Journal of Information Systems Engineering and Management
2025, 10(41s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Abstractive Gujarati Text Summarization Using Sequence-To-Sequence Model and Attention Mechanism

Shilpa Serasiya[1], Uttam Chauhan[2]
[1]*Research Scholar, Department of Computer Engineering, Gujarat Technological University, Ahmedabad, India*
[2]*Assistant Professor, Department of Computer Engineering, VGEC, Chandkheda, Gujarat Technological University, India*

ARTICLE INFO

Received: 24 Dec 2024

Revised: 12 Feb 2025

Accepted: 26 Feb 2025

ABSTRACT

Introduction: In recent years text summarization has been one of the piloting problems of natural language processing (NLP). It comprises a consolidated brief on a large text document. Extractive and Abstractive are the two output-based summarization techniques. For the Indian Language much research is being carried out in Extractive Summarization. Performance of Abstractive summarization remains a challenge for a language like Gujarati. With the rise of digital Gujarati news portals, automatic summarization can provide concise versions of news articles and make it easier for readers to grasp key information quickly

Objectives: We aim to create an effective and efficient abstractive text summarizer for Gujarati text, which can generate an understandable and expressive summary.

Methods: Our model works as a Sequence-to-Sequence model using encoder-decoder architecture with an attention mechanism. LSTM-based encoder-decoder with an attention-based model generates human-like sentences with core information of the original documents.

Results: Our experiment conducted the effectiveness and success of the proposed model by increasing the accuracy up to 87% and decreasing the loss to 0.48 for the Gujarati Text.

Novelty: In terms of NLP, Gujarati is a low-resource language for researchers, especially for text summarization. So to achieve our goal, we created our dataset by collecting Gujarati text data such as news articles and their headlines from online/offline resources like daily newspapers. Gujarati has unique grammatical structures and morphology, so for pre-processing the Gujarati text, we proposed a pre-processor(GujProc) specific to Gujarati to trace the linguistic.

Keywords: Abstractive Text Summarization, Gujarati text, Seq-to-Seq model, LSTM, Attention model

1. INTRODUCTION

In this century, our world is parachuted by gathering and broadcasting a massive amount of data. Propelled by modern technological innovations, as per International Data Corporation (IDC), the amount of digital data circulating annually around the world emerges from 4.4 Zettabytes in 2013-14 to 190 Zettabytes in 2025-26. With an increasing quantum of data available on the web, it's tough for a normal human being to summarize manually large document. Thus, the main challenge is to retrieve important information from the text within a short period. It observed that research in natural language processing (NLP) has grown incredibly in the last few decades, especially in text summarization. It has applications in a wide range of domains, including news, politics, medicine etc. With huge amounts of digital data in the form of digital media, newspaper, articles, social media platforms, electronic books and so on, a need occurs to automate summarization to get useful insights.

Text summarization is the process of automatically forming the compact form of a given document and maintaining its basic information into a condensed version with overall meaning. There are various applications of text summarization such as news article summaries, previews produced as snippets in search engines, product review summaries, automated research abstracts, one-line email summaries, for government officials and business organizations, abstracted information summaries, etc. Summarization for any regional language is a crucial part of language processing. Because it is involved with language awareness, interpretation, and presentation of common-

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

sense knowledge like humans [4].Text summarization can be categorized into different types based on various criteria. Extractive and abstractive are output-based summarization techniques. Extractive summarizer extracts the important sentences or phrases from the original document as a summary. Abstractive summarizer understands the document and rephrases the original text to new phrases to generate a summary which is close to the human-made summary. So it requires advanced machine learning techniques with NLP. It's always a challenging task while we work with regional text. For the Indian language much research is being carried out in extractive summarization [7], [15]. Performance of abstractive summarization remains a challenge for a language like Gujarati. With the rise of digital Gujarati news portals, and articals, books, automatic summarization can provide concise versions of news articles and make it easier for readers to grasp key information quickly.

