data from various online repositories, making it easier to locate relevant datasets directly from the search results [85].

Yahoo! has a financial platform called Yahoo! Finance, which aggregates news, data, and tools to assist users in making financial decisions. As a result, Yahoo! directly incorporates **Finance-related features** from Yahoo! Finance into its results pages when relevant. In this analysis, two such features were identified and are illustrated in Figure 4.26. The first feature, **Finance Markets**, provides an overview of the stock market, highlighting key indices and trending companies

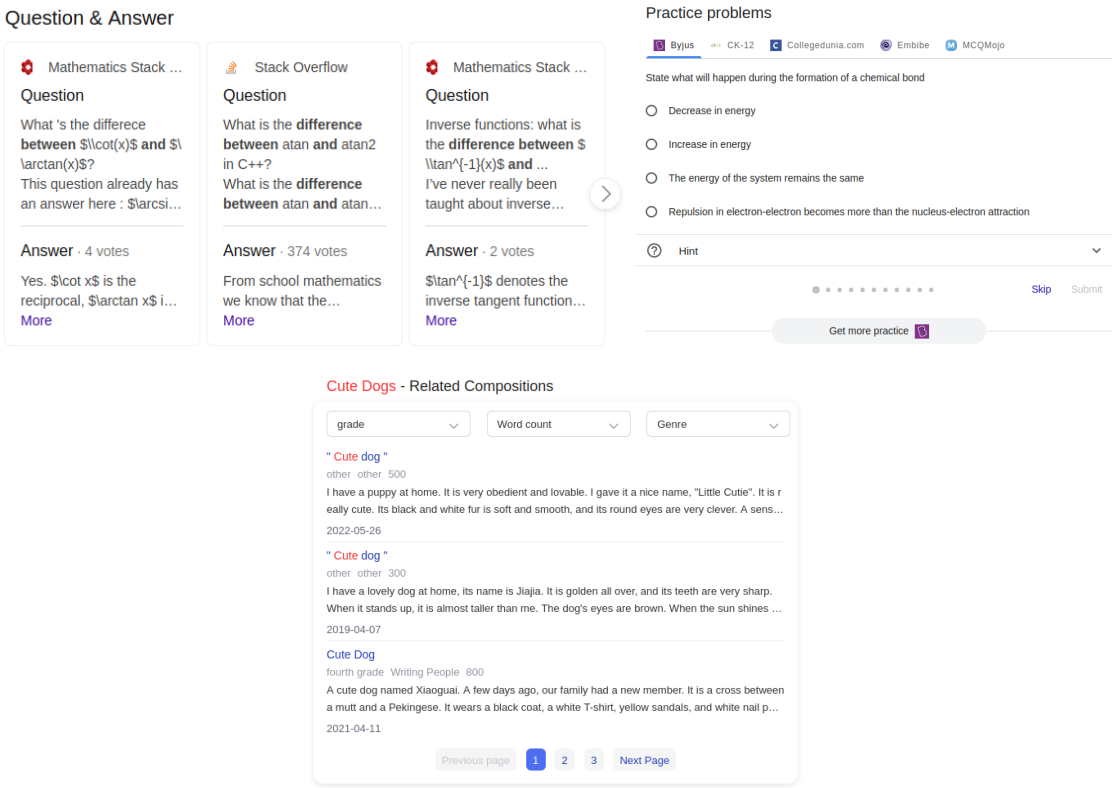


Figure 4.23: Educational Q&A (left), Practice Problems (right) and Related Compositions (bottom)

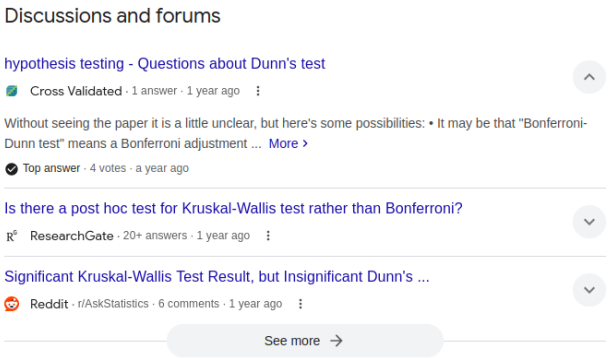


Figure 4.24: Discussion and Forums feature

along with their performance metrics. The second feature, **Company Financials**, presents detailed financial statistics about a company, including stock prices, market capitalization, and other relevant financial data.

How to Get There is a SERP feature designed to help users find the best routes to a specific location. It allows users to select their preferred mode of transportation and provides estimated travel time and distance to the destination. This feature was identified on Baidu, Bing, and Google. Figure 4.27 presents an example.

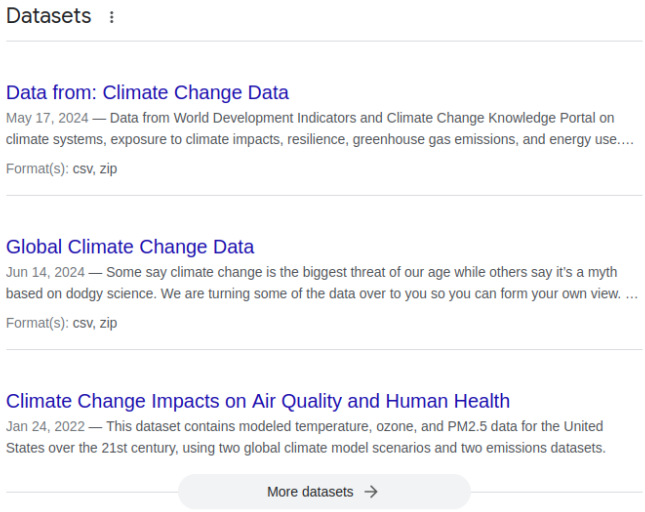


Figure 4.25: Datasets feature

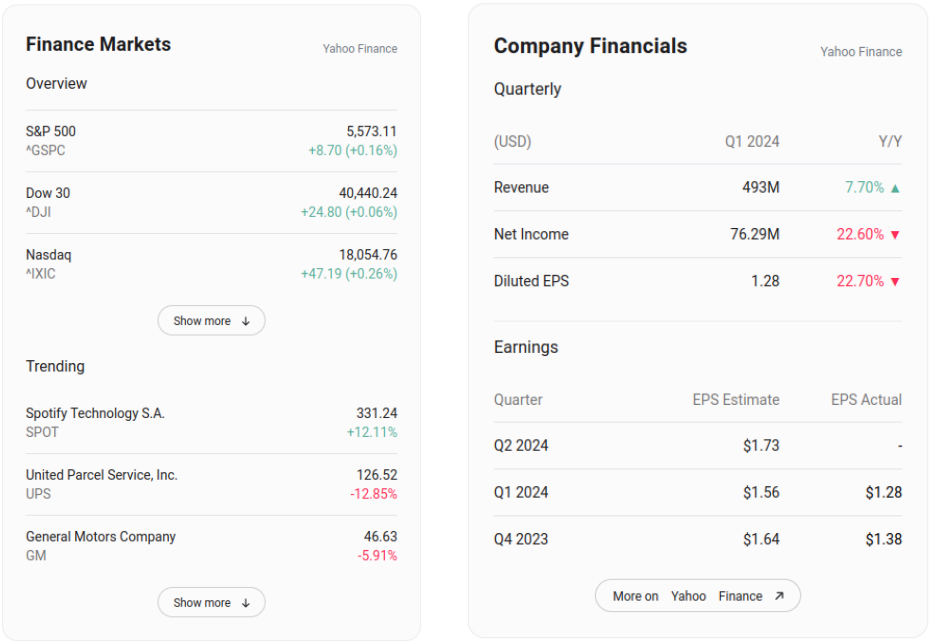


Figure 4.26: Finance Markets (left) and Company Financials (right) Features

Finally, **Songs** is a SERP feature that lists songs related to the search query. Typically, it provides information such as the song title, artist name, and an image thumbnail associated with the track. This feature, illustrated in Figure 4.28, was identified on Google and Baidu.

4.3.9 Search Engine Own Ads

Search engines may display ads for their own products and services. We consider these features rather than sponsored results, as they are designed by the search engine itself to induce growth

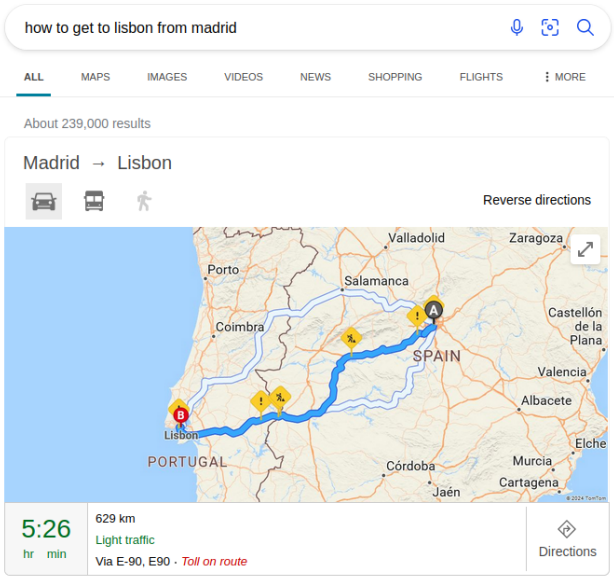


Figure 4.27: How to Get There Feature

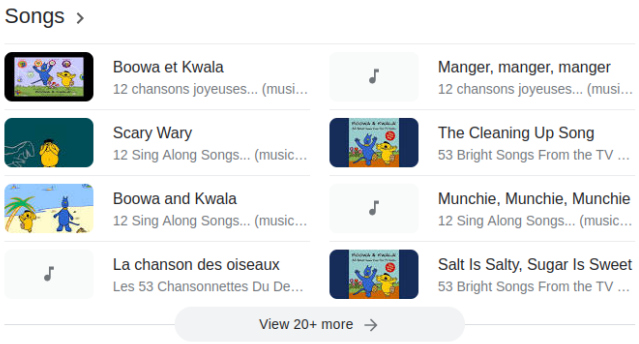


Figure 4.28: Songs Feature

rather than being externally sponsored.

During this analysis phase, three types of self-promotion ads were identified. The first is **"Advertise here" ads** [44], which encourage potential advertisers to place ads on the search engine. These were observed on Baidu and DuckDuckGo, with examples illustrated in Figure 4.30. Secondly, an **Ad promoting a Bing product**, specifically the Microsoft Bing Real Estate platform, was identified. This type of ad directs users to Bing's real estate services and is shown in Figure 4.29.

Finally, a **Baidu ad facilitating access to professional legal services** through Baidu's dedicated platform was also observed. This feature helps users find legal assistance directly from the search results pages, as shown in Figure 4.31.

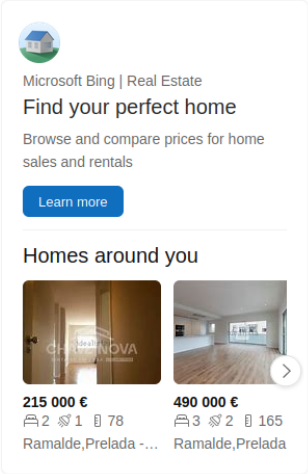


Figure 4.29: Microsoft Bing Real Estate Ad

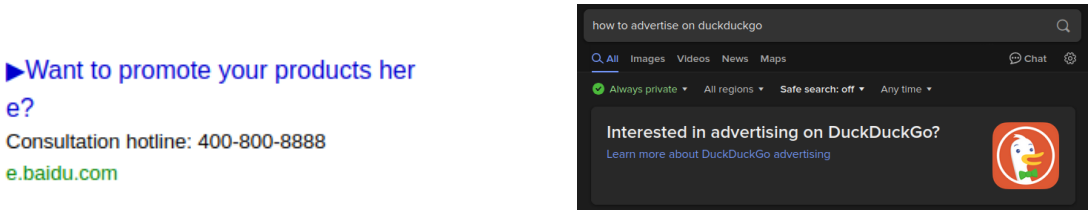


Figure 4.30: Baidu (left) and DuckDuckGo (right) Advertise Here Ads

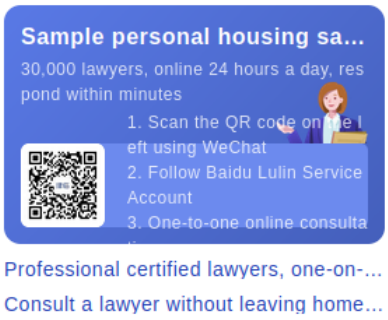


Figure 4.31: Ask a law professional Feature

4.3.10 SERP Notes

Textual notes typically appear on the results page and are sometimes accompanied by links to web pages explaining their presence. During this analysis, four types of notes were identified.

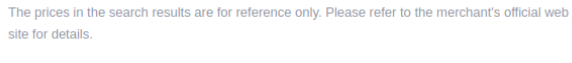
One type informs users that certain results have been omitted due to data protection regulations or applicable laws. These notes were observed on Bing, Google, and Yandex, ensuring compliance with regional legal requirements.

Specifically for Baidu, notes that provide information about the prices displayed and guidance on contacting customer service for further details were found. Additionally, a note prompting

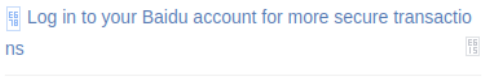
users to log into their Baidu account was observed, aimed at increasing transaction security.

In Yandex in particular, a note was found warning users that some results might contain false information.

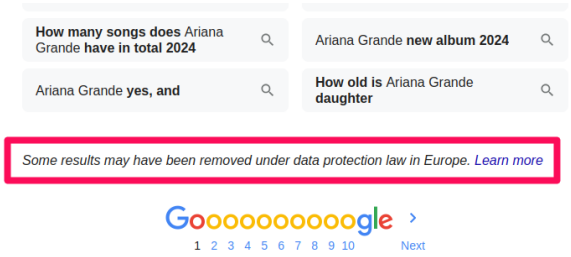
Figure 4.32 illustrates examples of these identified SERP notes.



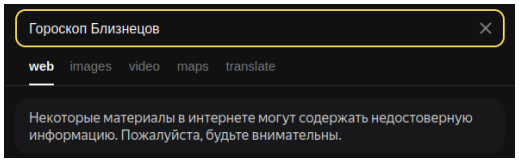
(a) Note related to the displayed prices



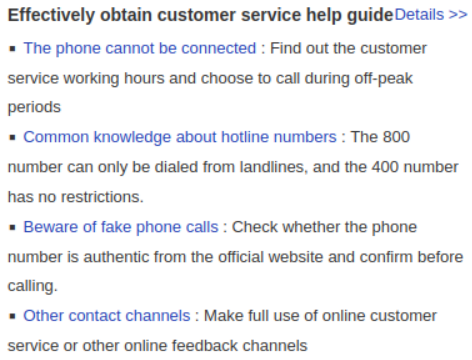
(b) Note to login for more secure transactions



(c) Note of omitted results due to protection laws



(d) Note on false information results



(e) Note on how to contact customer service

Figure 4.32: SERP Notes

Chapter 5

SERP Analysis by Query Type, Search Engine and Language

This chapter is organized into four sections. The first section presents the statistical approach used to analyze each of the independent variables in this study: the **type of the search query** based on its intent, the **language of the search query**, and the **search engine** used. The ections 5.2, 5.3 and 5.4 detail the analyses for each of these variables, respectively.

It is also important to note that some elements identified during the manual identification phase described in Chapter 4, and which were discovered using additional targeted search queries, were not detected in the captured SERPs. That is, the number of occurrences of these elements was consistently zero. Consequently, they are excluded from the results and discussion presented in this chapter. Specifically, the *Book Rich Snippet* and the *Exploration Feature* were not found among the organic elements. The *Official Site Tag*, *Medical Warning*, *Top Banner*, *Exploration Feature*, and *Brand Zone Ads* were not observed within the sponsored results category. From the feature elements category, the following were not detected in any of the captured SERPs: *You May Also Need*, *Related Results*, *Math Solver*, *Calendar*, *Horoscope*, *Poem*, *Quotes*, *Zip Code Enquiry*, *Car Shopping Widget*, *Flight Status Panel*, *House Pack*, *X Pack*, *Practice Problems*, *Related Compositions*, *Discussions and Forums*, *Company Financials*, *Bing Real Estate Ad*, *Baidu Legal Services Ad*, *Note on Displayed Prices*, *Note on How to Contact Customer Service* and *Note on False Information Results*.

5.1 Statistical Analysis Approach

Having recorded the number of occurrences of each element per SERP across the six search engines, as exemplified in Table 3.1, we assessed whether the presence of each element differed significantly based on the query type, search engine, or language of the search query by applying the statistical strategy described in the following paragraphs.

We first evaluated the normality of the data using the Anderson-Darling test. If the data followed a normal distribution, we applied Bartlett's test to assess the homogeneity of variances. For

non-normally distributed data, Levene's test was used instead [53]. If the assumption of homogeneity was met (p-value > 0.05), we proceeded with ANOVA [66]; otherwise, we employed the Kruskal-Wallis test as a non-parametric alternative [50].

Subsequently, we performed post hoc analyses to determine which specific query intent categories, search engines or languages exhibited significant differences for each element. For elements evaluated with ANOVA, pairwise comparisons were conducted using the t-test. For those analyzed via the Kruskal-Wallis test, the Mann-Whitney test was used. All post hoc analyses were conducted using the *scikit-posthocs* Python package [63].

This approach was applied across the independent variables analyzed in the following sections to build the significance tables presented therein.

5.2 Query Type Analysis

The type of search query in this study was defined based on its intent. Accordingly, this section evaluates the differences in SERP interfaces across the various intent categories from the selected dataset: abstain, factual, instrumental, navigational, and transactional. To perform this analysis, we examined two metrics by query intent: the frequency of each element and the proportion of SERPs in which each element appears. Specifically, element frequency refers to the average number of times an element occurs per SERP, while element proportion indicates the percentage of SERPs in which the element is present.

5.2.1 Element Frequency in SERPs

To analyze the distribution of the number of occurrences per SERP for each element across different query intents, we created scatter plots to facilitate data interpretation. Following the element categorization introduced in Chapter 4, we generated three separate scatter plots: one for organic elements, one for sponsored results, and one for feature elements. The scatter plot for organic elements is shown in Figure 5.1, while the plots for sponsored and feature elements are presented in Figures B.1 and B.2, respectively.

Each dot in the scatter plots corresponds to a row of the main table, exemplified in Table 3.1, which represents the number of times a specific element occurs in a particular SERP. The color intensity of the dot clusters reflects the density of occurrences for each value - darker areas indicate higher concentrations. Each color symbolizes a different query intent. The stars on the plots represent the average number of occurrences of each element per query intent. The detailed values of these averages are provided in Table B.1, B.2 and B.3. Additionally, it is important to note that any element and query intent combination for which all values were zero was excluded from the scatter plots.

Moreover, we also calculated the median number of occurrences for each element across the different query intents. These values are presented in Tables B.4, B.5, and B.6, corresponding to organic results, sponsored results, and feature elements, respectively.



To present the results of the post hoc analyses, following the same approach used for the scatter plots, we organized the findings into separate tables by element type. Specifically, Tables B.7 and B.8, located in Appendix B, present the results for organic elements and features, respectively.

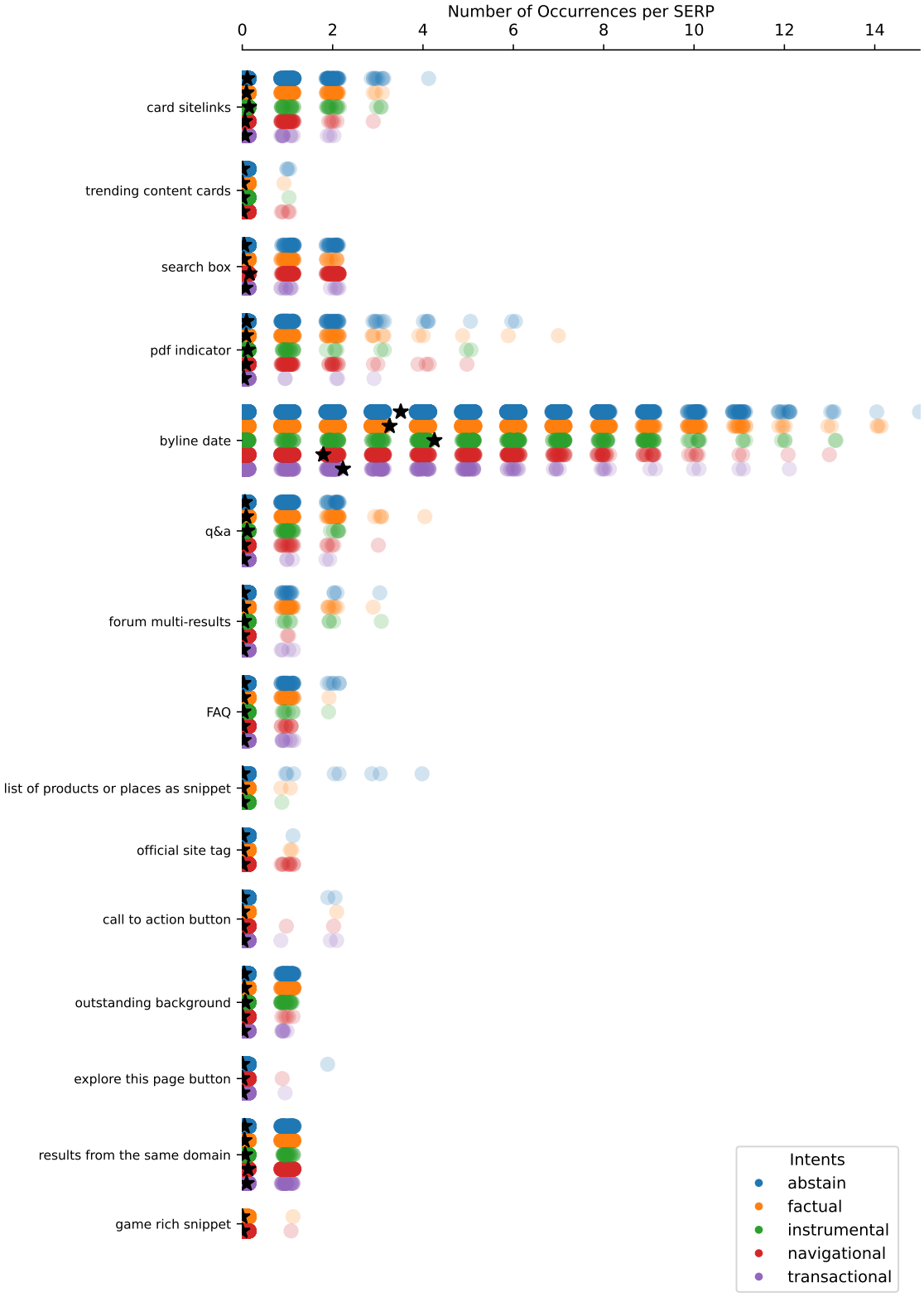


Figure 5.1: Distribution of organic elements occurrences per SERP by query intent. Stars represent mean values.

Table 5.1: Significance table for sponsored elements by query intent. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Abstain	**Factual**	**Instrumental**	**Navigational**	**Transactional**
Abstain >	—	regular textual ad*** sitelinks*** promotional offer***		promotional offer**	
Factual >		—		sitelinks per category*	
Instrumental >		regular textual ad*** sitelinks*** promotional offer***	—	promotional offer*	
Navigational >		regular textual ad* sitelinks***		—	
Transactional >		regular textual ad** sitelinks*** promotional offer**			—

The results for sponsored elements are shown next in Table 5.1.

In each cell of these tables, the presence of an element indicates that its frequency is significantly higher in SERPs associated with the query intent specified in the row compared to those associated with the intent in the corresponding column. For example, in Table 5.1, in the cell at the intersection of the "abstain" row and the "navigational" column, the presence of the promotional offer element indicates that it appears significantly more in abstain SERPs than in navigational SERPs. Asterisks denote the level of statistical significance: * for p < 0.01, ** for p < 0.001, and *** for p < 0.0001.

Regarding the conclusions that can be drawn from these tables, and beginning with the organic results table, it shows a clear distinction between the informational intents (abstain, factual, and instrumental) and the other intents (navigational and transactional). This distinction is evident in the significantly different number of elements present in cells, whose comparison involves one informational intent and one not informational intent compared to those between the three informational intents. Therefore, we aggregated the three informational intents into a single category and the results of this aggregation are presented in Table 5.2.

Table 5.2: Significance table for organic elements with aggregated informational intents. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Informational	**Navigational**	**Transactional**
Informational >	—	image thumbnail** translate this page link** unordered list snippet** numbered list snippet** cards snippet*** organic tab snippet*** structured snippet*** search tag filters*** card sitelinks*** byline date*** q&a*** forum multi-results* outstanding background***	cards snippet* byline date***
Navigational >	rating stars** sitelinks*** search box*** official site tag*** results from the same domain***	—	
Transactional >	rating stars*** sitelinks* call to action button*** results from the same domain*		—

An analysis of Table 5.2 reveals that Navigational SERPs have a higher presence of sitelinks, search boxes, official site tags, and buttons enabling users to retrieve results only from a specific domain. This observation aligns with expectations, as these elements commonly constitute the top result for search queries targeting a particular brand or organization, a typical scenario in which the user's intent is to access the official website, as is characteristic of navigational search queries.

Furthermore, it is important to note that the elements which appear significantly more often in informational queries than in navigational ones, such as various snippet formats, byline dates, q&a sections, and forum multi-results, are mainly introduced to present information to the user. Therefore, their higher prevalence in informational SERPs is consistent with this intent.

Finally, it is worth noting the presence of call-to-action buttons in the comparison between transactional and informational SERPs. As expected, these buttons appear significantly more often in transactional SERPs, where they enable users to initiate actions directly from the results page.

Regarding the analysis of the sponsored results presented in Table 5.1, factual SERPs generally show a lower presence of regular textual ads, sitelinks, and promotional offers. This might be due

to the nature of factual queries, which are typically aimed at retrieving objective information and are less likely to trigger sponsored content.

Furthermore, although it was expected that navigational and transactional SERPs would exhibit a higher presence of sponsored elements than the three informational intents, this pattern is not strongly reflected in the results. Analyzing the frequency averages for the regular textual ad and the sitelinks in Figure B.1, it shows that their averages are indeed higher in transactional queries. However, these differences were not statistically significant and do not appear in the significance table. A potential explanation for this may lie in the methodology used: the SERPs were captured using private browsing mode, which does not retain user history or profile information, potentially limiting the personalization and targeting of sponsored results.

