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Enhancing News Summarization Based On Advanced Deep Learning Models Using The BBC News Dataset

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Presentation Overview

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Introduction

- News is essential for keeping society informed and supporting decision-making. With vast digital content available, automatic summarization is now crucial for delivering concise, accessible information.
- Manual summarization is time-consuming, whereas machine learning models can efficiently identify and condense key information from lengthy articles.
- This research examines how different machine learning models both extractive and abstractive overcome the complexity and diversity of news language and themes to generate coherent summaries.

Literature Review

Previous work in automated text summarization has evolved from extractive methods to sophisticated abstractive approaches, using models like BERT and its variants, T5 for Indonesian text, RNNs with attention for Arabic, and transformers such as PEGASUS and BART for English news. Research has also explored query-based and unsupervised models, showing the value of hybrid approaches in improving summarization. Building on these efforts, our study evaluates eight advanced models (GPT-2, XLNet, BART, DistilBERT, T5, Pegasus, BigBird, and LED) on the BBC News dataset. By optimizing model Hyperparameters and employing preprocessing, we compare performance on ROUGE metrics, finding that GPT-2 and XLNet perform best for accurate news summarization.

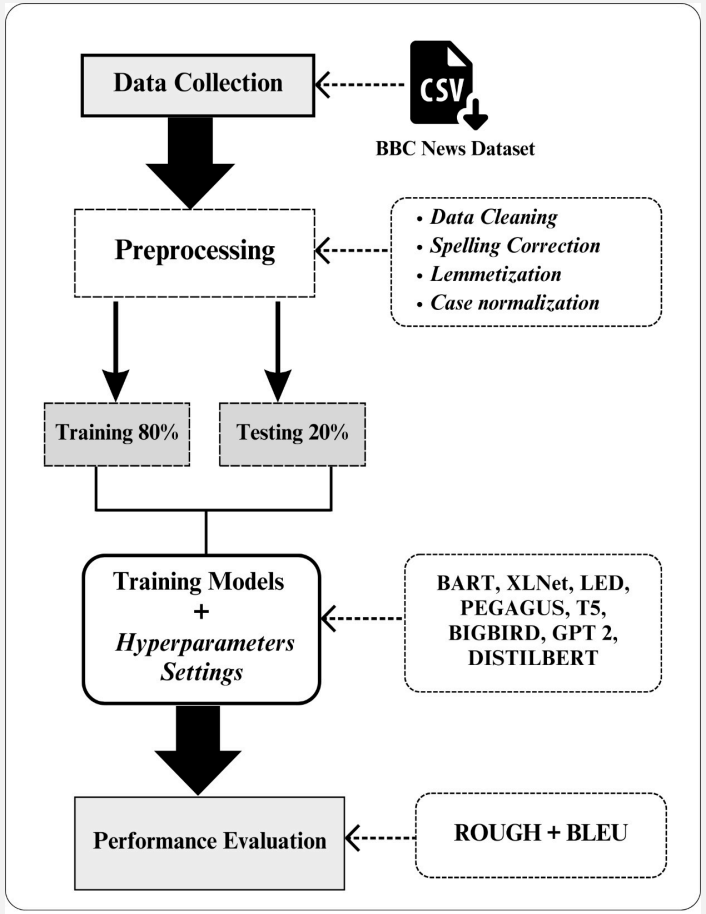
Problem Statement

Although the volume of news content available today offers readers access to vast information, it often leads to information overload, making it challenging to stay informed without spending extensive time on each article. However, manually summarizing these articles is difficult and impractical, particularly for readers aiming to engage efficiently with large amounts of news. Therefore, there is a need for an accurate, automated system that can generate coherent and relevant summaries, addressing both the speed and accuracy required for effective news summarization.

Objectives

- **Enhance Summarization Quality**: Improve the accuracy, coherence, and conciseness of automated news summaries using advanced deep learning models.
- **Model Performance Evaluation**: Assess the effectiveness of models like GPT-2, XLNet, and BART on the BBC dataset using ROUGE metrics.