Motivation

Gujarati is an Indo-Aryan language spoken primarily by the Gujarati people. It is the sixth most spoken language in India and is spoken by around 55 million people worldwide. A substantial percentage of the population across the world is spoken Gujarati language [5]. Especially for the Gujarati language, there is a considerable number of works have been done with extractive summarization, but no state-of-the-art work with an abstractive text summarization method is available[6] which motivated us to work on the Gujarati language. Prepare a standard and clean dataset is a challenging task for us. For that, we collected Gujarati data from online as well as offline resources like daily newspaper articles. Mostly we have collected from the gujaratsamachar.com online site, one of the reputed Gujarati daily newspapers.

In our proposed method, we have applied sequence to sequence model with encoder-decoder architecture. That uses LSTM as encoder and decoder. At decoder side we use attention model that focus on most important words to generate summary, and avoide duplication. In this paper, we have discussed the various work done in the Indian Language and its challenges. After the literature review, we discuss the methodology applied and then experimental results of the proposed model. Finally, we conclude the work as state-of art work.

2. RELATED WORK

If we consider research for summarization in the Indian Language, most work is done of extractive, in the last few years researchers have moved towards abstractive summarization. In this section, we discuss several works on abstractive text summarization in the regional language. It needs more linguistic processing and NLP tasks. Handling inflection is a very important part in summarization, even though there is no fixed word structure. There are certain complex problems to be taken care of while analyzing the text like case, agglutination, and gender differences between languages. To get a Bengali abstractive summarizer and reduce the training loss, Sheikh et. al. (2019) implements a sequence-to-sequence model that works with bi-directional RNNs with LSTM for encoding at the input layer and attention model for decoding at the output layer [1]. To achieve the best performance for the Arabic language author added several deep artificial neural networks like Long Short-Term Memory (LSTM), Gated Recurrent Units (GRU) or Bidirectional Long Short-Term Memory (BiLSTM) as encoders and the decoder to develop the sequence-to-sequence model. In addition, use a global attention mechanism instead of local attention to provide a better summary. (Wazery et. al.) [7]. An encoder-decoder based sequence-to-sequence model is used to create the summary of the Malayalam document. (Sindhya et. al.)[4] To get good in terms of quantitative results for the Telugu language, implemented a deep learning-based abstractive text summarization approach having encoder-decoder-based sequential models with an attention mechanism (Mohan et. al.)[8]. For the Kannada document, (Geetha et. al.(2015)) generates the sArAmsha system that involves analyzing and identifying named entities by the usage of abstraction schemes and information extraction to create the summary of the text. A Raza et. al show the LSTM as encoder/decoder approach is a promising method for abstractive summary generation in Urdu[23] and produce summaries that are grammatically correct and semantically meaningful.

Foundational work for comprehending the linguistic and contextual intricacies involved in summarizing Gujarati. [29]. From the above research we found that some initial work is done in various Indian languages but still for summary generation in the Gujarati language, no proper model is available. S. Madria et al.(2019) give a comparative analysis and evaluate the effectiveness of different types of stemmers for the Gujarati language. Pinkeh et al. (2014) introduce the pre-processing phase of text summarization for Gujarati language. To construct

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Journal of Information Systems Engineering and Management
2025, 10(41s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

summaries from Gujarati text, Shah and Patel use Textblob and Gensim for Gujarati text summarizer, this work is foundational for comprehending the linguistic and contextual intricacies involved in summarizing Gujarati. [9]. Patel examines the preprocessing phase for text summarization of Gujarati texts, emphasizing related issues and appropriate solutions.

It's proven that Deep learning techniques are language agnostic and gives better performance because of the semantics concerned with it. With the coming out of deep learning as a feasible alternative for many NLP tasks, its architectures have been generally accepted in abstractive text summarization, and they have since become state-of-the-art (Gupta and Gupta, 2019). In addition to the above recurrent neural network-based sequence-to-sequence attention models have proven effective in abstractive text summarization [10].

3. PROPOSED APPROACH

Considering modern NLP processing, language forming is the most important part. Text summarization is a substantial part of language modeling. This section presents our model for making an abstractive text summarizer for Gujarati text that can generate an identifiable summary from a given text. We have used TensorFlow to build up this model and train it. Figure 1 shows the architecture of proposed model and flow.