Turning to the features and to better analyze the patterns among the different types of features, we simplified Table B.8 by grouping individual elements according to their corresponding feature categories. These categories align with the subsections defined in the Features section of Chapter 4. The aggregated results are presented in the scatter plot shown in Figure 5.2 and Table 5.3.



Figure 5.2: Distribution of feature types occurrences per SERP by query intent. Stars represent mean values.

Table 5.3: Significance table for feature types by query intent. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Abstain	**Factual**	**Instrumental**	**Navigational**	**Transactional**
Abstain >			carousels** knowledge panels**	carousels** exploration features*** video and image packs*** zero-click answers***	video and image packs* zero-click answers***
Factual >	knowledge panels*** zero-click answers*		carousels** knowledge panels***	carousels* exploration features*** knowledge panels*** video and image packs*** zero-click answers***	knowledge panels*** video and image packs* zero-click answers***
Instrumental >				exploration features*** video and image packs*** zero-click answers***	exploration features** video and image packs*** zero-click answers***
Navigational >	local features* search engine notes*** search refinement features**	local features*** search engine notes* search refinement features***	local features** search refinement features**		
Transactional >	search engine notes***	search engine notes**	search engine notes*	video and image packs**	

An analysis of Table 5.3 reveals a clear distinction in the distribution of feature elements between informational and non-informational SERPs. Specifically, informational SERPs exhibit a significantly higher presence of zero-click answers, carousels, exploration features, and image and video packs. This pattern is expected for zero-click answers, carousels, and image and video packs, as these elements are designed to present content directly to users without requiring them to click through to external sites, which are aligned with the goals of informational queries. Although initially unexpected, the consistently higher presence of exploration features in informational SERPs can be explained by their function: they allow users to search deeper into related questions or topics, supporting a more exhaustive information discovery, which is characteristic of informational tasks. In contrast, such behavior is less typical for navigational or transactional intents.

Additionally, knowledge panels appear more frequently in SERPs associated with factual queries, aligning with their purpose of summarizing factual information about a specific topic or entity.

Search refinement features are more commonly observed in navigational SERPs than in informational ones. Although this outcome was unexpected, it may be attributed to the nature of navigational queries, which are typically aimed at locating a specific website. In such cases, search refinement features assist users improve their searches to locate precise content more efficiently. Additionally, aside from transactional SERPs, navigational SERPs exhibited the highest frequency of automatic spell corrections, which may further contribute to the distinction of search refinement features within this intent.

Furthermore, local features are more prevalent in navigational SERPs than in informational ones. This finding was expected, as such features are typically triggered by search queries looking for local places, which aligns with the navigational intent.

Lastly, search engine notes appear more frequently in transactional SERPs compared to informational ones. This aligns with expectations, as such notes often give important contextual or legal information relevant to online transactions - for example, Baidu's notes regarding secure transaction practices.

Going deeper in the feature comparison and focusing specifically on zero-click answers, as outlined in Section 4.3.3, four distinct types of these features were identified, each presented in a different format. Consequently, a more detailed analysis of these elements was conducted. The results of this analysis are presented in Figure 5.3 and Table 5.4.

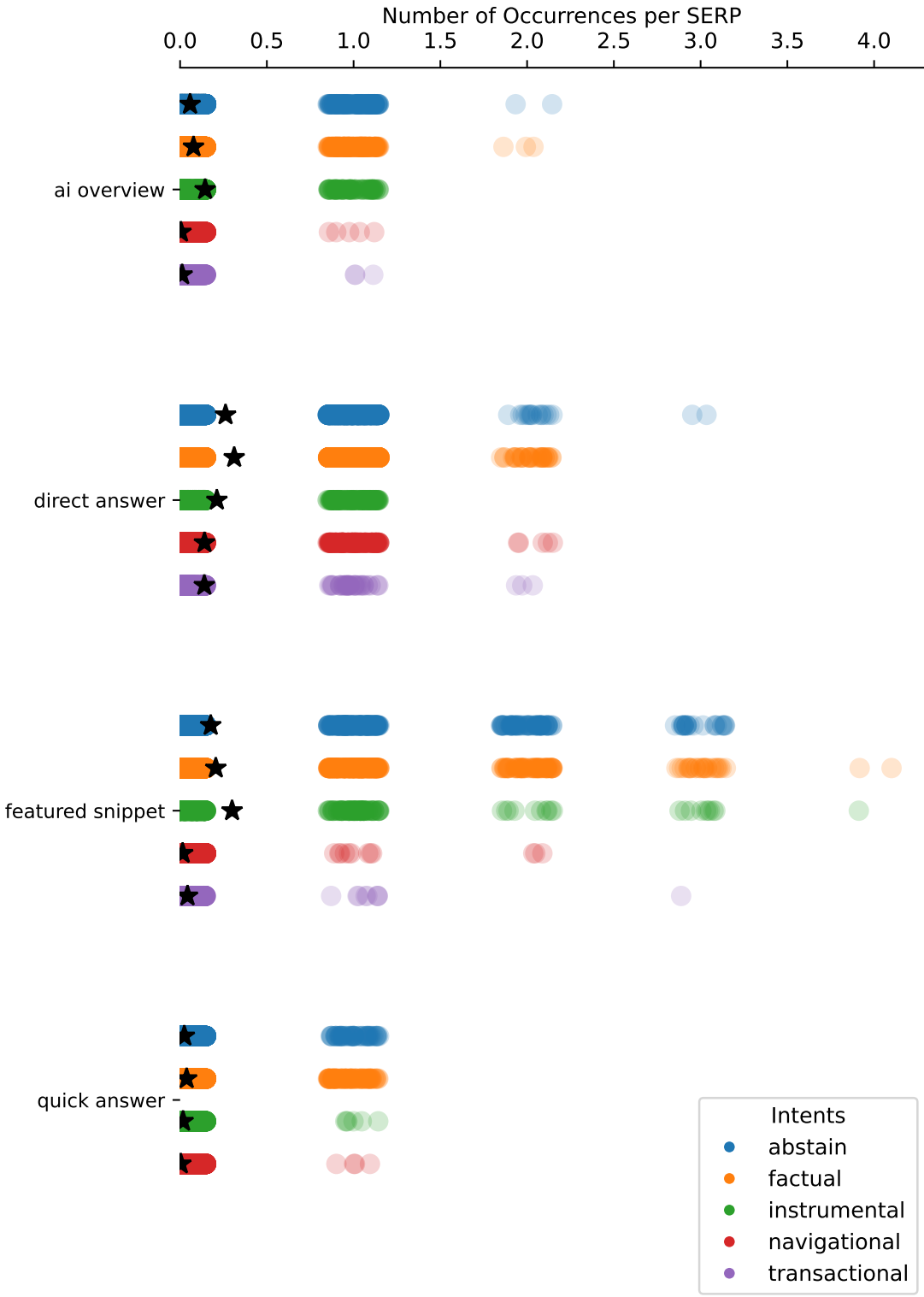


Figure 5.3: Distribution of zero-click answers occurrences per SERP by query intent. Stars represent mean values.

Table 5.4: Significance table for zero-click answers by query intent. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Abstain	**Factual**	**Instrumental**	**Navigational**	**Transactional**
Abstain				ai overview*** direct answer*** featured snippet*** quick answer**	direct answer*** featured snippet**
Factual				ai overview*** direct answer*** featured snippet*** quick answer***	ai overview** direct answer*** featured snippet***
Instrumental	ai overview*** featured snippet**	ai overview*		ai overview*** direct answer** featured snippet***	ai overview*** direct answer* featured snippet***
Navigational					
Transactional					

Based on the data presented in Table 5.4, we can concluded that these features, as anticipated, exhibit a significantly greater presence in informational SERPs compared to non-informational ones. Furthermore, The AI Overview feature appears more frequently in instrumental SERPs than in other categories. Although this result was not initially expected, it may be attributed to the nature of the AI Overview, which provides users with a topic summary. This outcome aligns more closely with the instrumental intent of learning how to perform something rather than simply acquiring factual information.

Following the same analysis done for the zero-click answers, it is pertinent to evaluate the topic-related features. Figure 5.4 presents the scatter plot with the distribution of the occurrences, while Table 5.5 provides the corresponding significance table.

Table 5.5: Significance table for topic-related features by query intent. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Abstain	**Factual**	**Instrumental**	**Navigational**	**Transactional**
Abstain >	—	shopping features***			
Factual >	songs*	—			
Instrumental >	recipe cards***		—	recipe cards***	
Navigational >				—	
Transactional >					—

From Table 5.5, it is important to highlight the increased presence of recipe cards in instrumental SERPs. Although this feature was expected to appear more frequently in instrumental SERPs compared to all other intent categories, the difference was not statistically significant across all

comparisons. Nevertheless, recipe cards exhibit the highest average number of occurrences in instrumental SERPs, which aligns with the nature of this intent: to provide users with step-by-step information on how to perform a task, such as cooking a recipe.

Unexpectedly, shopping features were found to be more prevalent in abstain SERPs than in factual ones. This result was surprising, as shopping features are generally associated with transactional intent. However, the significantly lower presence of these features in factual SERPs may explain this outcome, given that factual queries typically aim to retrieve objective information and are less likely to involve commercial elements. The relatively higher presence of shopping features in abstain SERPs may be attributed to queries involving product-related information without a clear intent to make a purchase. These ambiguous cases fall under the abstain category.

5.2.2 Element Proportion within SERPs

The proportion of SERPs in which each element appeared at least once was also measured. The results of this analysis are illustrated in the bar plots shown in Figures 5.5, 5.6, and 5.7, corresponding to organic results, sponsored results, and features, respectively, using the same categorization used in the previous section. The exact values obtained from this analysis are provided in Tables B.9, B.10, and B.11.

To evaluate whether each element's occurrence depended on the query intent, we conducted chi-square proportion tests, using 0.05 for the value of the alpha. In the bar plots, elements whose names are shown in bold and marked with an asterisk indicate that their occurrence depends on the search query's intent.

From Figure 5.5 we can highlight that organic results appear in all the SERPs. Apart from this, the three elements where the propotion of SERPs is higher are the byline date, the sitelinks and the image thumbnail. Regarding the elements on bold, we can observe that although some elements were not identified in the frequency analysis as more significant in one category than another, in this analysis they are presented as its occurrence depends on the intent, as is the case of the video thumbnail and the pdf indicator. The contrary can also be observed, since the byline date, the translate this page link, the image thumbnail, the call to action button and the official site tag, also presented in the significant tables, are not marked, indicating that the intent is not dependent on the intent. Observing the scatter plot in Figure 5.1 and the bar plot in Figure 5.5, we see that in general where the frequency is higher so is the proportion of SERPs where each element occurs at least once.

5.3 Search Engine Analysis

This section analyzes the results obtained by comparing the presence of each SERP element across the six search engines under study. The analysis is based on the frequency of each element observed within each search engine and follows a methodology similar to that employed in the intent-based analysis. As in the previous analysis, results are grouped by search engine to enable comparison of each element's presence across platforms. The outcomes of this comparison

are visualized in Figures C.1, C.2, and C.3, corresponding to organic results, sponsored results, and features, respectively. The precise average number of occurrences per SERP for each element is reported in Tables C.1, C.2, and C.3. Additionally, the median values were also calculated and are presented in Tables C.4, C.5, and C.6.

In addition, statistical tests identical to those used in the intent analysis were applied to evaluate the significance of the observed differences. The resulting significance tables are presented in Tables 5.6, 5.7, and C.7, which correspond to organic results, sponsored results, and features, respectively. To facilitate the interpretation of the features table, the feature elements were further grouped according to their types. The results of this grouping are presented in Table 5.8.

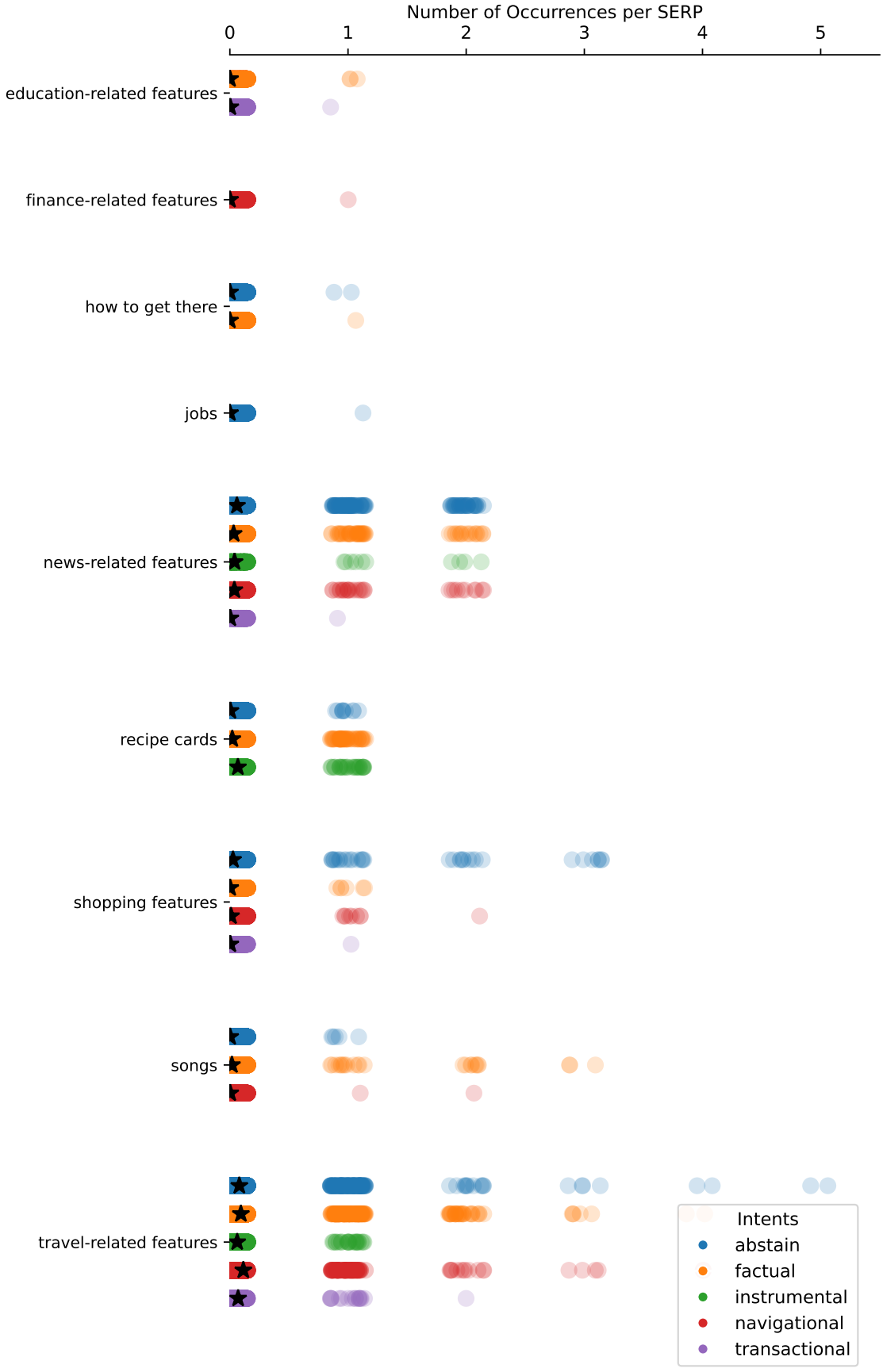


Figure 5.4: Distribution of topic-related features occurrences per SERP by query intent. Stars represent mean values.

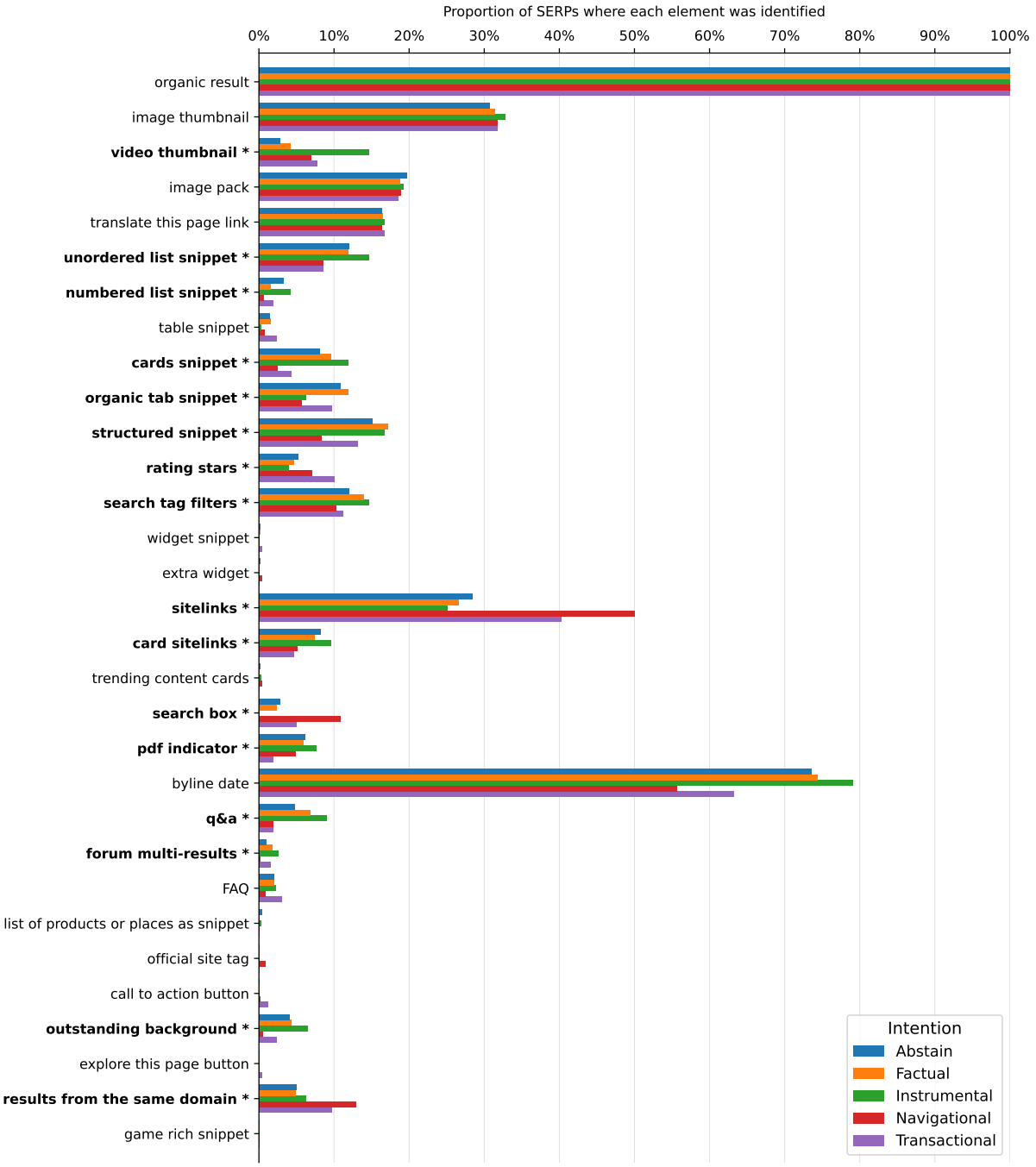


Figure 5.5: Proportion of SERPs in which each organic element appeared at least once. Bold names and asterisks indicate query intent dependence.

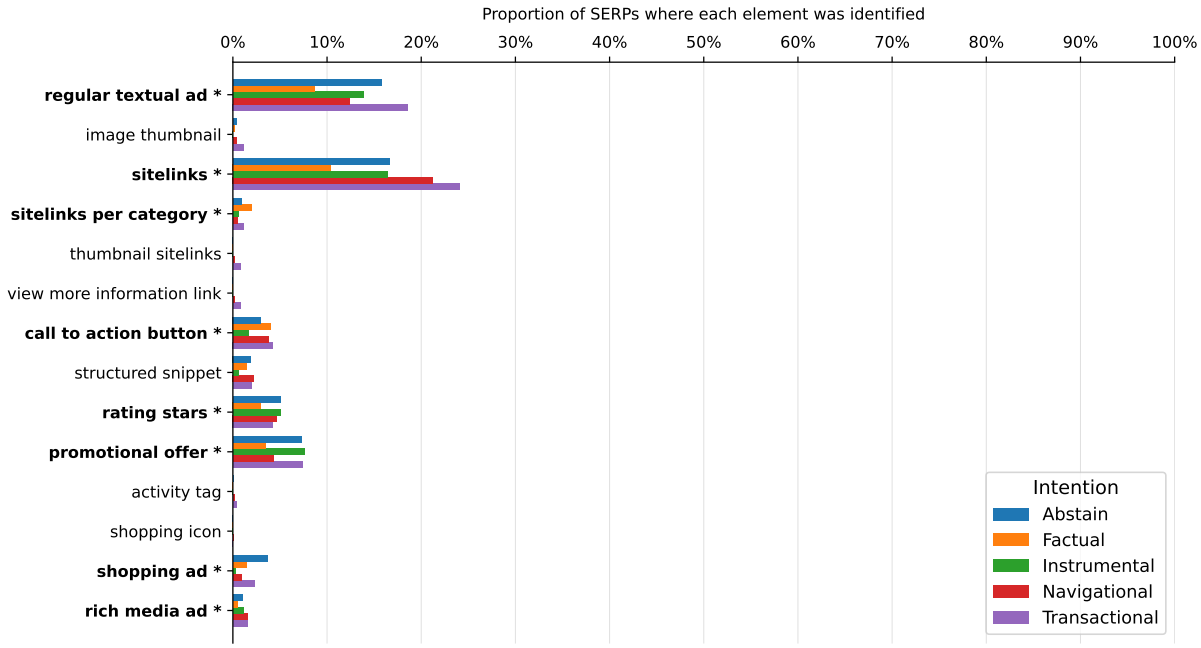
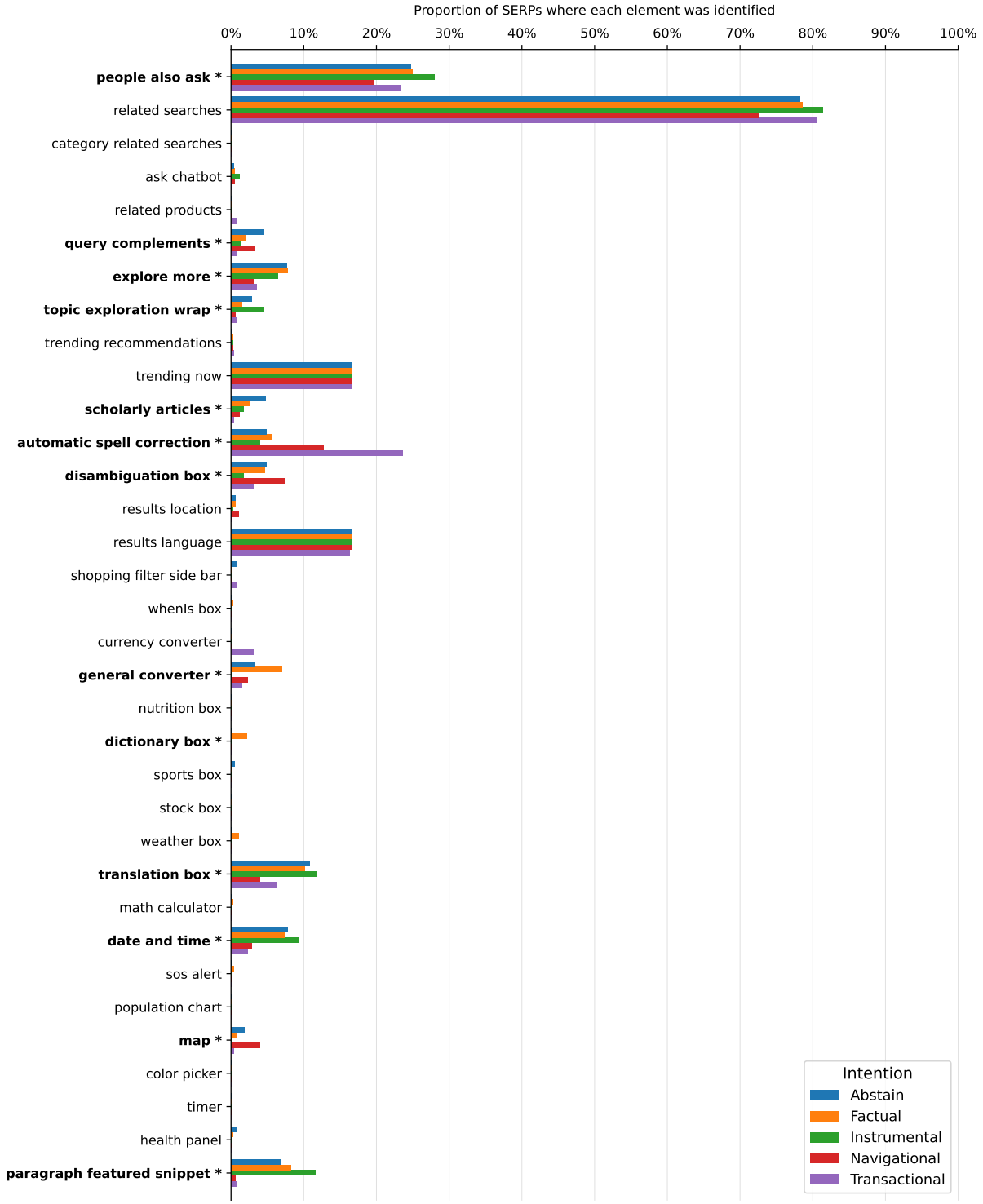


Figure 5.6: Proportion of SERPs in which each sponsored element appeared at least once. Bold names and asterisks indicate query intent dependence.


