



## Abstractive Text Summarization Using Attention Mechanism

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**Abstract:** In this world filled with data and that is increasing everyday people becomes lazy to read all data so for them we decided to generate a summary from that data which is news articles, large document files, reviews, big paragraphs. This problem we will solve using NLP (Natural Language Processing) and generates a meaningful abstractive summary. For generation of this abstractive summary we had used transformer model which focuses on multi-head mechanism. Also there is a seq2seq model having an encoder and a decoder.

### I. PROPOSED SYSTEM

Reading the large text of news available is hard for the users as it consumes much more time. Hence, the Text Summarization is much more helpful to easily understand large text by summary. The input data is processed using NLP and processed data input is converted into vector using word embedding. Word embedding means a set of feature learning and language modeling techniques in NLP where phrases or words from the vocabulary are mapped to vectors. Sentence ranking is used to extract higher ranked sentence from sentences and forms the extractive summary of the news text. The summarized data is then analyzed using subjectivity and polarity parameters.

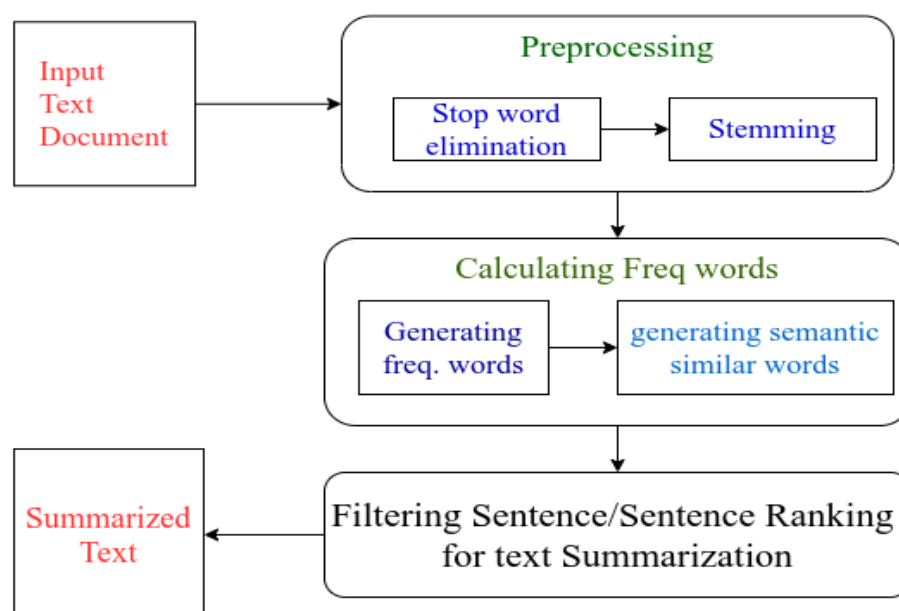


Figure 1: Proposed System

### II. HOW IT WORKS

Tokenization and normalization on input data is done by removing the stop words. Stop words are words which don't have meaning to a sentence. They can be ignored without affecting the meaning of the sentence. Using the Glove model of word embedding the processed text is converted into vector. Vector representation of words is obtained from unsupervised learning of Glove algorithm. The vector input data is used to sentence ranking using higher ranked sentences and cosine similarity are forms the abstractive summary. Selecting a subset of existing sentences, words or phrases in the original text is the work of abstractive method to form the summary.

The process flow of the project is divided into 3 sub divisions such as:

1. **Obtaining input from the user:**

The user is provided with a user interface i.e. a webpage, where in the user is provided with a text area to enter the text.

2. **Processing the input obtained from the user:**

The input obtained from the user is then provided as an input to the Encoder-Decoder based Attention model. Flask framework is used to transfer the data from the webpage to the Python script where the input is processed. Flask doesn't require any library or a tool that's why it is classified as micro web framework and it is written in python.

3. **Execution of text and display of summary:**

The decoded sequence i.e. the abstractive summary is generated and displayed on to the webpage as a result of the input text provided by the user.

