1. Few websites that offer a type of search within them are as follows:
   a. Amazon: It uses a search algorithm called A9 algorithm that is like that one of Google's. Here, Amazon also decides how products are ranked. In order to determine the product ranking, it uses specific keyword, sale conversions, customer reviews, performance history, delivery time and competitive pricing. The search algorithm is monumental to ensure Amazon's sustainability and increase in usage. It is through this search experience that users get their 'relevant' products for the items they have searched for. Without trying to meet the accurate desires and perspective of the user, Amazon would not be able to function efficiently.
   b. RIT libraries: This website uses of form of database searching wherein the user enters specific keywords like title or descriptions. After which, it narrows its results and displays them to the user's screen. This form of search is important as it allows students to identify whether their desired text is available in online or hard copy format. Since most of the search is pertaining to RIT academic resources, the search limit decreases as well, giving an increase in the speed of obtaining result.
   c. Online-Utility.org: Implements a grep style of search. The user enters a text, word or a paragraph. The user can then go search through the text by entering certain patterns, popularly from the reggex diction in order to locate the desired word or group of words.
   d. Slader: It uses a form of database that contains all kinds of study solutions that are created by the staff and the users having dedicated accounts in Slader. Its primary method of search is to first search for the textbook the question is from and then narrowing down to the sections and finally the page number of the question. The method is purely based on a database search algorithm where there is no form of ranking given to documents.
   e. Chegg: It uses a form of database search that contains ranking for each answer. Chegg is a website that allows students and teachers to either post answers to questions or post questions and answers to those questions. Upon searching for the required answer, Chegg's search engine performs character checking by identifying keywords from the entered text and then displays the possible links for those answers. Each answer is given a form of ranking that decides which link should appear first and so on. The ranking is based on number of likes, number of clicks for the link, number of comments and reputation of the user in terms of correct answers and wrong answers.
2. A. The queries are:
   a. Lion population
   b. Lion population location
   c. Where is the largest lion population?

The main goal to is to find where is the largest lion population in the world. This doesn't change with regards to each query I enter for search. On the basis of this main goal, the precision for each query within the respective search engines will be calculated.

In order to invoke the same kind of information from all the three queries, I decided to explore the intuition of the search engines. This was done by the keyword, 'population'. The idea by including 'population' was to give a gist of statistical information about the topic, in this case, lions.

To perform this experiment, I used Google's and Duck Duck Go's search engine. I also used Google's search engine in incognito mode to see what all changes in the search history there would be, if there might be. By doing this, I would further try to get a broad understanding of how the user's search history and preferences are being used in order to improve the overall search experience.

The idea behind the first query, Lion Population, was to return a broad statistical result of the lion's population. From the intuitive implication of the search query, the expected search result should comprise of highest and the lowest demographics, the specific species of lions with their population count, timeline data depicting number of lions within a period of time, some information regarding how to maintain a sustainable population growth of lions and some information regarding the ways the population might be at risk of reducing.

LOST KINGDOM

Lions were once found on three continents but have since disappeared from 94 percent of their historic range. Now fewer than 25,000 wild lions are estimated to remain in Africa. A group of around 600 Asiatic lions are isolated at a national park in India.
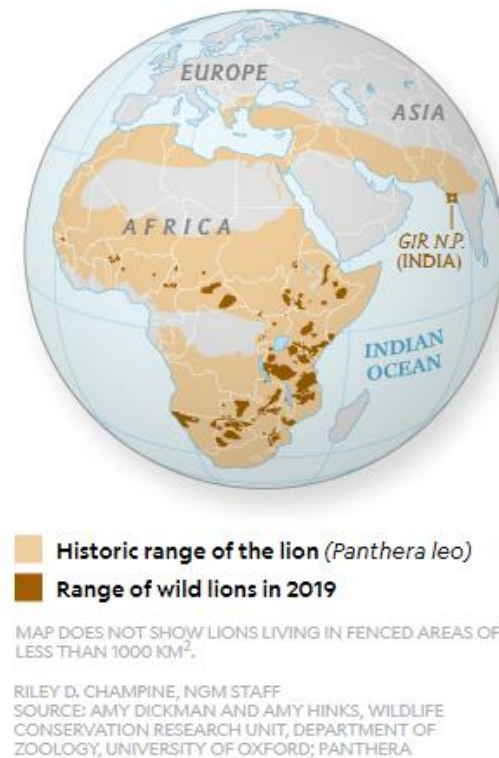
Historic range of the lion (*Panthera leo*)
Range of wild lions in 2019

MAP DOES NOT SHOW LIONS LIVING IN FENCED AREAS OF LESS THAN 1000 KM².