Proportion of SERPs where each element was identified
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
people also ask *
related searches
category related searches
ask chatbot
related products
query complements *
explore more *
topic exploration wrap *
trending recommendations
trending now
scholarly articles *
automatic spell correction *
disambiguation box *
results location
results language
shopping filter side bar
whenIs box
currency converter
general converter *
nutrition box
dictionary box *
sports box
stock box
weather box
translation box *
math calculator
date and time *
sos alert
population chart
map *
color picker
timer
health panel
paragraph featured snippet *
Intention
Abstain
Factual
Instrumental
Navigational
Transactional

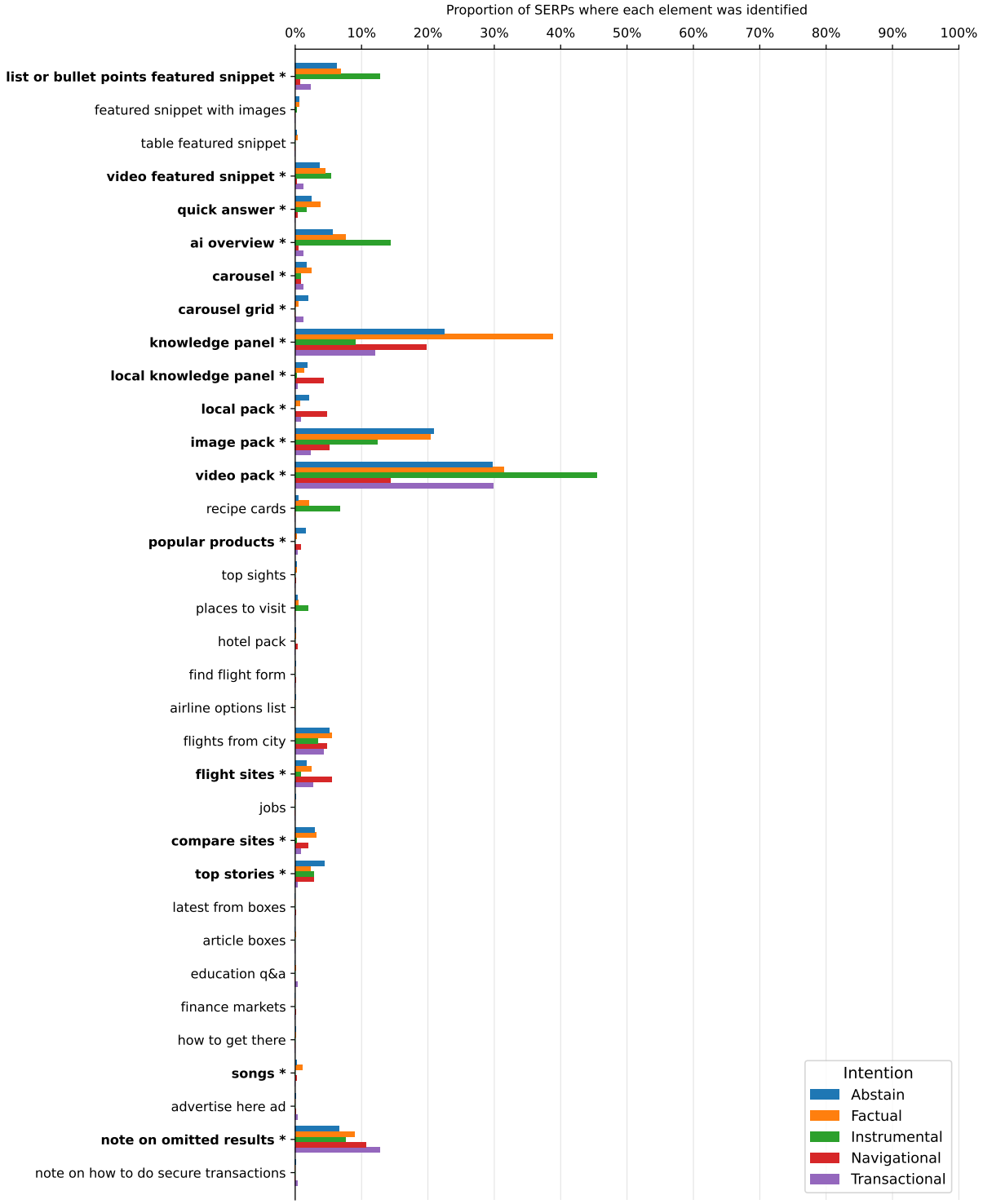


Figure 5.7: Proportion of SERPs in which each feature element appeared at least once. Bold names and asterisks indicate query intent dependence.

Table 5.6: Significance table for organic elements by search engine. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Baidu	**Bing**	**DuckDuckGo**	**Google**	**Yahoo!**	**Yandex**
Baidu >	—	video thumbnail*** pdf indicator*** byline date*** q&a***	byline date***	image thumbnail*** structured snippet*** byline date*** q&a***	organic result*** byline date*** q&a***	image thumbnail*** structured snippet*** byline date*** q&a***
Bing >	organic result*** image thumbnail*** structured snippet*** sitelinks*** FAQ*** list of products or places as snippet* results from the same domain***	—	sitelinks*** byline date**	organic result*** image thumbnail*** structured snippet*** card sitelinks*** search box*** byline date*** FAQ*** results from the same domain***	organic result*** cards snippet*** organic tab snippet*** sitelinks*** card sitelinks***	image thumbnail*** unordered list snippet*** structured snippet*** sitelinks*** card sitelinks*** byline date***
DuckDuckGo >	organic result*** sitelinks***	organic result*** pdf indicator***	—	organic result*** byline date***	organic result*** sitelinks***	sitelinks*** byline date***
Google >	organic result*** rating stars*** sitelinks*** FAQ* results from the same domain***	video thumbnail*** rating stars*** sitelinks*** pdf indicator*** q&a***	sitelinks*** pdf indicator*	—	organic result*** sitelinks*** q&a***	rating stars*** sitelinks*** byline date*** q&a***
Yahoo! >	structured snippet*** sitelinks***	image pack*** unordered list snippet*** structured snippet***		structured snippet*** card sitelinks** search box*** byline date***	—	unordered list snippet*** structured snippet*** sitelinks*** card sitelinks*** byline date***
Yandex >	organic result*** rating stars***	organic result*** video thumbnail*** rating stars*** pdf indicator***	organic result***	organic result***	organic result***	—

Table 5.7: Significance table for sponsored elements by search engine. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Baidu	**Bing**	**DuckDuckGo**	**Google**	**Yahoo!**	**Yandex**
Baidu >	—					
Bing >	regular textual ad*** sitelinks*** shopping ad*** rich media ad***	—		regular textual ad*** sitelinks*** call to action button*** structured snippet***	call to action button*** rating stars***	regular textual ad*** sitelinks*** structured snippet*** rating stars*** shopping ad*** rich media ad***
DuckDuckGo >			—			
Google >	regular textual ad*** sitelinks*** shopping ad***			—		regular textual ad*** shopping ad***
Yahoo! >	regular textual ad*** sitelinks*** shopping ad*** rich media ad**	regular textual ad*** sitelinks*** promotional offer***		regular textual ad*** sitelinks*** call to action button*** promotional offer***	—	regular textual ad*** sitelinks*** promotional offer*** shopping ad*** rich media ad**
Yandex >	sitelinks***				rating stars***	—

Table 5.8: Significance table for feature types by search engine. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Baidu	**Bing**	**DuckDuckGo**	**Google**	**Yahoo**	**Yandex**
Baidu >	—	exploration features***	exploration features*** zero-click answers***	exploration features*** zero-click answers***	exploration features*** zero-click answers***	exploration features*** topic related features** video and image packs*** zero-click answers***
Bing >	carousels*** knowledge panels*** local features*** search engine notes*** search refinement features* topic related features*** video and image packs***	—	carousels*** exploration features*** knowledge panels*** local features*** video and image packs*** zero-click answers***	exploration features*** knowledge panels*** local features*** search engine notes*** video and image packs*** zero-click answers***	exploration features*** knowledge panels*** local features*** topic related features*** video and image packs* zero-click answers***	carousels*** exploration features*** knowledge panels*** local features*** search engine notes*** topic related features*** video and image packs*** zero-click answers***
DuckDuckGo >	knowledge panels*** local features*** search refinement features*** topic related features*** video and image packs***	search refinement features***	—		topic related features*** zero-click answers***	exploration features*** knowledge panels*** local features*** search refinement features*** topic related features*** video and image packs***
Google >	carousels*** knowledge panels* local features*** search engine notes*** search refinement features*** topic related features***	carousels*** search refinement features*** topic related features***	carousels*** exploration features*** search refinement features*** topic related features***	—	carousels*** exploration features*** search refinement features*** topic related features*** zero-click answers***	carousels*** exploration features*** knowledge panels*** local features*** search engine notes*** search refinement features*** topic related features*** video and image packs*** zero-click answers*
Yahoo >	carousels*** knowledge panels*** local features*** search refinement features*** video and image packs***	carousels*** search refinement features***	carousels*** exploration features*** search refinement features*** video and image packs***	knowledge panels* video and image packs***	—	carousels*** exploration features*** knowledge panels*** local features* search refinement features*** topic related features** video and image packs***
Yandex >	search refinement features**				zero-click answers***	—

Based on Table 5.6 and Figure C.1, it can be concluded that Yandex is the search engine with the highest number of organic results, a difference that is statistically significant. In contrast, Yandex generally exhibits a lower presence of features when compared to the other search engines, as illustrated in Figure C.3.

In contrast, Yahoo! has the lowest number of organic results, which is consistent with being the search engine with the highest number of sponsored results. These differences are statistically significant, as indicated in Tables 5.7 and 5.6. Regarding features, Yahoo! shows a significantly higher presence of carousels, while the presence of zero-click answers is the lowest among all search engines analyzed.

Concerning Baidu, it shows the highest presence of the byline date and q&a elements within the organic results. Regarding sponsored elements and features, Baidu appears relatively simple, with no sponsored element showing a significantly higher presence than other search engines. When observing Table C.7, it is evident that Baidu has a higher number of elements where its presence is significantly lower (i.e., more entries in the Baidu column) than number of elements where its presence is significantly higher (entries in the Baidu row). Nevertheless, Baidu stands out for having the highest presence of exploration features.

In contrast, Bing demonstrates a more substantial presence of features, with significantly more elements where its presence is higher than lower (i.e., more entries in the Bing row than the Bing column in Table C.7). Bing shows the highest presence of knowledge panels, as also evidenced by the median values present in Table C.6: it is the only search engine with a median of 1 for this element, while all others have a median of 0. In addition, Bing displays a strong presence of video and image packs and local features. Beyond features, Bing is also a content-rich platform in terms of organic and sponsored results, ranking second in the number of sponsored elements and third in the number of organic results.

DuckDuckGo emerges as the simplest search engine in terms of variety, with only three organic elements identified beyond the organic results themselves. Moreover, no sponsored elements were identified for DuckDuckGo.

Finally, Google demonstrates the highest presence of topic-related, carousels and search refinement features. It is also the search engine where sitelinks are most frequently observed.

In summary, Yahoo! contains the highest proportion of sponsored results and, consequently, the fewest organic results. Yandex, while leading in organic results, shows limited presence in both features and sponsored elements, a pattern also observed in DuckDuckGo. Bing stands out as the most diverse search engine, showing a wide variety of elements in all three categories. Although Baidu ranked third in the total number of elements identified during the manual identification phase, it did not show a strong presence in the feature category. Google remains generally well-balanced across all categories, with a particularly strong presence in topic-related features.

5.4 Language Analysis

In the language analysis, the results for Baidu and Yandex were grouped according to the language of the search query in order to examine potential differences between using these search engines in their primary language and in English. The results of this grouping are illustrated in the scatter plots shown in Figures D.1, D.2 and D.3 for Baidu and D.4, D.5 and D.6 for Yandex.

Statistical tests, similar to those applied in the intent and search engine analyses, were conducted to assess the significance of the observed differences. The results of this analysis are presented in Tables 5.9 and 5.10, corresponding to Baidu and Yandex, respectively.

Table 5.9: Significance table for simplified Chinese and English search queries on Baidu. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$)

	Chinese	**English**
Chinese >	—	organic image thumbnail*** video thumbnail*** organic structured snippet*** organic sitelinks*** byline date*** q&a*** FAQ*** list of products or places as snippet*** organic official site tag** results from the same domain*** regular textual ad*** sponsored image thumbnail*** thumbnail sitelinks*** view more information link*** activity tag*** shopping ad*** rich media ad*** related searches*** category related searches*** ask chatbot*** query complements*** map** health panel*** ai overview*** knowledge panel*** image pack*** video pack*** top stories*** advertise here ad*** note on how to do secure transactions***
English >	organic result*** scholarly articles*** automatic spell correction*** translation box***	—

Table 5.10: Significance table for Russian and English search queries in Yandex. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Russian	**English**
Russian >	—	organic image thumbnail*** video thumbnail*** organic rating stars*** pdf indicator* organic official site tag*** sponsored structured snippet** sponsored rating stars*** image pack*** video pack*** note on omitted results***
English >	organic result* unordered list snippet* automatic spell correction** date and time*** paragraph featured snippet*	—

As expected, Table 5.9 shows a big discrepancy of number of SERP elements present on the SERPs that use Chinese search queries when compared to the ones using English search queries. The only results more present on the English SERPs have a plausivel explanation: there are more organic results because there is a less presence of features to occupy the page; the automatic spell correction is higher since the English search queries have spelling errors and when translated the spelling error disapear; the translation box is more present in the English SERPs because for every English search querie, the Baidu, which is exclusively a Chinese search engine, translates the search query to Chinese with the intent of showing what that english expression mean in Chinese. Moreover, the scholarly articles being higher in the Englsih SERPs can be explain by the fact the language used in general in scientific documents is English.

From 5.10 it is shown as expected that the organic results' presence is higher in the English search queries. Moreover, the higher presence of the automatic spell correction feature can be explained by the fact that while the English search queries have spelling errors, when translated to Russian the spelling error disapeared. Regarding the other features, it is notable that the for the Russian language there a bigger number of elements being more significant, although not soo much as Baidu. This can be explain since Yandex is not exclusivelly a Russian search engine as Baidu is for Chinese and accepts searching in English.

To sum up, we can conclude that there is a difference between using Chinese search queries on Baidu and Russian search queries on Yandex, showing a bigger variety of SERP elements when using search queries on their main language.

Chapter 6

Conclusions

This chapter is organized into three sections. Section 6.1 answers the research questions presented in Section 1.2. Section 6.2 highlights the key contributions of this work and Section 6.3 describes potential directions for future research.

6.1 Answering the Research Questions

This work was guided by three research questions. In the following sections, we present reflections on each of them.

6.1.1 RQ1: Does query intent influence the occurrence of elements in the SERPs?

To address this research question, we analyzed whether the frequency of occurrence of each SERP element varied across different query intents and assessed the statistical significance of the observed differences.

The findings demonstrate that query intent does indeed influence the occurrence of SERP elements. In particular, the most notable differences occur between the informational intents (abstain, factual, instrumental) and the non-informational intents (navigational and transactional).

In the organic results, informational SERPs show a higher presence of elements that provide additional information within the result itself, such as forum multi-results and Q&A sections. Navigational SERPs exhibit a higher presence of elements intended to assist users in locating a specific webpage, such as sitelinks and search boxes. Transactional SERPs display a higher occurrence of call-to-action buttons, which enable users to complete actions directly from the SERP.

For sponsored results, while transactional queries contain a greater number of sponsored results, this difference is not statistically significant. The only meaningful finding in this category is the lower presence of sponsored results and elements in factual SERPs.

Regarding features, informational SERPs have a strong presence of zero-click answers, carousels, exploration features, image and video packs, and knowledge panels. In navigational SERPs, search

refinement features and local features are significantly more frequent. Interestingly, shopping features appear more prominently in abstain SERPs than in transactional SERPs, which was unexpected.

Additionally, we analyzed the proportion of SERPs in which each element appeared and performed chi-square tests to evaluate the dependency between query intent and the occurrence of SERP elements. The results revealed that some elements identified as significantly different in the frequency analysis were not significant in the proportional analysis, such as the image thumbnail. Contrarily, elements like the video thumbnail and PDF indicator were identified as significant in the proportional analysis but not in the frequency analysis. Nevertheless, when comparing the average frequency values and the corresponding proportions, a general trend is verified: higher average frequency is typically associated with a higher proportional presence.

6.1.2 RQ2: How does element occurrence differ among search engines?

To address this question, we analyzed whether the number of occurrences of each SERP element varies across different search engines and whether these differences were statistically significant.

The results show that Yahoo! exhibits the highest number of sponsored results, which leads to the lowest number of organic results. Yandex ranks highest in organic results but shows a limited presence of both features and sponsored elements, a pattern that is similarly observed in DuckDuckGo. Bing stands out as the most diverse search engine, offering a wide range of elements across all three categories. Although Baidu ranked third in the total number of elements identified during the manual analysis phase, it displayed a weaker presence in the features category. Google remains generally well-balanced across all categories, with a particularly strong representation of topic-related features.

6.1.3 RQ3: Does query language influence the SERP interface composition on Baidu and Yandex?

To address this question, we analyzed whether the number of occurrences of each SERP element varied according to the search query language. We compared Chinese and English for Baidu and Russian and English for Yandex and determined whether these differences were statistically significant.

The analysis showed that both search engines present a significantly greater variety of elements when queries are in their primary languages (Chinese for Baidu and Russian for Yandex). Furthermore, the language-based differences are more evident for Baidu, which operates exclusively in Chinese [47]. In contrast, Yandex, which also offers an English version [79], shows less variation between Russian and English queries.

6.2 Contributions

This dissertation contributes to the field of information retrieval interfaces, providing research data and findings that may serve as a valuable foundation for future studies in the field. The main contributions of this work are as follows:

1. **Catalog of SERP Elements and Respective Identifiers**[1]**:** A catalog containing all SERP elements identified through manual analysis, along with a standardized classification of these elements across the analyzed search engines. It also includes a list of code identifiers used for the automatic detection of each element.

2. **HTML Dataset of SERPs**[2]**:** A dataset containing approximately 8,000 SERP captures. The data was extracted from six significant search engines: Baidu, Microsoft Bing, DuckDuckGo, Google, Yahoo!, and Yandex. This dataset will be submitted to a research repository.

3. **Translated ORCAS-I-gold Dataset**[2]**:** This work provides a translated version of the ORCAS-I-gold dataset into Simplified Chinese and Russian. This translation is intended to be submitted to a research repository.

4. **Dataset Containing Elements Occurrences per SERP**[2]**:** The dataset generated through the automatic detection of SERP elements, where each record contains the count of occurrences for a specific element within a SERP, corresponding to a particular search query and intent. This dataset is intended to be submitted to a research repository.

5. **SERP Analysis by Query Intent, Search Engine, and Language:** This work contributes to the study of interfaces in information retrieval systems by providing a comparative analysis of the presence of SERP elements across the leading web search engines. In addition, it examines how the composition of Baidu and Yandex SERPs varies depending on the language of the search queries. Furthermore, the study analyzes how SERP interface composition changes according to the query intent. The findings of this analysis are intended to be published during the final phase of this work.

6.3 Future Work

Despite the contributions made in this thesis, several open issues and promising research directions remain. The following paragraphs outline some paths for future work that are closely related to the research conducted.

Concerning the developed catalog, although it represents a significant contribution, particularly in standardizing elements across different search engines, it is not exhaustive. Some elements were probably not identified during the manual identification phase. For instance, our analysis did

[1] Available at: https://serp-elements-catalog.pages.dev/
[2] Available at: https://doi.org/10.25747/r7ew-wh96

not observe sponsored results in DuckDuckGo, which are known to exist [21]. Furthermore, the continuous development and introduction of new features by search engines make it challenging to maintain an up-to-date catalog that fully reflects all existing elements at any given time.

This study focused exclusively on the desktop versions of SERPs. However, with the growing importance of mobile-first web development, it would be valuable to replicate this analysis for mobile platforms, such as tablets and smartphones. These devices are now among the most common tools for information access, and it is likely that, for the same search query, SERPs may differ considerably between desktop and mobile versions.

Finally, while this work analyzed SERP interface composition based on query intent, it would be equally relevant to examine how SERP composition varies according to query topic, especially given that many of the identified features are topic-related. Furthermore, analyzing the combined effect of query intent and query topic on SERP composition could provide additional insights into how search engines tailor their interfaces to different factors.

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Appendix A

Element Identifiers

Table A.1: Element identifiers by search engine and element

Element Name	Search Engine	Element Identifier
organic result	Baidu	[srcid=”1599”]
	Bing	.b_tpcn
	DuckDuckGo	.E2eLOJr8HctVnDOTM8fs
	Google	.g .Ww4FFb .vt6azd .tF2Cxc .asEBEc
	Yahoo	.algo .algo-sr .relsrch
	Yandex	.Organic .organic .Typo .Typo_text_m .Typo_line_s
organic image thumbnail	Baidu	.c-img .c-img-radius-large .c-img3 .compatible_rxApe
	Bing	.b_imagePair .square_mp .reverse
	Google	.fiar4
	Yandex	.Organic .Organic_withThumb .Organic_thumbFloat_right .Organic_thumbPosition_full .organic .Typo .Typo_text_m .Typo_line_s
video thumbnail	Baidu	.video-poster_3md57 or [srcid=”1508”] or [srcid=”31761”]
	Bing	.capmed
	Google	.g .PmEWq
	Yandex	.Organic .Organic_withThumb .Organic_thumbFloat_left .Organic_thumbPosition_inContent .organic .Typo .Typo_text_m .Typo_line_s
organic image pack	Bing	.rcimgcol
	Yahoo	.compCardList .algoCarouselModern .crsl-modern .caption-2
translate this page link	Google	.fl .iUh30
	Yandex	.Organic .TranslatedSnippet .organic .Typo .Typo_text_m .Typo_line_s
unordered list snippet	Bing	.b_vList .b_divsec .b_bullet
	Yahoo	.pl-15

Element Name	Search Engine	Element Identifier
	Yandex	.List .List_bullets_square .List_gap_m .Typo .Typo_text_m .Typo_line_s
numbered list snippet	Bing	.lisn_content
table snippet	Bing	.tabcap
	Yahoo	.grp .grp-talgo-table .grp-talgo-ext
cards snippet	Bing	#b_wpt_container or #s_appgobigId or #wikiWidgetContainer or .b_RichCardAnswerV2 .b_rc_gb_window
	Yahoo	.compCardList .algoCarouselModern .crsl-modern .caption-5 .compJsScroll .showArrow
organic tab snippet	Bing	.b_caption .b_stsp1 or .rc_herotabheader
	Yahoo	.algoTabsBinder .nowrap .p-rel .overflowX
	Baidu	.c-gap-right-small .c-gap-left-xsmall or .open-source-software-card-break-all__6bQYM or [srcid="1547"] or [srcid="33754"]
organic structured snippet	Bing	.b_algo_EnhanceFacts or .b_factrow .b_twofr
	Google	[data-scnf="fhcVfc"]
	Yahoo	.grp .grp-talgo-facts
	Yandex	.KeyValue .KeyValue_layout_inline .KeyValue_noGap .Organic-KeyValue .Typo .Typo_text_m .Typo_line_m
organic rating stars	Baidu	[srcid="5819"]
	Bing	.b_poi_rating
	Google	.fG8Fp .uo4vr
	Yandex	.OrganicReviews-Rating .organic__reviews
search tag filters	Bing	.batg
widget snippet	Baidu	[srcid="11513"] or [srcid="51129"] or [srcid="5946"]
	Bing	#richdev_ans
	DuckDuckGo	.module .module–about .module–zci-stack_overflow .js-module–stack_overflowjs-about-module
extra widget	Baidu	[srcid="27081"] or [srcid="35"] or [srcid="39718"]
	Bing	#weakLocListCardContainer
	Google	.O6BwUe .p7bv .ar9V1 .DfMusf .y6CIle
	Yandex	.CodeLine-Wrapper
organic sitelinks	Baidu	.catalog-list_iR5a4 or [srcid="32268"]
	Bing	#b_algospacing or .b_algo .b_vtl_deeplinks or .b_annooverride
	DuckDuckGo	.FTrf7TqAcfxxEQ_3nfUg
	Google	.BYM4Nd or .HiHjCd
	Yahoo	.d-b .h-22 .ov-h .mb-8 or .ivmb-8 .td-hn .ov-h .w-576

Element Name	Search Engine	Element Identifier
	Yandex	.Organic .Bno .bno .organic .Typo .Typo_text_m .Typo_line_s or .Sitelinks .Sitelinks_size_m .Sitelinks_withDot .Organic-Sitelinks .Organic-Sitelinks_size_m .sitelinks
card sitelinks	Bing	.b_canvas .b_slideexp
	Google	.OD2hDc
	Yahoo	.content .pt-4 .pr-12 .pl-12 .pb-12 .mt-0 .lh-1_38x .bgc-refgray
	Yandex	.CostPlus .CostPlusAuto or .CostPlus .CostPlusRealty
trending content cards	Bing	.b_divdef .rc_vlrnTitle .rc_rnDesktop_vlrnTitle

Element Name	Search Engine	Element Identifier
search box	Bing	.sc_rf
	Google	.ojyYHb
	Yahoo	.compForm
pdf indicator	Baidu	[srcid="1525"]
	Bing	.b_pdf_profileContainer
	DuckDuckGo	.result__type
	Google	.ZGwO7 .s4H5Cf .Af9bid .AvolPe .b7GjXe .RiJqbb
	Yandex	.Sticker .Sticker_size_m .Sticker_theme_red .Button2-Sticker
byline date	Baidu	.c-color-gray2
	Bing	.news_dt
	DuckDuckGo	.MILR5XIVy9h75WrLvKiq
	Google	.LEwnzc .Sqrs4e
	Yahoo	.fc-smoke
	Yandex	.Label .Label_color_blue .Organic-Label .Organic-Label_date .label .organic__label or .LabelFreshness_size_3xs .Organic-Label .label .organic__label
q&a	Baidu	[srcid="1529"] or [srcid="205"] or [srcid="50176"]
	Bing	.b_bestAnswer
	Google	.YkS8D
	Yahoo	.dd .bd-0 .p-0 .technologyCodingAnswer
	Yandex	#a11y-search-result-code-snippet-label-ref
forum multi-results	Baidu	[srcid="10"]
	Google	.P1usbc
FAQ	Baidu	[srcid="5242"]
	Bing	.b_algoArticleTextCarousel
	Google	.sWISj .wHYlTd
list of products or places as snippet	Baidu	[srcid="39603"]
	Bing	.b_listnav
organic official site tag	Baidu	.c-text .c-text-authoritative or .label_2AO93 .c-gap-left-small
	Yandex	.VerifiedList .VerifiedList_size_m .Organic-VerifiedList
organic call to action button	Baidu	[srcid="33956"] or [srcid="5350"] or [tpl="ask_doctor"]
	Bing	#UnifiedAnswerGutterWidgetContainer or #ua_cid or .b_gotosite_button
	Yandex	.OfferInfo
outstanding background	Bing	.b_algo .b_algoBorder or .thi_wpr
explore this page button	Bing	.scs_arw