Methodology

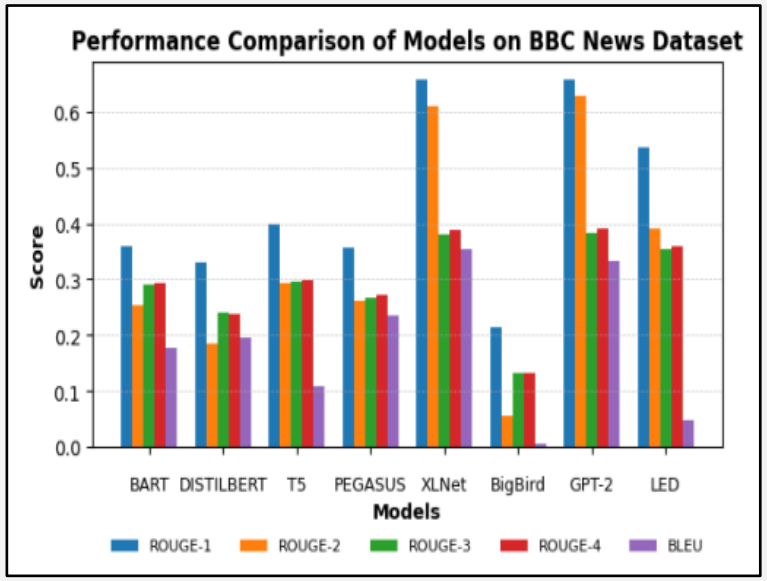


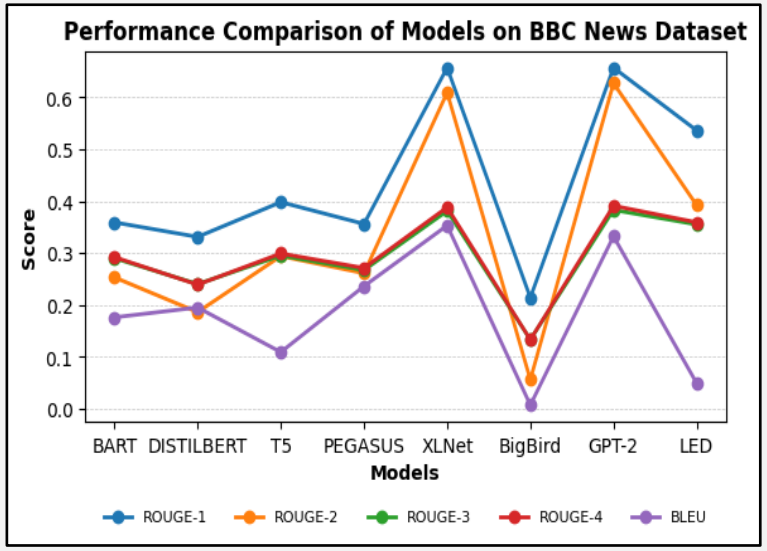
- **Dataset and Preprocessing:** Used the BBC News dataset with over 2,000 articles. Preprocessing steps included text cleaning, tokenization, and lemmatization to prepare data for training.
- **Model Training and Evaluation:** Models were trained with an 80-20 train-test split. Hyperparameters were optimized. Performance was evaluated using ROUGE and BLEU scores to measure summary quality.

RESULTS (1/2)

Models	ROUGE-1	ROUGE-2	ROUGE-3	ROUGE-4	BLEU
BART	0.359	0.253	0.290	0.292	0.18
DISTILBERT	0.331	0.186	0.240	0.239	0.2
T5	0.398	0.294	0.295	0.299	0.11
PEGASUS	0.356	0.261	0.267	0.271	0.24
XLNet	**0.657**	0.609	0.381	0.388	**0.35**
Bigbird-Pegasus	0.214	0.056	0.133	0.133	0.01
GPT-2	**0.657**	**0.627**	**0.383**	**0.391**	0.33
LED-Base	0.536	0.392	0.355	0.359	0.05

Results (2/2)





- GPT-2 and XLNet achieved the highest ROUGE-1 and ROUGE-2 scores, excelling in capturing key points and maintaining context.
- GPT-2 demonstrated coherence and relevancy in summaries due to its advanced design and extensive training.
- Big Bird performed less effectively, struggling with complex contexts in the BBC dataset.
- Visualization of results highlighted GPT-2 and XLNet as the leading models for unigrams and bigrams.

Conclusion

- This study confirms that advanced deep learning models, especially GPT-2 and XLNet, significantly improve the efficiency and coherence of news summarization.
- These models leverage robust contextual understanding, crucial for creating accurate and relevant summaries.
- High computational requirements and dataset specific training pose limitations for broader applications.
- The research emphasizes the value of sophisticated models for summarization but highlights the need for further work to address scalability and efficiency challenges.

Recommendation

- Future research should focus on domain-specific dataset training to improve summary quality across different types of content, as well as developing hybrid approaches that combine extractive and abstractive techniques for more balanced results.
- Exploring multilingual capabilities, optimizing computational efficiency, and making these advanced summarization tools accessible to a wider audience, including news agencies and public information platforms, are key areas for improvement.