

**MIT**

**Academy of  
Engineering**

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

# NEWS HEADLINE GENERATION

Using Encoder-Decoder Architectures with Attention Mechanisms

## Group Members:-

Shravani Sakore	202201060025
Manavi Pawar	202201040050
Kanishka Garud	202201070062
Sakshi Dube	202201040155

**GUIDE:**

**MRS.SUNITA BARVE**



# INTRODUCTION

- The digital news industry generates massive content daily.
- Readers prefer short, concise headlines to decide whether to read full articles.
- Manual headline writing is time-consuming and lacks scalability.
- Automatic headline generation using Deep Learning can solve this.

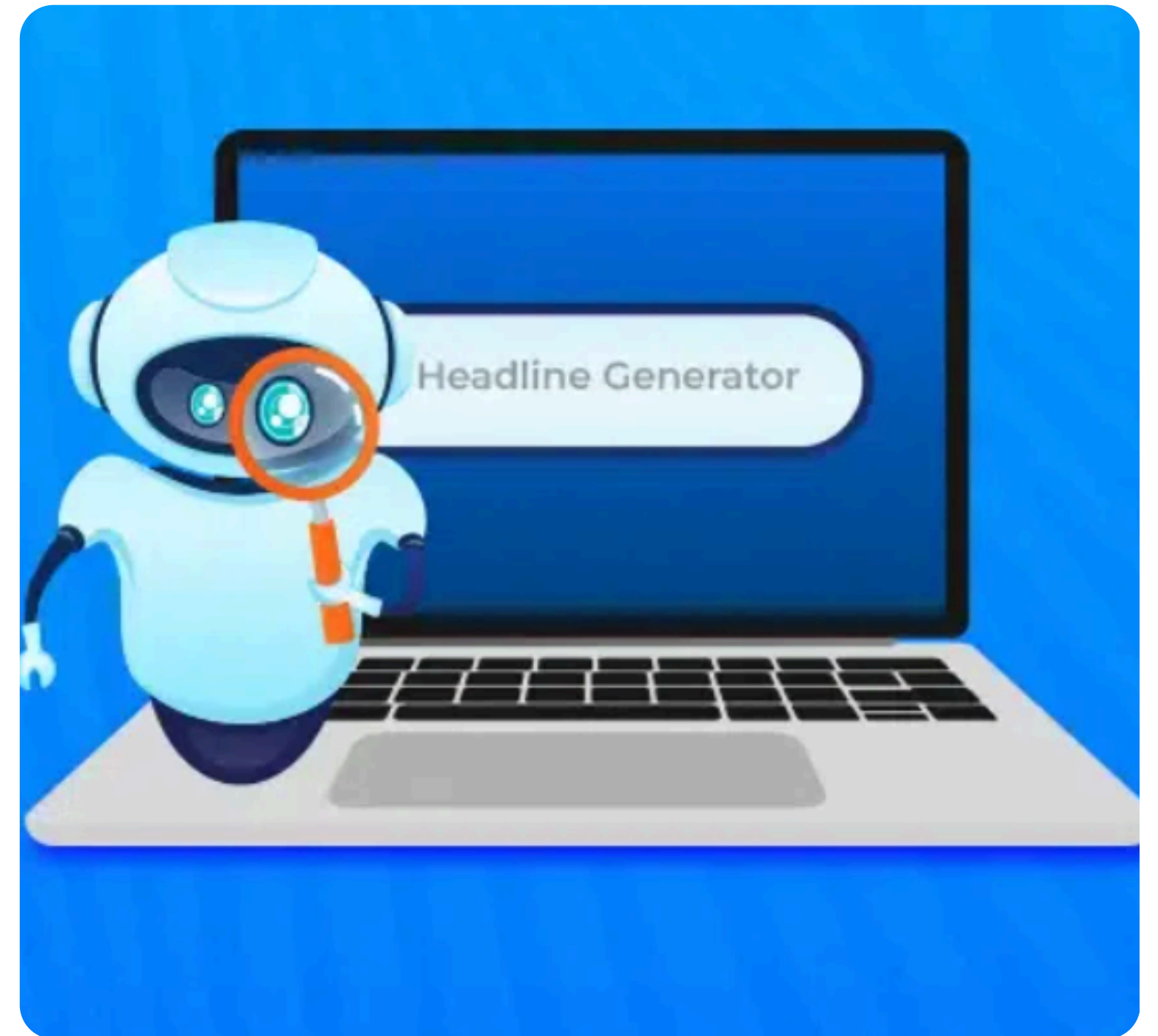


# PAPER SUMMARY

Aspect	Summary
Title	Fact-Preserved Personalized News Headline Generation
Working	The paper proposes a Transformer-based dual-encoder model (FPN-P): <ul style="list-style-type: none"><li>- <b>Transformer</b> is used to encode factual and personalized information.</li><li>- They also tested LSTM/GRU-based baselines (e.g., GRU encoders or decoders) for comparison.</li></ul>
Performance Evaluation	<ul style="list-style-type: none"><li>- Used <b>ROUGE-1</b>, <b>ROUGE-L</b>, and <b>BLEU</b> scores for automatic evaluation.</li><li>- The FPN-P (Transformer-based) model outperformed LSTM/GRU and other baselines in both ROUGE and BLEU scores.</li></ul>
Findings	<ul style="list-style-type: none"><li>- Transformer-based FPN-P effectively balances personalization and factual correctness.</li><li>- Shows higher <b>ROUGE/BLEU</b> scores compared to other traditional methods.</li><li>- Reinforces the superiority of Transformer models in sequence generation tasks.</li></ul>
