TEXT SUMMARIZATION USING NLP

TEAM - 1

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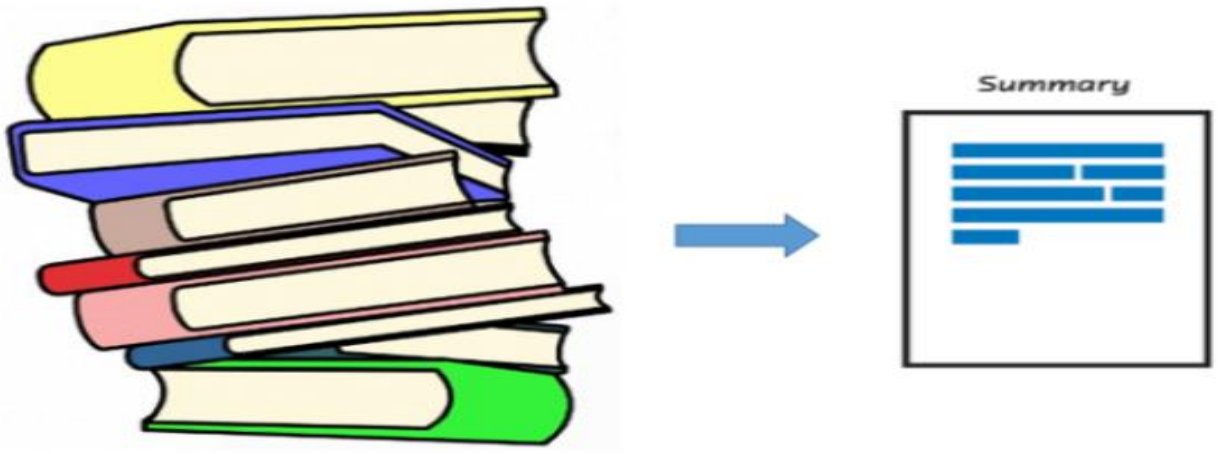
INTRODUCTION :-

- The Goal of Summarization is to produce a shorter version of a source text by preserving the meaning and the key contents of the original Book.



- A well written summary can significantly reduce the amount of work needed to digest large amount of text.

BUSINESS PROBLEM :-

Text summarization is one of the most interesting problems in NLP. It's hard for us, as humans, to manually extract the summary of a large document of text. To solve this problem, we use automatic text summarization. It's a way of identifying meaningful information in a document and summarizing it while conserving the overall meaning.

OBJECTIVE :-

The purpose is to present a shorter version of the original text while preserving the semantics. Here, you can use different traditional and advanced methods to implement automatic text summarization, and then compare the results of each method to conclude which is the best to use for your corpus.

