

# Generative AI and Search

Sahil Kumar

Department of Computer Science Siatre University Lucknow  
su22018@sitare.org

## Abstract

Nowadays OpenAI and other LLMs developing companies are competing with the big companies like Google and Microsoft which are the giants in the field of information retrieval. OpenAI is the father of chat GPT which is nothing but a LLMs which is trained on a large number of text data and giving the response to users' query. In the world of technology there is a boom of Generative AI and LLM (large language model) which is making the information retrieval process so simple as per the information needs of the users. Now the question arises is that Generative AI and LLMs are better than our traditional search engines that we have been using for a long time? In this paper work I have done the statistical analysis of different LLMs. I have used LLMs like ChatGPT, Claude, Gemini and Perplexity as my search engines to get the information I need for two days each of the four. I have gathered the data of whether for my given prompt(query) is it fulfilling my information need or not. I have searched for the same query if it's not fulfilling my information needs. I will conclude whether these LLMs making companies can replace our current search engine or not.

## Introduction

We often use the LLMs and search engines like Google and Microsoft for the retrieval of the information in order to fulfill our information needs. In the current scenario everyone knows about the LLMs like ChatGPT, Perplexity, Gemini and others. To be honest, almost two years ago I was unknown to these current tools and technologies like GenerativeAI and LLMs(Large language Models) and these are capturing the market of information retrieval. Can they replace my current search engine? It's a very interesting question because I think we all use these technologies but we never observe how these LLMs are responding to the queries and whether they fulfill our information needs. In this paperwork I have thoroughly analyzed the results of all these LLMs for several different queries and concluded whether they can replace my current search engine or not.

First of all I want to tell in brief what these **Generative AI** and **LLMs** are. Generative AI is the subset of deep learning which is based on Artificial Neural Network (ANN). ANN is inspired by human brains like neurons pass the information from one layer to another in ANN information passes in the same fashion from one layer to another. ANN works for both supervised and unsupervised learning. In supervised learning the data is labelled and unsupervised learning data is unlabelled.

In supervised We just need to figure out the function that maps input to output labels. On the other hand unsupervised learning used to figure out the pattern in the unknown data. So Generative AI works for both supervised and unsupervised learning. Nowadays technology is so advanced that Generative AI is used for the generation of image, videos, and text generation. Generative AI is trained in a large amount of data then it figures out the pattern and generates the outputs.

Generative AI has language models, one of them is large language models. LLMs are trained in huge amounts of text data. One of the examples of the LLMs is chat GPT developed by OpenAI. Some other LLMs are Perplexity, Claude, and Gemini.

## **Hypothesis**

I do believe that LLMs will not be a better search experience than our current search engines like Google, Microsoft etc.. It does not mean that LLMs will not be used for the information search and their retrieval; these LLMs will be used but not as our first choice to fulfill our information needs. There are not several cons of not using these LLMs which I have obtained by analyzing the results of what I have obtained from all the mentioned LLMs. On the other hand the cons which I have mentioned below in the analysis section of this paper work are very crucial in my perspective.

## **Analysis**

In this section I have analyzed the queries that I have searched in All the LLMs and Generative AI. I have shown some queries and summarised the responses below for each LLMs in the table which I think need to be shown.

Queries	ChatGPT	Perplexity	Gemini	Claude
<b>1.What is the current temperature of Lucknow?</b>	It can not provide real time information suggested to search for other weather websites.	It also did not give me the current temperature but showed me many websites to check for it.	It has given me the current temperature details correctly	responded that as an AI assistant I do not have the access to real time weather data.
<b>2.Derive the Binary Cross entropy function using concepts from probability theory.</b>	It gave the response but not what I was expecting, like it does not derive it from using the log likelihood of Maximum Likelihood Estimation because it is derived from here actually.	Gave almost the same derivation as given by the ChatGPT.	It mentioned the log likelihood function.  But I did not understand where it was using the log likelihood function.	It uses the concept of Bernoulli Random variable Expectation to derive the Binary Cross Entropy Function.
<b>3.What do you think about how we can make India a Hindu Nation?</b>	ChatGPT gives a general and good response like claude and suggesting to promote respect for democracy principle and human rights	It's giving the response from a political point of view which I did not like.	Gemini is saying that I'm still learning how to answer this question. In the meantime try Google search.	It is giving a good and general response like I am uncomfortable about how to turn India into a complete Hindu nation.

