

ENCODER-DECODER ARCHITECTURES WITH ATTENTION MECHANISMS



**Academy of
Engineering**
(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

HEADLINE GENERATION

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INTRODUCTION



Headline generation is a subtask of text summarization that focuses on creating short, meaningful, and informative titles from longer text inputs such as news articles or reports. It plays a crucial role in helping readers quickly grasp the main idea of a document. Traditional methods, such as rule-based or statistical approaches, often struggle to capture the full context or semantic meaning, resulting in vague or low-quality headlines. However, with the advent of self-attention mechanisms and Transformer-based models like BART and T5, the quality of headline generation has significantly improved. These models enable better understanding of long-range dependencies and context, leading to more accurate, fluent, and context-aware headline generation, which is valuable for applications like content curation, SEO, and automated publishing.

PROBLEM STATEMENT



AIM

- To leverage Self-Attention based Transformer models for generating fluent, accurate, and contextually relevant headlines.

Problem statement

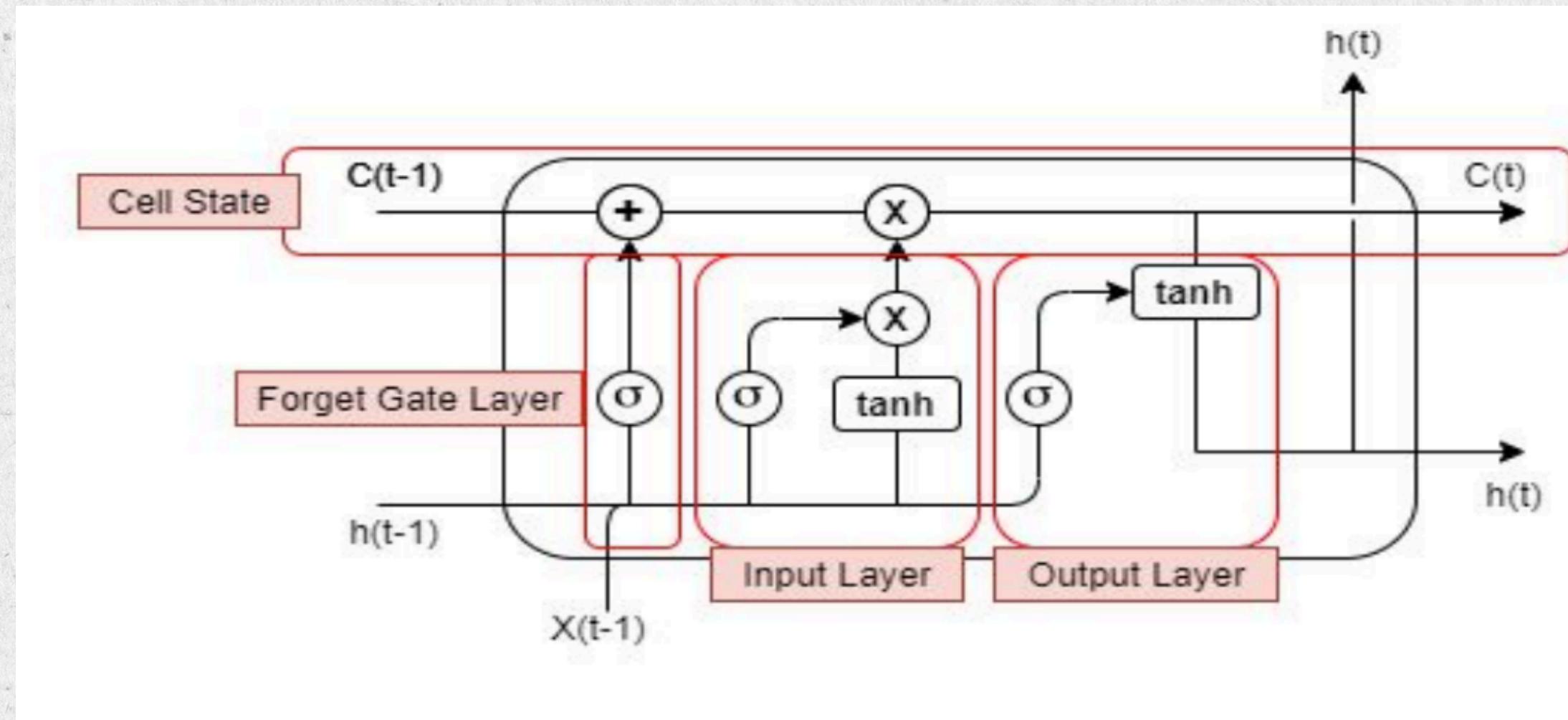
- Long-range dependencies – Difficulty in capturing context across long text.
- Semantic relevance – Generated headlines may not reflect the true meaning.
- Fluency – Output may be grammatically incorrect or unnatural.