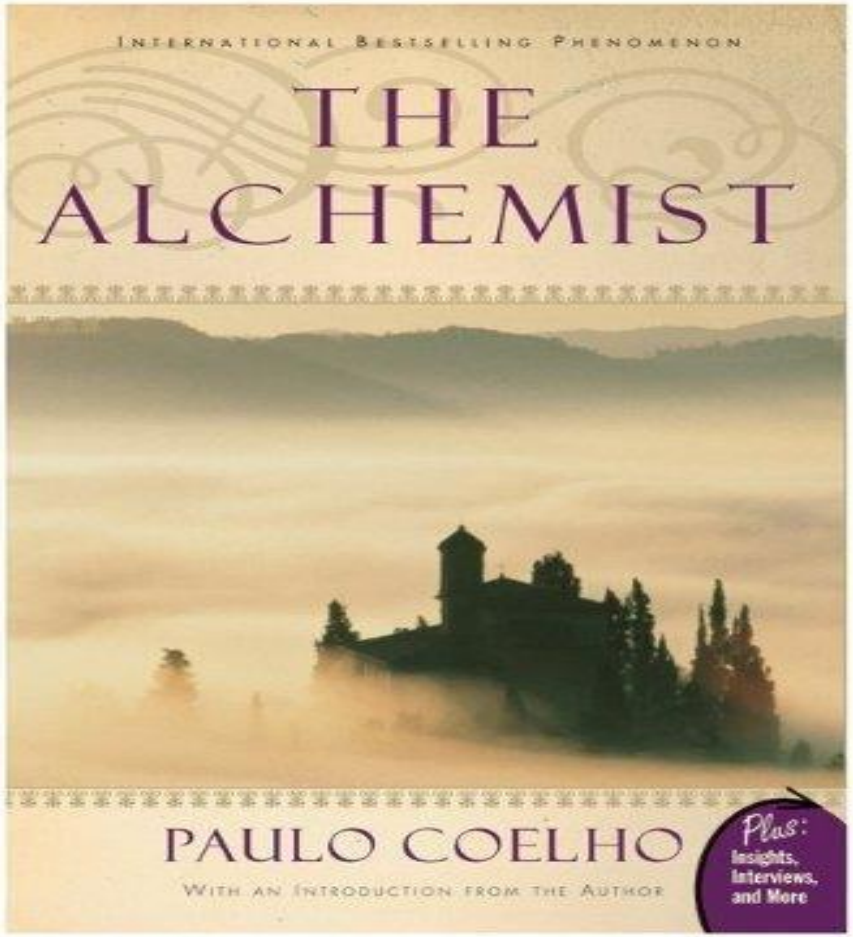
DATA INFORMATION : -

Book Name :- The Alchemist

Author :- Paul Coelho

Source :- Google

Pages :- 158



PROJECT ARCHITECTURE :-

EXPLORATORY DATA ANALYSIS (EDA)

- EDA is the basic step of the project. Before performing operations on the data, we need to clean the data.
- In text summarization , EDA can be done to remove the stopwords and punctuations in the text data.
- EDA Consists of following steps :-

  Tokenization

  Stopwords Removal

  Punctuation Removal

  Stemming

  Lemmatization

TOKENIZATION

- Tokenization is used to divide the text data into words or sentences.
- Tokenization is done by two ways :-

    a) Word based tokenization

    b) Sentence based tokenization
- We tokenized our data in the form of word based tokenization.
- We are using the NLTK library of python.

PUNCTUATIONS REMOVAL

- For data processing data should be cleaned so we need to remove the punctuation from the data.
- Punctuations are often unnecessary as it doesn’t add value or meaning.

STOPWORDS REMOVAL

- Stop words are most common words in any language that do not carry any meaning and are usually ignored by NLP
- Examples of stop words :-

ON ,A ,THE ,IS ,ARE ,I ,FOR ,YOU ,AND ,IN

FEATURE EXTRACTION TECHNIQUE

- Feature extraction techniques are used to convert text into a vecor.
- It assigns different weights to words.
- Types of feature extraction techniques are as follows :-

    a) Bag of words (BOW)

    b) TF-IDF

    c) Word Embedding

STEMMING & LEMMATIZATION

- Stemming and lemmatization both are text reduction techniques.
- Using stemming and lemmatization we reduce the text can size.
- In stemming the suffix and prefix of the word is removed irrespective of meaning.
- In Lemmatization the suffix and prefix of the word is removed by maintaining the semantic of the word.

BAG OF WORDS (BOW)

- BOW is the simple representative of the words.
- Representation of text describes the occurrence of words within the document.
- Generally it count the frequency of words that are repeated in the given document.