Element Name	Search Engine	Element Identifier
results from the same domain	Baidu	.c-gap-top-xsmall .f14
	Bing	.b_deep .b_moreLink or .b_deepmorebtnContainer
	Google	.H3TZoe
game rich snippet	Baidu	[srcid="5878"]
book rich snippet	Baidu	[srcid="5661"]
organic exploration feature	Baidu	.c-gap-top-xsmall .c-recommend
	Bing	.pageRecoContainer
	Yahoo	.rs-section .bdr-8 .trans-in
sponsored result	Baidu	._3rqxpq2 .EC_result .new-pmd .c-container
	Bing	.sb_add .sb_adTA
	Google	.uEierd
	Yahoo	.ads
	Yandex	.YDKngDdsBJ or .aNTtEtJsiT or .mCYOmUojUI or .oOwdHRDYxh
sponsored image thumbnail	Baidu	.c-img .c-img-radius-large ._4kcs16s
	Google	.SuXxEf
sponsored sitelinks	Baidu	._95tqnf4 .uph6cgn or .kwquj8k
	Bing	.ad_fls or .b_vlist2col .b_deep or .hsl_carousel .adsMvCarousel
	Google	.dcuivd .Va3FIb .lVm3ye .TElO2c .OSrXXb
	Yahoo	.ad-ql or .bb-DADADA
	Yandex	.Sitelinks .Sitelinks_size_l .Sitelinks_columns .Bno-Sitelinks .Bno-Sitelinks_size_l .Bno-Sitelinks_indented .sitelinks or .Sitelinks .Sitelinks_size_m .Sitelinks_withDot .Organic-Sitelinks .Organic-Sitelinks_size_m .sitelinks
sitelinks per category	Baidu	.xnk2nxp
	Bing	.hozdl_car
thumbnail sitelinks	Baidu	.gtsmk47 .c-img .c-img-radius-large
view more information link	Baidu	.z4dcy3x .c-gap-top-small
sponsored official site tag	Yahoo	.os .fl-r .mt-5 .ml-5 .pl-3 .pr-3 .fc-9th .fz-11 .d-ib .ac-1st .lh-17 .h-16 .bdr-2 .bgc-dolphin
sponsored call to action button	Bing	.b_floatR_img
	Google	.NBRiKc or .Swc83c .btku5b .k0Jjg .fCrZyc .LwdV0e .ogBxF .eFSWxd .gzV1t
	Yahoo	.compText .fl-r .z-1 .ml-8

Element Name	Search Engine	Element Identifier
sponsored structured snippet	Bing	.b_secondaryText .callout_vis or .b_topAd .b_secondaryText
	Google	.Qezod or .pHEqtf .H3wotc
	Yandex	.Meta .Meta_type_black .Meta_size_m .Organic-Meta
sponsored rating stars	Bing	.csrc .sc_rc1
	Yahoo	.ad-mr .fz-14 .lh-22
	Yandex	.VanillaReact .OrganicReviews
promotional offer	Bing	.ad_bdg
	Google	.ifk4y
	Yahoo	.va-top .lh-22 .selected
	Yandex	.InfoSection .PromoOffer
activity tag	Baidu	.wdmbvxt
medical warning	Yandex	.VanillaReact .Warning .Warning_cover .Warning_type_graphics-medicine .Warning_display_flex .Warning_theme_white .Organic-Warning
exploration feature	Baidu	.ec-d20-recomm-wrap-nobg .c-gap-top
	Bing	.b_hide .b_inline_ajax_rss
	Google	#aobm_1
	Yahoo	.rs-section .bdr-8 .trans-in
shopping icon	Yandex	.VerifiedList .VerifiedList_size_m .Organic-VerifiedList
shopping ad	Baidu	[srcid="28123"] or [srcid="5103"] or [srcid="5544"]
	Bing	.b_PolePAContainer or .pa_mlo .pa_carousel_mlo or .pa_sb .pa_list_sb or .pa_waterfall .pa_fade .adsMvCarousel .br-animLG .br-animLGSlide .br-animEnd or .ppa_ads_container
	Google	#bGmlqc or .mnr-c .Ioy6jb
	Yahoo	.compProductList
	Yandex	.Prbb6dcf86
rich media ad	Baidu	.bztxd3c .c-img .c-img-radius-large or [srcid="5846"]
	Bing	.sb_add .sb_adTA .sb_adBrandSidebar .ad_sc
	Yahoo	.dd .p-rel .pt-0 .bdr-l .ov-h .mb-32 .mma
	Yandex	.AdvMedia-Item
top banner	Baidu	#top-ad
brand zone ad	Baidu	.new-pmd .c-container .tenon_pc_material-left or .new-pmd .tenon_pc_material-right

Element Name	Search Engine	Element Identifier
people also ask	Bing	.rqnaContainerwithfeedback .df_alaskcarousel .rqnafbUlWrapper .rqnASCWrapper .ansTtlUndrlnWrapper
	Google	.cUnQKe
	Yahoo	.bingrelqa
	Yandex	#fodsaz4-P5Lhul0
related searches	Baidu	#rs_new or [srcid="28608"]
	Bing	#b_alsotry or #brsv3 or #relatedSearchesLGWContainer or .b_rrsr or .richrswrapper
	DuckDuckGo	[data-layout="related_searches"]
	Google	.oIk2Cb
	Yahoo	.dd .AlsoTry or .dd .AlsoTry_E or .dd .pasf_s
	Yandex	.VanillaReact .RelatedBottom
category related searches	Baidu	[srcid="21102"]
	Bing	.healthrqAnswerContainer
ask chatbot	Baidu	[srcid="52612"] or [srcid="60704"] or [srcid="60715"] or [srcid="60887"] or [tpl="ai_agent_distribute"]
	Bing	.rs_chatT
you may also need	Google	.sCEc3e .GssVdc
related results	Bing	.wpvn_ala
related products	Google	.EfDVh .wDYxhc .NFQFxe .viOShc
query complements	Baidu	#searchTag
	Bing	#b_shpmetis
	Google	.IUOThf or .yTYGId .hPcOWc
	Yahoo	.dd .multishoppingcarousels or .dd .pasf-local
explore more	Bing	#lgImgAnsContainer or #lgVidAnsContainer or .b_ans .b_explans .rrexqp .trirow or .b_remod or .coll_vc .coll_otl
	Yahoo	.dd .horoscopeListCenter
topic exploration wrap	Bing	.te_wrap
trending recommendations	Baidu	[tpl="right_game_recommend"]
trending now	Baidu	[srcid="20811"] or [srcid="50955"]
	Yahoo	.dd .p-8 .theme-single .trendingNow
scholarly articles	Baidu	[srcid="1577"] or [srcid="21"]
	Google	.wHYlTd .k6t1jb

Element Name	Search Engine	Element Identifier
automatic spell correction	Baidu	.result-molecule .hit-toptip .new-pmd
	Bing	.b_promtxt .sp_requery
	DuckDuckGo	[data-testid="spelling-message"]
	Google	#fprs
	Yahoo	.Sugg
	Yandex	.RequestMeta .Misspell
disambiguation box	Google	.EDblX .GpHuwc or .gqLncc .card-section .KDCVqf
	Yahoo	.disambilist
results location	Google	.vqkKIe .wHYlTd
results language	Google	#oFNiHe
shopping filter side bar	Yahoo	.dd .shoppingFilterReformulation
whenIs box	Bing	.b_tppFact
	DuckDuckGo	.biiqk1fQkbgmvzVx3wFU
	Google	.vk_bk .dDoNo .FzvWSb
	Yahoo	.dd .bb-1-EEE .ov-h .pb-8 .referenceTextlist0 or .dd .bdr-16 .bgc-refgray .p-16 .eventCountDownClock or .dd .ykakg
	Yandex	.EntityFact-Answer .Typo or .EntityFact-Answer .Typo .Typo_text_xl
currency converter	Baidu	[srcid="5293"]
	Bing	.currencyPanel
	DuckDuckGo	.iusvfprJWEdCDGKACeME
	Google	.I4v0Kc .wlkW8 .PZPZlf
	Yahoo	.dd .Currency
	Yandex	#a11y-search-result-converter
general converter	Baidu	[srcid="4978"]
	Bing	#rich_uc
	DuckDuckGo	.ighRT8XtMY1IQqf0wCFy
	Google	.hntNk .vk_c .vk_bk or .vk_c .card .obcontainer .card-section
	Yahoo	.dd .sys_conversion
nutrition box	Bing	.wellness-mainline-food-wrapper
	Google	.dG2XIf .EyBRub .Wnoohf .OJXvsb
	Yahoo	.dd .modern .bdr-l .bd-1-E0E4E9 .p-16 .sys_nutrition
dictionary box	Baidu	[srcid="28232"] or [srcid="51380"] or [srcid="51386"]
	Bing	#b_dict_container
	DuckDuckGo	.module .ia-module–definitions .has-content-height
	Google	.lr_container .mBNN3d
	Yahoo	.dd .bdr-l .p-rel .sys_dictionary

Element Name	Search Engine	Element Identifier
sports box	Baidu	[srcid="60627"]
	Bing	#bsp_lgcontainer
	DuckDuckGo	._AbRorjecNJv63nxazVE
	Google	#sports-app
	Yahoo	.dd .s-kg .kgBrowse .modern .refresh .sb-sports
stock box	Baidu	[srcid="46671"] or [srcid="5212"] or [srcid="5214"] or [srcid="5503"]
	Bing	#financeAnswer
	DuckDuckGo	.module .ia-module–stocks .decrease
	Google	.aviV4d
	Yahoo	.dd .modern .todaystockmarket or .dd .s-kg .kgBrowse .modern .refresh .sb-finance
	Yandex	#a11y-search-result-stocks
weather box	Baidu	[srcid="4982"] or [srcid="4999"]
	Bing	#lgWeatherContainer or #lgWeatherUpsellContainer or .wtr_core .b_topBleed .b_sideBleed .b_bottomBleed .wAlrt .wnoPrec .cursorPointer
	DuckDuckGo	.module .module–forecast .module__container
	Google	#wob_wc
	Yahoo	.dd .weatherInfo .bd-0 .pl-0 .pr-0 .Weather
	Yandex	.Organic .WeatherForecast-Organic .organic .Typo .Typo_text_m .Typo_line_s
translation box	Baidu	[srcid="16047"] or [srcid="23"] or [srcid="85"]
	Bing	.tta_mop
	DuckDuckGo	.translations-wrapper
	Google	.tw-bil-e .tw-bil-ex
	Yahoo	.dd .bingtranslate
	Yandex	.Translate .Translate_text .Translate_redesign .Translate_withBubblesx
math calculator	Baidu	[srcid="51044"]
	Bing	.MathSolver_iframe
	DuckDuckGo	#zci-calculator
	Google	.tyYmIf
	Yahoo	.appCalculator
	Yandex	.calculator .i-bem
math solver	Google	[jsname="zh9oD"]
date and time	Baidu	[srcid="60088"]
	Bing	.baselClock
	DuckDuckGo	.i_ahtgeTU2OYiMZz7Dnm .rTp3gjHLM_HhV51PNxOO
	Google	.vk_gy .vk_sh .card-section .sL6Rbf
	Yahoo	.dd .Time
	Yandex	.Fact

Element Name	Search Engine	Element Identifier
sos alert	Google	.Ww4FFb .vt6azd .obcontainer .wDYxhc
population chart	Baidu	[srcid="50716"]
	Google	.L29P6c .fm06If .SldcQ
map	Baidu	[srcid="4282"]
	Bing	.v8Map .mv_desktop
	DuckDuckGo	.module .module–map .js-module–maps_maps
	Google	.vk_c .PAq55d
	Yandex	.Toponyms
color picker	DuckDuckGo	#zci-color_picker
	Google	.yp1CPe .wDYxhc
timer	Bing	.ml_utilityAnswer
	DuckDuckGo	#zci-timer
	Google	.g .wF4fFd .g-blk
calendar	Baidu	[srcid="5601"]
horoscope	Baidu	[srcid="48227"]
	Bing	#zodiac_container
	Yahoo	.dd .Horoscopes
poem	Baidu	[srcid="51376"]
quotes	Baidu	[srcid="51328"]
health panel	Baidu	[srcid="28420"] or [srcid="5041"] or [srcid="5633"]
	Bing	#ConditionMainline_Container or #wellness_mainline_wrapper
	Google	.g .VjDLd .kno-kp .wF4fFd
zip code enquiry	Baidu	[srcid="50419"]
paragraph featured snippet	DuckDuckGo	.l9zzCS1YxeRxFHNsi9IQ
	Google	.iOWvff .P58Kof
	Yahoo	.dd .QnATuring .bingref
	Yandex	.Fact .Fact_answerGap_l
list or bullet points featured snippet	Bing	.ans-itm-cntr .qna-df .qna-aggr-genItems
	Google	.RqBzHd
	Yandex	.Fact-ECFragment .Fact-ECFragment_marker_number .Fact-ECFragment .Fact-ECFragment_typo
featured snippet with images	Google	.DhGrzc .BDXcec
table featured snippet	Google	.webanswers-webanswers_table__webanswers-table
video featured snippet	Google	.g .wF4fFd .JnwWd .g-blk
quick answer	Bing	.b_tophbh .bgtopwh or .df_da
	Google	.Qc895c or .WC0BKe
	Yahoo	.compTitle .fz-32 .lh-40 .fc-midnight .mb-8
	Yandex	.Fact-Summarize .Typo

Element Name	Search Engine	Element Identifier
ai overview	Baidu	[srcid="278"] or [srcid="279"] or [srcid="34799"] or [srcid="35735"] or [srcid="51930"] or [srcid="52575"]
	Bing	.qna-mf .qna_tg or .sto_slides
	DuckDuckGo	[data-react-module-id="wikinlp"]
	Yahoo	.dd .refresh .genAiSum or .dd .what-to-do-results .refresh .refresh-v2 .rft .p-rel .ivmb-10 .whatToDoAI
carousel	Baidu	[srcid="51274"]
	Bing	#ent-car-exp
	DuckDuckGo	.nr_ewG6AQFJyBVJ9CQON .ZGLwIfIXEQH7cB985mXf
	Google	.UjPkWd or .uciohe
	Yahoo	.compGenericCardList .wtwStCrds or .grp .grp-mediaCastCarousel or .grp .grp-peopleMovieTv .p-rel or .highlightsCarousel or .s-crsl .showArrow
	Yandex	.main__carousel-item .main__carousel-item_type_entity_carousel
carousel grid	Bing	#sp-car
	Google	.ULSxyf .a2qDab .EyBRub
knowledge panel	Baidu	[srcid="51527"]
	Bing	#financeL3Tabs or .b_sideBleed .lite-entcard-ans or .b_wpTab
	DuckDuckGo	.module .ia-module-covid or .module .module–lyrics .js-lyrics-module or [data-react-module-id="about"]
	Google	.HdbW6 .MjUjnf .VM6qJ or .TQc1id .IVvPP .Jb0Zif .k5T88b or .jYcvae .kY5Gde or .kp-wholepage .ss6qqb .u7yw9 .zLsiYe .mnr-c .kp-wholepage-osrp .Jb0Zif .EyBRub
	Yahoo	.catKG or .dd .ent-card_movie .KgMoviesYKC or .dd .ent-card_tv .KgTv or .dd .ent-header or .tab-general .KgOlympicsHeaderSuper
	Yandex	.EntityHeader .EntityHeader_hasTiles or .entity-search__badge
local knowledge panel	Bing	#lstpContainer or .b_entityTP or .lgb_ans
	DuckDuckGo	.js-places-module-content .js-places-single or .wbUB0U7KMDyukXtzMd8Y .NCwWYRkAos7ntUjEoEWk
	Google	.zhZ3gf
	Yahoo	.dd .lrrLocal .singleLocal

Element Name	Search Engine	Element Identifier
local pack	Baidu	[tpl=”poi_mapdots”]
	Bing	.b_lmLocal
	DuckDuckGo	.module–places-multiple .js-places-multiple or [data-react-module-id=”maps_places”]
	Google	.Qq3Lb
	Yahoo	.LocalPc-listings
	Yandex	#a11y-search-result-companies-list or .companies-map-list__list .companies-map-list__list_visible or [data-fast-name=”companies”]
image pack	Baidu	[srcid=”4”]
	Bing	.b_imgsmall or .iavs .iaclk2irp
	DuckDuckGo	[data-layout=”images”]
	Google	.Lv2Cle
	Yahoo	.dd .fst .lst .bing_dd .bb-1-EEE .pb-16 .Img
	Yandex	.ImagesGrid or .ImagesScroller
video pack	Baidu	[srcid=”4185”] or [srcid=”4295”]
	Bing	#serpvidans or .b_ans .b_vidAns
	DuckDuckGo	[data-layout=”videos”]
	Google	.uVMCKf or .vtSz8d
	Yahoo	.dd .Video or .topVideoPlayList
	Yandex	.VideoSnippetsList .Video-SnippetsList
recipe cards	Bing	#recipeCells or .b_ans .b_mop .b_mopb .b_mop .b_mopb
	DuckDuckGo	[data-testid=”recipes-carousel-module”]
	Google	.MmzWWe
	Yahoo	.srch-mg .sys_yahoo_recipe
popular products	Bing	#ShoppingAnswerPALGFilterContainer or .sa_main .sa_cont
	Google	product-viewer-group
car shopping widget	Baidu	[srcid=”4526”]
top sights	Baidu	[srcid=”5735”]
	Bing	.ewrc
	Google	.NfrtPd .UE0K3b .QsV5nc
places to visit	Bing	#b_wfCarousel
	Google	.LJQfbb .mnr-c or .fUNhv
hotel pack	Baidu	[srcid=”60454”]
	Bing	.lm_maptop .lm_hotels_reduced .hotel_ans
	Google	.fPmcEc or .hijiJc
	Yahoo	.dd .bd-1 .bdr-l .p-rel .LocalPc-listings
	Yandex	.HotelsCarousel
find flight form	Baidu	[srcid=”5789”]
	Yahoo	.dd .modern .bdr-8 .flight_ticket_dd
airline options list	Bing	#fb_bking
	Google	.p21Z4
flight status panel	Google	.aeayCf .mnr-c

Element Name	Search Engine	Element Identifier
flights from city	Google	[data-hveid="CCUQAA"]
flight sites	Google	.XNfAUb
house pack	Bing	.b_re_serpListCard .lm_maptop .b_lmHouse .b_lmCust .b_mapFullBleed
jobs	Bing Google	.jobsAnswerContainer .jb_iconCards .iYivne .Ww4FFb .vt6azd
compare sites	Google	.KYLHhb .Ww4FFb .vt6azd or [data-hveid="CFoQAA"]
top stories	Baidu Bing DuckDuckGo Google Yahoo	[srcid="19"] or [srcid="52596"] #ans_nws or .b_nwsAnsTopItem [data-layout="news"] .e2BEnf .q8U8x .dd .tn-carousel
latest from boxes	Google	.m5t0v .MQlzab
article boxes	Baidu Google	[srcid="206"] or [srcid="30741"] or [srcid="50352"] .EyBRub .yG4QQe .TBC9ub
x pack	Google	.g .eejeod
perspectives	Google	.yLWA8b .rsmgO .WA6vUb
education q&a	Bing Google	#b_super_task_pane or .qzCap .f0FBcf
practice problems	Google	.TzHB6b .cLjAic .LMRCfc .h7Bft
related compositions	Baidu	[srcid="4697"]
discussions and forums	Google	.qtOtne .gVrOEd
datasets	Google	.e2BEnf .U7izfe .hWIMdd
finance markets	Yahoo	.sb-finance-explore
company financials	Yahoo	.sb-finance-stats
how to get there	Baidu Bing Google	[srcid="5773"] .dr_routeInfo #lud-ed
songs	Baidu Google	[srcid="50393"] or [srcid="5178"] .yTFeqb .wp-ms .oJxARb .nBWfrd .VE2Ztc
advertise here ad	Baidu DuckDuckGo	.ad-block .ad-block-0 .O9Ipab51rBntYb0pwOQn .nr_ewG6AQFJyBVJ9CQON .me1itxoHbX8rHrjqV4R3
bing real estate ad	Bing	.re_standalone .ctx_upsell .re_pc .re_wide
baidu legal services ad	Baidu	[srcid="50519"]

Element Name	Search Engine	Element Identifier
note on omitted results	Bing Google Yandex	.b_msg .b_canvas or .rblk_msg #ofr or .a1DBFd .RequestMeta-Level .RequestMeta-Level_type_antispam
note on displayed prices	Baidu	.k8vt8hp
note on how to do secure transactions	Baidu	.hint-title_1SnSy .c-gap-bottom-middle
note on how to contact customer service	Baidu	[tpl="right_timeliness"]
note on false information results	Yandex	.RequestMeta-Level .RequestMeta-Level_type_level

Appendix B

Supplementary Data for Query Intent Analysis

Table B.1: Average number of occurrences per SERP of organic elements by query intent

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
organic result	9.114	9.225	9.268	9.087	9.213
image thumbnail	1.244	1.218	1.356	1.066	1.256
video thumbnail	0.039	0.056	0.184	0.073	0.078
image pack	1.231	1.235	1.212	1.229	1.244
translate this page link	1.231	1.169	1.260	1.060	1.186
unordered list snippet	0.196	0.158	0.215	0.104	0.112
numbered list snippet	0.049	0.021	0.059	0.008	0.035
table snippet	0.017	0.021	0.003	0.011	0.023
cards snippet	0.107	0.113	0.161	0.026	0.058
organic tab snippet	0.125	0.143	0.071	0.063	0.105
structured snippet	0.221	0.273	0.305	0.122	0.194
rating stars	0.092	0.095	0.056	0.136	0.236
search tag filters	0.892	1.009	1.102	0.710	0.787
widget snippet	0.001	0.002	0.000	0.000	0.004
extra widget	0.002	0.000	0.000	0.004	0.000
sitelinks	0.434	0.380	0.325	0.807	0.570
card sitelinks	0.110	0.092	0.150	0.058	0.058
trending content cards	0.001	0.000	0.003	0.004	0.000
search box	0.040	0.029	0.000	0.160	0.070
pdf indicator	0.093	0.084	0.121	0.077	0.035
byline date	3.508	3.262	4.254	1.794	2.229
q&a	0.056	0.086	0.107	0.024	0.027

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
forum multi-results	0.012	0.022	0.040	0.002	0.016
FAQ	0.023	0.020	0.025	0.009	0.031
list of products or places as snippet	0.008	0.001	0.003	0.000	0.000
official site tag	0.000	0.001	0.000	0.009	0.000
call to action button	0.002	0.001	0.000	0.003	0.019
outstanding background	0.041	0.043	0.065	0.005	0.023
explore this page button	0.001	0.000	0.000	0.001	0.004
results from the same domain	0.049	0.049	0.062	0.130	0.097
game rich snippet	0.000	0.000	0.000	0.001	0.000
book rich snippet	0.000	0.000	0.000	0.000	0.000
exploration feature	0.000	0.000	0.000	0.000	0.000

Table B.2: Average number of occurrences per SERP of sponsored elements by query intent

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
regular textual ad	0.510	0.192	0.469	0.417	0.643
image thumbnail	0.005	0.001	0.000	0.028	0.047
sitelinks	0.613	0.253	0.630	0.561	0.764
sitelinks per category	0.009	0.020	0.006	0.005	0.012
thumbnail sitelinks	0.000	0.000	0.000	0.005	0.008
view more information link	0.000	0.000	0.000	0.005	0.008
official site tag	0.000	0.000	0.000	0.000	0.000
call to action button	0.045	0.046	0.028	0.067	0.058
structured snippet	0.037	0.028	0.008	0.045	0.043
rating stars	0.160	0.129	0.254	0.203	0.070
promotional offer	0.135	0.055	0.147	0.072	0.159
activity tag	0.000	0.000	0.000	0.003	0.004
medical warning	0.000	0.000	0.000	0.000	0.000
exploration feature	0.000	0.000	0.000	0.000	0.000
shopping icon	0.000	0.000	0.000	0.001	0.000
shopping ad	0.068	0.026	0.011	0.013	0.058
rich media ad	0.011	0.005	0.011	0.016	0.016
top banner	0.000	0.000	0.000	0.000	0.000
brand zone ad	0.000	0.000	0.000	0.000	0.000

Table B.3: Average number of occurrences per SERP of feature elements by query intent

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
people also ask	0.247	0.249	0.280	0.199	0.233
related searches	1.049	1.070	1.130	1.003	1.109
category related searches	0.001	0.002	0.000	0.002	0.000
ask chatbot	0.004	0.006	0.011	0.005	0.000
you may also need	0.000	0.000	0.000	0.000	0.000
related results	0.000	0.000	0.000	0.000	0.000
related products	0.001	0.000	0.000	0.000	0.008
query complements	0.045	0.020	0.014	0.032	0.008
explore more	0.096	0.114	0.073	0.038	0.035
topic exploration wrap	0.029	0.015	0.045	0.006	0.008
trending recommendations	0.002	0.002	0.003	0.003	0.004
trending now	0.167	0.167	0.167	0.167	0.167
scholarly articles	0.059	0.034	0.017	0.015	0.004
automatic spell correction	0.054	0.063	0.042	0.148	0.271
disambiguation box	0.051	0.049	0.017	0.081	0.031
results location	0.006	0.006	0.003	0.011	0.000
results language	0.165	0.166	0.167	0.167	0.163
shopping filter side bar	0.008	0.001	0.000	0.000	0.008
whenIs box	0.001	0.003	0.000	0.000	0.000
currency converter	0.001	0.001	0.000	0.000	0.031
general converter	0.033	0.070	0.000	0.023	0.016
nutrition box	0.001	0.000	0.000	0.000	0.000
dictionary box	0.002	0.029	0.000	0.001	0.000
sports box	0.005	0.001	0.000	0.002	0.000
stock box	0.001	0.001	0.000	0.000	0.000
weather box	0.001	0.011	0.000	0.000	0.000
translation box	0.109	0.101	0.119	0.040	0.062
math calculator	0.000	0.003	0.000	0.000	0.000
math solver	0.000	0.000	0.000	0.000	0.000
date and time	0.078	0.073	0.093	0.028	0.023
sos alert	0.001	0.004	0.000	0.000	0.000
population chart	0.000	0.001	0.000	0.000	0.000
map	0.021	0.010	0.000	0.045	0.008
color picker	0.000	0.000	0.000	0.000	0.000
timer	0.000	0.000	0.000	0.001	0.000
calendar	0.000	0.000	0.000	0.000	0.000