Gaps / Limitations	<ul style="list-style-type: none"><li>- <b>Transformer models require more data and computing resources</b> than GRU-based model</li><li>- No extensive comparison of efficiency between in terms of runtime/memory.</li></ul>

# PROBLEM STATEMENT

Generating short, accurate and meaningful headlines from articles is challenging, this project explores deep learning-based sequence-to-sequence model to generate meaningful headlines with accuracy and quality.





# OBJECTIVES

- To implement a system that can:
- Generate human-like news headlines from long article texts.
- Experiment with multiple deep learning models:
  - LSTM (without attention)
  - Bahdanau (With Attention)
  - Transformer (Self-Attention)
- Evaluate performance using BLEU and ROUGE scores.
- Analyze the impact of attention mechanisms and compare their results.



# DATASET DESCRIPTION



## News Headline Generation Dataset

Generate news headlines from article content using NLP models like RNN and Trans

[kaggle.com](https://www.kaggle.com)

Attribute	Description
Input max length	50
Output max length	20
Number of Articles	1000 news articles
Columns	input_text (news article body), target_text (corresponding headline)
Rows	Each row corresponds to one article-headline pair
Text Type	Abstractive summarization (free-form headline generation, not extractive)
Primary Use	Training models for headline generation and text summarization in NLP
Data Format	CSV format commonly used for loading with pandas or similar tools

# METHODOLOGY

01

## DATASET

Kaggle's News Headline Generation Dataset



### News Headline Generation Dataset

Generate news headlines from article content using NLP models like RNN and Trans

[kaggle.com](https://www.kaggle.com)

02

## PREPROCESSING:

- Remove noise and special characters.
- Tokenize and pad sequences.