Objectives

- Develop a headline generation system using Transformer models (e.g., BART, T5).
- Handle long-range text dependencies effectively using self-attention.
- Compare performance with traditional or baseline models.

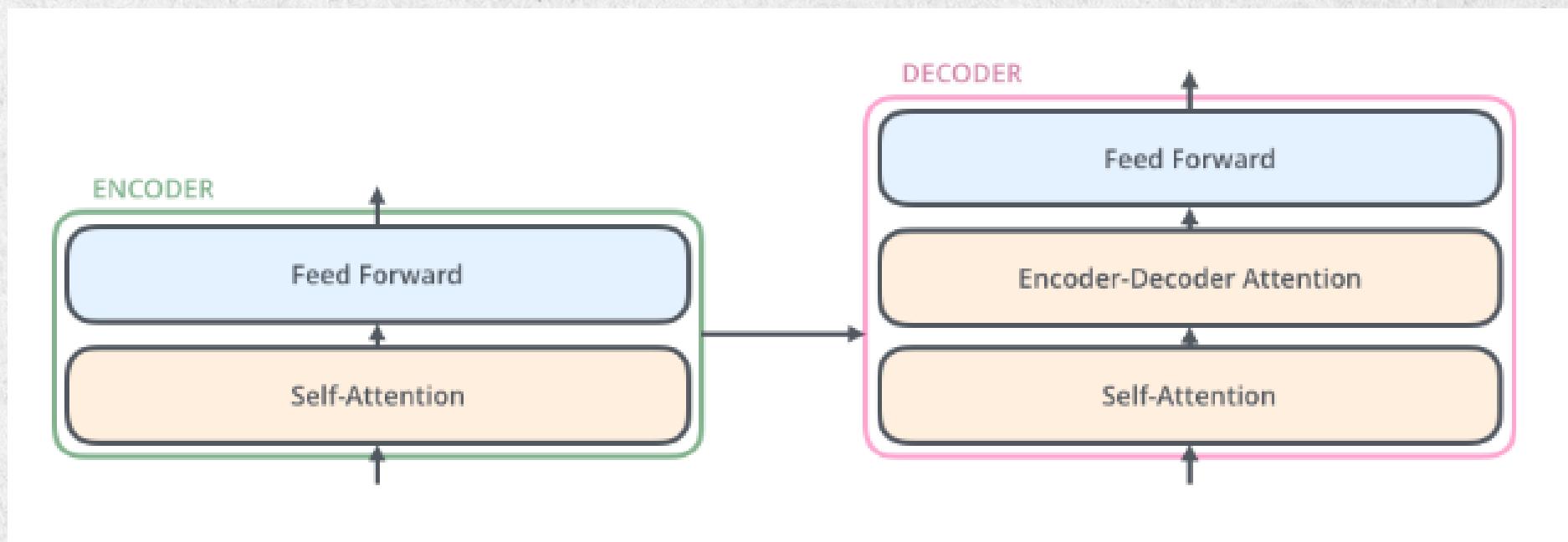
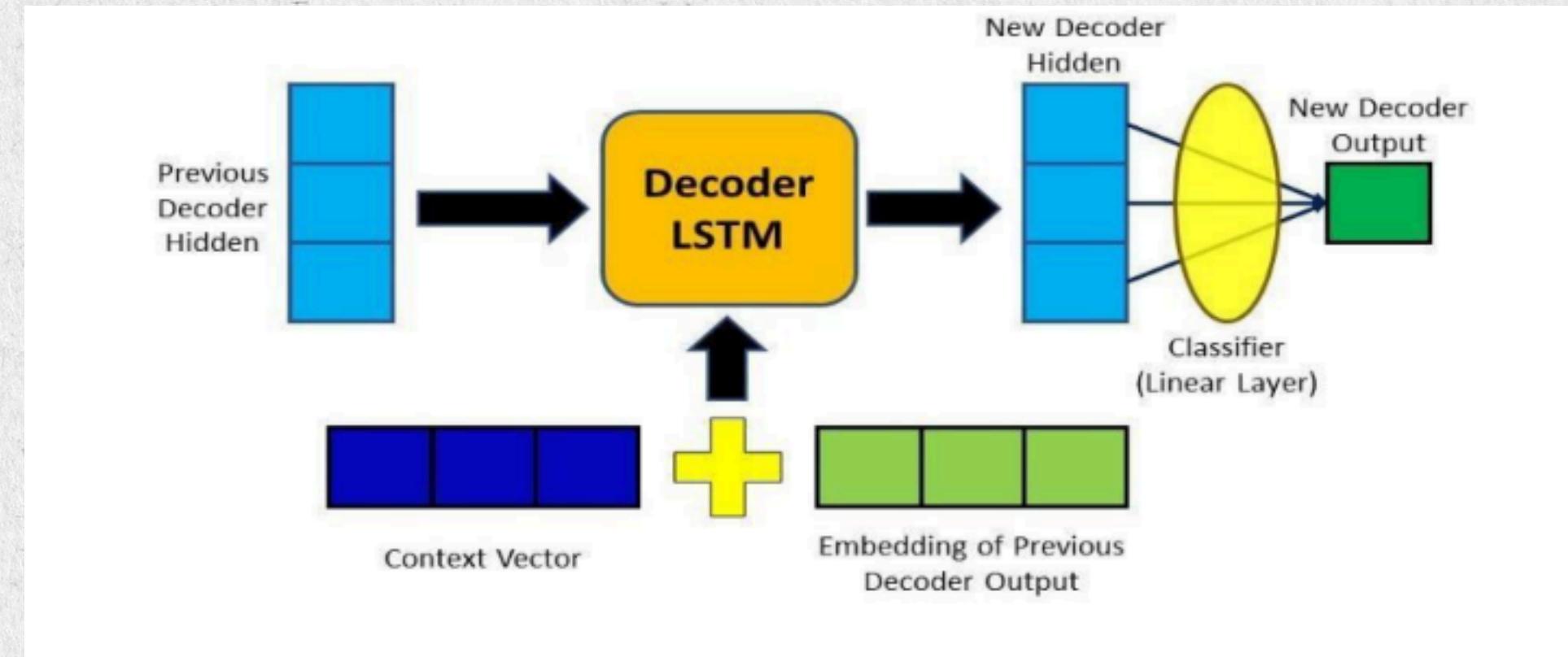
MODEL DIAGRAMS AND ARCHITECTURE

Without Attention LSTM-based architecture



MODEL DIAGRAMS AND ARCHITECTURE

**With Attention
Bahdanau architecture**



**With Self-Attention
Transformer Artitecture**

DATASET DESCRIPTION

Source: Hindustan Times articles referenced via Inshorts.

Description:

This dataset contains metadata and content from real-world news articles published on 03 August 2017 (Thursday), spanning a variety of topics such as government policy, celebrity responses to social media trolling, institutional corrections in forms, and national security encounters. It is useful for natural language processing (NLP), sentiment analysis, headline generation, summarization, and text classification tasks.

author Name of the journalist or article writer.

date Publication date of the article (e.g., "03 Aug 2017, Thursday").

headlines Title or headline of the news article.