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
horoscope	0.000	0.000	0.000	0.000	0.000
poem	0.000	0.000	0.000	0.000	0.000
quotes	0.000	0.000	0.000	0.000	0.000
health panel	0.007	0.003	0.000	0.000	0.000
zip code enquiry	0.000	0.000	0.000	0.000	0.000
paragraph featured snippet	0.069	0.083	0.116	0.006	0.008
list or bullet points featured snippet	0.063	0.069	0.127	0.007	0.023
featured snippet with images	0.006	0.006	0.003	0.000	0.000
table featured snippet	0.002	0.003	0.000	0.000	0.000
video featured snippet	0.037	0.045	0.054	0.002	0.012
quick answer	0.024	0.038	0.017	0.004	0.000
ai overview	0.057	0.077	0.144	0.005	0.012
carousel	0.024	0.034	0.008	0.010	0.016
carousel grid	0.019	0.005	0.000	0.000	0.012
knowledge panel	0.248	0.466	0.093	0.215	0.143
local knowledge panel	0.021	0.014	0.003	0.056	0.004
local pack	0.024	0.008	0.000	0.052	0.008
image pack	0.209	0.204	0.124	0.052	0.023
video pack	0.300	0.318	0.460	0.143	0.302
recipe cards	0.005	0.021	0.068	0.000	0.000
popular products	0.027	0.003	0.000	0.010	0.004
car shopping widget	0.000	0.000	0.000	0.000	0.000
top sights	0.002	0.002	0.000	0.001	0.000
places to visit	0.003	0.005	0.020	0.000	0.000
hotel pack	0.001	0.001	0.000	0.003	0.000
find flight form	0.000	0.000	0.000	0.001	0.000
airline options list	0.000	0.000	0.000	0.000	0.000
flight status panel	0.000	0.000	0.000	0.000	0.000
flights from city	0.051	0.055	0.034	0.048	0.043
flight sites	0.022	0.031	0.008	0.061	0.027
house pack	0.000	0.000	0.000	0.000	0.000
jobs	0.000	0.000	0.000	0.000	0.000
compare sites	0.030	0.034	0.003	0.021	0.008
top stories	0.060	0.031	0.040	0.037	0.004
latest from boxes	0.000	0.000	0.000	0.001	0.000
article boxes	0.000	0.001	0.000	0.000	0.000
x pack	0.000	0.000	0.000	0.000	0.000
perspectives	0.000	0.000	0.000	0.000	0.000

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
education q&a	0.000	0.001	0.000	0.000	0.004
practice problems	0.000	0.000	0.000	0.000	0.000
related compositions	0.000	0.000	0.000	0.000	0.000
discussions and forums	0.000	0.000	0.000	0.000	0.000
datasets	0.000	0.000	0.000	0.000	0.000
fiNot Performedce markets	0.000	0.000	0.000	0.001	0.000
company fiNot Performedcials	0.000	0.000	0.000	0.000	0.000
how to get there	0.001	0.000	0.000	0.000	0.000
songs	0.002	0.017	0.000	0.003	0.000
advertise here ad	0.001	0.000	0.000	0.001	0.004
bing real estate ad	0.000	0.000	0.000	0.000	0.000
baidu legal services ad	0.000	0.000	0.000	0.000	0.000
note on omitted results	0.071	0.092	0.082	0.127	0.155
note on displayed prices	0.000	0.000	0.000	0.000	0.000
note on how to do secure transactions	0.001	0.000	0.000	0.000	0.004
note on how to contact customer service	0.000	0.000	0.000	0.000	0.000
note on false information results	0.000	0.000	0.000	0.000	0.000

Table B.4: Medians of element occurrences in organic results across different query intents

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
organic result	10.0	10.0	10.0	10.0	10.0
image thumbnail	0.0	0.0	0.0	0.0	0.0
video thumbnail	0.0	0.0	0.0	0.0	0.0
image pack	4.5	5.0	5.0	5.0	4.5
translate this page link	0.0	0.0	0.5	0.0	0.5
unordered list snippet	0.0	0.0	0.0	0.0	0.0
numbered list snippet	0.0	0.0	0.0	0.0	0.0
table snippet	0.0	0.0	0.0	0.0	0.0
cards snippet	0.0	0.0	0.0	0.0	0.0
organic tab snippet	0.0	0.0	0.0	0.0	0.0
structured snippet	0.0	0.0	0.0	0.0	0.0
rating stars	0.0	0.0	0.0	0.0	0.0
search tag filters	7.0	7.0	7.0	5.0	6.0
widget snippet	0.0	0.0	0.0	0.0	0.0
extra widget	0.0	0.0	0.0	0.0	0.0
sitelinks	0.0	0.0	0.0	0.5	0.0

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
card sitelinks	0.0	0.0	0.0	0.0	0.0
trending content cards	0.0	0.0	0.0	0.0	0.0
search box	0.0	0.0	0.0	0.0	0.0
pdf indicator	0.0	0.0	0.0	0.0	0.0
byline date	3.0	3.0	4.0	1.0	2.0
q&a	0.0	0.0	0.0	0.0	0.0
forum multi-results	0.0	0.0	0.0	0.0	0.0
FAQ	0.0	0.0	0.0	0.0	0.0
list of products or places as snippet	0.0	0.0	0.0	0.0	0.0
official site tag	0.0	0.0	0.0	0.0	0.0
call to action button	0.0	0.0	0.0	0.0	0.0
outstanding background	0.0	0.0	0.0	0.0	0.0
explore this page button	0.0	0.0	0.0	0.0	0.0
results from the same domain	0.0	0.0	0.0	0.0	0.0
game rich snippet	0.0	0.0	0.0	0.0	0.0
book rich snippet	0.0	0.0	0.0	0.0	0.0
exploration feature	0.0	0.0	0.0	0.0	0.0

Table B.5: Medians of element occurrences in sponsored elements across different query intents

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
sponsored result	0.0	0.0	0.0	0.0	0.0
image thumbnail	0.0	0.0	0.0	0.0	0.0
sitelinks	0.0	0.0	0.0	0.0	0.0
sitelinks per category	0.0	0.0	0.0	0.0	0.0
thumbnail sitelinks	0.0	0.0	0.0	0.0	0.0
view more information link	0.0	0.0	0.0	0.0	0.0
official site tag	0.0	0.0	0.0	0.0	0.0
call to action button	0.0	0.0	0.0	0.0	0.0
structured snippet	0.0	0.0	0.0	0.0	0.0
rating stars	0.0	0.0	0.0	0.0	0.0
promotional offer	0.0	0.0	0.0	0.0	0.0
activity tag	0.0	0.0	0.0	0.0	0.0
medical warning	0.0	0.0	0.0	0.0	0.0
exploration feature	0.0	0.0	0.0	0.0	0.0
shopping icon	0.0	0.0	0.0	0.0	0.0
shopping ad	0.0	0.0	0.0	0.0	0.0

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
rich media ad	0.0	0.0	0.0	0.0	0.0
top banner	0.0	0.0	0.0	0.0	0.0
brand zone ad	0.0	0.0	0.0	0.0	0.0

Table B.6: Medians of element occurrences in feature elements across different query intents

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
people also ask	0.0	0.0	0.0	0.0	0.0
related searches	1.0	1.0	1.0	1.0	1.0
category related searches	0.0	0.0	0.0	0.0	0.0
ask chatbot	0.0	0.0	0.0	0.0	0.0
you may also need	0.0	0.0	0.0	0.0	0.0
related results	0.0	0.0	0.0	0.0	0.0
related products	0.0	0.0	0.0	0.0	0.0
query complements	0.0	0.0	0.0	0.0	0.0
explore more	0.0	0.0	0.0	0.0	0.0
topic exploration wrap	0.0	0.0	0.0	0.0	0.0
trending recommendations	0.0	0.0	0.0	0.0	0.0
trending now	1.0	0.5	0.5	0.5	0.5
scholarly articles	0.0	0.0	0.0	0.0	0.0
automatic spell correction	0.0	0.0	0.0	0.0	0.0
disambiguation box	0.0	0.0	0.0	0.0	0.0
results location	0.0	0.0	0.0	0.0	0.0
results language	1.0	1.0	1.0	1.0	1.0
shopping filter side bar	0.0	0.0	0.0	0.0	0.0
whenIs box	0.0	0.0	0.0	0.0	0.0
currency converter	0.0	0.0	0.0	0.0	0.0
general converter	0.0	0.0	0.0	0.0	0.0
nutrition box	0.0	0.0	0.0	0.0	0.0
dictionary box	0.0	0.0	0.0	0.0	0.0
sports box	0.0	0.0	0.0	0.0	0.0
stock box	0.0	0.0	0.0	0.0	0.0
weather box	0.0	0.0	0.0	0.0	0.0
translation box	0.0	0.0	0.0	0.0	0.0
math calculator	0.0	0.0	0.0	0.0	0.0
math solver	0.0	0.0	0.0	0.0	0.0
date and time	0.0	0.0	0.0	0.0	0.0

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
sos alert	0.0	0.0	0.0	0.0	0.0
population chart	0.0	0.0	0.0	0.0	0.0
map	0.0	0.0	0.0	0.0	0.0
color picker	0.0	0.0	0.0	0.0	0.0
timer	0.0	0.0	0.0	0.0	0.0
calendar	0.0	0.0	0.0	0.0	0.0
horoscope	0.0	0.0	0.0	0.0	0.0
poem	0.0	0.0	0.0	0.0	0.0
quotes	0.0	0.0	0.0	0.0	0.0
health panel	0.0	0.0	0.0	0.0	0.0
zip code enquiry	0.0	0.0	0.0	0.0	0.0
paragraph featured snippet	0.0	0.0	0.0	0.0	0.0
list or bullet points featured snippet	0.0	0.0	0.0	0.0	0.0
featured snippet with images	0.0	0.0	0.0	0.0	0.0
table featured snippet	0.0	0.0	0.0	0.0	0.0
video featured snippet	0.0	0.0	0.0	0.0	0.0
quick answer	0.0	0.0	0.0	0.0	0.0
ai overview	0.0	0.0	0.0	0.0	0.0
carousel	0.0	0.0	0.0	0.0	0.0
carousel grid	0.0	0.0	0.0	0.0	0.0
knowledge panel	0.0	0.0	0.0	0.0	0.0
local knowledge panel	0.0	0.0	0.0	0.0	0.0
local pack	0.0	0.0	0.0	0.0	0.0
image pack	0.0	0.0	0.0	0.0	0.0
video pack	0.0	0.0	0.0	0.0	0.0
recipe cards	0.0	0.0	0.0	0.0	0.0
popular products	0.0	0.0	0.0	0.0	0.0
car shopping widget	0.0	0.0	0.0	0.0	0.0
top sights	0.0	0.0	0.0	0.0	0.0
places to visit	0.0	0.0	0.0	0.0	0.0
hotel pack	0.0	0.0	0.0	0.0	0.0
find flight form	0.0	0.0	0.0	0.0	0.0
airline options list	0.0	0.0	0.0	0.0	0.0
flight status panel	0.0	0.0	0.0	0.0	0.0
flights from city	0.0	0.0	0.0	0.0	0.0
flight sites	0.0	0.0	0.0	0.0	0.0
house pack	0.0	0.0	0.0	0.0	0.0
jobs	0.0	0.0	0.0	0.0	0.0

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional
compare sites	0.0	0.0	0.0	0.0	0.0
top stories	0.0	0.0	0.0	0.0	0.0
latest from boxes	0.0	0.0	0.0	0.0	0.0
article boxes	0.0	0.0	0.0	0.0	0.0
x pack	0.0	0.0	0.0	0.0	0.0
perspectives	0.0	0.0	0.0	0.0	0.0
education q&a	0.0	0.0	0.0	0.0	0.0
practice problems	0.0	0.0	0.0	0.0	0.0
related compositions	0.0	0.0	0.0	0.0	0.0
discussions and forums	0.0	0.0	0.0	0.0	0.0
datasets	0.0	0.0	0.0	0.0	0.0
finance markets	0.0	0.0	0.0	0.0	0.0
company financials	0.0	0.0	0.0	0.0	0.0
how to get there	0.0	0.0	0.0	0.0	0.0
songs	0.0	0.0	0.0	0.0	0.0
advertise here ad	0.0	0.0	0.0	0.0	0.0
bing real estate ad	0.0	0.0	0.0	0.0	0.0
baidu legal services ad	0.0	0.0	0.0	0.0	0.0
note on omitted results	0.0	0.0	0.0	0.0	0.0
note on displayed prices	0.0	0.0	0.0	0.0	0.0
note on how to do secure transactions	0.0	0.0	0.0	0.0	0.0
note on how to contact customer service	0.0	0.0	0.0	0.0	0.0
note on false information results	0.0	0.0	0.0	0.0	0.0

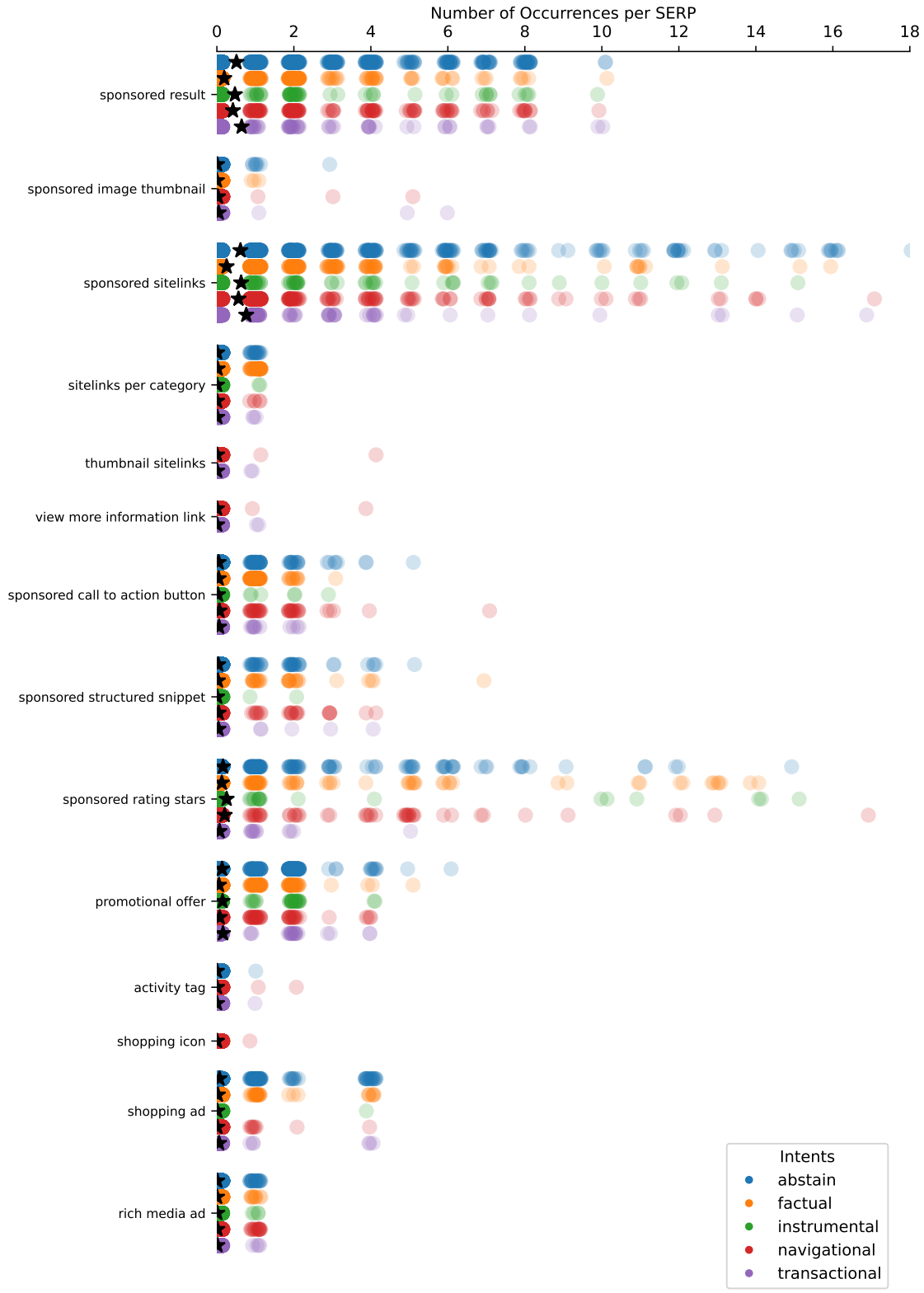
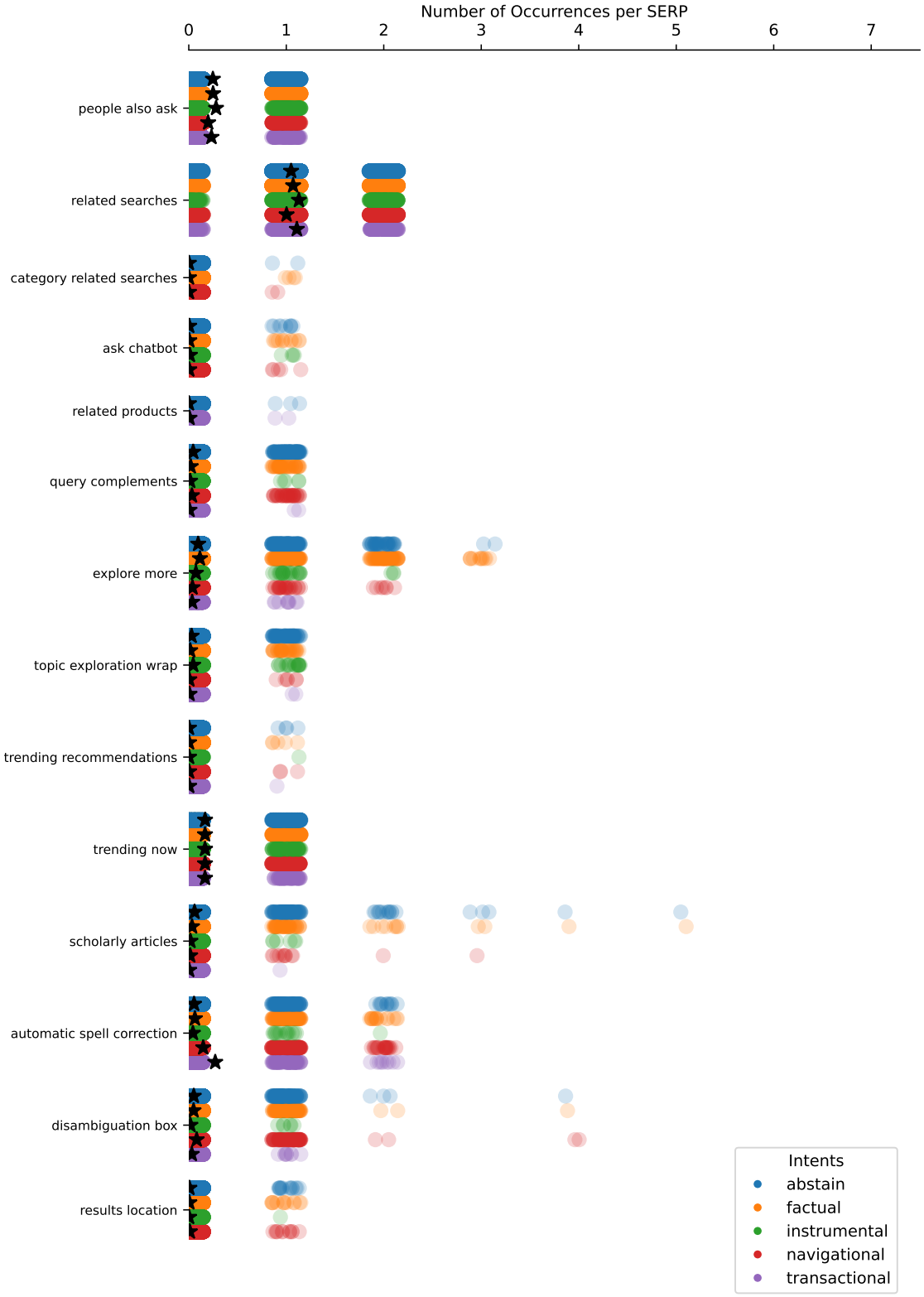
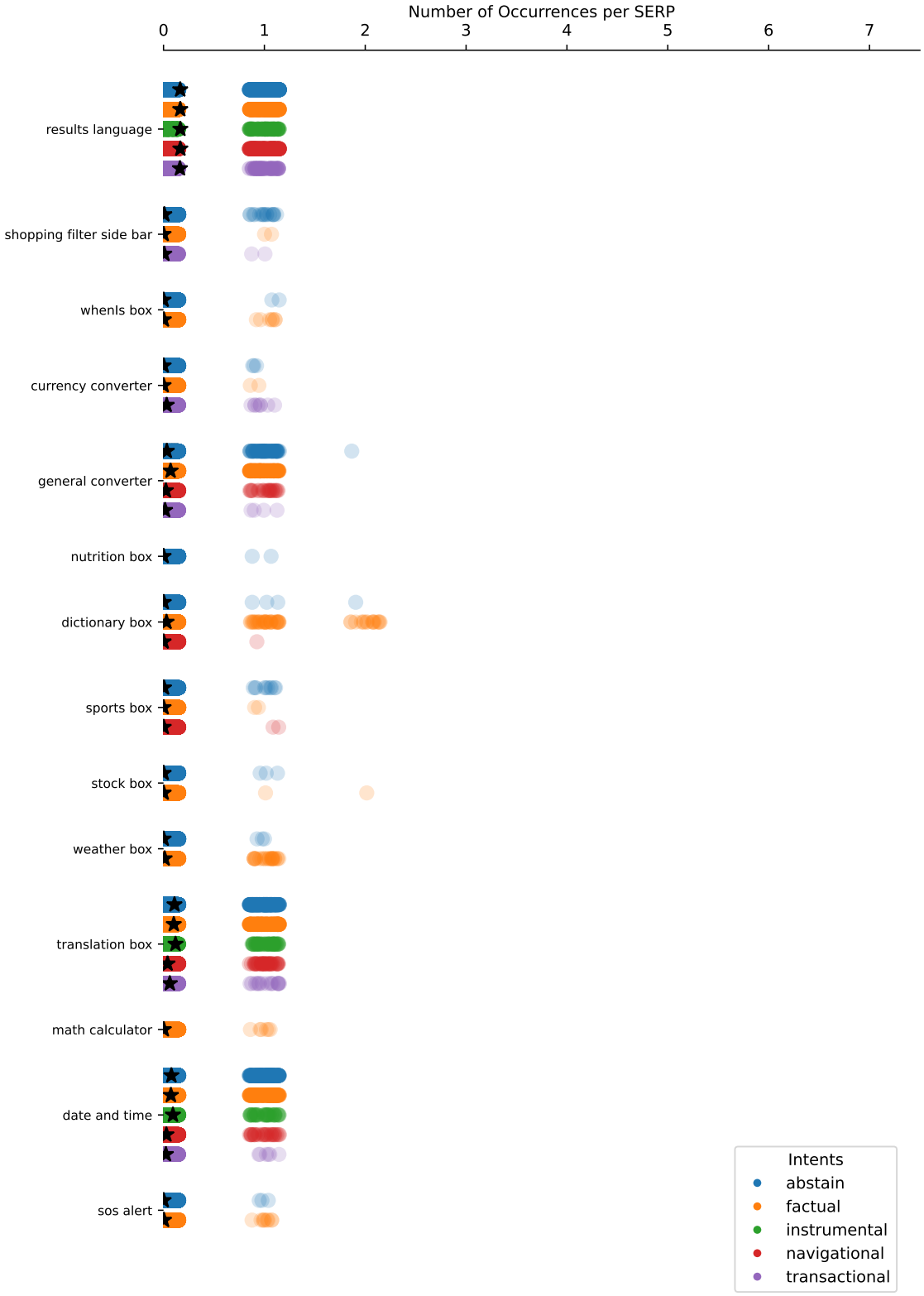
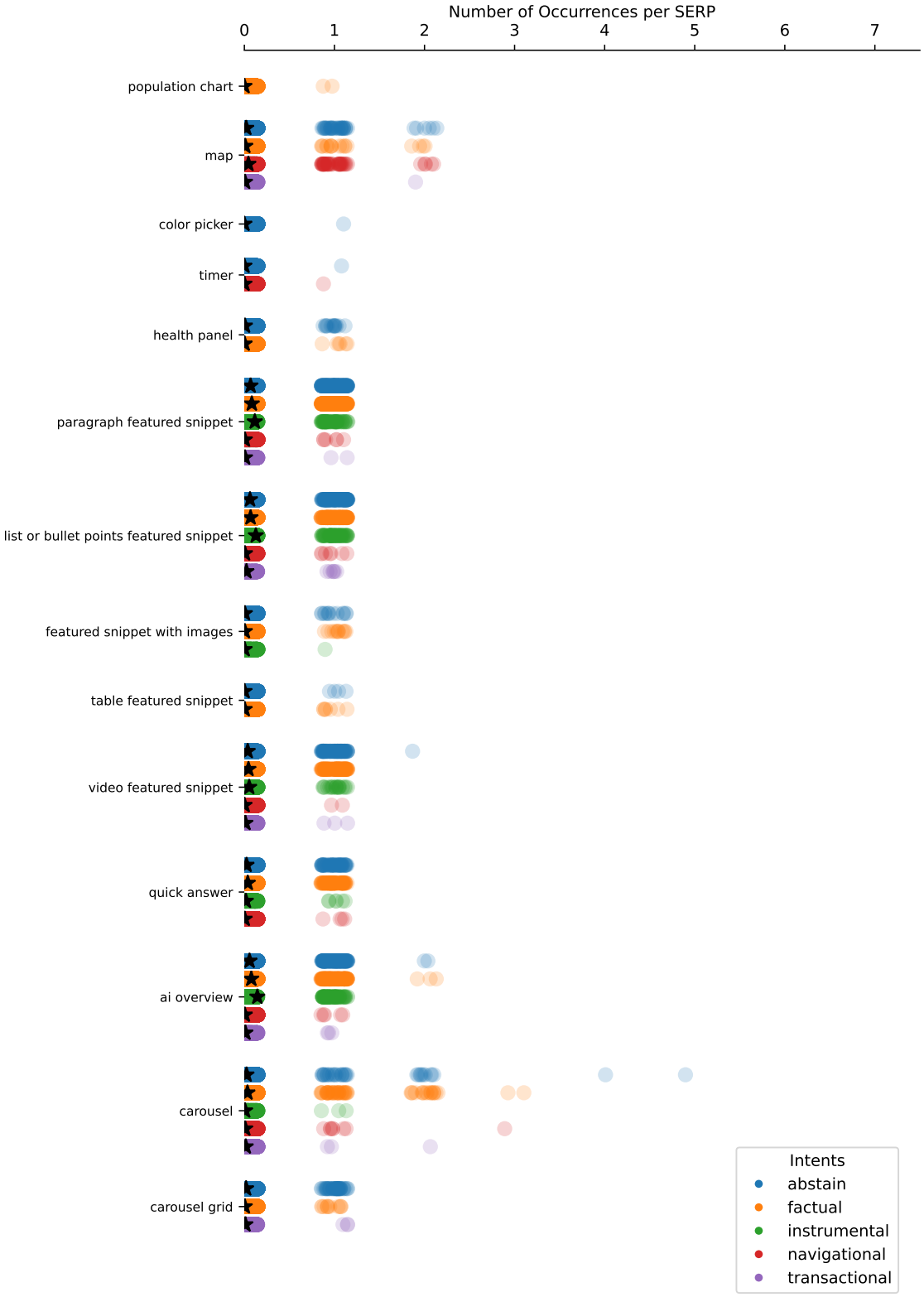


Figure B.1: Distribution of sponsored elements occurrences per SERP by query intent. Stars represent mean values.


