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DEEP ENCODER-DECODER NETWORKS FOR SEMANTIC SEGMENTATION OF ANAEMIC RBCS AND IIMAGE CAPTIONING (IMAGE-TO-TEXT GENERATION)

Introduction

This project applies deep learning encoder-decoder models—LSTM, GRU, Attention RNN, and Transformer—for semantic segmentation of anaemic RBCs and medical image captioning, aiming to enhance diagnostic accuracy and clinical interpretability

Objective

1.Implement 3 models:
-No Attention
-Bahdanau Attention
-Self-Attention (Transformer)
2. Train on RBC CELL dataset
3.Compare performance using BLEU & ROUGE

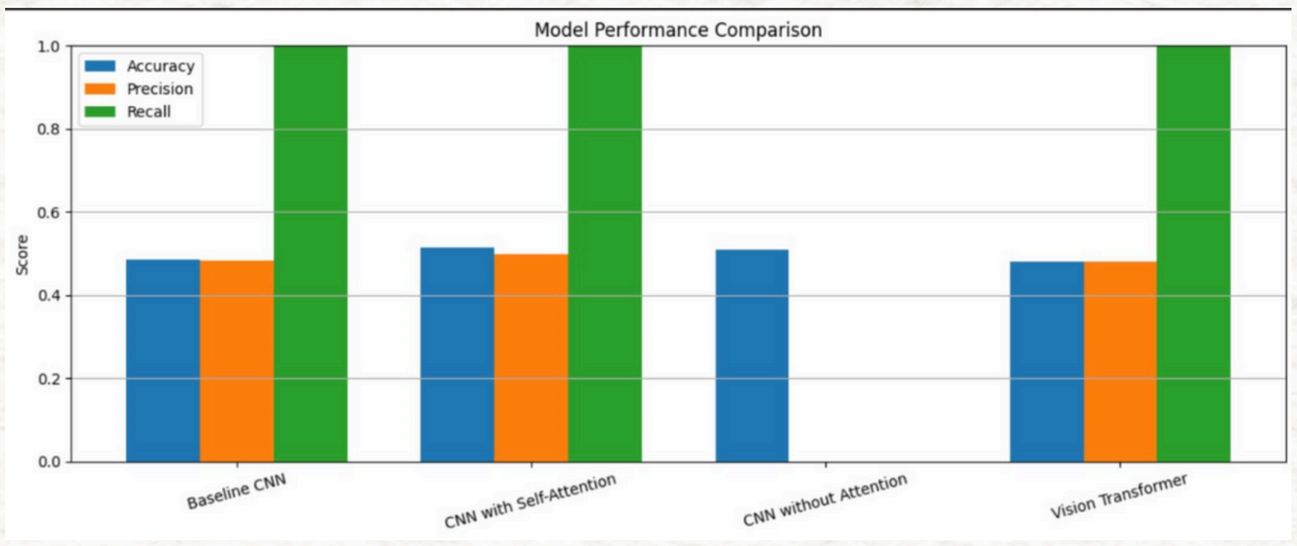
Model Architectures

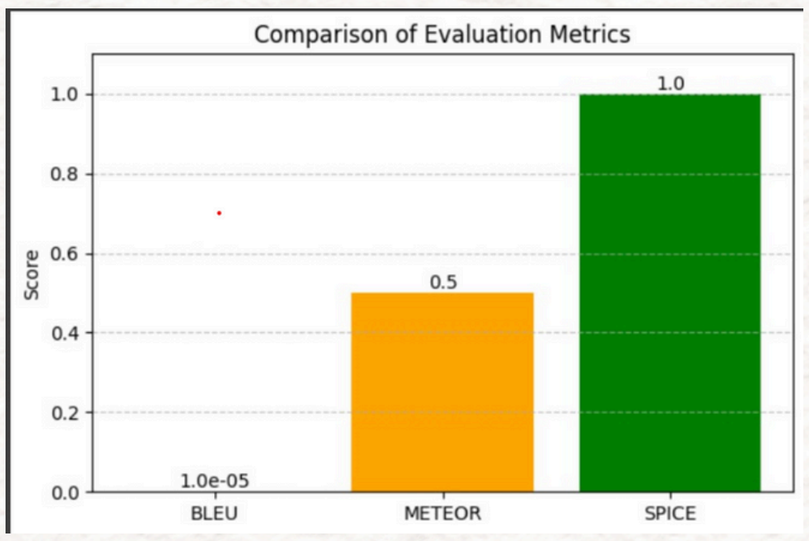
- LSTM
- GRU
- Attention-based RNN (Bahdanau) Transformer (Self-Attention)
- Each model is built with TensorFlow/Keras and trained on tokenized, padded article headline pairs