### III. COMPARISON OF OTHER ALGORITHMS

#### A. Sequence to Sequence Model

Seq2Seq model is made up of a decoder and an encoder. Where encoder takes input text sequence in hidden state vector form and transfers it to the decoder, which produces output summary. Sequenced based task has the decoder and encoder tend to use some form of GRUs, RNNs, LSTMs, etc.

The encoder reads an input text, denoted by  $x$ , and converts it to hidden states, denoted by  $h$ ; while the decoder uses hidden states as input and generates output summary denoted by  $y$ .

Here,  $y_j$  and  $x_i$  are representations of the tokens (words) in the summary and source article respectively. We use  $T$  and  $J$  to represent the summary and the number of tokens (words) of the main article, respectively. Generating a summary from a given input text article using the seq2seq framework is called as summarization.

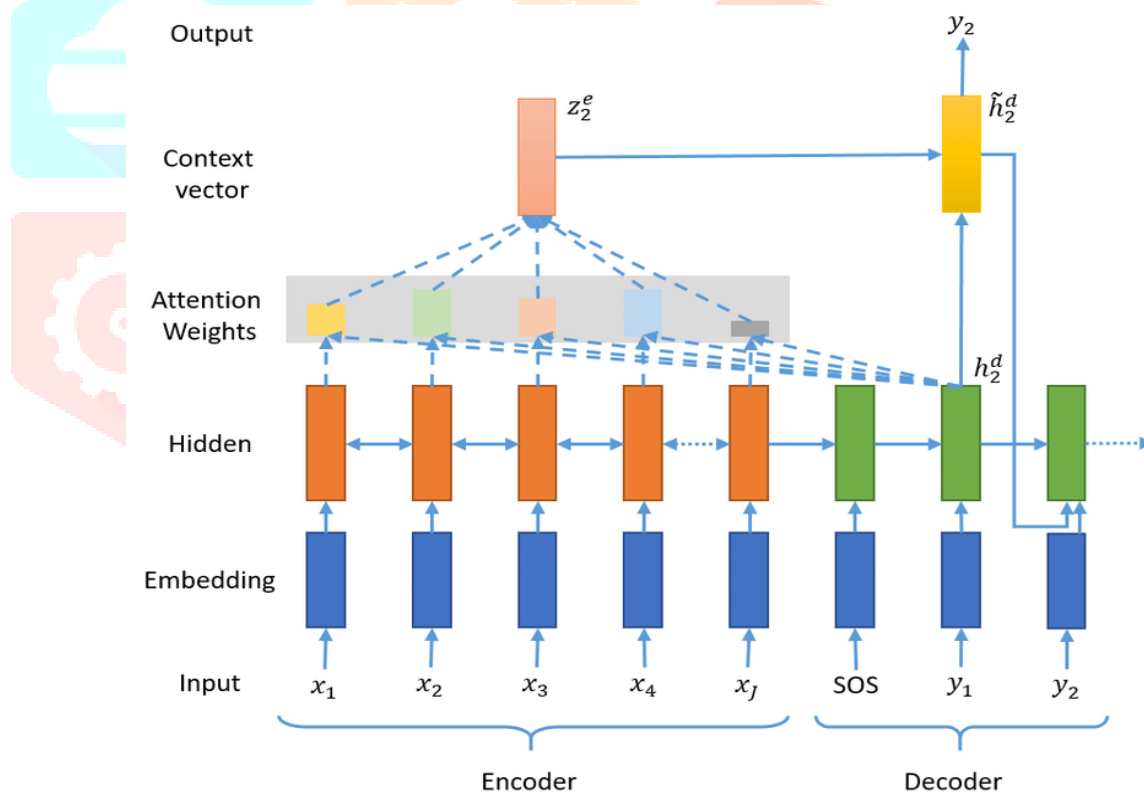


Figure 2: Sequence-to-Sequence model with Attention

#### B. LSTM Model

**Long short-term memory (LSTM)** is an RNN architecture used for deep learning. Networks in LSTM are used to classify text, process, and make predictions based on the time of the source article. The Encoder-Decoder framework of the sequence 2 sequence model can be implemented by the Recurrent Neural Network framework called LSTM.

It is applied NLP-based problems like text summarization, headline generation, speech recognition, and machine translation. We developed an abstractive text summary using multi-layer attention peephole convolutional LSTM.