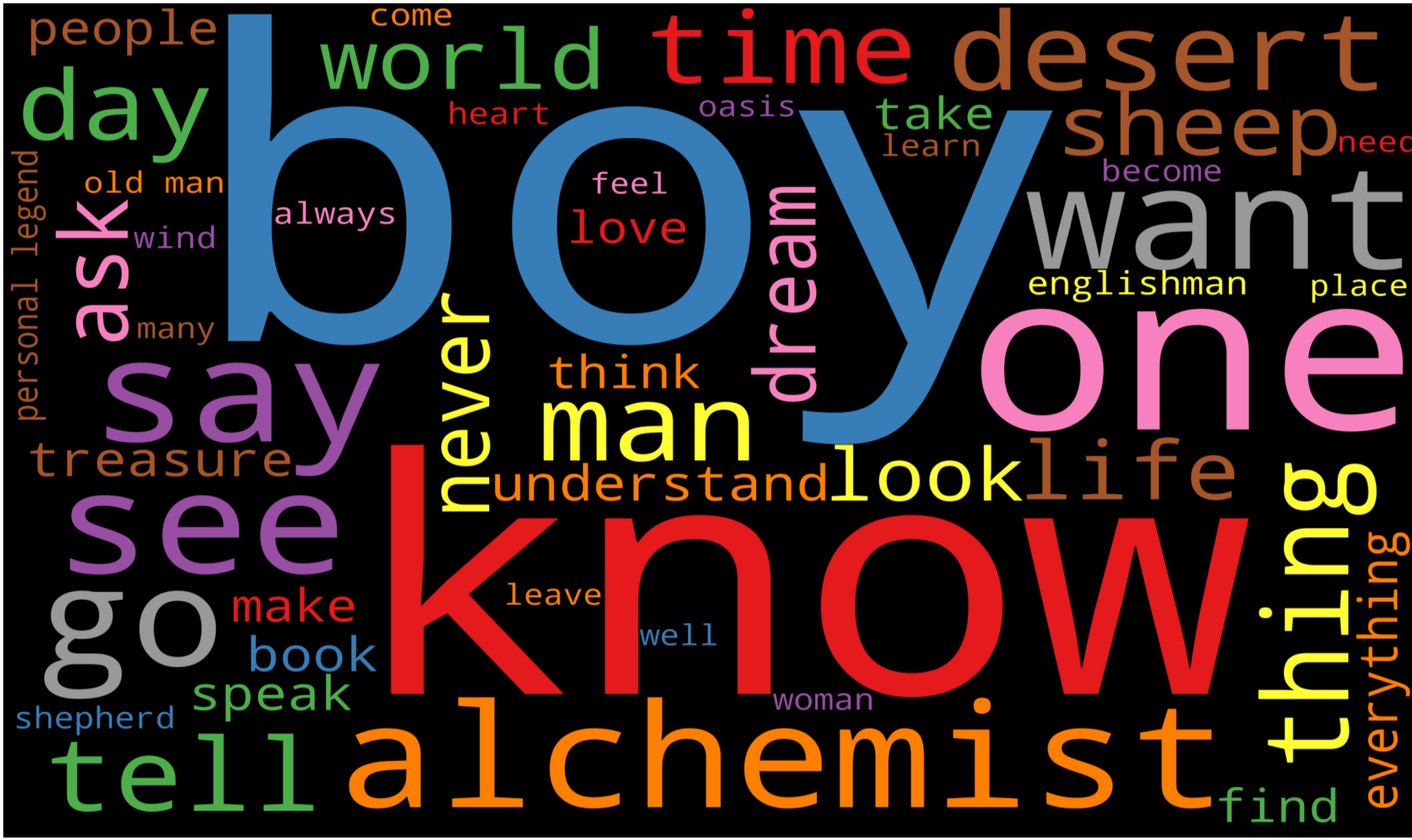
TERM FREQUENCY- INVERSE DOCUMENT FREQUENCY(TF-IDF)

- TF calculates the frequency of the word in given document divided by the total words in the document.
- **TF = No. of words in the document / Total count of words in the document.**
- IDF calculates the frequency of the words on the total document.
- **IDF = Total no. of documents / No. of documents with word in it.**
- Weight= TF*IDF
- So in this way weights are assigned to the words & is more semantic than the BOW.
- Higher weight is assigned to the most repetitive words so it is considered as less significant.