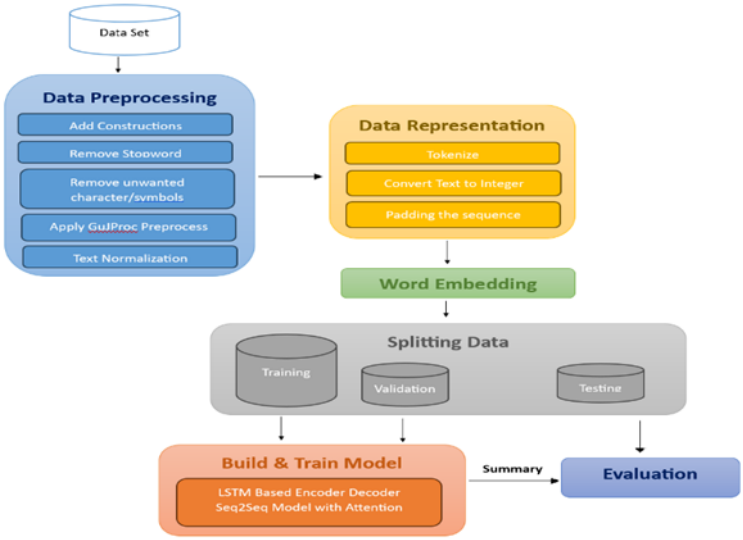

Figure 1. Architecture of Proposed Model

In language processing tasks especially for regional languages, preprocessing the data takes an important role [11]. Because of the structure of Gujarati text there are some barriers to processing it. The presence of some specific symbols like constructions, and English words in a text yields us to create a preprocessor for Gujarati text. To process these data, we need to apply some preprocessing steps like stopword removal, removing unwanted words to reduce all of those obstacles and keep a clean Gujarati text.

Data Representation includes tokenization that breaks down the text into smaller units, usually words or sub words (tokens). This granularity allows the summarization algorithm to understand and manipulate the text at a more detailed level, which is crucial for generating accurate summaries. Each unique token typically corresponds to an index in a vocabulary or embedding space, enabling the summarization model to process the text in a structured manner. Converting text to integers facilitates effective processing by neural networks, enables the use of word embeddings to capture semantic meaning, manages vocabulary efficiently, maintains sequence structure, and supports computational efficiency in training and inference phases of text summarization models. In the context of text summarization models, "pad sequence" refers to a processing step where sequences of text are adjusted to a uniform length by padding shorter sequences with a special token (typically a zero or a specific placeholder) at the end. Padding sequences is crucial for text summarization models to ensure uniform input size, enable efficient batch processing, and facilitate the use of advanced neural network architectures that require fixed-length inputs or utilize attention mechanisms effectively [13].

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Journal of Information Systems Engineering and Management
2025, 10(41s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Word embedding is a crucial for generating abstractive summaries that are coherent and contextually accurate because it helps in capturing the semantic meanings of words and their relationships within a text. It transforms words into dense vectors where semantically similar words have similar vector representations. This allows models to understand the meaning of words based on their context.

Proposed Model is following the encoder-decoder based Seq-To Seq architecture with attention mechanism. A sequence-to-sequence (Seq2Seq) model is one type of neural network, a training mechanism designed to transform one sequence into another different lengths, Two components of a Seq2Seq model are encoder and decoder[1], [5]. Encoder processes the input sequence and compresses the information into a context vector. The decoder receives the context vector as input and generates the output sequence one step at a time. At each step, the decoder predicts the next token in the output sequence based on the current hidden state and the previously generated tokens [15], [16]. In our work we use Long Short-Term Memory (LSTM) as encoder and decoder.

One limitation of the basic Seq2Seq model is that the entire input sequence must be compressed into a single context vector, which can be problematic for long sequences. The attention mechanism addresses this by allowing the decoder to focus on different parts of the input sequence at each step of the decoding process. Instead of taking the final hidden state of the encoder, the attention mechanism uses all hidden states from the encoder. This allows the decoder to refer back to specific parts of the input sequence.[18], [19] For each decoding step, attention weights are computed to determine which encoder hidden states are most relevant for generating the current token. These weights are derived from a score function that measures the alignment between the decoder's current state and each of the encoder's hidden states. Detailed workflow with attention model is as follows.