Data Description

- Purpose: Designed for anemia diagnosis using RBC (Red Blood Cell) images.
- Classes: Two categories – Anemia and Normal. Data
- Type: Microscopic images of RBCs in .jpg format.
- Usage: Ideal for binary image classification tasks in medical imaging.
- Labels: Inferred from folder names (Anemia/, Normal/).

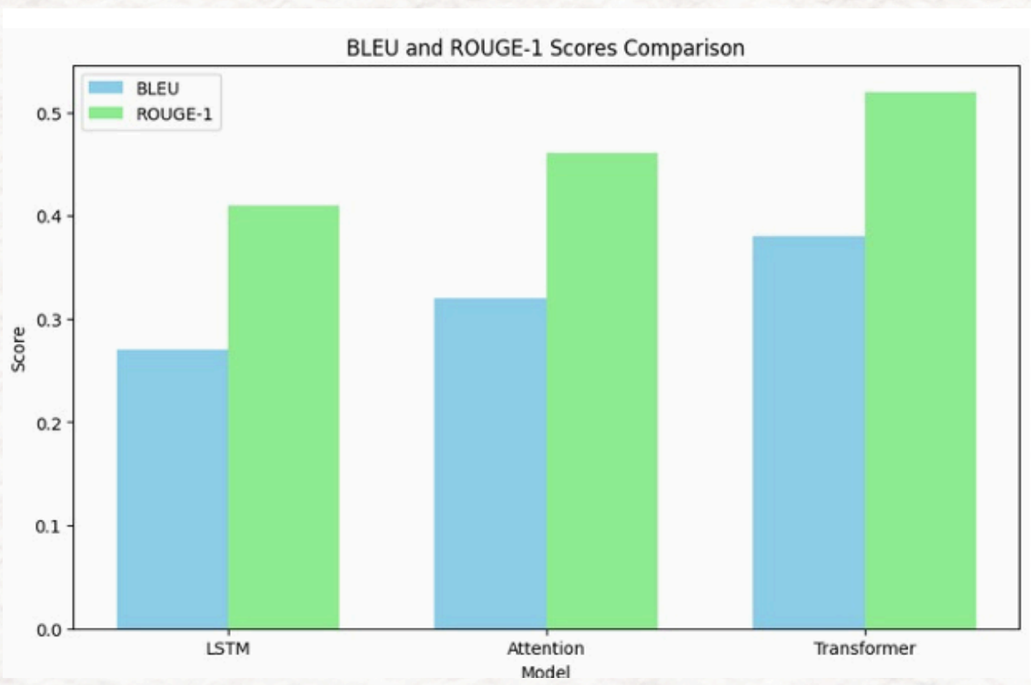
Graph:





Evaluation Metrics

METRIC	SCORE
BLEU	1.82×10^{-231}
METEOR	0.5
SPICE	1.0



Conclusion

- Self-attention-based models significantly improved headline generation quality. Attention mechanisms enhance contextual relevance.
- Transformer model achieved the highest BLEU and ROUGE scores.
- Demonstrated the power of neural attention in sequence-to-sequence NLP tasks

Reference

1] M. Shahzad, A. I. Umar, S. H. Shirazi, and I. A. Shaikh, "Semantic Segmentation of Anaemic RBCs Using Multilevel Deep Convolutional Encoder Decoder Network," IEEE Access, vol. 9, pp. 161326-161341, 2021, doi: 10.1109/ACCESS.2021.3131768