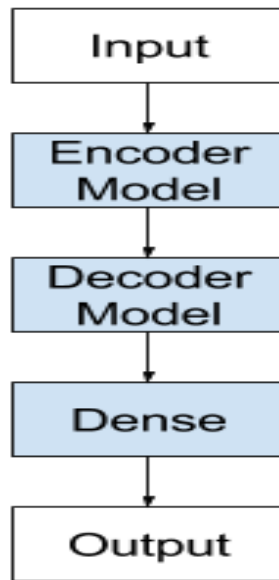


Figure 3: Encoder-Decoder LSTM Model Architecture

### C. Transformer Model

The Transformer model is based on multi-head attention mechanism. It uses self-attention layers to train faster than convolution and recurrent architectures.

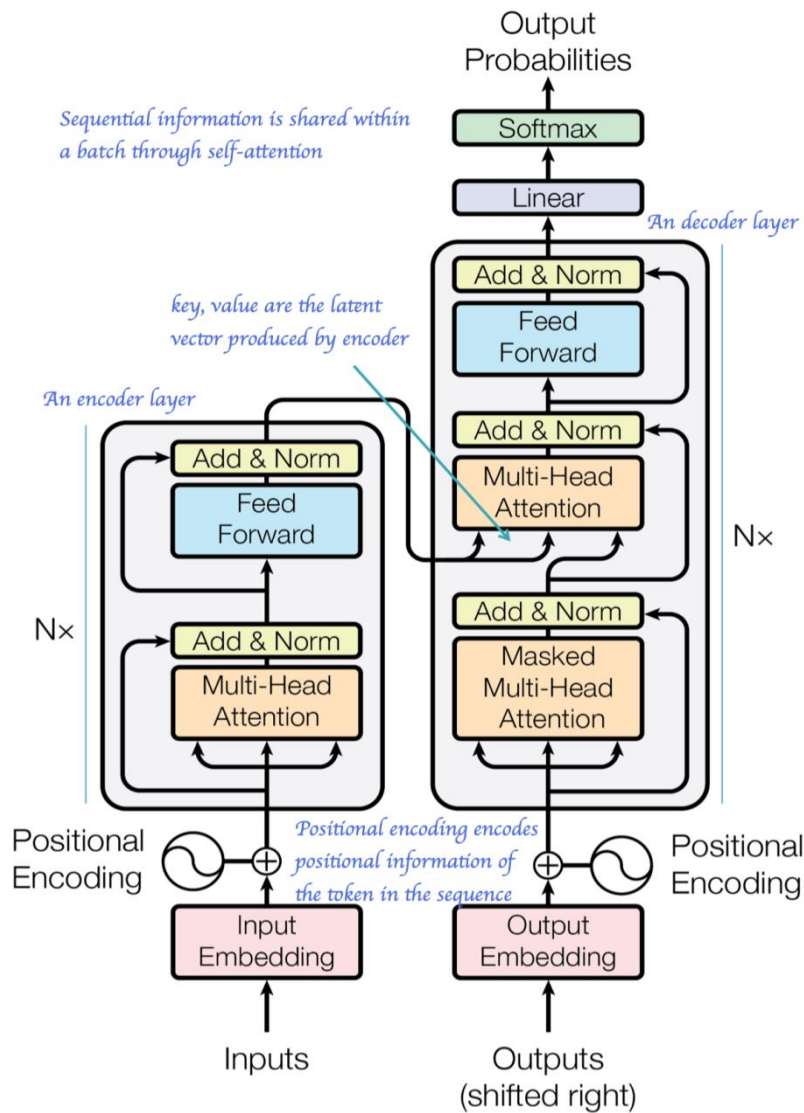


Figure 4: Transformer Model Architecture

### IV. FLOWCHART

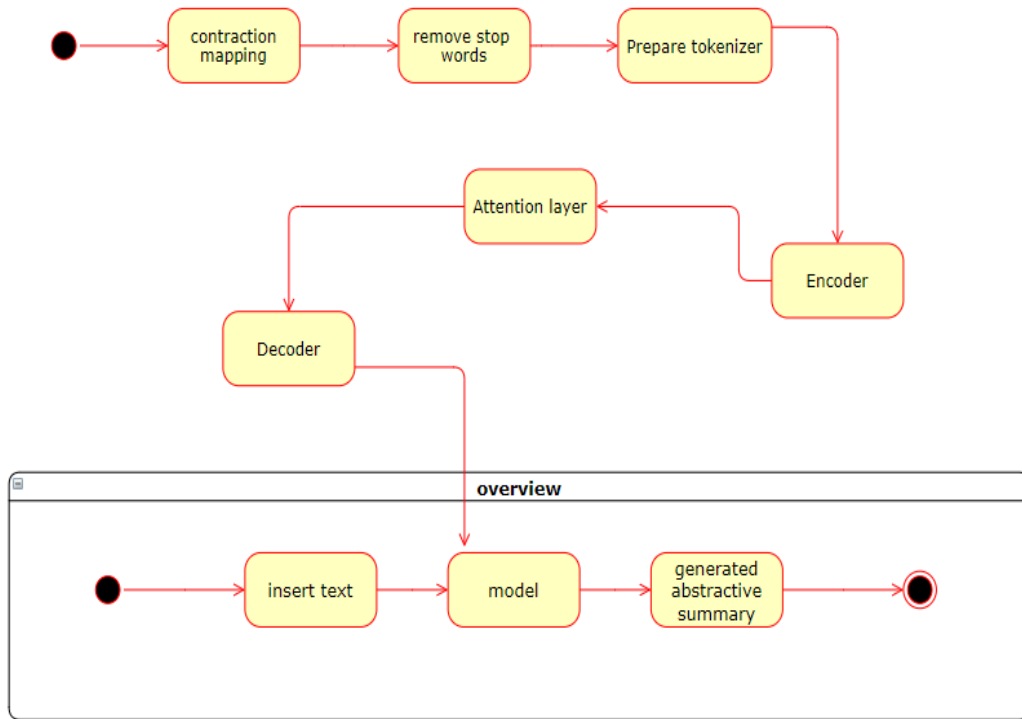
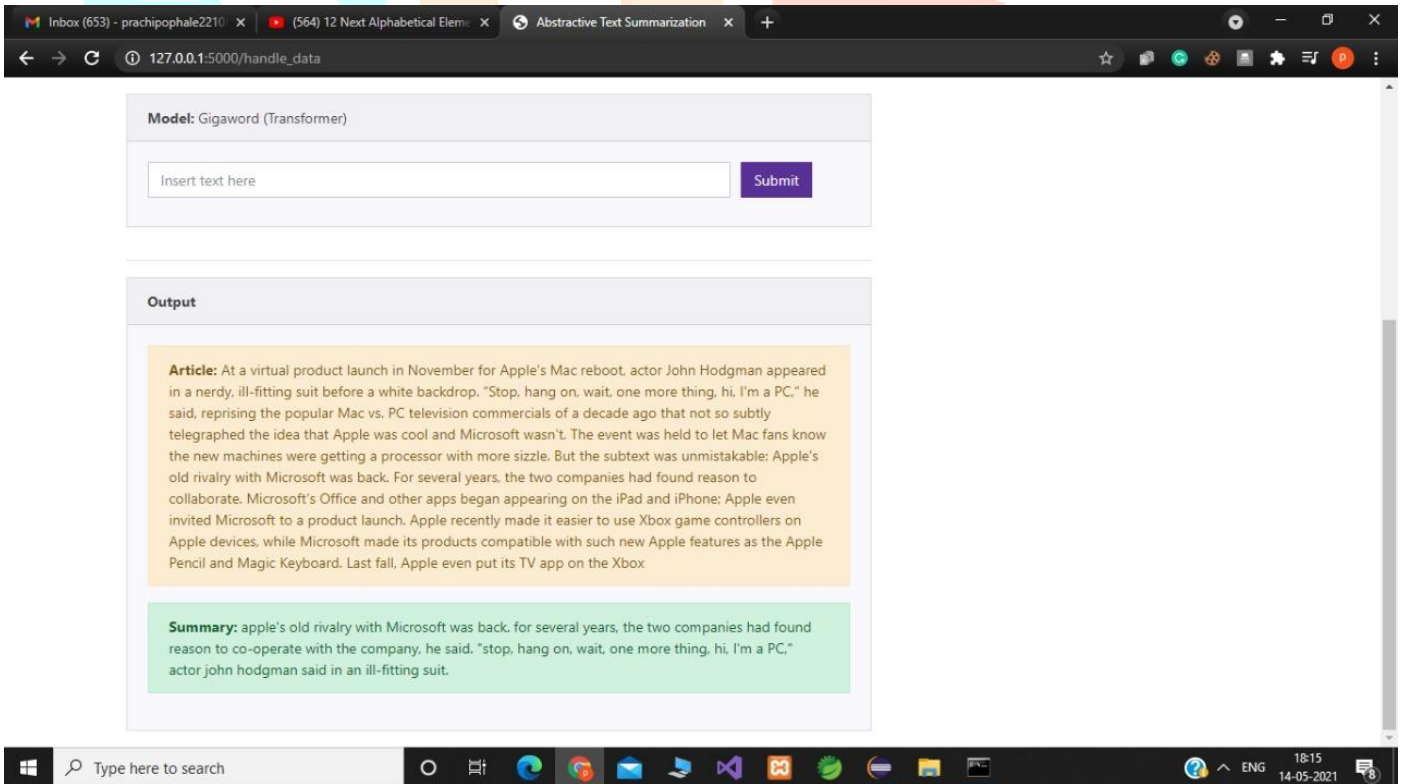