Suppose we have input $x_1, x_2, \ldots x_n$ and will get output $y_1, y_2, \ldots y_m$.

At each time step t of the decoder,

h_j = hidden encoder unit j .

α_{tj} = the amount of attention to be paid.

s_t-1 = previous hidden state of decoder.

The alignment score e_{tj} is calculated by following function a,

$$e_{tj} = a(s_{t-1}, h_j) \quad \forall j \in [1,T]$$

The idea behind score functions is to measure the similarity between two vectors. Convert the scores into probabilities using following softmax function to distribute the attention. These probabilities are the attention weights (softmax score) of each hidden state.

$$\alpha_{tj} = \frac{\exp(e_{tj})}{\sum_{k=1}^{T} \exp(e_{tk})} \quad (1)$$

Get the Alignment Vectors by multiplying encoder hidden state with its attention weight. Expected output word is highly influenced to the input encoder embedding with maximum alignment vector. Compute context vector C_t a weighted sum of the encoder hidden states with its attention weights using following equation

$$c_t = \sum_{j=1}^{T} \alpha_{tj} h_j \quad (2)$$

To compute the new hidden state s_t and output of the decoder y_t, feed the previous hidden state of the decoder s_t-1 along with context vector c_t and the previous output y_{t-1} into the decoder.

$$s_t = f(s_{t-1}, y_{t-1}, c_t) \quad (3)$$

This process allows the model to produce more relevant and coherent summaries by focusing on the most important parts of the input text[20].

4. RESULTS AND DISCUSSION

For proposed model of Gujarati Abstractive text summarization, it found that it is a low-resource language for

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Journal of Information Systems Engineering and Management
2025, 10(41s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

researchers. So to achieve our goal, we create our own dataset by collecting 18860 data such as news articles and their headlines from online/offline resources like daily Gujarati newspaper a gujaratsamachar.com one of the reputed Gujarati daily newspapers. We proposed a pre-processor specific to Gujarati to traces the linguistic. In this section we represent a comprehensive and structured analysis that demonstrates the performance and effectiveness of the proposed model which is encoder-decoder based Seq-to-Seq model with attention.

Model Performance and Evaluation

The Gujarati language has a diverse morphological structure, Lack of Standardization (આજુ-બાજુ ,આજુબાજુ) and huge vocabulary. We experimented the proposed model with different hidden layers and result show in figure 2.

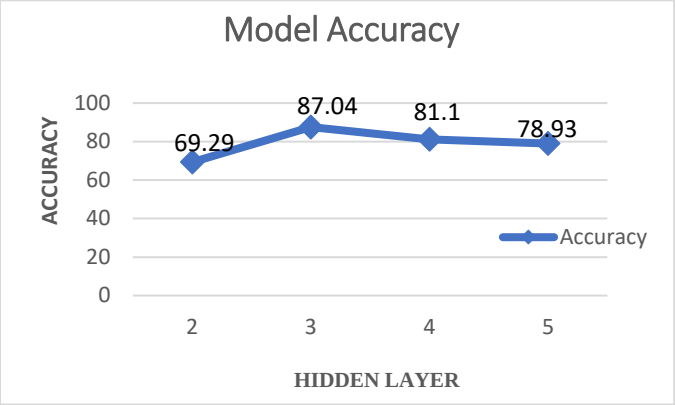

Figure 2. Line chart of accuracy at different hidden layer

It analyzes that at hidden layer 3 we get better result. Increasing the hidden layers can help the model learn more complex patterns and representations and can lead to improving accuracy. But as the sequences are short, a deeper network might not be necessary and model might be over fit to the training data, and reduced performance on unseen data.

Now the experiment model accuracy and loss over different epoch values shown in figure 3 and figure 4 shows model's accuracy and loss graph respectively. Further table 1 shows the accuracy of proposed model and general seq-to-seq model. It shows that the proposed model that is seq-to-seq model with attention mechanism gives better results as compared to basic Seq-To-Seq model.

