

ARTICLE TYPE

Search Engine For Job Posts

Abstract

This project addressed the development of an advanced search engine to optimize user engagement and real-time responsiveness in a job-posting website with a diverse user spectrum, ranging from novices to long-term users. Our proposed solution integrates a fine-tuned BERT model for text conversion and employs Elasticsearch for numerical data indexing. A specialized BERT variant captures user search query histories. An ensemble model based on XGBoost is employed for sorting the posts obtained from the query to increase engagement, incorporating BERT outputs and metadata. The implemented solution yields a 4% click-through rate increase for new users and 6.5% for users with more than 20 queries, fostering enhanced user interaction with search results and positively influencing the client's revenue.

The Problem

The project at hand involves the development of an advanced search engine based on natural language processing for English free-text queries. The primary aim is to provide search results that are optimized for user engagement, predicting the user's likelihood of clicking on a given result. This optimization will encompass a broad spectrum of user profiles, ranging from new users to those with extensive search histories, leveraging comprehensive client information. Additionally, a critical goal is to achieve real-time responsiveness, with an algorithmic performance target of providing search results within 0.5 seconds. These results will be drawn from a dataset of 10,000 possible answers, constructed from diverse components including free-text titles, abstracts, keywords, and metadata associated with the owners of the results. This project requires the integration of advanced natural language processing techniques, predictive modeling, and efficient indexing and retrieval methodologies to fulfill the aforementioned objectives.

The Solution

To address the project's objectives, a multi-faceted solution is proposed. Firstly, the implementation of a state-of-the-art Natural Language Processing (NLP) model at the time, named BERT, is used to convert the textual task into a numerical one. Specifically, we trained a unique version of BERT of the client's 100M posts (2.5B tokens) which is fine-tuned with a diverse dataset containing client-specific information. Using Elasticsearch, we indexed the numerical data for each existing and new post that entered the system. Moreover, we used another instance of BERT that trained specifically on the user's search query histories, encompassing both new and experienced users' search histories. To this end, in order to ensure real-time responsiveness, we used a compressed trie structure to represent the possible posts satisfying a search query before sorting them. For the sorting task itself, we developed an ensemble model based on the XGBoost algorithm taking the numerical data from the BERT models alongside other meta-data such as search history, click-through patterns, and metadata of the results' owners.

The Outcome

Implementing this solution yields tangible business outcomes. Namely, a 4% increase in click-through rates for new users while a 6.5% increase in click-through rates for users with at least

20 search queries in achieved. This elevated engagement translates to a substantial uptick in user interaction with search results, directly contributing to the client's income.