

Smart Headlines: A Comparative Study of Encoder–Decoder Architectures

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Project Introduction

- In recent years, Encoder–Decoder models have become foundational in many natural language and vision-language generation tasks.
- However, the evolution from simple LSTM-based models to sophisticated attention and Transformer-based architectures has significantly boosted the quality, interpretability, and efficiency of generative models.
- This project explores how each model performs across a common task to understand the real impact of architectural choices.

Project Objectives

- Implement three Encoder–Decoder architectures on a selected Text-to-Text or Image-to-Text task.
- Evaluate and compare their performance using task-specific metrics.
- Visualize and analyze attention mechanisms to interpret model decisions.
- Present comparative insights through graphs, tables, and attention maps.

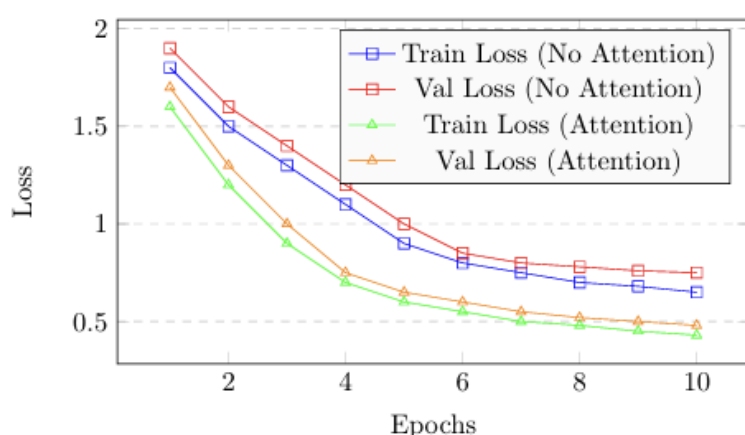
Project Aim

To compare and analyze the performance of different Encoder–Decoder architectures:

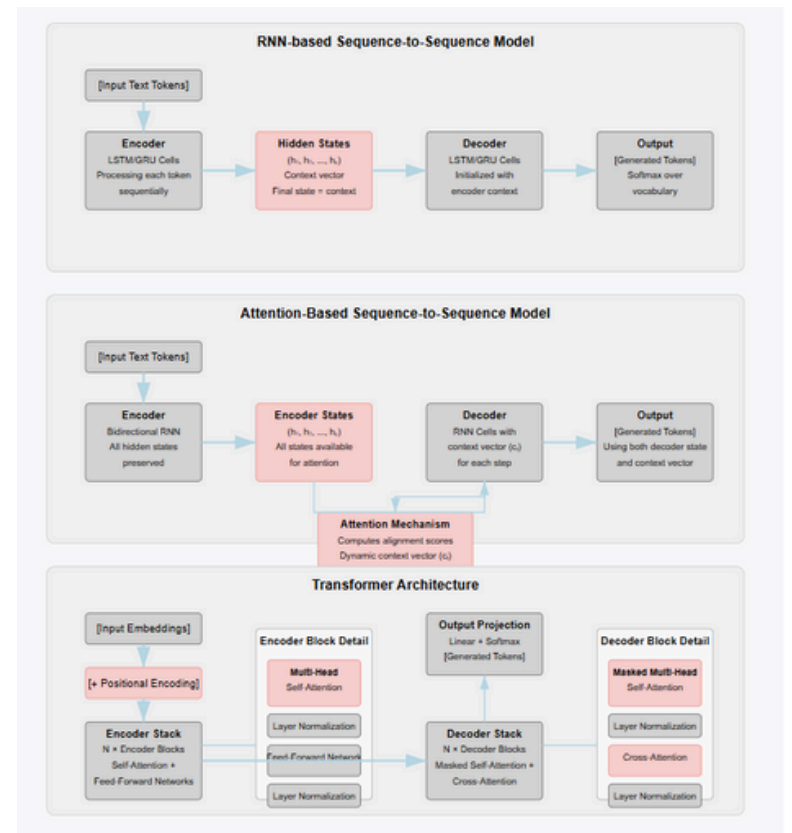
- Without Attention (LSTM/GRU-based)
- With Attention (Bahdanau or Luong)
- With Self-Attention (Transformer)

Analysis

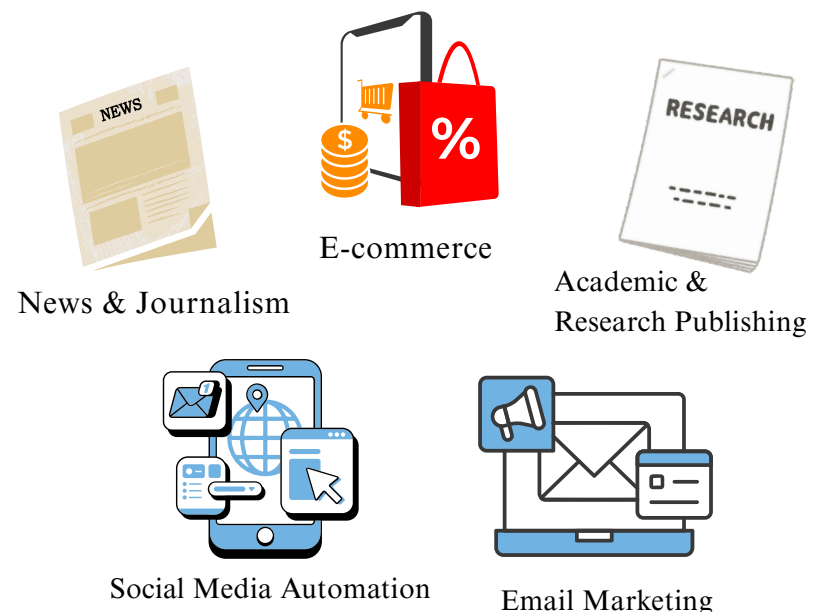
Model	BLEU-4	METEOR	CIDEr	SPICE	Training Time
No Attention	0.0000	0.0215	0.0827	0.0088	2.1h
With Attention	0.0000	0.0117	0.0098	0.0000	3.8h
Self-Attention	0.2147	0.3460	2.3833	0.4608	1.2h



Architecture



Use Cases



Conclusion

This project systematically compared three encoder-decoder architectures—non-attention (LSTM/GRU), attention-based (Bahdanau/Luong), and self-attention (Transformer)—for generating context-aware headlines. Key findings include:

References

- Sutskever, I., Vinyals, O., & Le, Q. V. (2014). Sequence to Sequence Learning with Neural Networks. NeurIPS.
- Luong, M. T., Pham, H., & Manning, C. D. (2015). Effective Approaches to Attention-based Neural Machine Translation. EMNLP.
- Vaswani, A., et al. (2017). Attention Is All You Need. NeurIPS.