Model	**Accuracy(%)**
Seq-to-Seq	66.43
Proposed Model	87.04

Table 1. Model Accuracy

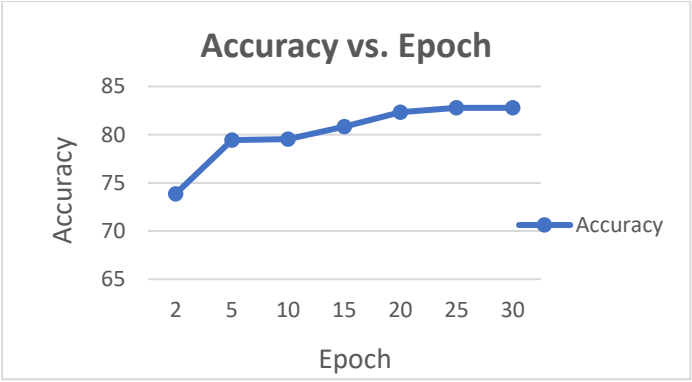

Figure 3. Model Accuracy Graph

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Journal of Information Systems Engineering and Management
2025, 10(41s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

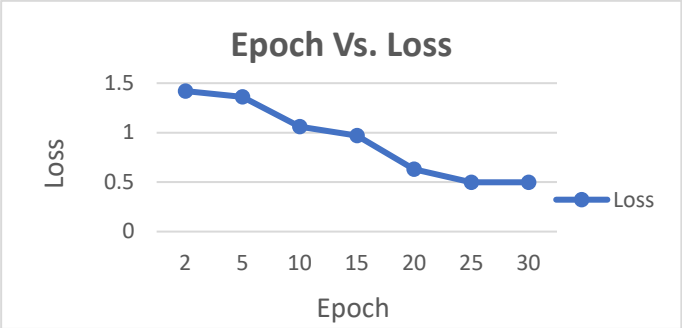

Figure 4. Model Loss Graph

ROUGE-1 (unigram), ROUGE-2(bigram), and ROUGE-L (longest common subsequence) measure the quality of the summary generated by the system [8]. Figure 5 gives F1 score of proposed model and basic Seq-to Seq model. We found that our model achieved higher ROUGE-1 and ROUGE-L scores, due to the fine-tuning process on not any domain-specific corpus.

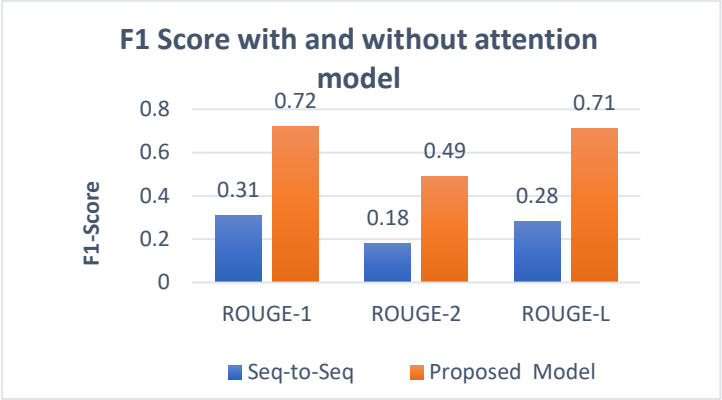

Figure 5. ROUGE Score comparism of proposed model and basic Seq-To-Seq model.

Now illustrates some predictions of our proposed model for Gujarati language showing the actual summary and model's predicted summary of following the input news article.

Article:

કરદાતાઓ આવકવેરા રિટર્ન ફાઇલ કરવાની 31 જુલાઈની નિયત તારીખ ચૂકી જાય, તો તેઓ 31 ડિસેમ્બર સુધી વિલંબિત ITR ફાઇલકરી શકે છે. વિલંબિત ITR માટે કરદાતાઓ પર ₹5,000 ફી વસૂલવામાં આવશે. જોકે, જો તેમની વાર્ષિક આવક ₹5 લાખથી વધુ ન હોય, તો મહત્તમ દંડ ₹1,000 હશે. વધુમાં, જો કર બાકી હોય, તો કરદાતાઓ પાસેથી વધારાનું વ્યાજ વસૂલવામાં આવશે. જોકે, જે વ્યક્તિઓની કરપાત્ર આવક મૂળભૂત મુક્તિ મર્યાદાથી ઓછી છે અને જેઓ ફક્ત રિફંડનો દાવો કરવા માટે ITR ફાઇલ કરે છે તેઓ આ દંડમાંથી મુક્ત છે. આવક વેરા રિટર્ન ફાઇલ કરવું એ કાનૂની જરૂરિયાત છે, અને તેનું પાલન કરવામાં નિષ્ફળ જવાથી દંડ અને સંભવિત કાનૂની પરિણામો આવી શકે છે.