Number of Occurrences per SERP
0
1
2
3
4
5
6
7
people also ask
related searches
category related searches
ask chatbot
related products
query complements
explore more
topic exploration wrap
trending recommendations
trending now
scholarly articles
automatic spell correction
disambiguation box
results location
Intents
abstain
factual
instrumental
navigational
transactional


Number of Occurrences per SERP
0
1
2
3
4
5
6
7
results language
shopping filter side bar
whenIs box
currency converter
general converter
nutrition box
dictionary box
sports box
stock box
weather box
translation box
math calculator
date and time
sos alert
Intents
abstain
factual
instrumental
navigational
transactional


Number of Occurrences per SERP
0
1
2
3
4
5
6
7
population chart
map
color picker
timer
health panel
paragraph featured snippet
list or bullet points featured snippet
featured snippet with images
table featured snippet
video featured snippet
quick answer
ai overview
carousel
carousel grid
Intents
abstain
factual
instrumental
navigational
transactional

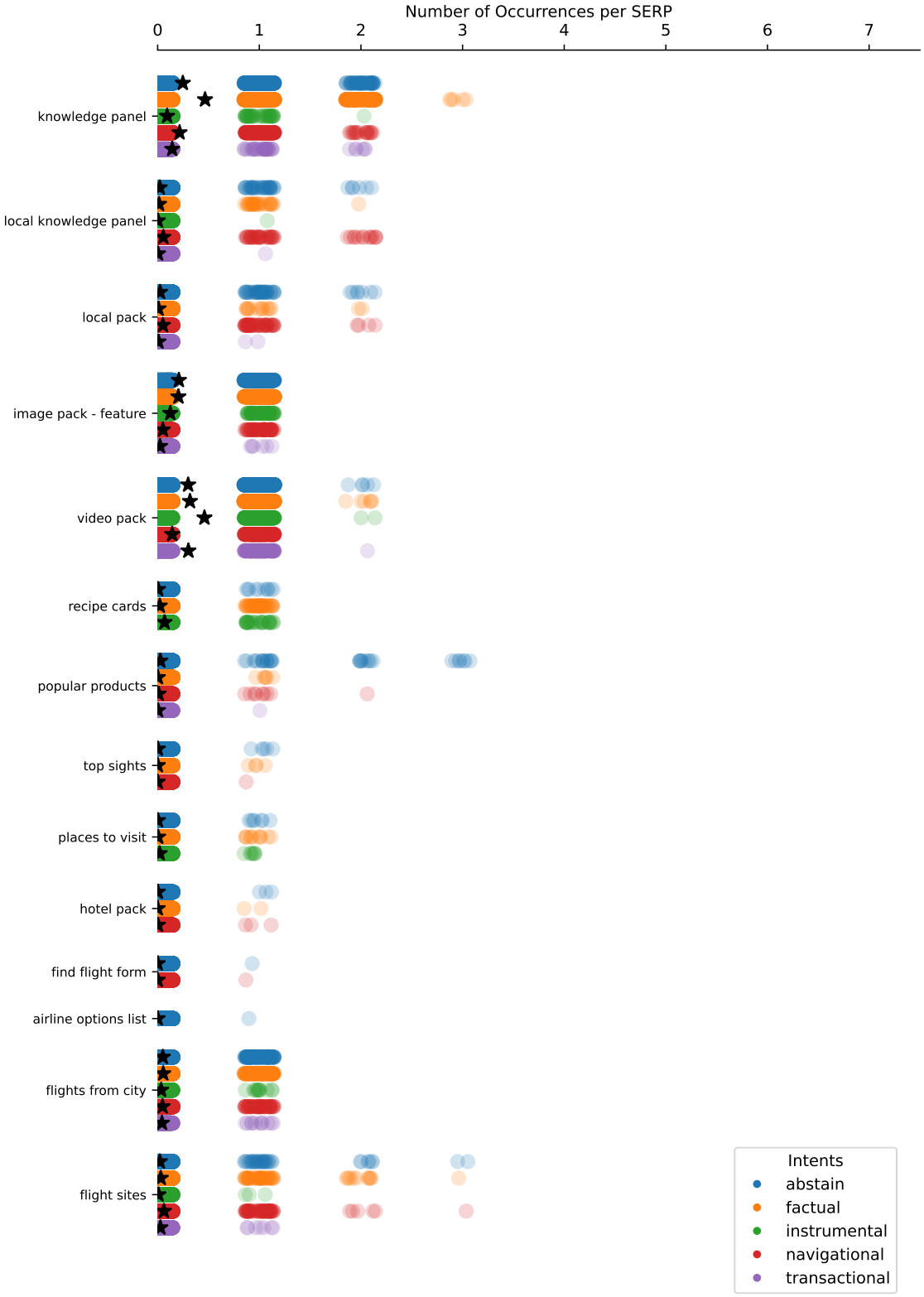

Number of Occurrences per SERP
0
1
2
3
4
5
6
7
knowledge panel
local knowledge panel
local pack
image pack - feature
video pack
recipe cards
popular products
top sights
places to visit
hotel pack
find flight form
airline options list
flights from city
flight sites
Intents
abstain
factual
instrumental
navigational
transactional



Figure B.2: Distribution of feature elements occurrences per SERP by query intent. Stars represent mean values.

Table B.7: Significance table for organic elements by query intent. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Abstain	**Factual**	**Instrumental**	**Navigational**	**Transactional**
Abstain >	—	numbered list snippet**		image thumbnail* translate this page link** numbered list snippet*** cards snippet*** organic tab snippet*** structured snippet*** search tag filters* card sitelinks** byline date*** q&a** outstanding background***	byline date***
Factual >		—		image thumbnail* unordered list snippet* cards snippet*** organic tab snippet*** structured snippet*** search tag filters*** card sitelinks* byline date*** q&a*** forum multi-results** outstanding background***	byline date**
Instrumental >	video thumbnail*** byline date* q&a*	video thumbnail*** numbered list snippet* byline date***	—	image thumbnail* video thumbnail** numbered list snippet*** cards snippet*** structured snippet*** search tag filters*** card sitelinks*** byline date*** q&a*** forum multi-results** outstanding background***	cards snippet* byline date*** q&a*
Navigational >	video thumbnail*** rating stars* sitelinks*** search box*** official site tag* results from the same domain***	rating stars* sitelinks*** search box*** results from the same domain***	sitelinks*** search box*** results from the same domain**	—	
Transactional >	video thumbnail* rating stars*** call to action button*	rating stars*** sitelinks* call to action button**	rating stars** sitelinks* search box*		—

Table B.8: Significance table for feature elements by query intent. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Abstain	Factual	Instrumental	Navigational	Transactional
Abstain >		query complements*** topic exploration wrap* scholarly articles* shopping filter side bar* carousel grid** popular products***	general converter* knowledge panel**	people also ask*** explore more*** topic exploration wrap*** scholarly articles*** translation box*** date and time*** paragraph featured snippet*** list or bullet points featured snippet*** video featured snippet*** quick answer** ai overview*** carousel grid** image pack*** video pack***	explore more* scholarly articles* translation box* date and time** paragraph featured snippet** image pack***
Factual >	general converter*** dictionary box*** knowledge panel*** songs*		general converter*** knowledge panel*** compare sites*	people also ask*** related searches*** explore more*** general converter*** dictionary box* translation box*** date and time*** paragraph featured snippet*** list or bullet points featured snippet*** video featured snippet*** quick answer*** ai overview*** knowledge panel*** image pack*** video pack***	explore more* general converter*** date and time* paragraph featured snippet** list or bullet points featured snippet* ai overview** knowledge panel*** image pack***
Instrumental >	related searches** list or bullet points featured snippet*** ai overview*** video pack*** recipe cards*** places to visit**	topic exploration wrap** list or bullet points featured snippet** ai overview* video pack***		people also ask*** related searches*** topic exploration wrap*** translation box*** date and time*** paragraph featured snippet*** list or bullet points featured snippet*** video featured snippet*** ai overview*** image pack* video pack*** recipe cards*** places to visit***	translation box* date and time** paragraph featured snippet*** list or bullet points featured snippet*** ai overview*** image pack* video pack*
Navigational >	automatic spell correction* disambiguation box* map** local knowledge panel* local pack** flight sites*** note on omitted results***	automatic spell correction* disambiguation box* map*** local knowledge panel** local pack*** flight sites***	disambiguation box** map** local knowledge panel* local pack* flight sites**		
Transactional >	automatic spell correction*** note on omitted results***	related products** automatic spell correction*** currency converter** note on omitted results*	note on omitted results*	related searches* currency converter* carousel grid* video pack***	

Table B.9: Proportion of SERPs in which each organic element is present and corresponding Chi-square significance

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional	Significant
regular result	100.0%	100.0%	100.0%	100.0%	100.0%	Not Performed
organic image thumbnail	31.5%	32.19%	32.77%	31.87%	31.78%	Not Performed
video thumbnail	8.01%	8.68%	14.69%	6.92%	7.75%	True
organic image pack	6.78%	5.28%	6.5%	5.07%	5.04%	Not Performed
translate this page link	16.39%	16.48%	16.67%	16.37%	16.67%	Not Performed
unordered list snippet	12.0%	11.89%	14.69%	8.58%	8.53%	True
numbered list snippet	3.25%	1.52%	4.24%	0.58%	1.94%	True
table snippet	1.42%	1.61%	0.28%	0.78%	2.33%	False
cards snippet	8.1%	9.6%	11.86%	2.44%	4.26%	True
organic tab snippet	11.77%	12.81%	7.91%	6.14%	10.85%	True
organic structured snippet	15.11%	17.22%	16.67%	8.38%	13.18%	True
organic rating stars	5.17%	4.64%	3.95%	7.02%	10.08%	True
search tag filters	12.0%	13.96%	14.69%	10.33%	11.24%	True
widget snippet	0.18%	0.32%	0.28%	0.0%	0.39%	Not Performed
extra widget	0.18%	0.05%	0.0%	0.39%	0.0%	Not Performed
organic sitelinks	32.28%	29.98%	30.51%	59.75%	50.39%	True
card sitelinks	8.24%	7.76%	9.6%	5.07%	4.65%	True
trending content cards	0.14%	0.05%	0.28%	0.39%	0.0%	Not Performed
search box	2.84%	2.39%	0.0%	10.82%	5.04%	True
pdf indicator	6.09%	5.92%	7.63%	4.87%	1.94%	True
byline date	73.76%	74.38%	79.1%	55.75%	63.18%	Not Performed
q&a	4.81%	6.8%	9.04%	1.85%	1.94%	True
forum multi-results	0.96%	1.84%	2.54%	0.19%	1.55%	True
FAQ	2.06%	1.97%	2.26%	0.88%	3.1%	False
list of products or places as snippet	0.37%	0.09%	0.28%	0.0%	0.0%	Not Performed
organic official site tag	0.05%	0.09%	0.0%	0.88%	0.0%	Not Performed
organic call to action button	0.09%	0.05%	0.0%	0.19%	1.16%	Not Performed
outstanding background	4.08%	4.32%	6.5%	0.49%	2.33%	True
explore this page button	0.05%	0.0%	0.0%	0.1%	0.39%	Not Performed
results from the same domain	5.04%	4.91%	6.21%	13.16%	10.47%	True
game rich snippet	0.0%	0.05%	0.0%	0.1%	0.0%	Not Performed
book rich snippet	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
organic exploration feature	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed

Table B.10: Proportion of SERPs in which each sponsored element is present and corresponding Chi-square significance

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional	Significant
regular textual ad	15.75%	8.68%	13.84%	12.38%	18.99%	True
sponsored image thumbnail	0.37%	0.14%	0.0%	0.39%	1.16%	Not Performed
sponsored sitelinks	16.76%	10.51%	16.38%	21.44%	24.03%	True
sitelinks per category	0.92%	1.97%	0.56%	0.49%	1.16%	True
thumbnail sitelinks	0.0%	0.0%	0.0%	0.19%	0.78%	Not Performed
view more information link	0.0%	0.0%	0.0%	0.19%	0.78%	Not Performed
sponsored official site tag	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
sponsored call to action button	2.98%	4.04%	1.69%	3.8%	4.26%	True
sponsored structured snippet	1.92%	1.47%	0.56%	2.24%	1.94%	False
sponsored rating stars	5.04%	2.98%	5.08%	4.68%	4.26%	True
promotional offer	7.28%	3.44%	7.63%	4.29%	7.36%	True
activity tag	0.05%	0.0%	0.0%	0.19%	0.39%	Not Performed
sponsored medical warning	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
sponsored exploration feature	16.44%	16.3%	16.38%	16.47%	16.67%	Not Performed
shopping icon	0.0%	0.0%	0.0%	0.1%	0.0%	Not Performed
shopping ad	3.66%	1.47%	0.28%	0.88%	2.33%	True
rich media ad	1.05%	0.46%	1.13%	1.56%	1.55%	True
top banner	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
brand zone ad	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed

Table B.11: Proportion of SERPs in which each feature element is present and corresponding Chi-square significance

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional	Significant
people also ask	35.3%	35.77%	39.27%	33.53%	35.66%	True
related searches	78.25%	78.6%	81.36%	72.61%	80.62%	Not Performed
category related searches	0.09%	0.18%	0.0%	0.19%	0.0%	Not Performed
ask chatbot	0.41%	0.55%	1.13%	0.49%	0.0%	False
you may also need	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
related results	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
related products	0.18%	0.18%	0.0%	0.0%	0.78%	Not Performed
query complements	4.53%	1.97%	1.41%	3.22%	0.78%	True
explore more	7.74%	7.85%	6.5%	3.12%	3.49%	True
topic exploration wrap	2.88%	1.47%	4.52%	0.58%	0.78%	True
trending recommendations	0.18%	0.23%	0.28%	0.29%	0.39%	Not Performed
trending now	16.71%	16.67%	16.67%	16.67%	16.67%	Not Performed
scholarly articles	4.72%	2.48%	1.69%	1.17%	0.39%	True
automatic spell correction	4.85%	5.56%	3.95%	12.77%	23.64%	True
disambiguation box	4.9%	4.68%	1.69%	7.31%	3.1%	True
results location	0.69%	0.64%	0.28%	1.66%	0.0%	False
results language	16.53%	16.57%	16.67%	16.67%	16.28%	Not Performed
shopping filter side bar	0.78%	0.09%	0.0%	0.0%	0.78%	Not Performed
whenIs box	0.14%	0.64%	0.0%	0.0%	0.0%	Not Performed
currency converter	0.14%	0.09%	0.0%	0.0%	3.1%	Not Performed
general converter	3.21%	6.98%	0.0%	2.34%	1.55%	True
nutrition box	0.09%	0.0%	0.0%	0.0%	0.0%	Not Performed
dictionary box	0.46%	4.82%	0.0%	0.39%	0.0%	True
sports box	0.46%	0.09%	0.0%	0.19%	0.0%	Not Performed
stock box	0.14%	0.09%	0.0%	0.0%	0.0%	Not Performed
weather box	0.18%	1.52%	0.0%	0.0%	0.0%	Not Performed
translation box	10.85%	10.15%	11.86%	4.0%	6.2%	True
math calculator	0.0%	0.28%	0.0%	0.0%	0.0%	Not Performed
math solver	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
date and time	7.78%	7.3%	9.32%	2.83%	2.33%	True
sos alert	0.14%	0.55%	0.0%	0.0%	0.39%	Not Performed
population chart	0.0%	0.09%	0.0%	0.0%	0.0%	Not Performed
map	1.88%	0.83%	0.0%	4.0%	0.39%	True
color picker	3.66%	4.45%	5.37%	0.19%	0.39%	Not Performed
timer	4.35%	4.78%	5.37%	0.68%	1.16%	Not Performed
calendar	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
horoscope	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
poem	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
quotes	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
health panel	1.1%	0.32%	0.0%	0.0%	0.0%	Not Performed
zip code enquiry	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
paragraph featured snippet	7.42%	8.82%	12.43%	0.88%	0.78%	True
list or bullet points featured snippet	6.27%	6.89%	12.71%	0.68%	2.33%	True
featured snippet with images	0.6%	0.55%	0.28%	0.0%	0.0%	Not Performed
table featured snippet	0.18%	0.32%	0.0%	0.0%	0.0%	Not Performed

Element Name	Abstain	Factual	Instrumental	Navigational	Transactional	Significant
video featured snippet	3.85%	4.59%	5.37%	0.19%	1.16%	True
quick answer	2.43%	3.76%	1.69%	0.39%	0.0%	True
ai overview	8.42%	9.64%	18.93%	0.58%	2.71%	True
carousel	1.65%	2.57%	0.85%	0.78%	1.16%	True
carousel grid	1.92%	0.51%	0.0%	0.0%	1.16%	True
knowledge panel	22.66%	39.35%	9.04%	20.66%	12.02%	True
local knowledge panel	1.79%	1.33%	0.28%	4.29%	0.39%	True
local pack	2.06%	0.73%	0.0%	4.78%	0.78%	True
image pack	20.88%	20.43%	12.43%	5.17%	2.33%	True
video pack	34.94%	35.95%	54.52%	17.93%	34.88%	True
recipe cards	5.4%	7.21%	7.63%	1.95%	0.39%	Not Performed
popular products	1.56%	0.28%	0.0%	0.88%	0.39%	True
car shopping widget	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
top sights	0.23%	0.18%	0.0%	0.1%	0.0%	Not Performed
places to visit	0.32%	0.51%	1.98%	0.0%	0.0%	Not Performed
hotel pack	0.14%	0.09%	0.0%	0.29%	0.0%	Not Performed
find flight form	0.05%	0.0%	0.0%	0.1%	0.0%	Not Performed
airline options list	0.05%	0.0%	0.0%	0.0%	0.0%	Not Performed
flight status panel	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
flights from city	5.08%	5.46%	3.39%	4.78%	4.26%	False
flight sites	1.69%	2.48%	0.85%	5.46%	2.71%	True
house pack	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
jobs	0.05%	0.0%	0.0%	0.0%	0.0%	Not Performed
compare sites	2.88%	3.21%	0.28%	1.95%	0.78%	True
top stories	6.04%	4.22%	5.65%	4.0%	1.16%	True
latest from boxes	0.0%	0.0%	0.0%	0.1%	0.0%	Not Performed
article boxes	0.0%	0.09%	0.0%	0.0%	0.0%	Not Performed
x pack	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
perspectives	16.67%	16.67%	16.67%	16.67%	16.67%	Not Performed
education q&a	0.0%	0.14%	0.0%	0.0%	0.39%	Not Performed
practice problems	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
related compositions	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
discussions and forums	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
datasets	0.23%	0.83%	2.26%	0.1%	0.0%	Not Performed
fiNot Performedce markets	0.0%	0.0%	0.0%	0.1%	0.0%	Not Performed
company fiNot Performedcials	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
how to get there	0.09%	0.05%	0.0%	0.0%	0.0%	Not Performed
songs	0.23%	1.1%	0.0%	0.19%	0.0%	True
advertise here ad	0.14%	0.0%	0.0%	0.1%	0.39%	Not Performed
bing real estate ad	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
baidu legal services ad	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
note on omitted results	6.64%	8.95%	7.63%	10.62%	12.79%	True
note on displayed prices	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
note on how to do secure transactions	0.14%	0.0%	0.0%	0.0%	0.39%	Not Performed
note on how to contact customer service	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed
note on false information results	0.0%	0.0%	0.0%	0.0%	0.0%	Not Performed

Appendix C

Supplementary Data for Search Engine Analysis

Table C.1: Average number of occurrences per SERP of each organic element by search engine

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
organic result	8.230	9.248	9.996	8.802	7.199	11.503
organic image thumbnail	3.149	4.024	—	0.068	—	0.025
video thumbnail	0.087	0.047	—	0.147	—	0.086
organic image pack	—	0.191	—	—	7.199	—
translate this page link	—	—	—	7.075	—	0.000
unordered list snippet	—	0.399	—	—	0.505	0.081
numbered list snippet	—	0.190	—	—	—	—
table snippet	—	0.046	—	—	0.055	—
cards snippet	—	0.515	—	—	0.064	—
organic tab snippet	—	0.453	—	—	0.248	—
organic structured snippet	0.049	0.466	—	0.000	0.842	0.002
organic rating stars	0.000	0.000	—	0.508	—	0.122
search tag filters	—	5.468	—	—	—	—
widget snippet	0.000	0.008	0.000	—	—	—
extra widget	0.000	0.009	—	0.000	—	0.000
organic sitelinks	0.026	0.750	0.494	1.213	0.369	0.013
card sitelinks	—	0.521	—	0.011	0.037	0.000
trending content cards	—	0.009	—	—	—	—
search box	—	0.187	—	0.015	0.131	—
pdf indicator	0.109	0.003	0.110	0.187	—	0.109
byline date	6.737	3.464	3.005	2.393	3.080	0.008
q&a	0.279	0.000	—	0.090	0.007	0.005

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
forum multi-results	0.000	—	—	0.095	—	—
FAQ	0.001	0.107	—	0.013	—	—
list of products or places as snippet	0.001	0.019	—	—	—	—
organic official site tag	0.006	—	—	—	—	0.006
organic call to action button	0.000	0.014	—	—	—	0.000
outstanding background	—	0.217	—	—	—	—
explore this page button	—	0.004	—	—	—	—
results from the same domain	0.051	0.231	—	0.112	—	—
game rich snippet	0.002	—	—	—	—	—
book rich snippet	0.000	—	—	—	—	—
organic exploration feature	0.000	0.000	—	—	0.000	—

Table C.2: Average number of occurrences per SERP of each sponsored element by search engine

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
sponsored result	0.018	0.481	—	0.180	1.591	0.021
image thumbnail	0.040	—	—	0.014	—	—
sitelinks	0.000	0.607	—	0.061	2.197	0.021
sitelinks per category	0.000	0.073	—	—	—	—
thumbnail sitelinks	0.007	—	—	—	—	—
view more information link	0.007	—	—	—	—	—
official site tag	—	—	—	—	0.000	—
call to action button	—	0.230	—	0.000	0.064	—
structured snippet	—	0.170	—	0.006	—	0.026
rating stars	—	0.794	—	—	0.031	0.122
promotional offer	—	0.011	—	0.011	0.558	0.002
activity tag	0.005	—	—	—	—	—
medical warning	—	—	—	—	—	0.000
exploration feature	0.000	0.000	—	0.000	0.000	—
shopping icon	—	—	—	—	—	0.001
shopping ad	0.001	0.158	—	0.048	0.030	0.000
rich media ad	0.001	0.038	—	—	0.018	0.000
top banner	0.000	—	—	—	—	—
brand zone ad	0.000	—	—	—	—	—



Table C.3: Average number of occurrences per SERP of each features by search engine

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
people also ask	—	0.000	—	0.768	0.678	0.000

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
related searches	1.546	1.924	0.973	0.914	0.981	0.000
category related searches	0.008	0.000	—	—	—	—
ask chatbot	0.030	0.000	—	—	—	—
you may also need	—	—	—	0.000	—	—
related results	—	0.000	—	—	—	—
related products	—	—	—	0.005	—	—
query complements	0.015	0.000	—	0.159	0.008	—
explore more	—	0.533	—	—	0.000	—
topic exploration wrap	—	0.119	—	—	—	—
trending recommendations	0.014	—	—	—	—	—
trending now	1.000	—	—	—	0.001	—
scholarly articles	0.190	—	—	0.034	—	—
automatic spell correction	0.028	0.118	0.149	0.072	0.055	0.070
disambiguation box	—	—	—	0.138	0.178	—
results location	—	—	—	0.039	—	—
results language	—	—	—	0.994	—	—
shopping filter side bar	—	—	—	—	0.021	—
whenIs box	—	0.007	0.000	0.002	0.000	0.000
currency converter	0.001	0.002	0.003	0.004	0.003	0.000
general converter	0.000	0.001	0.247	0.003	0.000	—
nutrition box	—	0.000	—	0.001	0.001	—
dictionary box	0.000	0.031	0.000	0.039	0.000	—
sports box	0.000	0.004	0.002	0.000	0.008	—
stock box	0.004	0.001	0.000	0.001	0.000	0.000
weather box	0.002	0.001	0.007	0.007	0.010	0.000
translation box	0.557	0.000	0.000	0.000	0.000	0.000
math calculator	0.001	0.001	0.001	0.001	0.001	0.001
math solver	—	—	—	0.000	—	—
date and time	0.000	0.000	0.004	0.003	0.001	0.389
sos alert	—	—	—	0.012	—	—
population chart	0.000	—	—	0.002	—	—
map	0.001	0.108	0.000	0.001	—	0.006
color picker	—	—	0.000	0.001	—	—
timer	—	0.001	0.000	0.001	—	—
calendar	0.000	—	—	—	—	—
horoscope	0.000	0.000	—	—	0.000	—
poem	0.000	—	—	—	—	—
quotes	0.000	—	—	—	—	—