Figure 5: Flowchart of Project

### V. RESULTS



Result I

**Model:** Gigaword (Transformer)

Insert text here

**Output**

**Article:** A new deep-sea exploration technology that could one day search for life in subsurface oceans on the moons of Jupiter and Saturn will be put to test during a two-week demonstration expedition aboard a National Oceanic and Atmospheric Administration (NOAA) ship. The new underwater vehicle, called Orpheus, relies on autonomous navigation software developed by NASA's Jet Propulsion Laboratory (JPL) in California for the Mars Perseverance rover and the Ingenuity helicopter. The primary task for the mini-submarine, which was built by the Woods Hole Oceanographic Institution (WHOI) in Massachusetts, will be to advance humanity's understanding of the deepest regions of the oceans, the so-called hadal zone. With trenches and troughs as deep as 20,000 to 36,000 feet (6,000 to 11,000 meters), the hadal zone presents similar challenges to those experienced by exploration vehicles on other planets, Russel Smith, a roboticist at JPL, said during an online news conference on May 5

**Summary:** a new deep-sea exploration technology could one day search for life in subsurface oceans on the moons of Jupiter and Saturn, the mini-submarine, called Orpheus, relies upon autonomous navigation software developed by NASA's Jet Propulsion Laboratory (JPL) in California for the Mars Perseverance rover and the Ingenuity helicopter.