Actual Summary	**Predicted Summary**	
	Seq-to-Seq	**Proposed Model**
જો કરદાતાઓ ITR ફાઇલ કરવાની 31 જુલાઇ ની અંતિમ તારીખ ચૂકી જાય તો શું થશે?	અંતિમ તારીખ ચૂકી જાય તો	જો કરદાતાઓ ITR ફાઇલ કરવાની અંતિમ તારીખ ચૂકી જાય તો.

Table 2. Actual Summary and Predicted Summary With and Without Attention

From table 2 we found that for regional language like Gujarati, proposed model (Seq-to-Seq with attention mechanism) gives better result. Our model retained key information more accurately. For abstractive text

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Journal of Information Systems Engineering and Management
2025, 10(41s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

summarization, especially for any regional language summary evaluation by ROUGE is not enough. For that human evaluation is preferable.

The Mean Opinion Score (MOS) [21] offers a numerical representation of human evaluations, reflecting the quality of an output. This method enables direct measurement of user perceptions. It usually ranges from 1(poor) to 5(excellent). Overall, it bridges the gap between quantitative technical evaluations (e.g., accuracy, loss) and qualitative user satisfaction. Test was conducted with 10 users as our initial test field users. A survey was conducted to gather human opinions on the effectiveness of the summarizer represented in table 3. The questionnaire considered the following criteria for evaluation.

Q1 -Adequate Length

Q2 - Is the summary simple?

Q3 - Relevance (Covers most important Points)

Q4 - Clarity and Readability (easy to read and understand)

Q5 - Conciseness (free from unnecessary details)

Q6 - Quality (grammatically well-structured)

Q7 - Reader Impact (overall)

User	Q1	Q2	Q3	Q4	Q5	Q6	Q7
User 1	5	5	4.75	4.5	5	3.75	5
User 2	5	4.5	5	4.75	5	4.5	5
User 3	4.5	5	4.5	4.75	4.75	4.5	5
User 4	5	5	4.5	3.75	4.5	4	4.5
User 5	5	5	4	5	4	4	5
User 6	5	5	4.5	4	4.5	4	4.5
User 7	5	5	4	4.5	5	4.5	4.75
User 8	4.5	4	4	5	5	4.5	5
User 9	4.75	5	4.5	4.75	4.5	4.5	4.75
User 10	4.5	4	4	4	4.5	4	4.5
Average:	**4.8**	**4.7**	**4.4**	**4.5**	**4.7**	**4.2**	**4.8**

Table 3. Evaluation of Summary by MOS Questionnaire

The test results are very positive and imply that the system generated summaries are of good linguistic quality with greater satisfaction as shown in table 3.

5. CONCLUSION AND FUTURE WORK

The proposed model presents a sequence-to-sequence approach for an abstractive summarization task for Gujarati language with promising results. The model predicts an understandable summary. For this development of the standard summarization, dataset of Gujarati news has been one of our pioneering accomplishments. Hence, after analyzing of Gujarati news articles we conclude that Gujarati has unique grammatical structures and morphology. Even though many English words, specific symbols and short forms of some words are present in the news articles. So based on all this analysis, we develop tokenizer and preprocessor specific to Gujarati text to traces the linguistic. For abstractive summarization we proposed a neural LSTM-based encoder-decoder with an attention-based model that generates human-like sentences with key information of the original documents. Along with that, a large-scale

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

experiment was conducted to research the efficiency of the proposed model Our experiment conducted the effectiveness and success of the proposed model by increasing the accuracy up to 87% and decreasing the loss to 0.48 for the Gujarati Text. There still are many issues to be addressed in this context. Normalization of non-standard words like acronyms, symbols, etc. needs to be handled. Further we would like to extend our work to generate multiple line summaries.