RILEY D. CHAMPINE, NGM STAFF
SOURCE: AMY DICKMAN AND AMY HINKS, WILDLIFE CONSERVATION RESEARCH UNIT, DEPARTMENT OF ZOOLOGY, UNIVERSITY OF OXFORD; PANTHERA

Figure 1 (Prentzel, 2019)

Figure 2 shows the lion population distribution that has been taken from the website https://www.nationalgeographic.com/animals/2019/07/lion-numbers-halved-since-original-lion-king/ that appeared among the search results in Duck Duck Go for the first query itself. Observing the different search engines, I was especially impressed by this result as the website gave a higher amount of detail than the other websites that were shown for Google, while searching with the first query. This has been shown below in Graph 1.

Due to the vagueness in the search query, the earlier prediction of possible search results also showed information regarding the reasons for the reduction of the population of lions in Africa. (Impact, 2018).
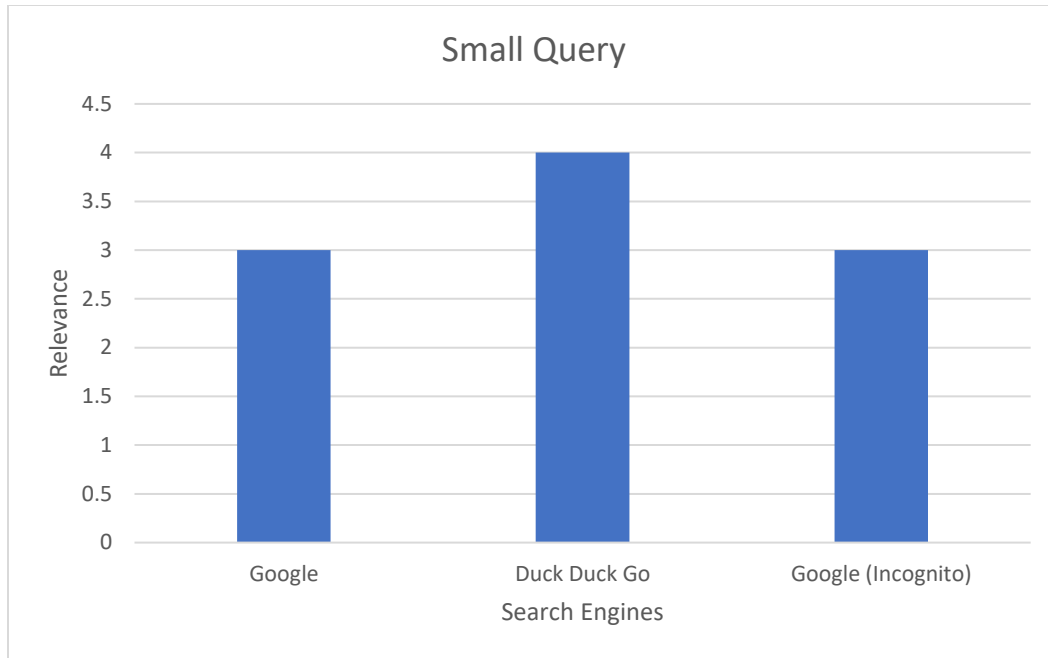
Graph 1.

Graph 1 shows the User relevance level that had been calculated with the Main goal being the outcome. It shows that Duck Duck Go was able to get a higher amount of results that pertained to the intended topic.

Search Engine	Small Query	Relevant
Google	Lion Population	3
Duck Duck Go	Lion Population	4
Google (Incognito)	Lion Population	3

Table 1.

Table 1 depicts the earlier graph in a tabular form and also contains all the links of the result pages for the specific search Engines.