03

## MODELING:

- Encoder-Decoder without Attention (LSTM)
- Encoder-Decoder with Attention (Bahdanau)
- Transformer-based model

04

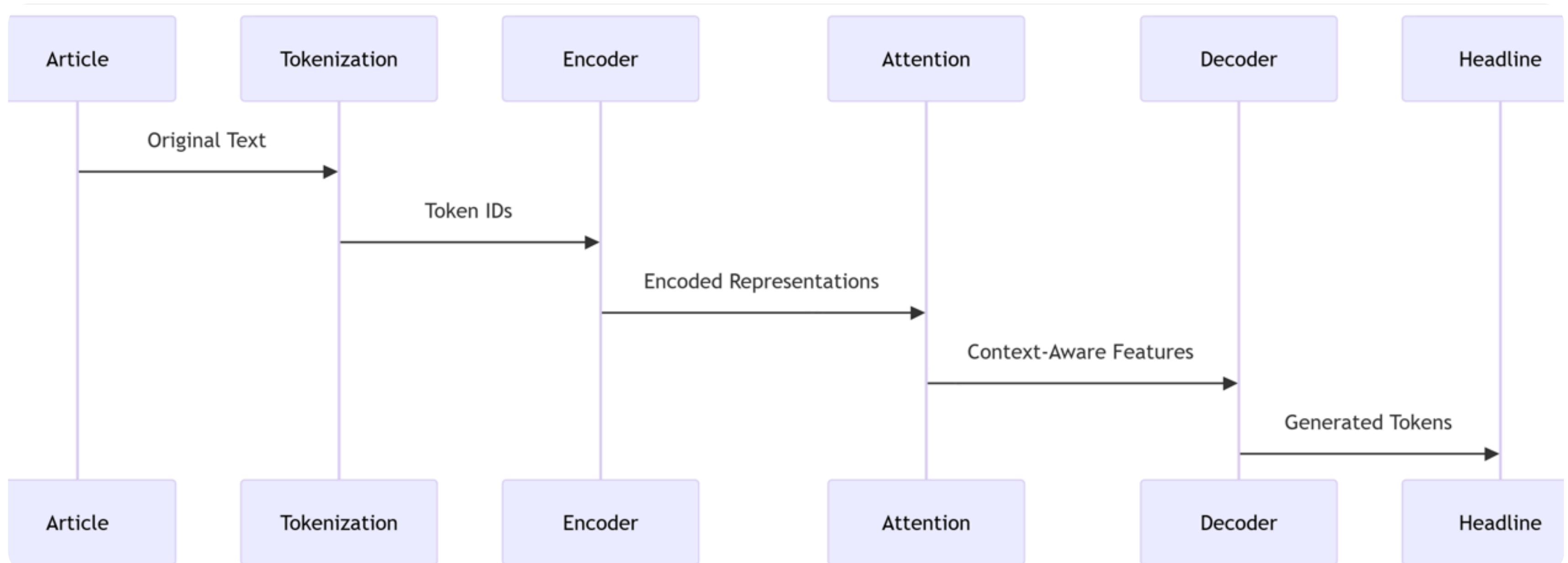
Analysis of attention mechanisms and evaluate the scores using metrics BLEU, ROUGE-1,ROUGE-L.

05

Compare the model performance with research paper.