REFERENCES

[1] Abu Kaisar, Sheikh Abujar, Md A. I. Talukder, "Abstractive method of text summarization with sequence to sequence RNNs" IEEE Conference , December 2019 DOI:10.1109/ICCCNT45670.2019.8944620
[2] D. Suleiman and A. A. Awajan, "Deep learning based extractive text summarization: approaches, datasets and evaluation measures," in Proceedings of the 2019 Sixth International Conference on Social Networks Analysis, Management and Security (SNAMS), pp. 204–210, Granada, Spain, 2019. DOI:10.1109/SNAMS.2019.8931813
[3] K KMamidala, S K Snampuri, " Text Summarization for an Indian Language: A survey", International Journal of Advanced Research in Engineering and Technology (IJARET) Volume 12, Issue 1, January 2021, pp. 530-538" DOI: 10.34218/IJARET.12.1.2021.049
[4] S K Nambiar, D Peater S, S. M Idicula, " Abstractive Summarization of Malayalam Document using Sequence to Sequence Model", 7th International Conference on Advanced Computing & Communication Systems (ICACCS) pp-347-352, 2021, DOI: 10.1109/ICACCS51430.2021.9442060
[5] Rahul Tangsali, Aabha Pingle, Aditya Vyawahare, Isha Joshi, Raviraj Joshi, "Implementing Deep Learning-Based Approaches for Article Summarization in Indian Languages", arXiv:2212.05702v1-2022, DOI: 10.48550/arXiv.2212.05702
[6] Riddhi Kevat, SheshangDegadwala, " A Comprehensive Review on Gujarati-Text Summarization Through Different Features ,IInternational Journal of Scientific Research in Computer Science, Engineering and Information Technology(IJSRCSEIT), ISSN : 2456-3307, Volume 9, Issue 10, pp.301-306, September-October-2023. DOI:10.32628/CSEIT2361051
[7] Y.M. Wazery, Marwa E. Saleh , Abdullah Alharbi, and Abdelmgeid A. Ali, " Abstractive Arabic Text Summarization Based on Deep Learning", Hindawi Computational Intelligence and Neuroscience Volume 2022, DOI:10.1155/2022/1566890
[8] B. Mohan Bharath, B. Aravindh Gowtham & M. Akhil ,"Neural Abstractive Text Summarizer for Telugu Language" , International conference on Advance in Inteligent system and computing, 2022,DOI: 10.48550/arXiv.2101.07120
[9] Malvi Shah, Kalyani Patel,"સારાંશ Gujarati Text Summarizer" International Research Journal of Engineering and Technology, 2019. https://www.irjet.net/archives/V6/i6/IRJET-V6I6230.pd
[10] Kaichun Yao, Libo Zhang, Dawei Du, Tiejian Luo, Lili Tao, Yanjun Wu. "Dual Encoding for Abstractive Text Summarization", IEEE Transactions on Cybernetics, 2020 DOI: 10.1109/TCYB.2018.2876317
[11] Surendrabikram Thapa, Sushruti Mishra, "Review of Text Summarization in Indian Regional Languages", 3rd International Conference on Computing Informatics and Networks pp.23-32. DOI: 10.1007/978-981-15-9712-1_3
[12] Viet Nguyen Quoc, Huong Le Thanh, Tuan Luu Minh, "Abstractive Text Summarization Using LSTMs with Rich Features", pp. 28–40, Springer Nature Singapore- 2020. DOI:10.1007/978-981-15-6168-9_3
[13] P Varma, Anshul Varma, "Accountability of NLP Tools in Text Summarization for Indian Languages" , Journal of Scientific Research ,Volume 64, Issue 1, 2020. DOI: 10.37398/JSR.2020.640149
[14] Yusuf Sunusi, Nazlia Omar, Lailatul Qadri Zakaria, "Exploring Abstractive Text Summarization: Methods, Dataset, Evaluation, and Emerging Challenges", International Journal of Advanced Computer Science and Applications, Volume 15 Issue 7,pp 1340-1357, 2024 DOI: 10.14569/IJACSA.2024.01507130
[15] Minakshi Tomer, Manoj Kumar, "Improving Text Summarization using Ensembled Approach based on Fuzzy with LSTM", Arabian Journal for Science and Engineering, Volume 45, pages 10743–10754, (2020), DOI: 10.1007/s13369-020-04827-6
[16] Dima Suleiman and Arafat Awajan, "Deep Learning based Abstractive Arabic Text Summarization using two layers encoders and one layer decoder" Journal of Theoretical and Applied Information Technology, Vol.98. pp: 3233-3244, September 2020. DOI: 10.13140/RG.2.2.34426.08649