The second query is supposed to reduce the indexing of the spider by making a query with a narrow filter. Here, the query is Lion population location, which is supposed to remove a great deal of unwanted results from the previous search query. This time, the search query should be enlisting details about the demographics of the lion population, giving some insight into the history of once most populated areas becoming sparse with the population of lions while some sparse areas become more profound with the population of lions.
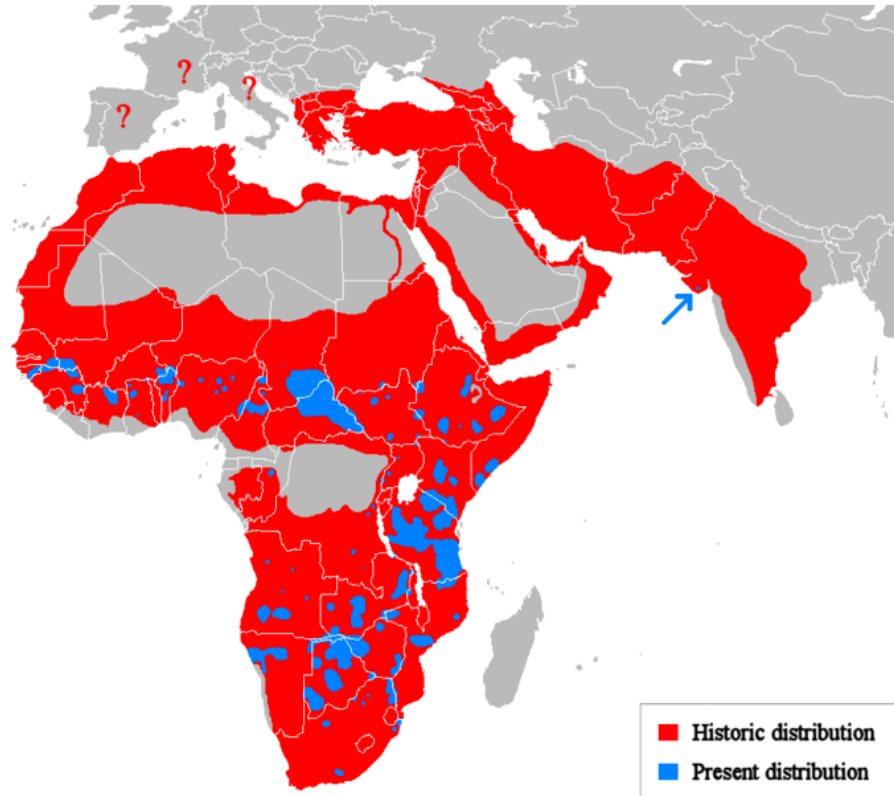
Figure 2. (Knocker, 2009)

Figure 2, shows a clearer and better representation of the distribution of the lion's population over time. This image was found in the website https://brilliantmaps.com/distribution-of-lions/ , which is a result in the medium query and relevant to the user's main goal.
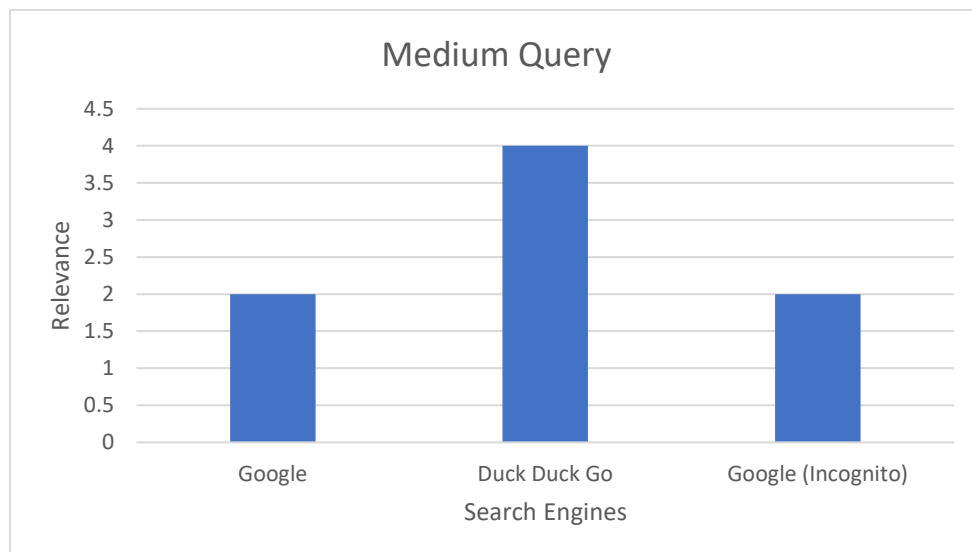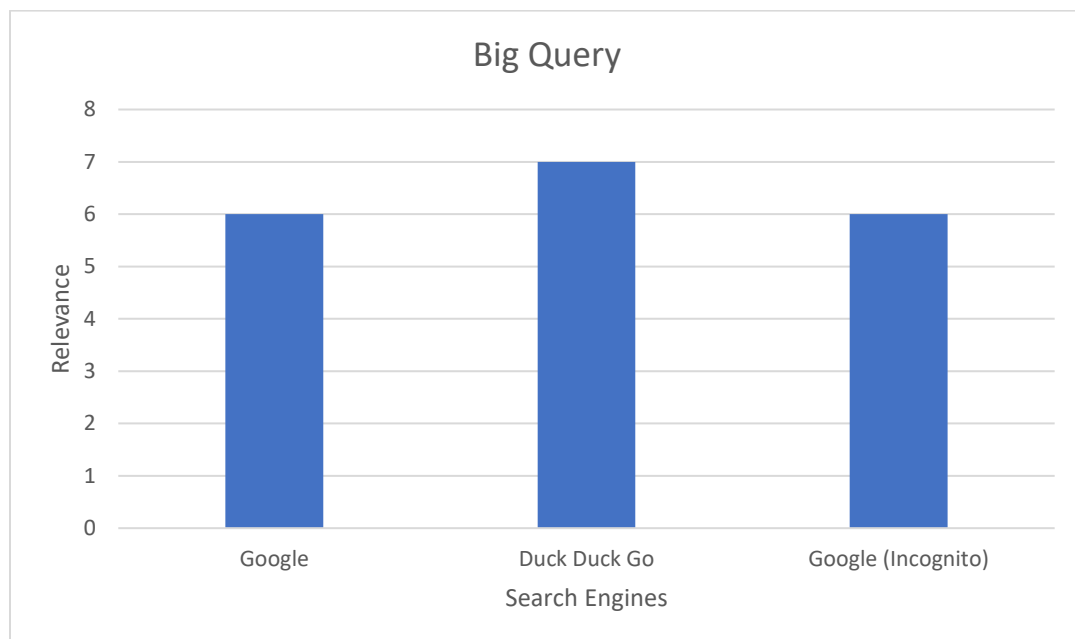