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
health panel	0.001	0.020	—	0.000	—	—
zip code enquiry	0.000	—	—	—	—	—
paragraph featured snippet	—	—	0.095	0.192	0.000	0.092
list or bullet points featured snippet	—	0.304	—	0.028	—	0.013
featured snippet with images	—	—	—	0.026	—	—
table featured snippet	—	—	—	0.011	—	—
video featured snippet	—	—	—	0.204	—	—
quick answer	—	0.102	—	0.027	0.016	0.000
ai overview	0.012	0.240	0.095	—	0.005	—
carousel	0.000	0.003	0.000	0.006	0.136	0.000
carousel grid	—	0.020	—	0.036	—	—
knowledge panel	0.154	0.715	0.243	0.301	0.314	0.121
local knowledge panel	—	0.112	0.000	0.018	0.004	—
local pack	0.000	0.032	0.039	0.033	0.017	0.004
image pack	0.034	0.276	0.222	0.174	0.204	0.094
video pack	0.235	0.596	0.204	0.165	0.532	0.003
recipe cards	—	0.022	0.021	0.021	0.015	—
popular products	—	0.002	—	0.073	—	—
car shopping widget	0.000	—	—	—	—	—
top sights	0.000	0.000	—	0.010	—	—
places to visit	—	0.020	—	0.005	—	—
hotel pack	0.000	0.003	—	0.005	0.000	0.000
find flight form	0.000	—	—	—	0.002	—
airline options list	—	0.001	—	0.000	—	—
flight status panel	—	—	—	0.000	—	—
flights from city	—	—	—	0.302	—	—
flight sites	—	—	—	0.187	—	—
house pack	—	0.000	—	—	—	—
jobs	—	0.001	—	0.000	—	—
compare sites	—	—	—	0.166	—	—
top stories	0.011	0.155	0.065	0.020	0.000	—
latest from boxes	—	—	—	0.001	—	—
article boxes	0.002	—	—	0.000	—	—
x pack	—	—	—	0.000	—	—
perspectives	—	—	—	0.000	—	—
education q&a	—	0.004	—	0.000	—	—
practice problems	—	—	—	0.000	—	—
related compositions	0.000	—	—	—	—	—

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
discussions and forums	—	—	—	0.000	—	—
datasets	—	—	—	0.000	—	—
fi—ce markets	—	—	—	—	0.001	—
company fi—cials	—	—	—	—	0.000	—
how to get there	0.000	0.001	—	0.002	—	—
songs	0.004	—	—	0.042	—	—
advertise here ad	0.005	—	0.000	—	—	—
bing real estate ad	—	0.000	—	—	—	—
baidu legal services ad	0.000	—	—	—	—	—
note on omitted results	—	0.515	—	0.037	—	0.003
note on displayed prices	0.000	—	—	—	—	—
note on how to do secure transactions	0.004	—	—	—	—	—
note on how to contact customer service	0.000	—	—	—	—	—
note on false information results	—	—	—	—	—	0.000

Table C.4: Medians of element occurrences in organic elements across different search engines

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
organic result	8.0	10.0	10.0	9.0	7.0	10.0
organic image thumbnail	3.0	4.0	—	0.0	—	0.0
video thumbnail	0.0	0.0	—	0.0	—	0.0
organic image pack	—	0.0	—	—	7.0	—
translate this page link	—	—	—	8.0	—	0.0
unordered list snippet	—	0.0	—	—	0.0	0.0
numbered list snippet	—	0.0	—	—	—	—
table snippet	—	0.0	—	—	0.0	—
cards snippet	—	0.0	—	—	0.0	—
organic tab snippet	—	0.0	—	—	0.0	—
organic structured snippet	0.0	0.0	—	0.0	0.0	0.0
organic rating stars	0.0	0.0	—	0.0	—	0.0
search tag filters	—	7.0	—	—	—	—
widget snippet	0.0	0.0	0.0	—	—	—
extra widget	0.0	0.0	—	0.0	—	0.0
organic sitelinks	0.0	1.0	0.0	1.0	0.0	0.0
card sitelinks	—	0.0	—	0.0	0.0	0.0
trending content cards	—	0.0	—	—	—	—
search box	—	0.0	—	0.0	0.0	—

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
pdf indicator	0.0	0.0	0.0	0.0	—	0.0
byline date	7.0	3.0	3.0	2.0	3.0	0.0
q&a	0.0	0.0	—	0.0	0.0	0.0
forum multi-results	0.0	—	—	0.0	—	—
FAQ	0.0	0.0	—	0.0	—	—
list of products or places as snippet	0.0	0.0	—	—	—	—
organic official site tag	0.0	—	—	—	—	0.0
organic call to action button	0.0	0.0	—	—	—	0.0
outstanding background	—	0.0	—	—	—	—
explore this page button	—	0.0	—	—	—	—
organic results from the same domain	0.0	0.0	—	0.0	—	—
game rich snippet	0.0	—	—	—	—	—
book rich snippet	0.0	—	—	—	—	—
organic exploration feature	0.0	0.0	—	—	0.0	—

Table C.5: Medians of element occurrences in sponsored elements across different search engines

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
sponsored result	0.0	0.0	—	0.0	0.0	0.0
image thumbnail	0.0	—	—	0.0	—	—
sitelinks	0.0	0.0	—	0.0	0.0	0.0
sitelinks per category	0.0	0.0	—	—	—	—
thumbnail sitelinks	0.0	—	—	—	—	—
view more information link	0.0	—	—	—	—	—
official site tag	—	—	—	—	0.0	—
call to action button	—	0.0	—	0.0	0.0	—
structured snippet	—	0.0	—	0.0	—	0.0
rating stars	—	0.0	—	—	0.0	0.0
promotional offer	—	0.0	—	0.0	0.0	0.0
activity tag	0.0	—	—	—	—	—
medical warning	—	—	—	—	—	0.0
exploration feature	0.0	0.0	—	0.0	0.0	—
shopping icon	—	—	—	—	—	0.0
shopping ad	0.0	0.0	—	0.0	0.0	0.0
rich media ad	0.0	0.0	—	—	0.0	0.0
top banner	0.0	—	—	—	—	—

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
brand zone ad	0.0	—	—	—	—	—

Table C.6: Medians of element occurrences in features across different search engines

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
people also ask	—	0.0	—	1.0	1.0	0.0
related searches	2.0	2.0	1.0	1.0	1.0	0.0
category related searches	0.0	0.0	—	—	—	—
ask chatbot	0.0	0.0	—	—	—	—
you may also need	—	—	—	0.0	—	—
related results	—	0.0	—	—	—	—
related products	—	—	—	0.0	—	—
query complements	0.0	0.0	—	0.0	0.0	—
explore more	—	0.0	—	—	0.0	—
topic exploration wrap	—	0.0	—	—	—	—
trending recommendations	0.0	—	—	—	—	—
trending now	1.0	—	—	—	0.0	—
scholarly articles	0.0	—	—	0.0	—	—
automatic spell correction	0.0	0.0	0.0	0.0	0.0	0.0
disambiguation box	—	—	—	0.0	0.0	—
results location	—	—	—	0.0	—	—
results language	—	—	—	1.0	—	—
shopping filter side bar	—	—	—	—	0.0	—
whenIs box	—	0.0	0.0	0.0	0.0	0.0
currency converter	0.0	0.0	0.0	0.0	0.0	0.0
general converter	0.0	0.0	0.0	0.0	0.0	—
nutrition box	—	0.0	—	0.0	0.0	—
dictionary box	0.0	0.0	0.0	0.0	0.0	—
sports box	0.0	0.0	0.0	0.0	0.0	—
stock box	0.0	0.0	0.0	0.0	0.0	0.0
weather box	0.0	0.0	0.0	0.0	0.0	0.0
translation box	1.0	0.0	0.0	0.0	0.0	0.0
math calculator	0.0	0.0	0.0	0.0	0.0	0.0
math solver	—	—	—	0.0	—	—
date and time	0.0	0.0	0.0	0.0	0.0	0.0
sos alert	—	—	—	0.0	—	—
population chart	0.0	—	—	0.0	—	—

Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
map	0.0	0.0	0.0	0.0	—	0.0
color picker	—	—	0.0	0.0	—	—
timer	—	0.0	0.0	0.0	—	—
calendar	0.0	—	—	—	—	—
horoscope	0.0	0.0	—	—	0.0	—
poem	0.0	—	—	—	—	—
quotes	0.0	—	—	—	—	—
health panel	0.0	0.0	—	0.0	—	—
zip code enquiry	0.0	—	—	—	—	—
paragraph featured snippet	—	—	0.0	0.0	0.0	0.0
list or bullet points featured snippet	—	0.0	—	0.0	—	0.0
featured snippet with images	—	—	—	0.0	—	—
table featured snippet	—	—	—	0.0	—	—
video featured snippet	—	—	—	0.0	—	—
quick answer	—	0.0	—	0.0	0.0	0.0
ai overview	0.0	0.0	0.0	—	0.0	—
carousel	0.0	0.0	0.0	0.0	0.0	0.0
carousel grid	—	0.0	—	0.0	—	—
knowledge panel	0.0	1.0	0.0	0.0	0.0	0.0
local knowledge panel	—	0.0	0.0	0.0	0.0	—
local pack	0.0	0.0	0.0	0.0	0.0	0.0
image pack	0.0	0.0	0.0	0.0	0.0	0.0
video pack	0.0	1.0	0.0	0.0	1.0	0.0
recipe cards	—	0.0	0.0	0.0	0.0	—
popular products	—	0.0	—	0.0	—	—
car shopping widget	0.0	—	—	—	—	—
top sights	0.0	0.0	—	0.0	—	—
places to visit	—	0.0	—	0.0	—	—
hotel pack	0.0	0.0	—	0.0	0.0	0.0
find flight form	0.0	—	—	—	0.0	—
airline options list	—	0.0	—	0.0	—	—
flight status panel	—	—	—	0.0	—	—
flights from city	—	—	—	0.0	—	—
flight sites	—	—	—	0.0	—	—
house pack	—	0.0	—	—	—	—
jobs	—	0.0	—	0.0	—	—
compare sites	—	—	—	0.0	—	—
top stories	0.0	0.0	0.0	0.0	0.0	—

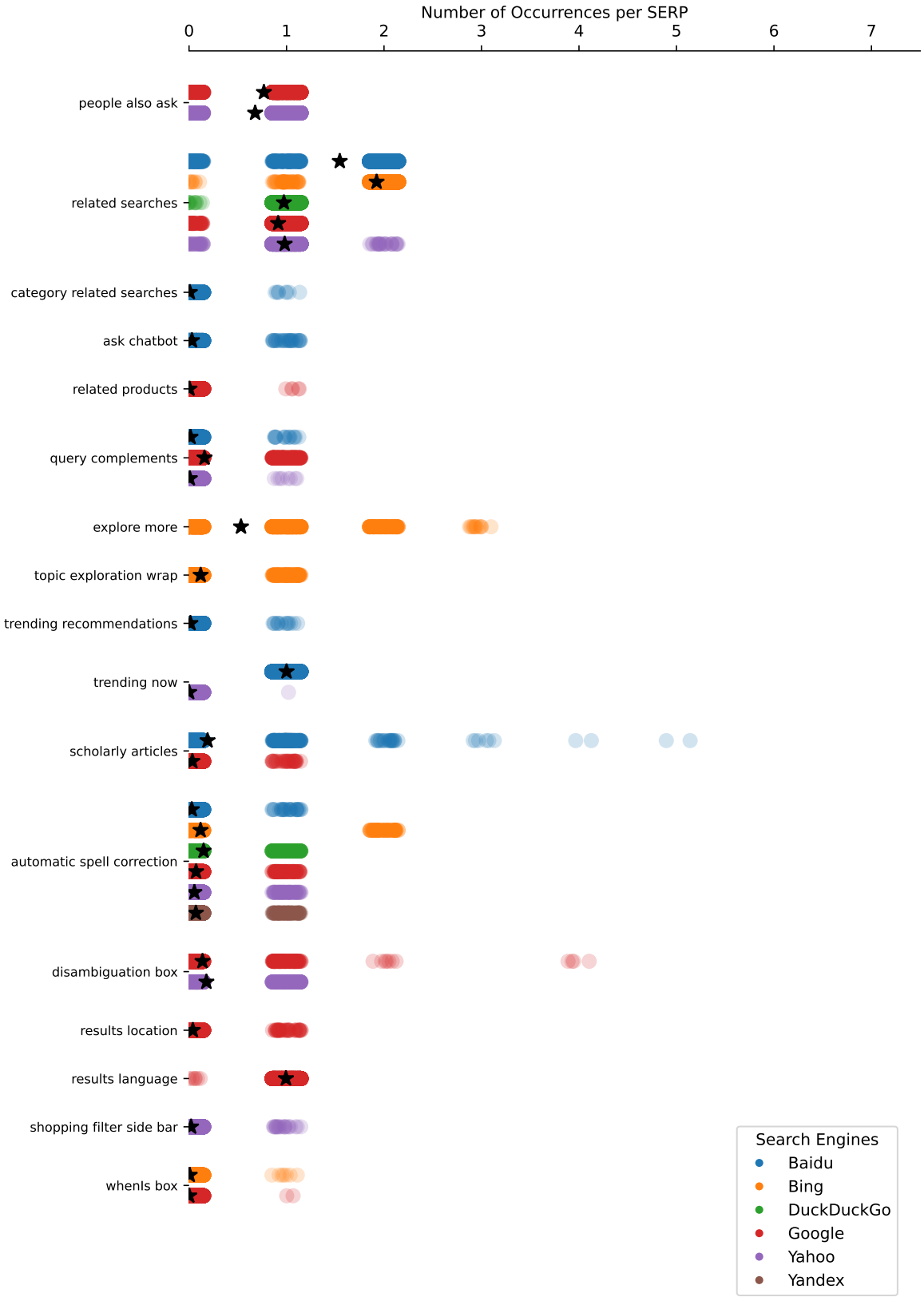
Element Name	Baidu	Bing	Duckduckgo	Google	Yahoo	Yandex
latest from boxes	—	—	—	0.0	—	—
article boxes	0.0	—	—	0.0	—	—
x pack	—	—	—	0.0	—	—
perspectives	—	—	—	0.0	—	—
education q&a	—	0.0	—	0.0	—	—
practice problems	—	—	—	0.0	—	—
related compositions	0.0	—	—	—	—	—
discussions and forums	—	—	—	0.0	—	—
datasets	—	—	—	0.0	—	—
fi—ce markets	—	—	—	—	0.0	—
company fi—cials	—	—	—	—	0.0	—
how to get there	0.0	0.0	—	0.0	—	—
songs	0.0	—	—	0.0	—	—
advertise here ad	0.0	—	0.0	—	—	—
bing real estate ad	—	0.0	—	—	—	—
baidu legal services ad	0.0	—	—	—	—	—
note on omitted results	—	0.0	—	0.0	—	0.0
note on displayed prices	0.0	—	—	—	—	—
note on how to do secure transactions	0.0	—	—	—	—	—
note on how to contact customer service	0.0	—	—	—	—	—
note on false information results	—	—	—	—	—	0.0

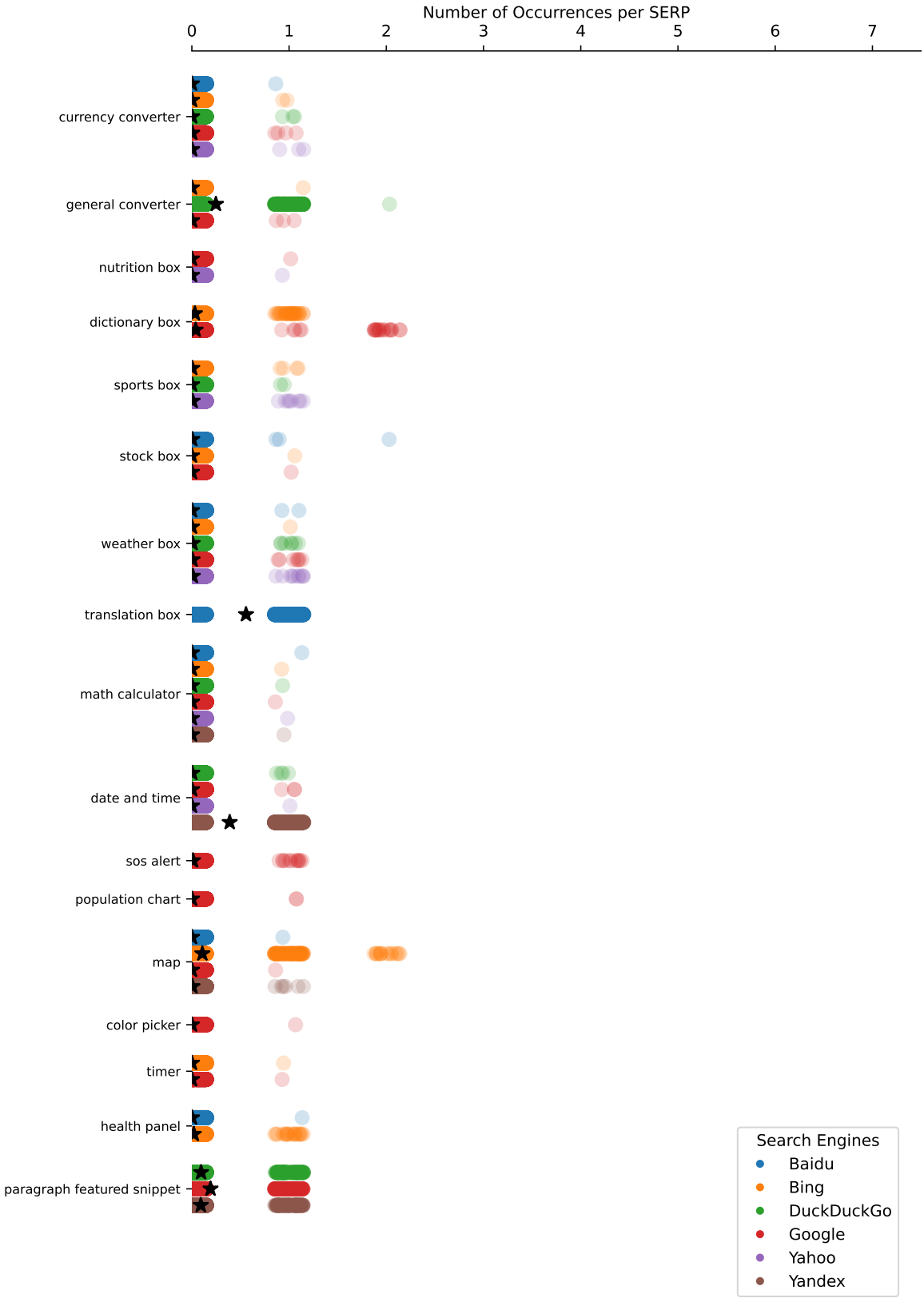


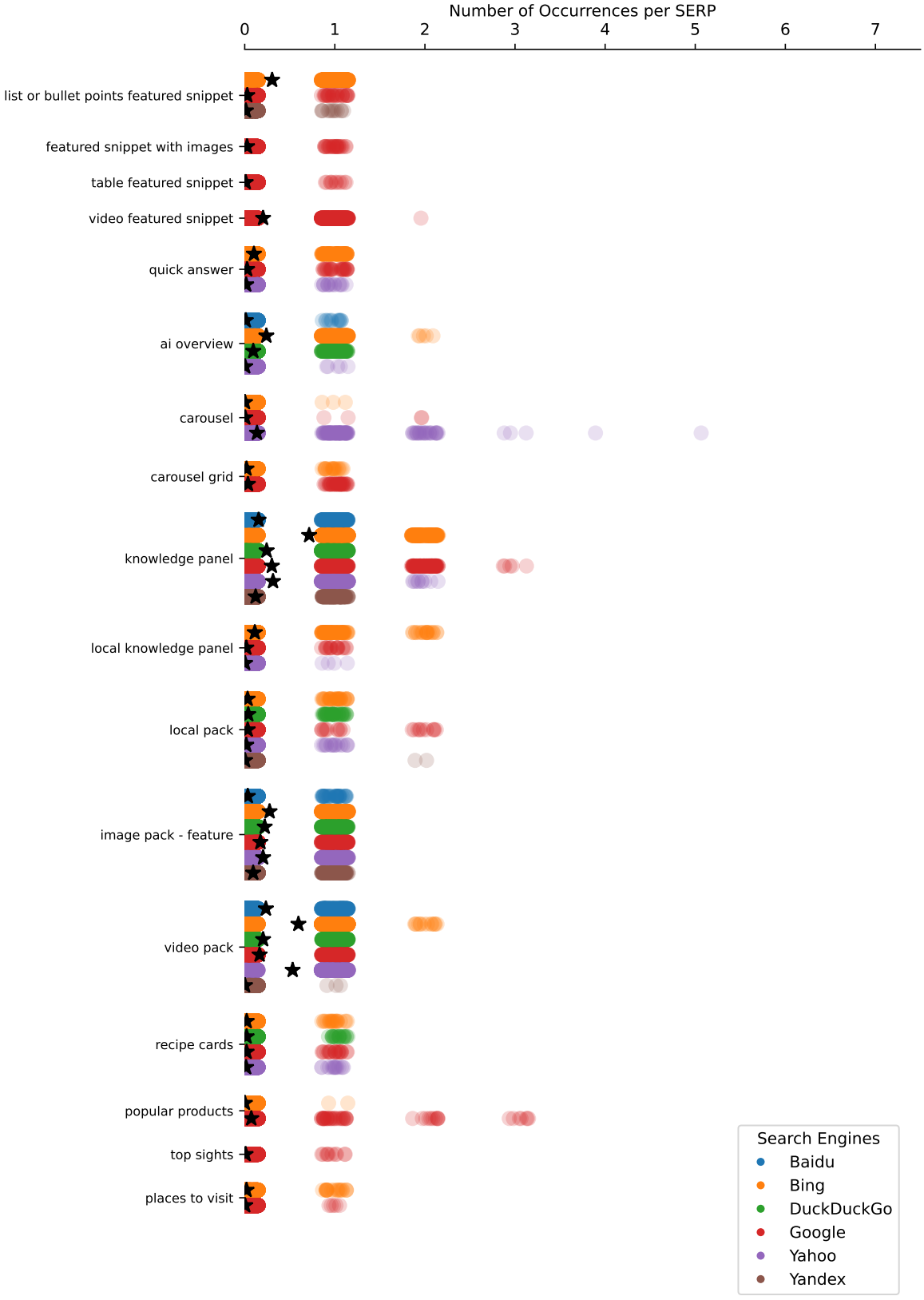
Figure C.1: Distribution of organic elements occurrences per SERP by search engine. Stars represent mean values.



Figure C.2: Distribution of sponsored elements occurrences per SERP by search engine. Stars represent mean values.


Number of Occurrences per SERP
0
1
2
3
4
5
6
7
people also ask
related searches
category related searches
ask chatbot
related products
query complements
explore more
topic exploration wrap
trending recommendations
trending now
scholarly articles
automatic spell correction
disambiguation box
results location
results language
shopping filter side bar
whenIs box
Search Engines
Baidu
Bing
DuckDuckGo
Google
Yahoo
Yandex


Number of Occurrences per SERP
0
1
2
3
4
5
6
7
currency converter
general converter
nutrition box
dictionary box
sports box
stock box
weather box
translation box
math calculator
date and time
sos alert
population chart
map
color picker
timer
health panel
paragraph featured snippet
Search Engines
Baidu
Bing
DuckDuckGo
Google
Yahoo
Yandex


Number of Occurrences per SERP
0
1
2
3
4
5
6
7
list or bullet points featured snippet
featured snippet with images
table featured snippet
video featured snippet
quick answer
ai overview
carousel
carousel grid
knowledge panel
local knowledge panel
local pack
image pack - feature
video pack
recipe cards
popular products
top sights
places to visit
Search Engines
Baidu
Bing
DuckDuckGo
Google
Yahoo
Yandex

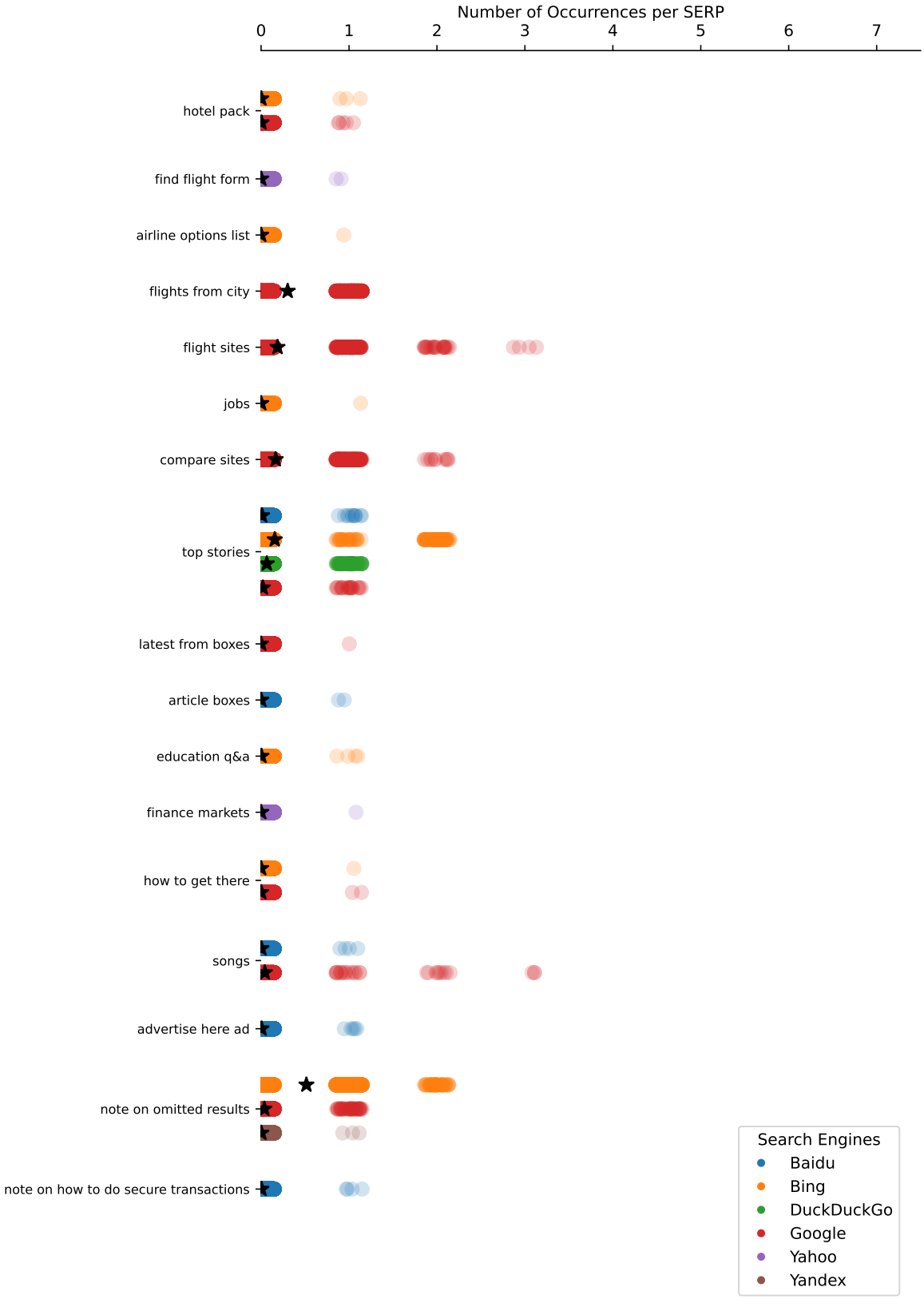


Figure C.3: Distribution of feature elements occurrences per SERP by search engine. Stars represent mean values.