WORD EMBEDDING

- Word embedding is used for the representation of the word for text analysis.
- The most used type of word embedding is Word2Vec.
- Each word is basically represent as vector of 32 or more dimension instead of the single word.
- Here semantic information & relation between word is also preserved.
- Word2Vec assigns nearby vector according to the class.

WORD CLOUD



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know
everything
leave
make
go
well
book
speak
woman
shepherd
tell
alchemist
find

MODEL BUILDING

- We used pretrained models for text summarization and they are as follows :-

    1) Lex rank

    2) Luhn model

    3) LSA model

    4) Text rank

    5) Bart model

TEXT SUMMARIZATION

Text summarization are of two types

1) Extractive Text summarization :-

Extractive summarization picks up sentences directly from the document based on a scoring function to form a coherent summary. This method word by identifying important sections of the text and crops out and stitches together portions of the content to produce a condensed version.

Example :- Text Rank, Luhn, LexRank , LSA etc.

2) Abstractive Text summarization :-

Abstractive summarization methods aims at producing summary by interpreting the text using advanced natural language techniques in order to generate a new shorter text parts of which may not appear as part of the original document. Abstractive text summarization generates text with respect to the surrounding text.

Example :- LSTM, RNN, BERT, Transformer BART etc.

LEX RANK

LexRank is an unsupervised graph based approach for automatic text summarization.

In this model we have a connectivity matrix based on intra-sentence cosine similarity which is used as the adjacency matrix of the graph representation of sentences.

With the help of cosine similarity scored sentences are extracted from the document and are arranged in order.

LUHN TEXT SUMMARIZATION

Luhn’s algorithm is a naive approach based on TF-IDF and on “window size” of non-important words and between words of high importance.

It also assigns higher weights to sentences occurring near the beginning of a document.

It is useful when very low frequent words as well as highly frequent words(stop words) both are not significant. Based on this, sentence scoring is carried out and high ranking sentences

make it to the summary.

LSA TEXT SUMMARIZATION

Latent Semantic Analysis is an unsupervised learning algorithm that can be used for extractive text summarization. It extracts semantically significant sentences by applying singular value decomposition (SVD) to the matrix of term-document frequency.

TEXT RANK

TextRank uses an extractive approach and is an unsupervised graph based text summarization technique. PageRank is an algorithm used to calculate rank of web pages, and is used by search engines such as Google. TextRank is based on the PageRank Algorithm.

It finds the similarities between sentences and then organizes in descending order.

BART MODEL

BART is a sequence - to - sequence model trained as a denoising autoencoder. This means that a fine - tuned BART model can take a text sequence as input and produce a different text sequence at the output. The idea here will be to use all the weights of the pretrained neural network model and use it as a initial point, in order to speed up training and improve performance.

MODEL EVALUATION

ROUGE-N MEASURE

Rouge measure the number of common N-grams between the generated summary and the original text.

With the help of this we measure PRECISION, RECALL and FI-Score

MODEL EVALUATION RESULT

Score	LexRank	Luhn	LSA	TextRank	BART
Recall	0.08484	0.11191	0.15117	0.06859	0.0909
Presicion	1	1	1	1	0.2647
F-score	0.1564	0.2012	0.2626	0.1283	0.1353