Graph 2.

Graph 2 shows a lower number of user relevance results from the Medium query. This did seem rather strange, however Duck Duck Go continues the lead with the relevant data search results being displayed.

Search Engine	Medium Query	Relevant
Google	Lion Population location	2
Duck Duck Go	Lion Population location	4
Google (Incognito)	Lion Population location	2

Table 2.

Table 2 shows the tabular form of Graph 2 and contains the links of the search results from the corresponding search engines.

The third and final query aims to directly ask the question thought by the user itself. Thereby indicating a detail of description for the search, allowing it to give near precise results or answers in the form of search results. The search query that will be entered is 'Where is the largest lion population?'.

Graph 3

Naturally The big Query displayed a higher form of User relevant data as the spider had more amount of information to index from, thus increasing the accuracy of getting a

relevant search result. Graph 3 shows this behavior correctly where Duck Duck Go is still in the lead with the greatest number of relevant searches.

Search Engine	Big Query	Relevant
Google	Where is the largest lion population	6
Duck Duck Go	Where is the largest lion population	7
Google (Incognito)	Where is the largest lion population	6

Table 3.

Table 3 shows the tabular form of Graph 3 and contains the links of the search results from the corresponding search engines.

B.
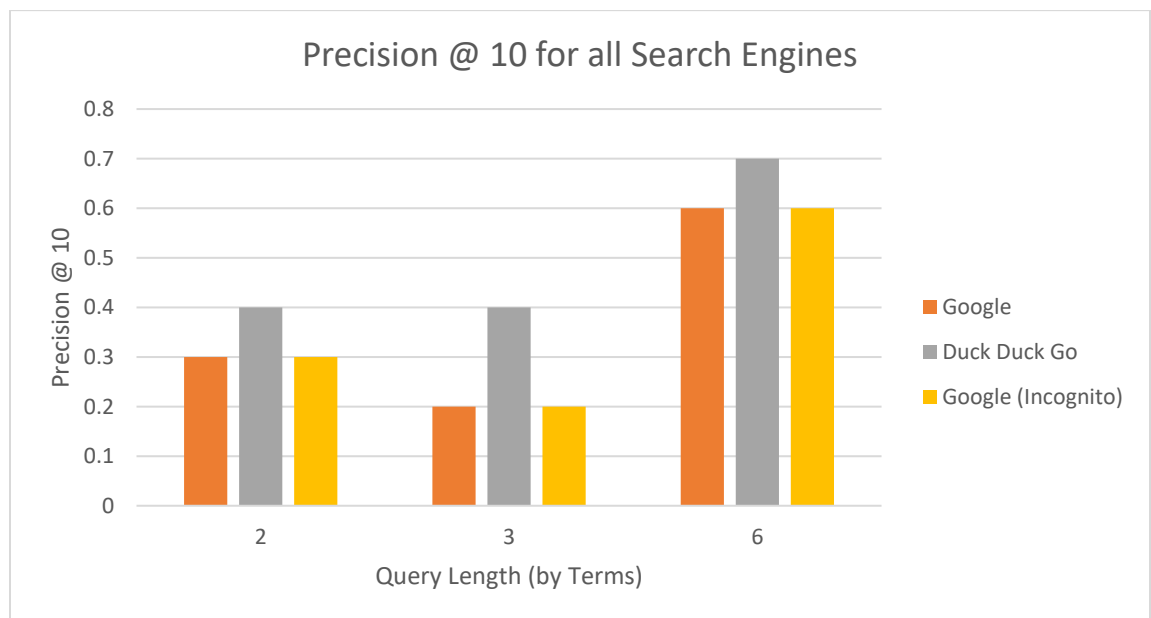
Graph 4.

Query Length	Precision Google	Precision Duck Duck Go	Precision Google (Incognito)
2	0.3	0.4	0.3
3	0.2	0.4	0.2
6	0.6	0.7	0.6

Table 4.

Graph 4 shows a visual representative of the precision form the user relevant standpoint of all the search engines with the different queries. The precision was calculated by taking the number of relevant searches and dividing them by the top 10 search results. From this, and with the help of Table 4, it can clearly be seen that Duck Duck Go had an overall higher precision in all the different form of queries.

For all the search engines, the overall topical results were 1, that is all the search results showed the data that was pertaining to the topic of lion population. However, the Medium query for Duck Duck go had a topic precision of 0.9 as the very last search result was pertaining to a city in France called Lyon as shown in this link https://worldpopulationreview.com/world-cities/lyon-population.

Here, checking with Google and Google in Incognito was done to check whether the search engine displays different results if there was no user with predetermined search history. However, in this case, all the search results were identical from one another.

C.   The precision of the results caries from the search queries.

The small search query averaged to an overall amount of 0.34 of precision including both the search engines. Where Google had a precision score of 0.3 and Duck Duck Go had 0.4.

The medium search query averaged to an overall amount of 0.267 of precision including both the search engines. Where Google had a precision score of 0.2 and Duck Duck Go had 0.4.

The big search query averaged to an overall amount of 0.634 of precision including both the search engines. Where Google had a precision score of 0.6 and Duck Duck Go had 0.7.

The most common of the result that overlapped between the 2 search engines were https://brilliantmaps.com/distribution-of-lions/ and https://www.awf.org/wildlife-conservation/lion. These 2 results appeared at every query and was one of the most user relevant sources for the topic.

From the results of this experiment, it can be said that in terms of user relevance, Duck Duck Go seems to have a greater accuracy of getting the User Relevant data than that of Google. This behavior is mainly noticed with the current topic as the subject of search. For other search queries, it is possible for the search relevance to alter.

Comparing the short and long queries, it makes sense that the long queries were able to get a higher precision score than that of the short query. Due to an increase in the number of terms that are used to describe what the user wants allows the search engine to narrow its search index and thus produce a higher chance of getting an accurate and precise set of results.