Table C.7: Significance table for feature elements by search engine. Asterisks indicate statistically significant differences ('*' for $p < 0.01$, '**' for $p < 0.001$, '***' for $p < 0.0001$).

	Baidu	**Bing**	**DuckDuckGo**	**Google**	**Yahoo**	**Yandex**
Baidu >	—	query complements**	related searches***	related searches*** scholarly articles*** video pack*	related searches*** top stories*	related searches*** video pack***
Bing >	related searches*** automatic spell correction* map*** health panel*** ai overview*** knowledge panel*** local pack*** image pack*** video pack*** top stories***	—	related searches*** map*** ai overview*** knowledge panel*** local knowledge panel*** video pack***	related searches*** map*** health panel*** list or bullet points featured snippet*** quick answer*** knowledge panel*** local knowledge panel*** image pack*** video pack*** places to visit* top stories*** note on omitted results***	related searches*** quick answer*** ai overview*** knowledge panel*** local knowledge panel*** image pack* top stories***	related searches*** map*** list or bullet points featured snippet*** quick answer*** knowledge panel*** local pack*** image pack*** video pack*** note on omitted results***
DuckDuckGo >	automatic spell correction*** general converter*** ai overview*** knowledge panel*** local pack*** image pack*** top stories***	automatic spell correction*** general converter***	—	related searches*** automatic spell correction*** general converter*** top stories***	automatic spell correction*** general converter*** paragraph featured snippet*** ai overview*** top stories***	related searches*** automatic spell correction*** knowledge panel*** local pack*** image pack*** video pack***
Google >	query complements*** automatic spell correction*** knowledge panel* local pack*** image pack*** songs***	people also ask*** query complements*** popular products***	paragraph featured snippet*** local knowledge panel**	—	people also ask*** query complements*** paragraph featured snippet*** top stories***	people also ask*** related searches*** paragraph featured snippet*** quick answer*** knowledge panel*** local pack** image pack*** video pack*** note on omitted results***
Yahoo >	carousel*** knowledge panel*** local pack** image pack*** video pack***	people also ask*** carousel***	carousel*** video pack***	related searches*** disambiguation box** carousel*** knowledge panel* video pack***	—	people also ask*** related searches*** quick answer** carousel*** knowledge panel*** local pack* image pack*** video pack***
Yandex >	automatic spell correction** date and time*** image pack***	date and time***	date and time***	date and time***	date and time*** paragraph featured snippet***	—

Appendix D

Supplementary Data for Language Analysis

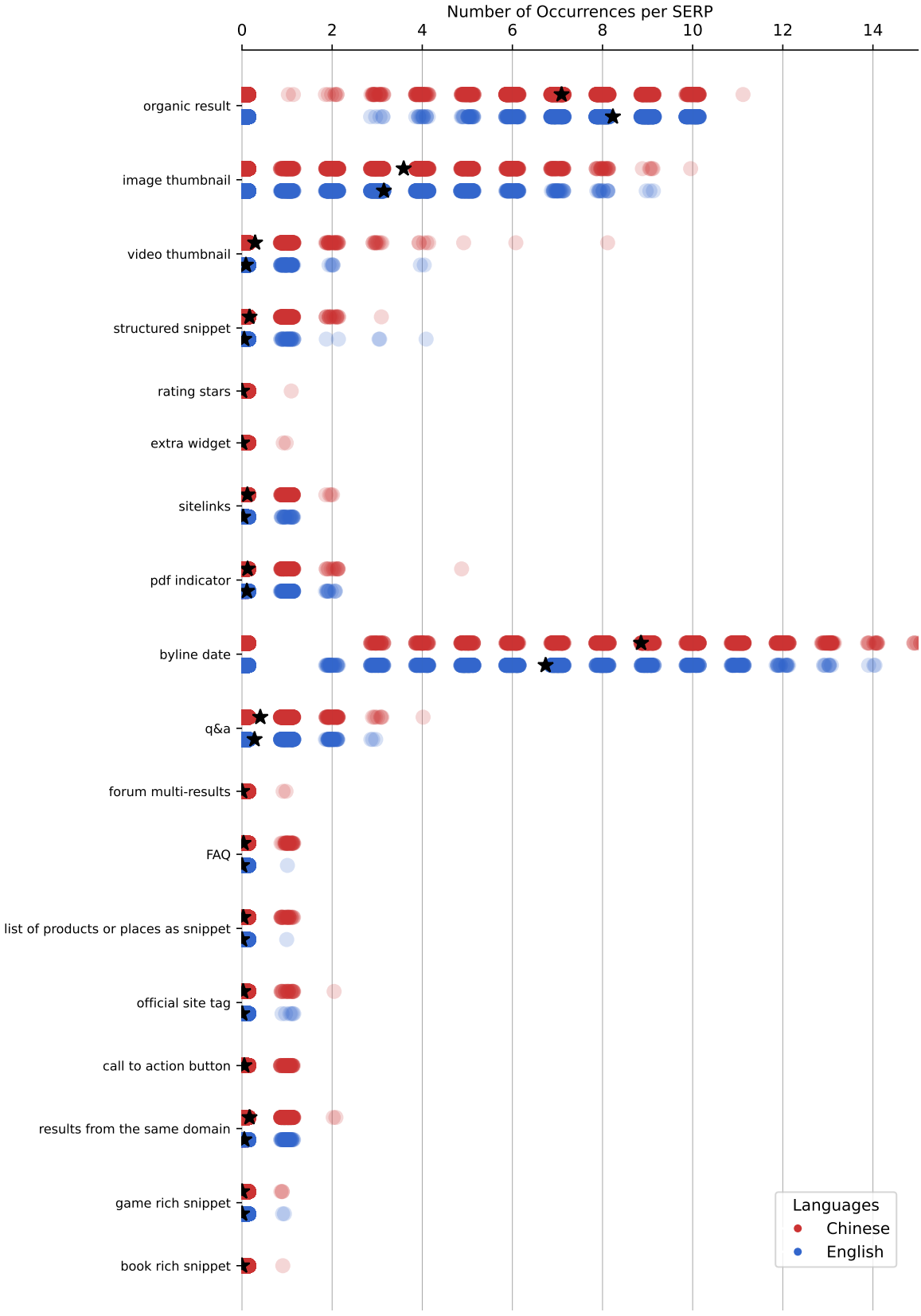


Figure D.1: Distribution of organic elements occurrences per SERP in Baidu. Stars represent mean values.

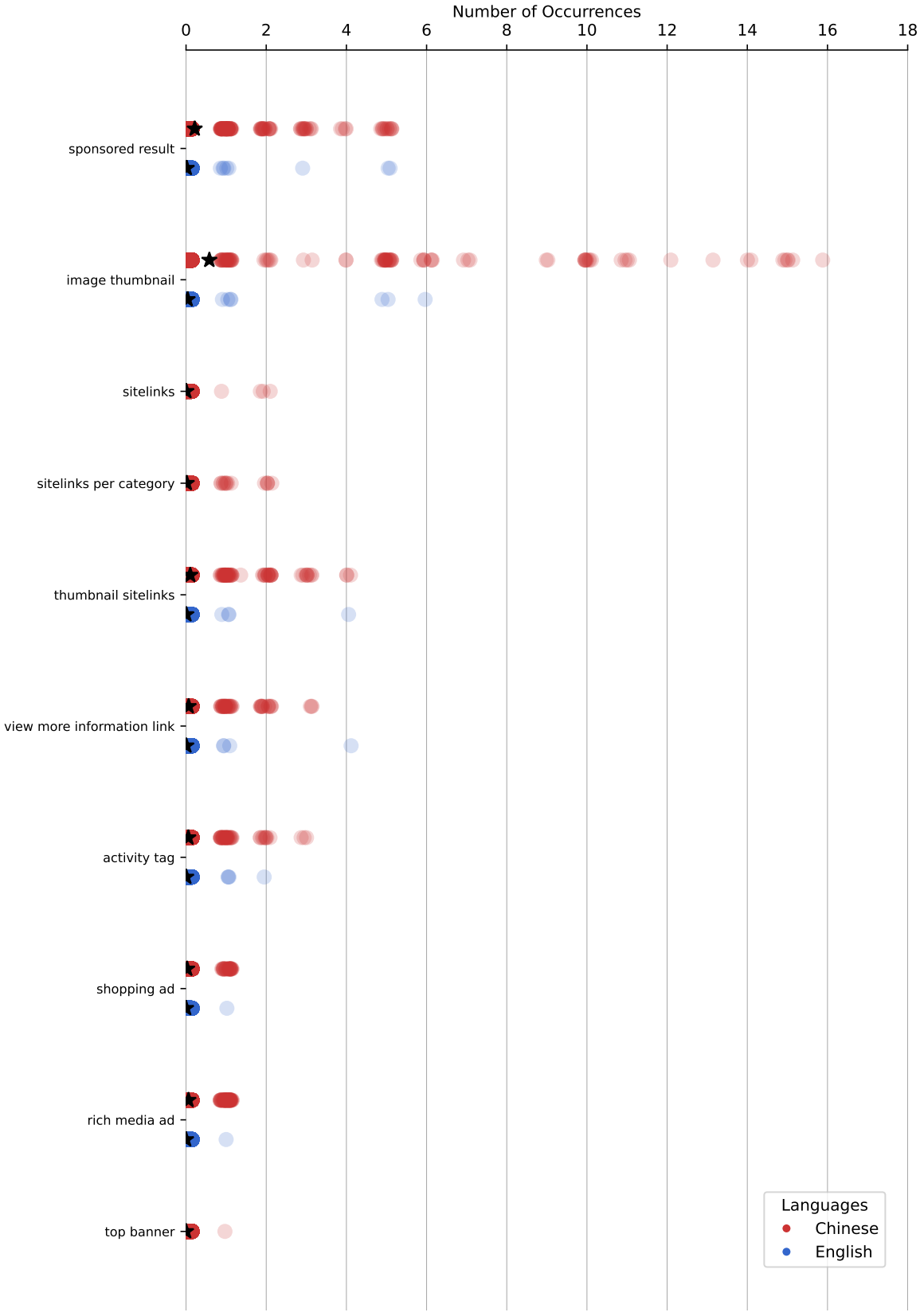


Figure D.2: Distribution of sponsored elements occurrences per SERP in Baidu. Stars represent mean values.

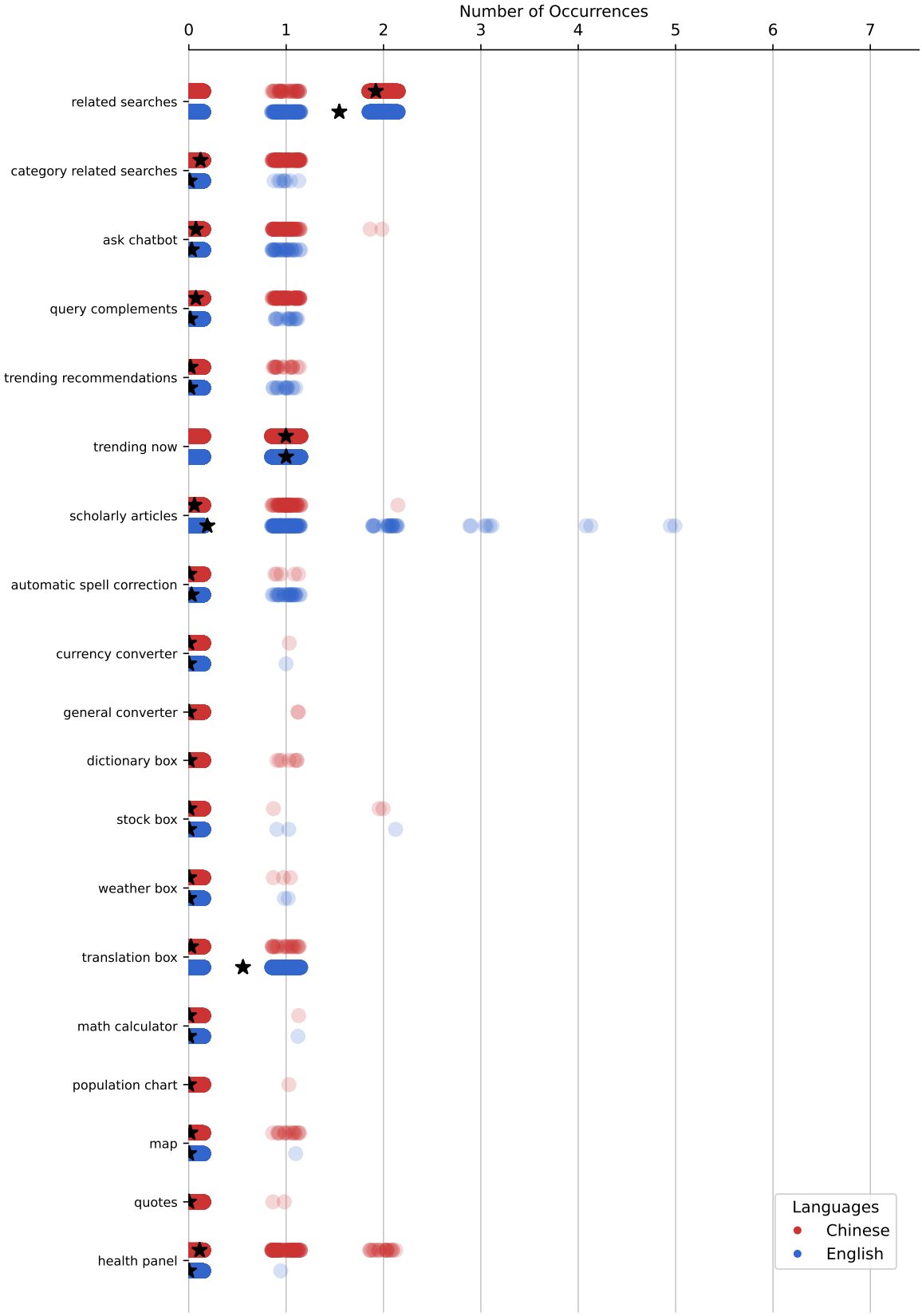

Number of Occurrences
0
1
2
3
4
5
6
7
related searches
category related searches
ask chatbot
query complements
trending recommendations
trending now
scholarly articles
automatic spell correction
currency converter
general converter
dictionary box
stock box
weather box
translation box
math calculator
population chart
map
quotes
health panel
Languages
Chinese
English



Figure D.3: Distribution of feature elements occurrences per SERP in Baidu. Stars represent mean values.

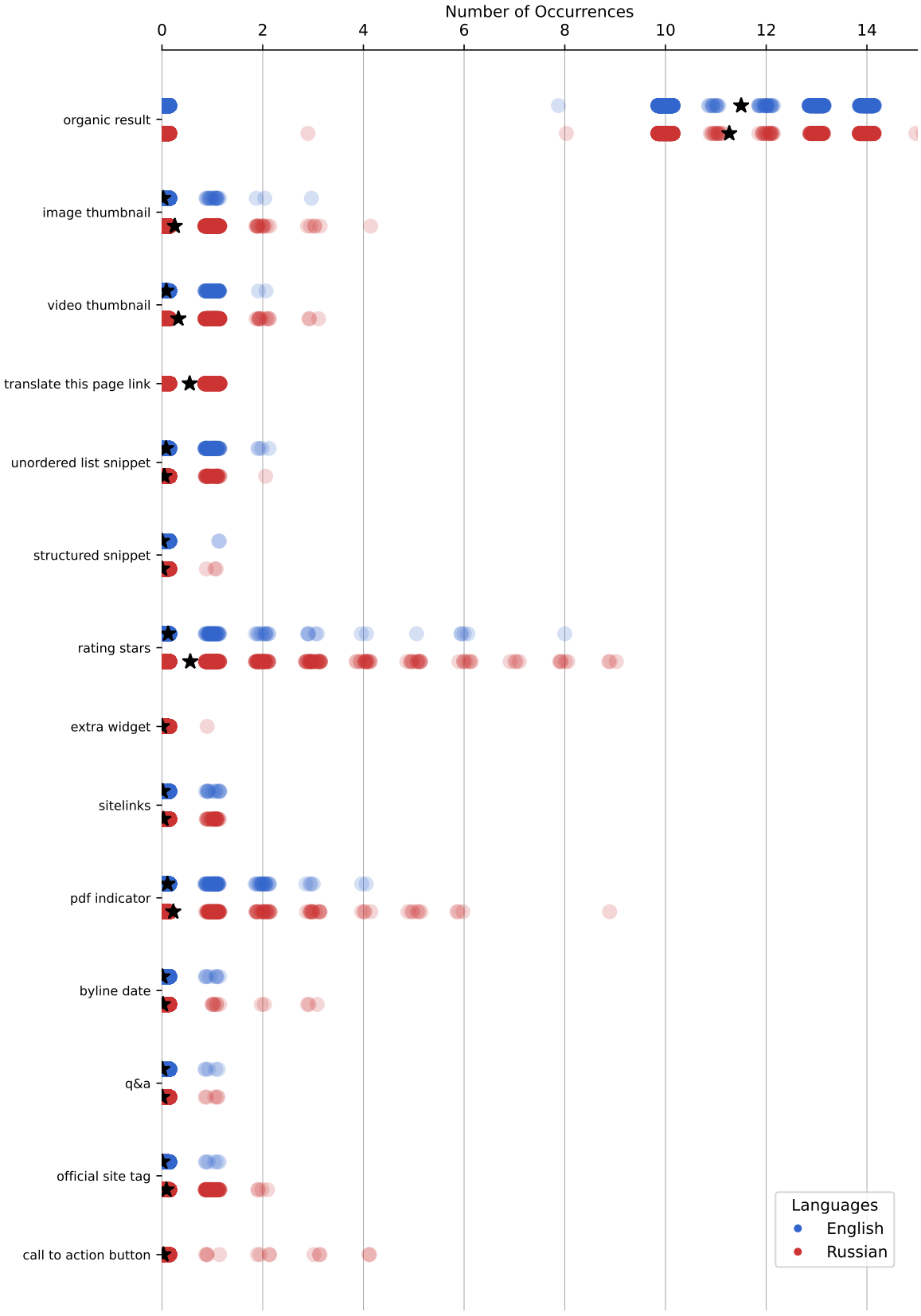


Figure D.4: Distribution of organic elements occurrences per SERP in Yandex. Stars represent mean values.

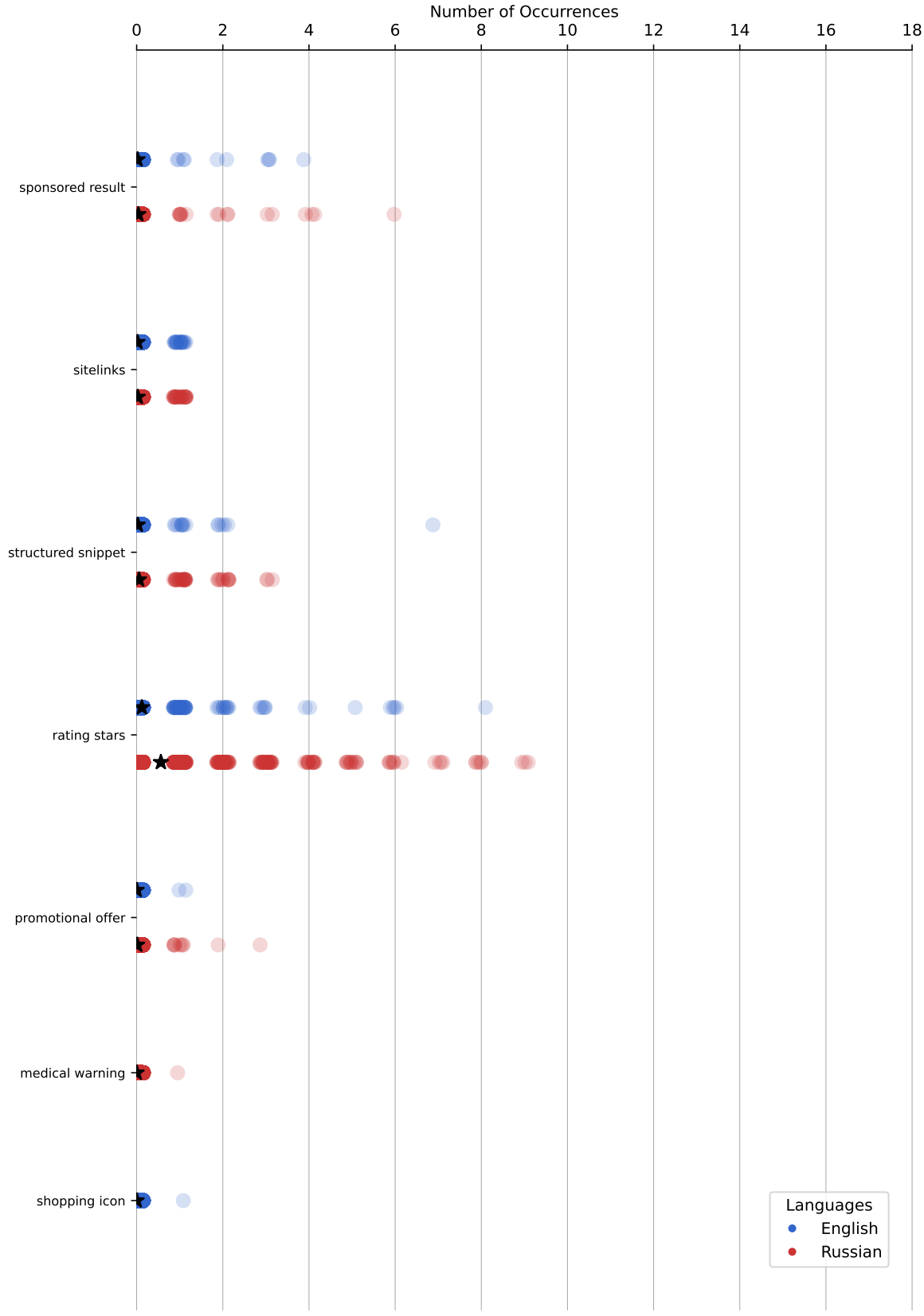


Figure D.5: Distribution of sponsored elements occurrences per SERP in Yandex. Stars represent mean values.

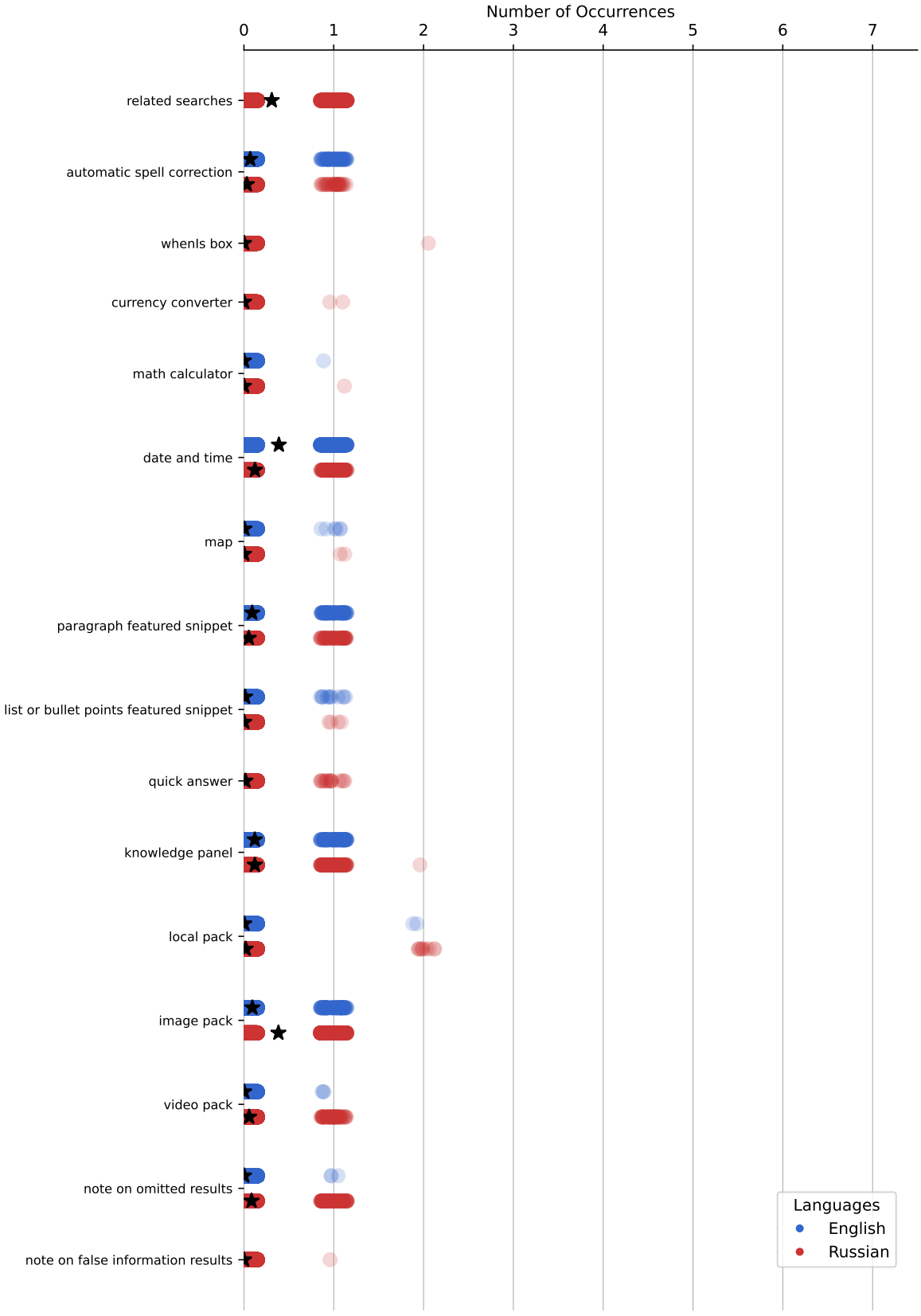


Figure D.6: Distribution of feature elements occurrences per SERP in Yandex. Stars represent mean values.