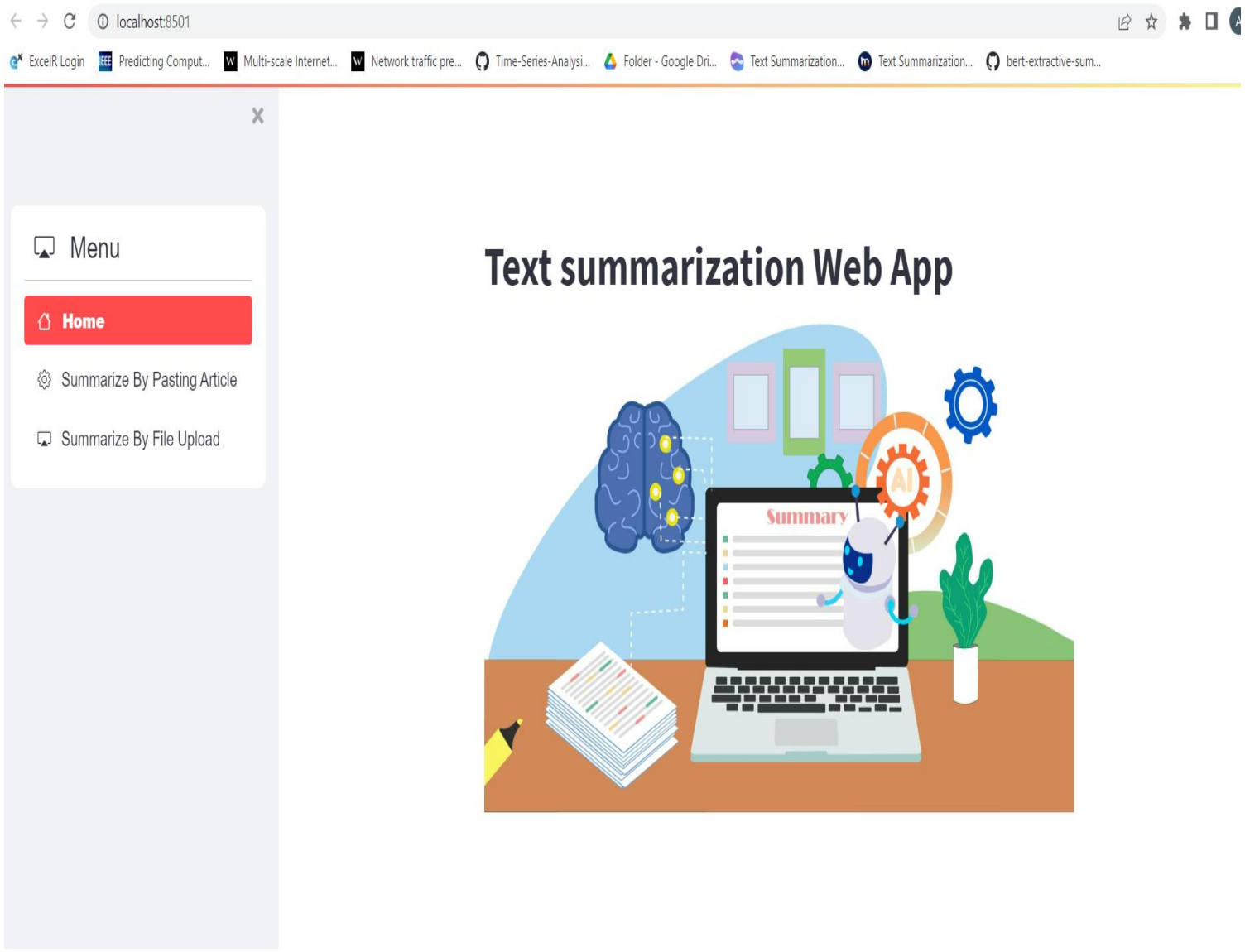
Conclusion :- LSA model gives high FI-Score we choose LSA model for deployment.

- LSA
- 0.15117
- 1
- 0.2626

MODEL DEPLOYMENT

- With the help of ROUGE score we choose our LSA model for the deployment. As LSA model gives high FI-Score value i.e 0.2626.
- We deployed our model with the help of streamlit.
- Streamlit is an open-source app framework for creating and deploying data science applications.
- We deploy our model in anaconda prompt.