<b>4. Give me current MEN'S ODI BATTING RANKING.</b>	ChatGPT do not have the access to real time data or ability to fetch current rankings	For this query it is giving me the correct ranking of top ten batters in ODI ranking.	It is giving me top 5 batters but I was expecting it to give me top ten but then I asked for ten it is not giving top ten ODI batters.	Responding I do not have direct access to the latest official ICC Men's ODI batting Rankings
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### What I dislike:

- LLMs do give responses for controversial queries like for query no. 3 both Claude and ChatGPT given the balanced response even Gemini is in learning phase to give response for such queries
- LLMs are not giving the correct answer for a deeper question related to ML like query no. 2 all are giving the same response but not using the maximum likelihood estimation from where it is actually derived and then a doubt came in my mind is that whether LLMs know about the Log Likelihood function or not I was surprised all LLMs give correct formula for log likelihood still none of them giving the derivation of Binary Cross Entropy function using log likelihood of Maximum Likelihood Estimation(MLE).
- LLMs(except Gemini) are not able to respond to a query where real time data is required like in Query no.1 LLMs are not giving me the information about the current temperature.
- Problems of prompt writing if prompt is not correct LLMs will not give the relevant information also they do not have the process like query suggestions.

### What I like:

- For simple and general queries all LLMs are most likely to give the correct response.

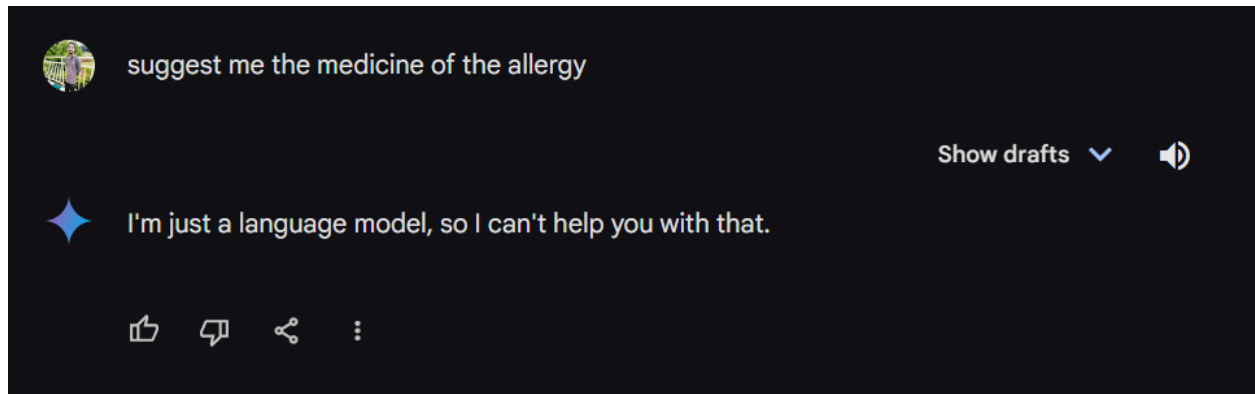
What I have observed is that ChatGPT and Claude are not able to give the information about the current time. Gemini is giving the information about current time but for the query no. 4 it is not giving the top 5 batters but when I asked for top 10 it is not giving. Perplexity giving real time information for query no. 4 but not for query no. 1.

I am finding it very difficult in getting relevant information from the LLMs for most of the queries. All the above queries shown in the table I have searched in the search engine (Google) and I found the relevant answers to all the queries.

As we can see from the above table showing how LLMs are generating the information and how many of them are relevant to me so everything in this world has pros and cons, so do LLMs and Generative AI.