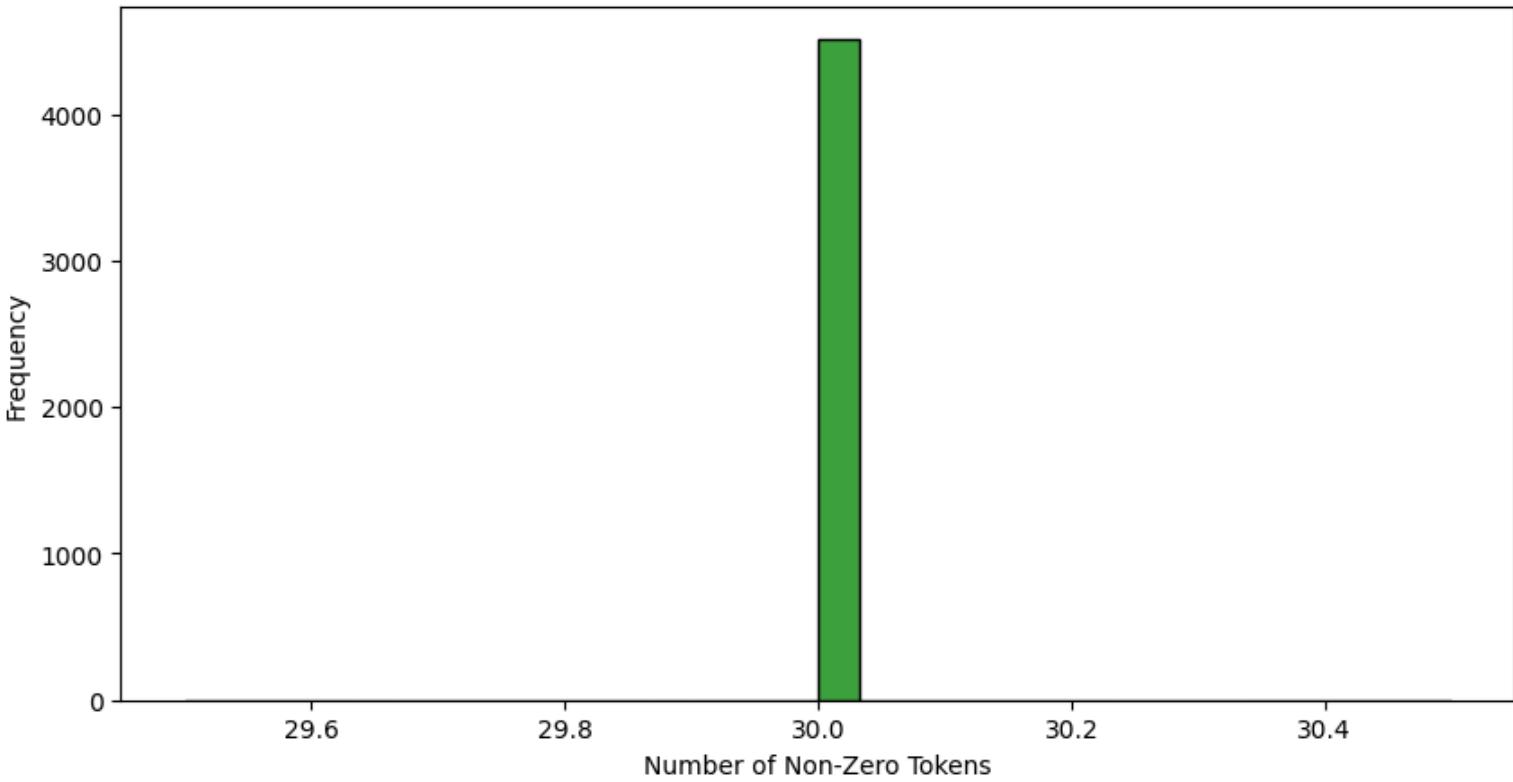
read_more URL link to the full article for reference.

text Short summary of the article, typically 1-2 sentences.