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Research Article

[17] Prithwiraj Bhattacharjee, Avi Mallick, Md. Saiful Islam, and Marium-E-Jannat, "Bengali Abstractive News Summarization (BANS): A Neural Attention Approach", Springer- 2021, PP-41-51, https://doi.org/10.1007/978-981-33-4673-4_4

[18] Mahsa Abrishami; Mohammad Javad Rashti; Marjan Naderan,"Machine Translation Using Improved Attention-based Transformer with Hybrid Input", 2020 6th International Conference on Web Research (ICWR) -IEEE, DOI: 10.1109/ICWR49608.2020.9122317

[19] Jiawen Jiang, Haiyang Zhang, Chenxu Dai, Qingjuan Zhao, Hao, Hao Feng , "Enhancements of Attention-Based Bidirectional LSTM for Hybrid Automatic Text Summarization", IEEE Access, Volume -9 2021, 123660 – 123671 DOI: 10.1109/ACCESS.2021.3110143

[20] Dong Qiu Bing Yang "Text summarization based on multi-head self-attention mechanism and pointer network", Complex & Intelligent Systems Volume 8, pages 555–567, 2022, https://doi.org/10.1007/s40747-021-00527-2

[21] Shilpa G V, Shashi Kumar D R, "Abs-Sum-Kan: An Abstractive Text Summarization Technique for an Indian Regional Language by Induction of Tagging Rules", International Journal of Recent Technology and Engineering Volume-8, Issue-2S3, July 2020, DOI : 10.35940/ijrte.B1193.0782S319

[22] Ali Raza, Hadia Sultan Raja, Usman Maratib "Abstractive Summary Generation for the Urdu Language", arXiv:2305.16195v1 [cs.CL] 25 May 2023

[23] Abhinaba Bala, Ashok Urlana, Rahul Mishra, Parameswari Krishnamurthy, "Exploring News Summarization and Enrichment in a Highly Resource-Scarce Indian Language: A Case Study of Mizo", arXiv:2405.00717v1 [cs.CL] 25 Apr 2024

[24] Mrithula Kl, Aishwarya Krishnakumar, B. Bharathi, " Text summarization for Indian languages using pre-trained models", Conference on Forum for Information Retrieval Evaluation, Vol-3395 May 2023,

[25] Aparna Madhukar Mete, Manikrao Laxmanrao Dhore, "A Comprehensive Survey on Abstractive Text Summarization of Devanagari Script Based Hindi Language", International Journal of Intelligent Systems And Applications In Engineering, 2024, 12(3), pp 3604–3620

[26] Srisudha Garugu, D. Lalitha Bhaskari, "Enhancing Abstractive Text Summarization using Two-Staged Network for Telugu Language (EATS2N)", International Journal of Intelligent Systems and Applications in Engineering IJISAE, 2024, 12(19s), 686–695

[27] Dhaval Taunk, Vasudeva Varma, "Summarizing Indian Languages using Multilingual Transformers based Models", arXiv:2303.16657v1 [cs.CL] 29 Mar 2023

[28] Prakash Dhakal, Daya Sagar Baral, "Abstractive Summarization Of Low Resourced Nepali Language Using Multilingual Transformers" , arXiv:2409.19566v1 [cs.CL] 29 Sep 2024

[29] Riddhi Kevat, Sheshang Degadwala, "A Comprehensive Review on Gujarati-Text Summarization Through Different Features", International Journal of Scientific Research in Computer Science Engineering and Information Technology(IJSRCSEIT), ISSN : 2456-3307, Volume 9, Issue 10, pp.301-306, September October-2023. DOI:10.32628/CSEIT236105

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.