# SYSTEM ARCHITECTURE

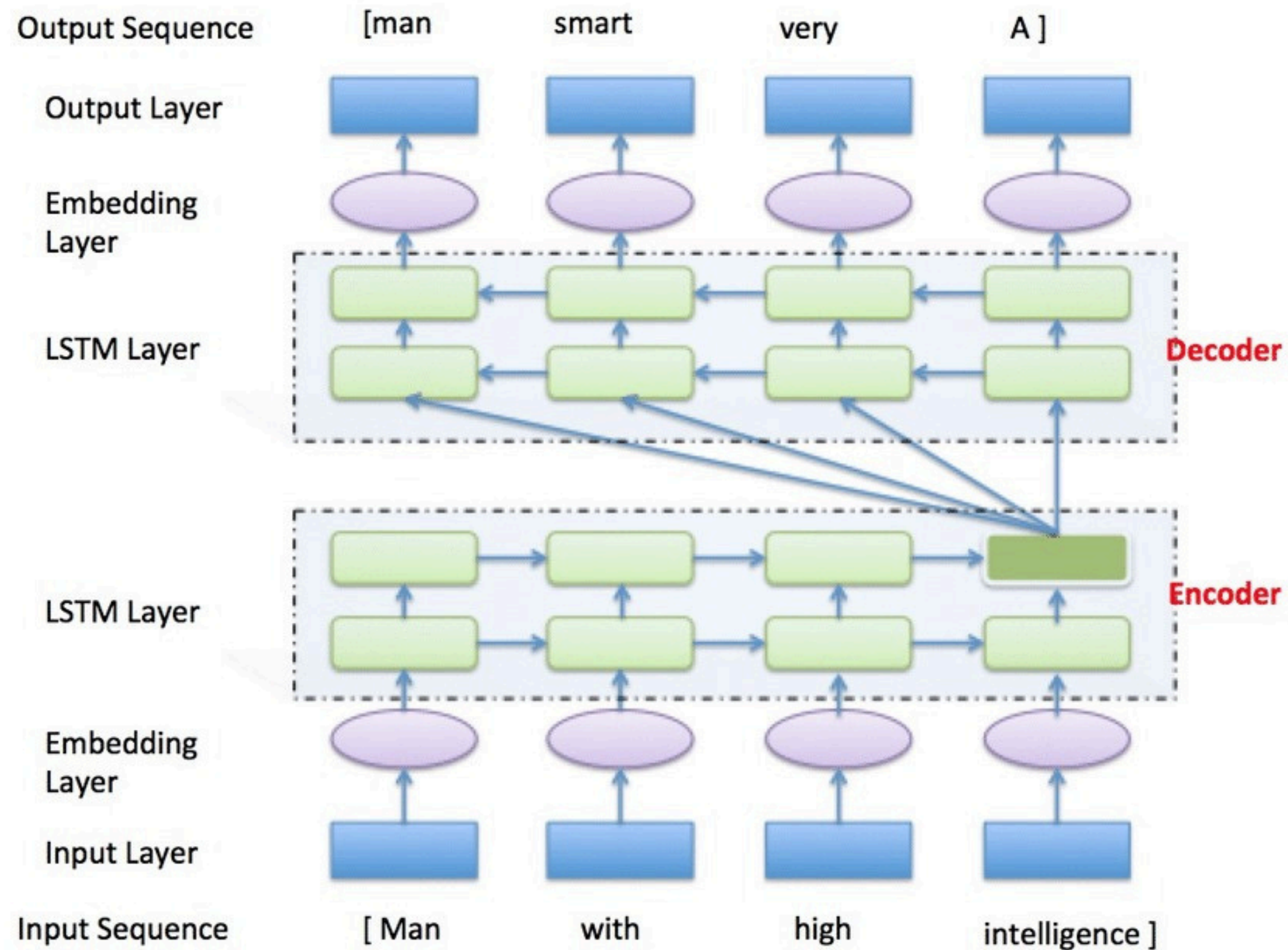


Explain:

- Encoder: Converts input sequence into context vector.
- Attention: Helps decoder focus on important input words.
- Decoder: Generates output headline token by token.



