Problem Statement

Let's look at a problem statement that asks you to design a search relevance system for a search engine.

We'll cover the following ∧

- Problem statement
- Clarifying questions
  - Problem scope
  - Scale
  - Personalization

Problem statement

The interviewer has asked you to design a search relevance system for a search engine.

Design a search relevance system to display results on a search engine result page

Clarifying questions

Let's clarify the problem statement by specifying three aspects: scope, scale, and personalization.

Problem scope

The interviewer's question is really broad. Your best bet is to avoid ambiguities and ask the interviewer as many questions as you can. This will narrow down your problem space as you are thinking out loud for the best solution.

So, your first question for the interviewer would be something like the following:

Is it a general search engine like Google or Bing or a specialized search engine like Amazon products search?

This scoping down of the problem is critical as you dive into finding the solutions. For the sake of this chapter, we will assume that you are working towards finding relevant results using a general search engine like Google search or Bing search, but the techniques and discussion apply to all search engines.

Finally, the problem statement can be precisely described as:

Build a generic search engine that returns relevant results for queries like "Richard Nixon", "Programming

This will require you to build a machine learning system that provides the most relevant results for a search query by ranking them in order of relevance. Therefore, you will be working on the *search ranking problem*.

The approach to handle a specialized search engine will be fairly similar.

Scale

Once you know that you are building a general search engine, it's also critical to determine the scale of the system. A couple of important questions are:

- *How many websites exist that you want to enable through this search engine?*
- *How many requests per second do you anticipate to handle?*

We will assume that you have billions of documents to search from, and the search engine is getting around 10K *queries per second* (QPS).

Understanding this scale is important to architect our relevance system. For example, later in the chapter, we will go over the funnel-based approach where you will continue to increase model complexity and reduce document set, as you go down the funnel for this large scale search system.

Personalization

Another important question that you want to address is whether the *searcher is a logged-in user or not*. This will define the level of personalization that you can incorporate to improve the relevance of our results. You will assume that the user is logged in and you have access to their profile as well as their historical search data.

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