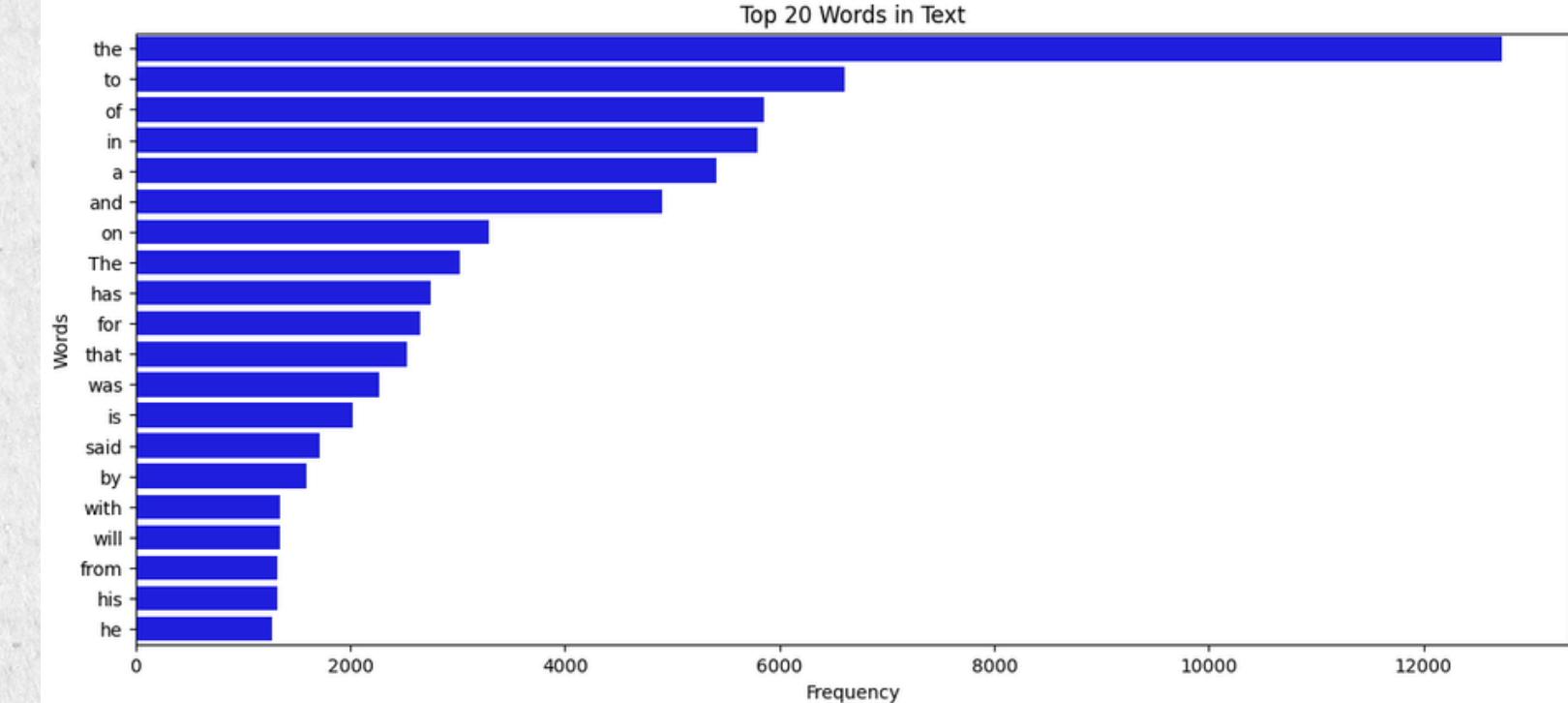
ctext Complete news content or detailed text of the article.