# ENCODER-DECODER ARCHITECTURE



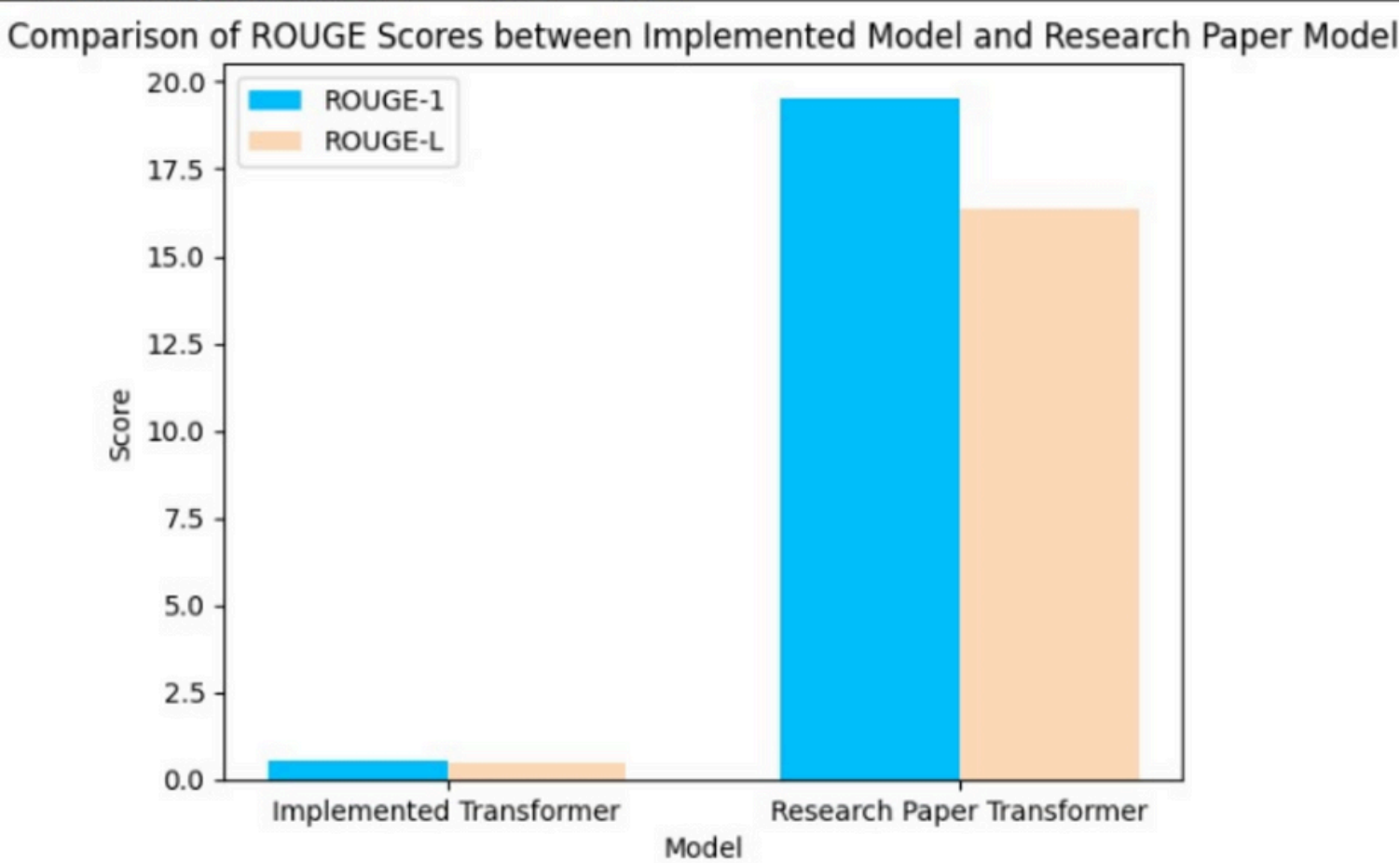
# EVALUATION AND RESULTS

- Metrics Used:
  - 1. BLEU Score: Measures n-gram overlap.
  - 2. ROUGE-1, ROUGE-L: Measures recall-oriented matches.