Result II

**Model:** Gigaword (Transformer)

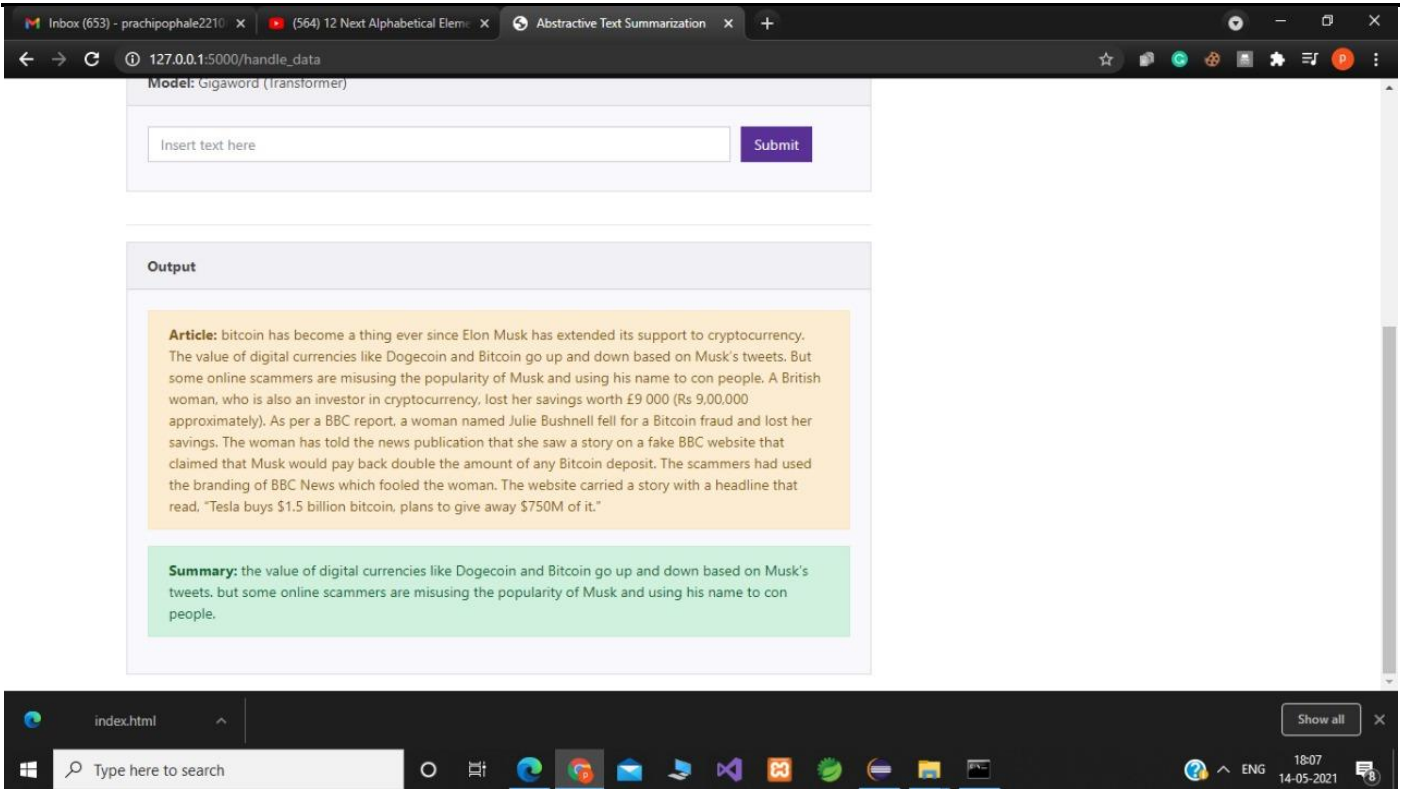
Insert text here

**Output**

**Article:** Prime Minister Narendra Modi on Friday warned about the spread of coronavirus pandemic through rural areas, with the second wave raging across the country. The National Centre for Disease Control (NCDC) had on Thursday asked the Union government to prioritize testing and vaccination in rural areas as covid-19 was now spreading in peri-urban and rural places. The government has been facing increasing criticism over its mishandling of the second wave, as superspreader events, such as political rallies and Kumbh Mela, threaten to spread covid infections to India's villages. India is facing an unprecedented health crisis, amid an acute shortage of medical oxygen, medicines, vaccines, and hospital and ICU beds.

**Summary:** the second wave raging across the country, with covid-19 spreading in rural areas, the government has been facing increasing criticism over its mishandling of the first wave, as superspreader events threaten to spread the disease to India's villages, india is facing an unprecedented health crisis, amid an acute shortage of medical oxygen, medicines, vaccines, and hospital and ICU beds.

Result III



Result IV

## VI. FUTURE SCOPE

In a future we can bring Beam Search in Decoder to generate more efficient abstractive summary, Transfer Learning for better tokenization and to select important words, generalized dataset to train model with different words, multi GPU setup so that model will train and work efficiently.

## VII. ACKNOWLEDGEMENT

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## VIII. CONCLUSION

Our results clearly demonstrate that the system is successful in achieving high accuracy (both develop form and execution). The system outperforms the alternative methods presented in the research. The dataset used for the project could be improved so that the system would be capable of handling more complex questions and form the required queries accordingly.

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