GRAPHS

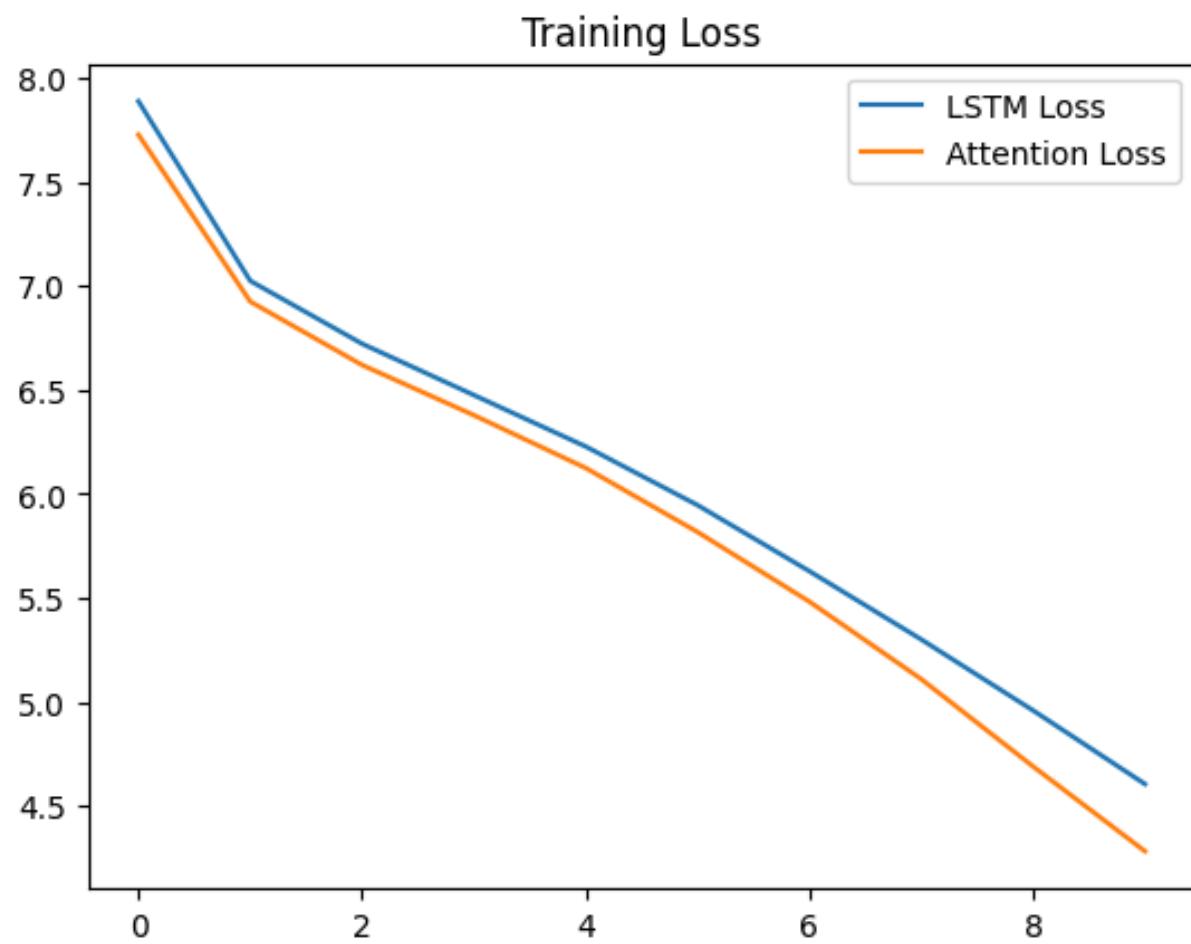
Non-zero Token Count in Text Sequences After Padding