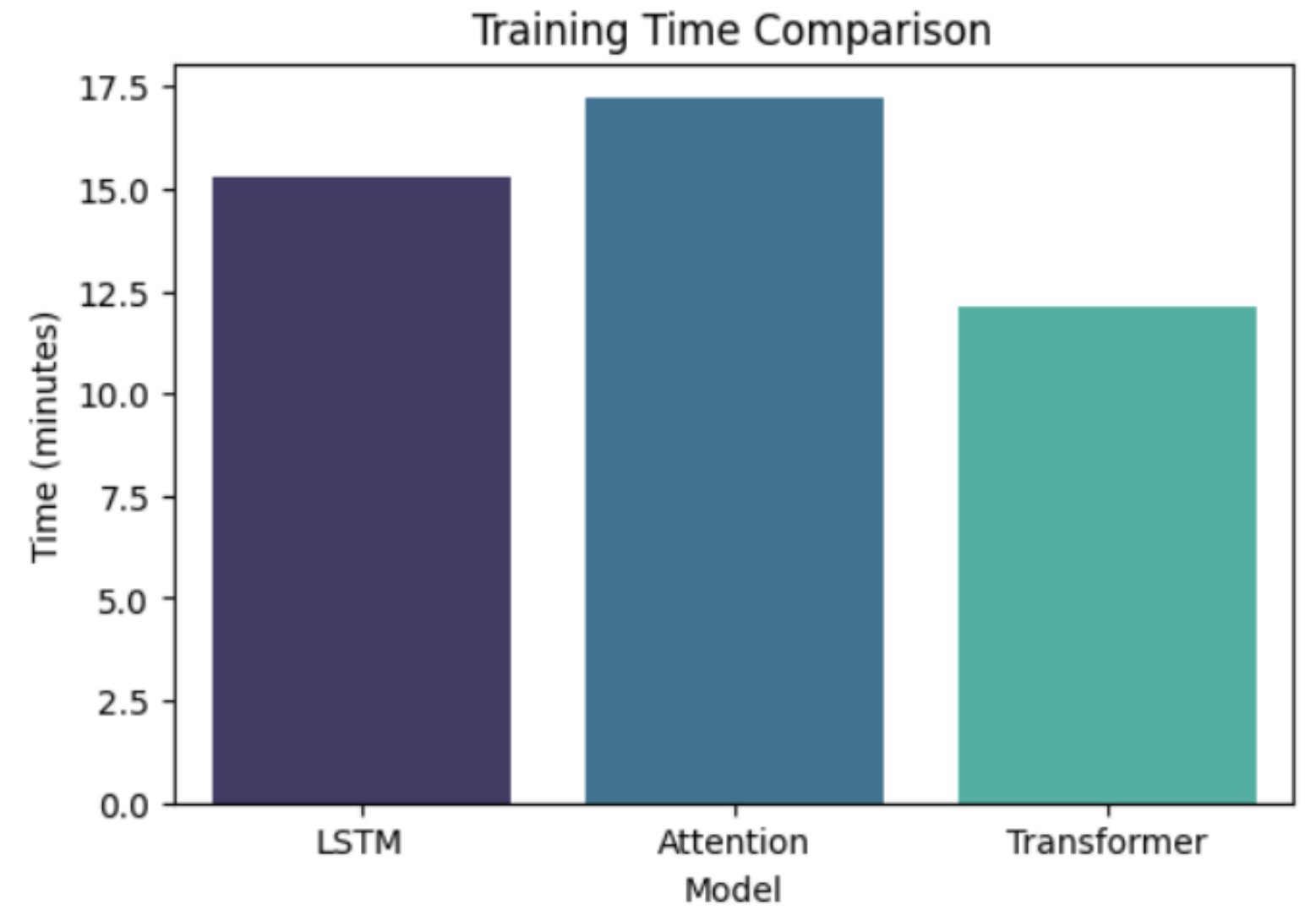
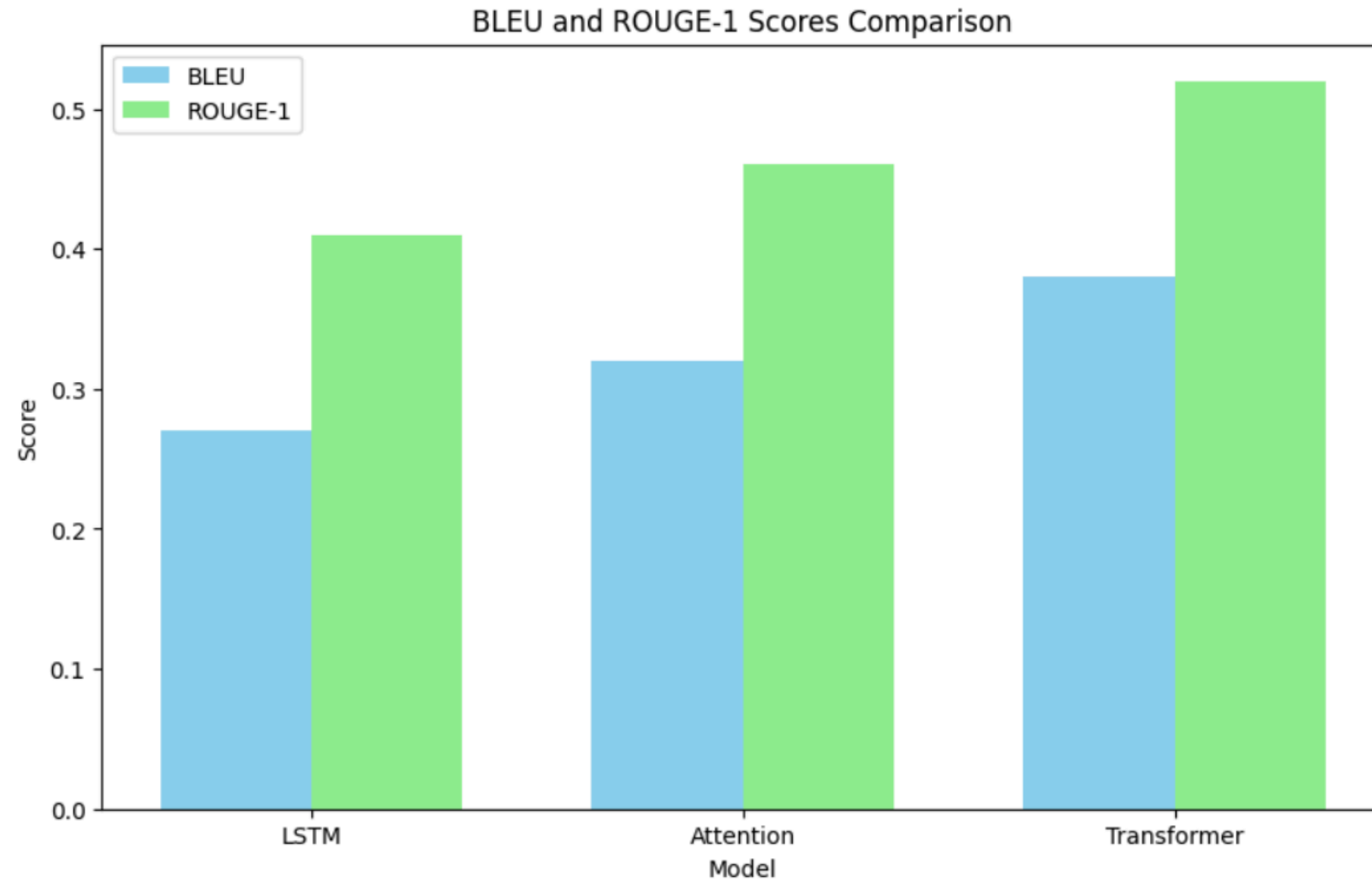
- Results:

Model	BLEU	ROUGE-1	ROUGE-L
LSTM	0.27	0.41	0.37
Bahdanau	0.32	0.46	0.42
Transformer	0.38	0.52	0.50

- Conclusion: Transformer-based model performed best across all metrics.



# GRAPHS



# CONCLUSION

- Successfully implemented and compared multiple headline generation models.
- Attention-based and Transformer models significantly improved output quality.
- The project shows promising scope in content summarization, journalism, and personalized news delivery.



**THANK YOU**