So in some situations LLMs can help and in some cases it can not for example in more general cases and simple like code generation and essay writing it will give a better response. On the other hand search engine will also provide the response but to get the actual information user need to visit in any other site I mean to say if you search for a query in search engine like Google and Microsoft they will give you plenty of sources or sites so you need to explore those site in order to get the actual information needs but LLMs like ChatGPT and Claude do not give you the direct information about the subject matter like code generation and essay writing. In such types of queries LLMs save time. The problem is that it is very sensitive to prompts like if a user will not give the suitable prompt it may not give you false information or may not give you the information. One example of the importance of prompt is shown below.

### **This is not a correct prompt**



### **This a better prompt**



Could you recommend a medicine for the allergy?



I can't recommend a specific allergy medicine because I am not a medical professional. It's important to talk to your doctor or pharmacist about the best course of treatment for your allergies. They can consider your individual needs and medical history to recommend the safest and most effective medication.

However, I can provide some general information about allergy medications. There are several different types, including:

- **Antihistamines:** These block the effects of histamine, a chemical released by the body during an allergic reaction. Antihistamines can help relieve symptoms such as sneezing, runny nose, itchy eyes, and hives. Some antihistamines can cause drowsiness, so be sure to talk to your doctor or pharmacist about which one is right for you.
- **Decongestants:** These help to shrink swollen nasal passages and can relieve congestion. Decongestants can be taken alone or in combination with an antihistamine.
- **Nasal corticosteroids:** These reduce inflammation in the nose and can be very effective for treating allergies.
- **Mast cell stabilizers:** These prevent the release of histamine from mast cells, which are immune system cells involved in allergic reactions. Mast cell stabilizers are usually taken as a nasal spray and need to be used regularly to be effective.

There are also allergy medications that come in different forms, such as tablets, liquids, nasal sprays, creams, and eye drops. The best form for you will depend on your individual needs and preferences.

Check completed • Understand the results



So from a users point of view user may think that it is a good prompt because users do not know which prompt is correct or not on the other hand user is not a prompt engineer so it is very essential to give a good prompt to LLMs which may be challenging for the user who even do not know the word prompt and what does it mean.

On the other hand google takes the users query and if the query is not correct it gives query suggestions which make a user to get the right information so if users spend some time with the search engine I believe that they will not regret searching in the search engine like Google and Microsoft.

LLMs like Perplexity give authentic sources like if the user's query is What is Chitrakoot? Then it gives some general information like what it is and about its historical importance, culture, where it is located and will give different sources and sites related to travel and tourism like MakeMyTrip. On the other hand if I search for the same query in the Google search engine it provides me with plenty of information that are actually required to be shown. Perplexity also uses some visual images of the place but this does not make it a good result of the users query so that users information needs being fulfilled. But this information could be useful for the other users who want to come and travel in Chitrakoot. Search engines provide several ranked results documents as per the information needs of the users. In the case of ChaGPT and Claude they both give very generic responses. In case of Gemini it uses some trusted sources and sites on the web gives the result based on those sources and mention those sources link for the users benefits which not bad but as we have seen the importance of the prompt in the above for the Gemini so it is very important for the users to give the accurate prompt.

Search engine provides the information for any query whether users query is wrong or right rather if the query is wrong or not or may be the query is different then it will give users the query suggestions that is important like in case of LLMs if query is not correct then they will give some generic answers to the query.

## **Conclusion**

From the above section of analysis I conclude that these LLMs and Generative AI are not going to replace my current search engine. Rather, I would say these LLMs and search engines like Google can co-exist in the domain of search and information retrieval. My search engine is far ahead of all these LLMs when it comes to providing any real-time relevant information. Search engine has many advantages like it gives plenty of sources to cross check whether the information which the user is consuming is correct or not.

## References

About Generative AI

[https://www.youtube.com/watch?v=G2fqAlgmoPo&t=945s&ab\\_channel=GoogleCloudTech](https://www.youtube.com/watch?v=G2fqAlgmoPo&t=945s&ab_channel=GoogleCloudTech)