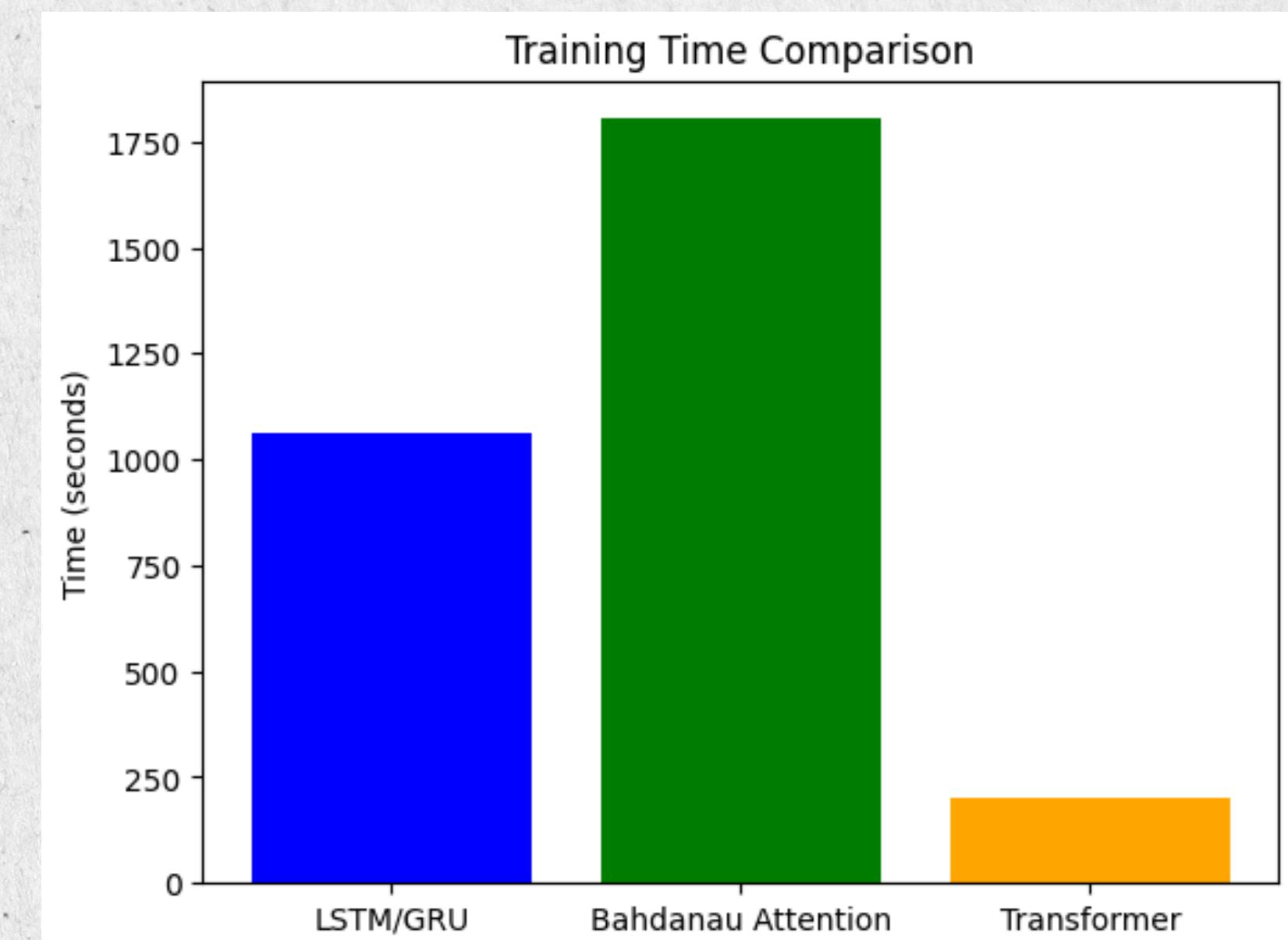
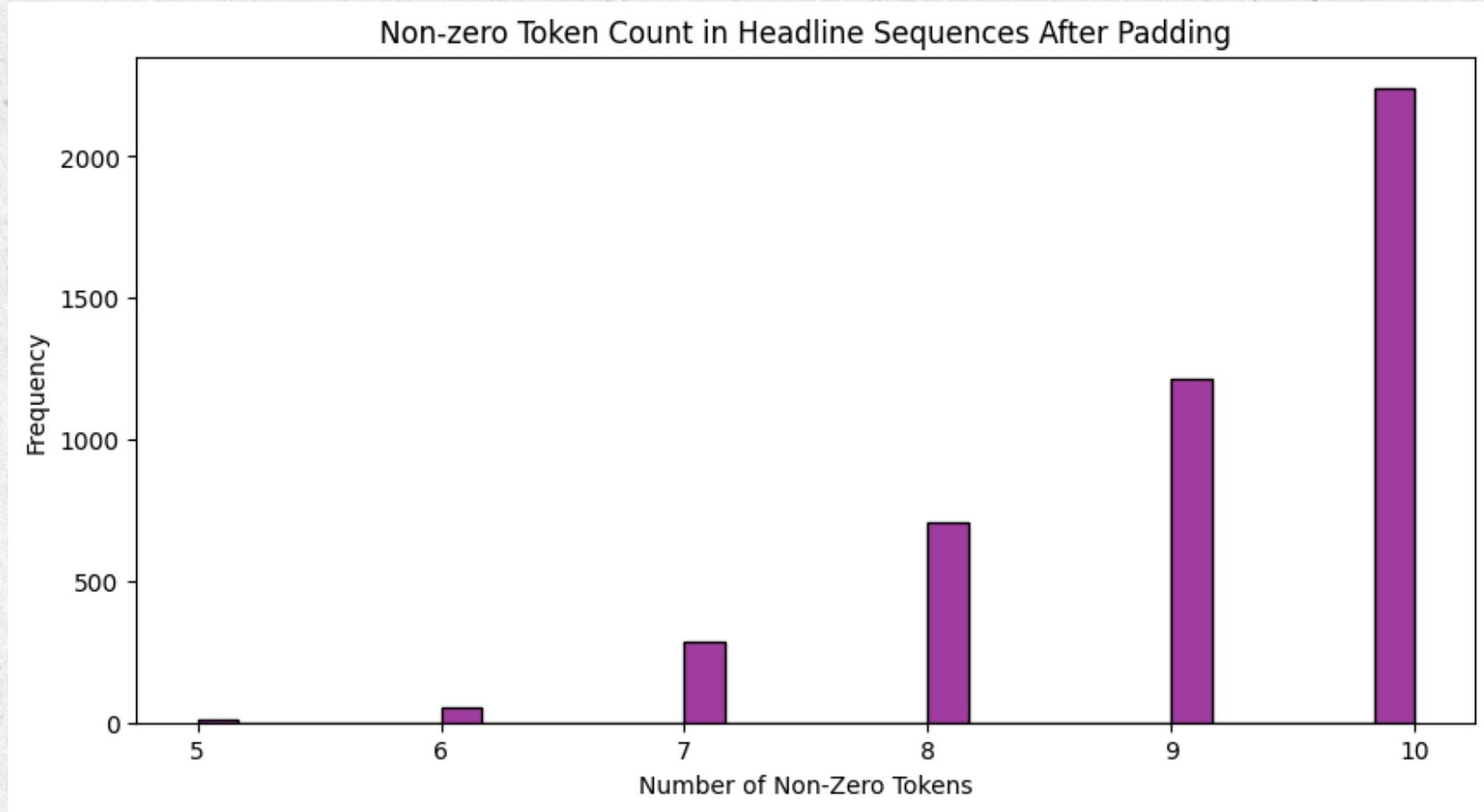
Top 20 Words in Text



Training Loss



GRAPHS



RESULTS & ANALYSIS

Criteria	LSTM/GRU (No Attention)	Attention (Bahdanau/Luong)	Transformer (Self-Attention)
Accuracy	0.66	0.83	0.0327
ROUGE	Rouge : 0.6666	Rough : 0.0	Rough : 0.44
Training Time	1650 sec	2950 sec	220 sec



CONCLUSION

In conclusion, self-attention models have proven to be highly effective for abstractive summarization, enabling the generation of concise and coherent summaries. Transformer-based models, particularly for headline generation, have shown promising results in producing relevant and impactful headlines. Looking ahead, there is potential to further enhance these models by incorporating factual verification mechanisms to ensure the accuracy of the generated content. Additionally, domain-specific headline tuning can be explored to improve the relevance of generated headlines across different industries. Lastly, applying Reinforcement Learning could lead to better optimization of these models, enhancing their ability to adapt and improve over time.

THANK YOU....