MODEL DEPLOYMENT



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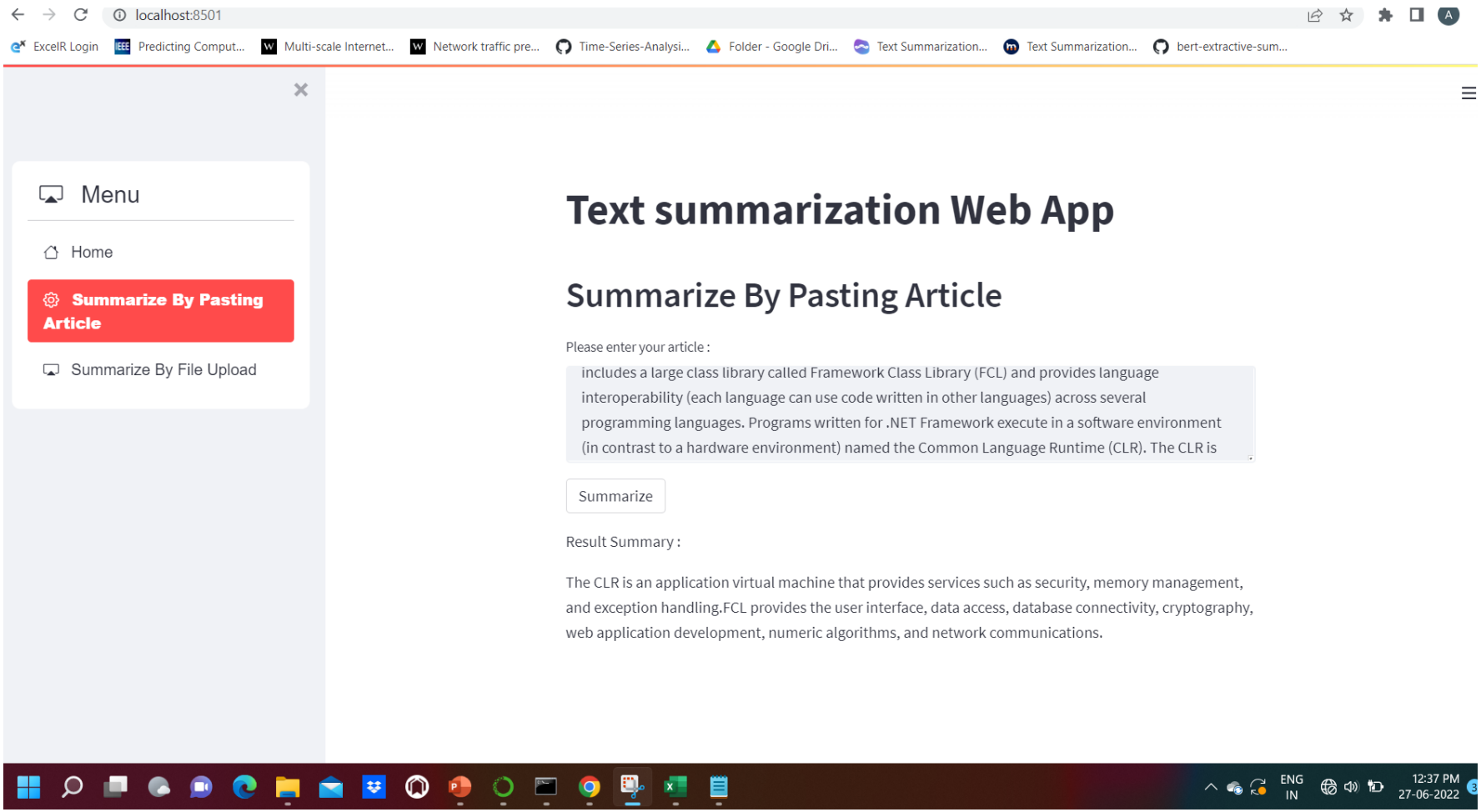