3. A. Both the interfaces, Google and Duck Duck Go have a similar look, however there are subtle changes that highlight the general user preference that is enough to differentiate the user experience from one another.
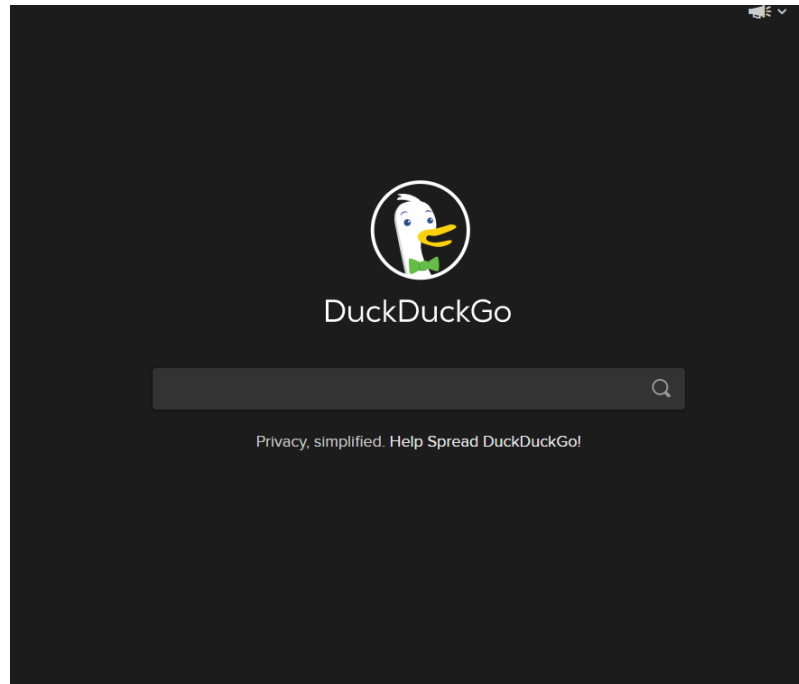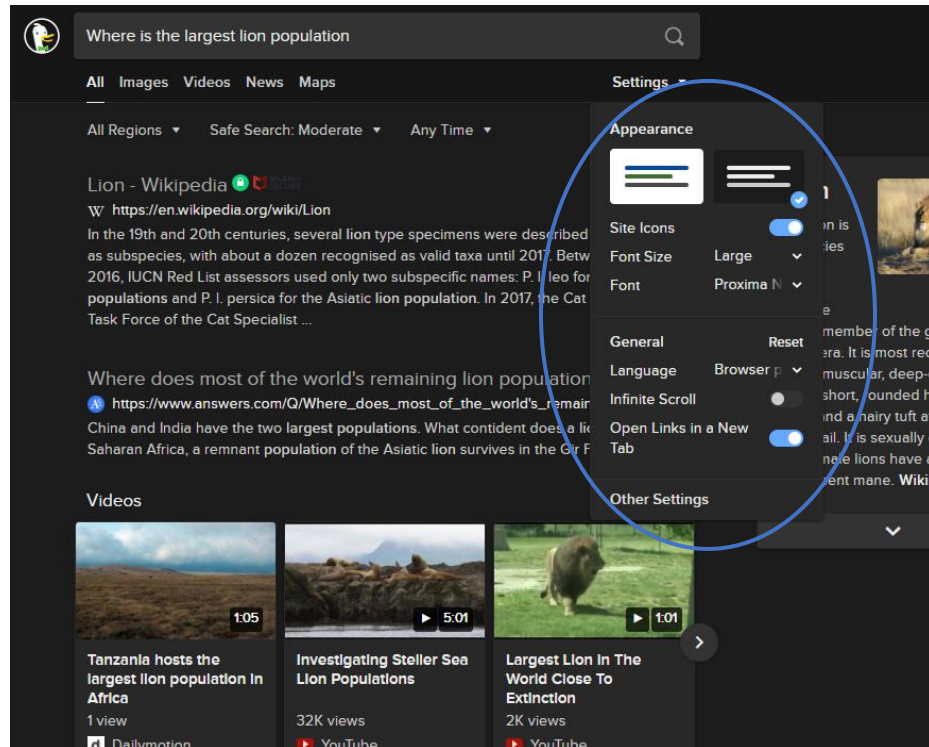

Duck Duck Go Front Page
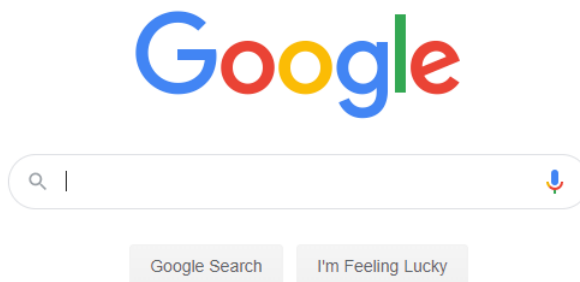
Google Front Page

For Duck Duck Go, first and foremost, it has a default of dark theme that is very comfortable and soothing to the eye than the immediate white background of Google.

After getting the result, the settings button that is situated below the search bar is more catered to the user in Duck Duck Go than Google.

