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Algorithms for Information Retrieval and Intelligence Web Project - Review 1

Query Autocompletion using Trie and LSTM model

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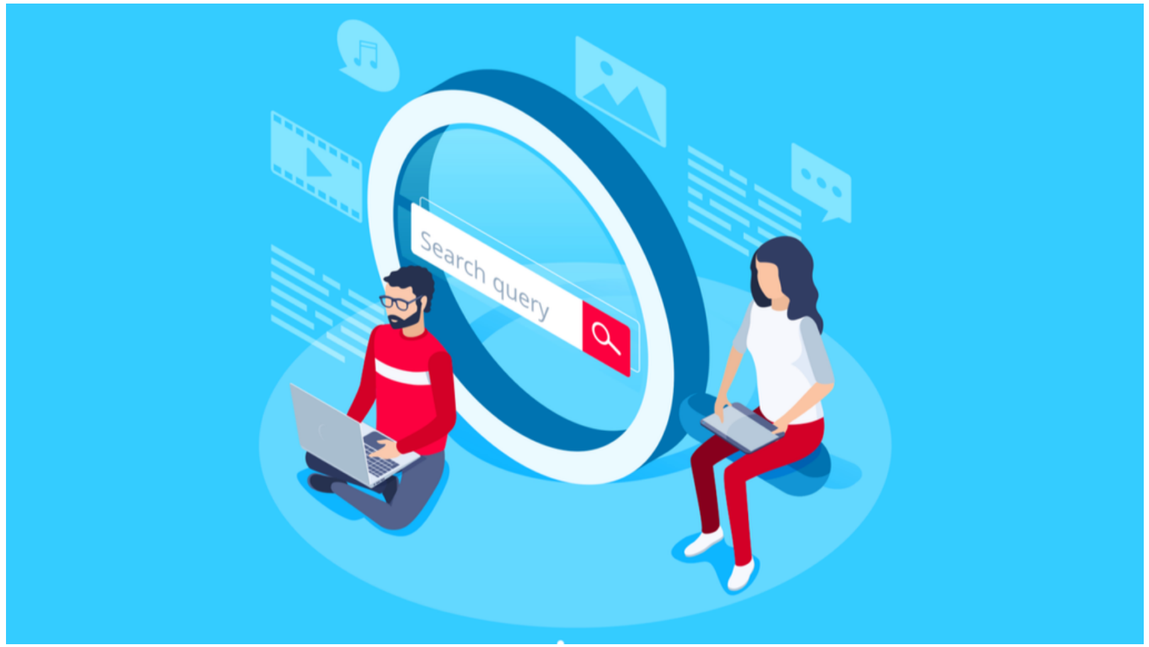
INTRODUCTION

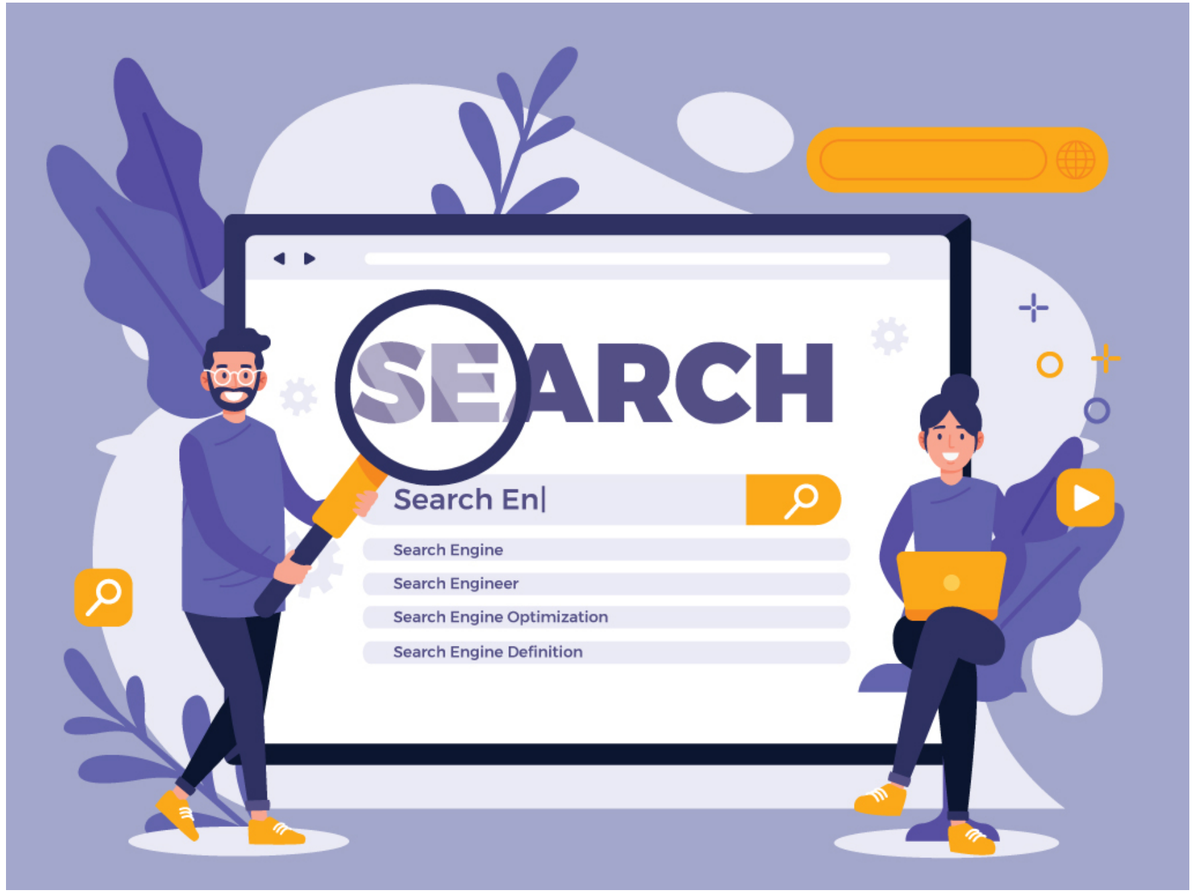
In the domain of information retrieval, users often face challenges when formulating search queries, especially when dealing with long or complex terms.