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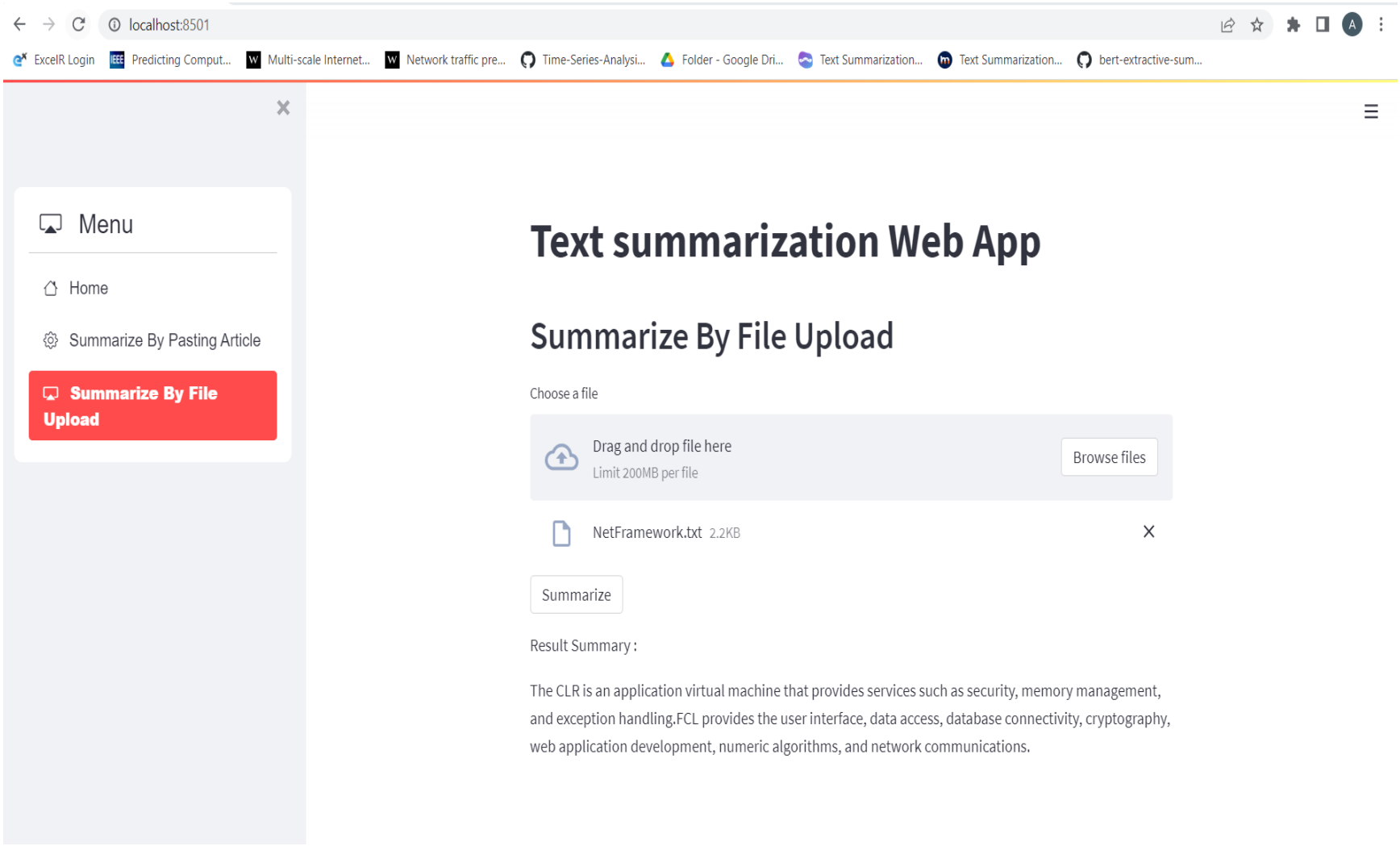

CHALLENGES FACED ?

1. Removing Unnecessary things from the text file
2. Choosing the better model

HOW DID WE OVERCOME

1. Exploratory data analysis
2. Compare the accuracy of all the models

Thank You