Settings button action in Duck Duck Go

The initial settings in Duck Duck Go are regarding theme, behavior of each search result upon clicking it, font, font size, language and infinite scrolling that are without doubt more catered to the general public's immediate changes of the webpage. For Google, it becomes a tedious process as it requires the user to go into advance search and then literally search through those immediate changes. This easily affects the user experience drastically.
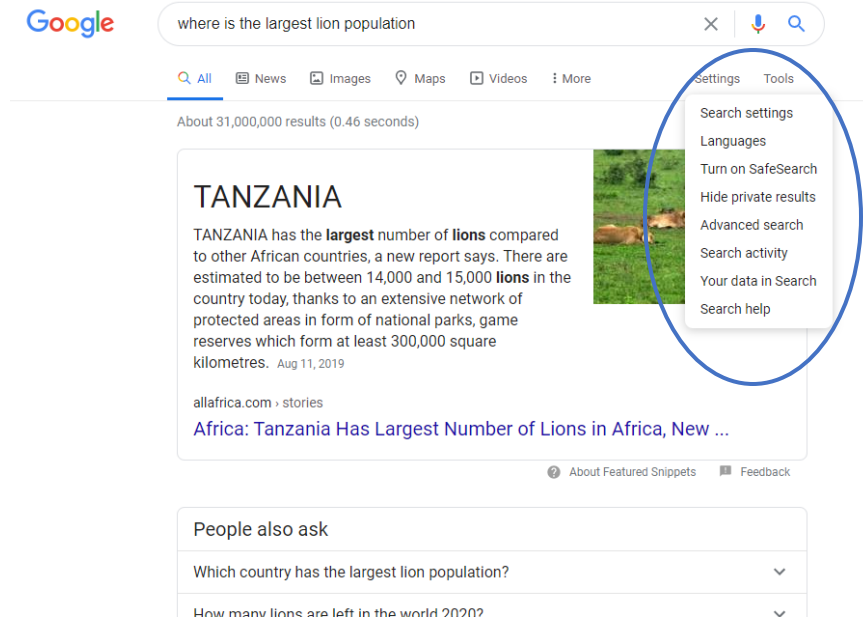
Settings button action in Google

The few features, such as the positioning of the search bar, the length of the search bar, the viewing of the search results and the intuitive UI upon asking simple queries like an actors name or the definition of a word, remain similar to one another.

B.   Due to the fantastic machine learning algorithm supporting the entire google framework and the fact that many people are using google, thus allowing the engine to correct itself rapidly, gives it a huge advantage when it comes to giving the correct result. Here, for the longest query, I was able to get answers from both of them. However, Google was able to comprehend the question accurately and thus make the answer as the main subject, instead of what Duck Duck Go did. They took the subject from the Query and displayed that as the main subject. As a user experience, it might appear that the search engine is being able to comprehend the user, however, intuitively speaking, it would cost the user experience as the user would have to 'search' for the answer. That shouldn't be what a search engine should be doing after it has shown the results.

Here, the result of the Long query is being shown abundantly clear.

Here, the user will have to search for the answer by either reading through the small information under each website link or actually go into the link itself.

C. I wasn't able to see any features that weren't already described in Hearst Chp 1 as Yahoo's UI happened to be one of the examples mentioned in the chapter 1 as a drawback. From this, prominent search engines like Google and Duck Duck Go have appeared while ensuring that they wouldn't do the same UI mistakes as Yahoo did. Thus in the current UI of these search engines, its very difficult to notice any such drawback that could be found irritable in the user experience.

D. The UI of Duck Duck Go is more user friendly. It appears to understand the user to a greater deal and knows how to connect with the user in terms of usability and appearance. However, Google happens to have technology backing it up to a massive extent that is enough to overlook simple UI drawbacks. Google is able to be intuitive enough and thus understanding enough to be able to give the exact, if not near, result that is required by the user. Due to the helpful behavior of Google, I still remain loyal to Google and thus still prefer Google over any other search engine so far.

Citations:

Impact, A. (2018, June 18). African Lion - A Vulnerable And Endangered Species. *African Impact* . Retrieved September 7, 2020, from https://www.africanimpact.com/african-lion/

Knocker, T. (2009, August 24). Lion Distribution. Wikimedia. Retrieved September 6, 2020, from https://commons.wikimedia.org/wiki/File:Lion_distribution.png

Prentzel, O. (2019, June 18). Lost Kingdom. National Geographic. Retrieved September 6, 2020, from https://www.nationalgeographic.com/animals/2019/07/lion-numbers-halved-since-original-lion-king/