Query autocompletion aims to assist users by **predicting** and **suggesting completions** for **partially entered queries** in real-time, enhancing the search experience and improving query formulation efficiency.



PROBLEM STATEMENT

Design and implement an **autocomplete system** to efficiently **predict and suggest completions for partially entered queries** in real-time.



SUPPORTING LITERATURE

Early Research:

- Initial focus on rule-based or statistical methods.
- Common techniques include prefix matching, trie data structures, and n-gram models.

Integration of IR Techniques:

- Adoption of inverted index structures, TF-IDF weighting, and relevance ranking algorithms.

Machine Learning Approaches:

- Research on Markov models, decision trees, and support vector machines for suggestion generation.

Neural Language Models:

- Adoption of RNNs, LSTMs, BERT, and GPT for capturing linguistic patterns and generating relevant suggestions.

Generative Models:

- Transformer-based architectures gain traction for generating completions by learning from large text corpora and capturing semantic relationships.

SUPPORTING LITERATURE

1. QueryBlazer: Efficient Query Autocompletion Framework:
   Generative query completion system using an n-gram language model

2. Efficient and Effective Query Auto-Completion:
   The solution is based on the combination of an inverted index with succinct data structures

1. Efficient query autocompletion with edit distance-based error tolerance:
   Neighborhood generation-based method to process error-tolerant query autocompletion maintaining only a small set of active nodes, thus saving both space and time to process the query.

METHODOLOGY

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- **Data Collection and Preprocessing:**
  - Preprocess the data by tokenizing it into words or subwords, removing stop words, punctuation, and special characters, and applying techniques like stemming or lemmatization for normalization.

- **Building a Trie Data Structure for word completion:**
  - Constructing a trie data structure to efficiently store and retrieve completions for partially entered prefixes.

- **Training an LSTM RNN for sentence completion :**

  a.Training an LSTM model, such on the preprocessed text data. Fine-tuning the model on the specific task of query autocompletion.

METHODOLOGY

- **Combining Suggestions:**
  - Combining the completions obtained from the trie structure with those generated by the LSTM model to form a hybrid set of autocomplete suggestions.
  - rank and filter the hybrid suggestions based on relevance scores, user preferences, or other criteria.

- **User Interface Integration(demo):**
  - Integrating the hybrid autocompletion functionality into user interfaces
  - Provide a mechanism for users to input queries and display the hybrid suggestions in real-time as they type.

DATASET

The SIGIR 2017 data set includes files for four data:

- **background** (6,773,535 queries; used for training our neural language model; queries that appear less than three times are removed to filter out noisy queries.)
- **training** (75,198 prefixes; used for training LambdaMART.)
- **validation** (30,993 prefixes)
- **test** (32,559 prefixes; it is written as "32,044" in the paper by mistake.)

In each of training, validation, and test data, there are only two columns: a **prefix** and the **corresponding query**.

(or) subset of wikipedia dataset in word document format consisting of paragraphs on various topics.

REFERENCES

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THANK YOU

TEAM 5