

# Financial News Summarization and Sentiment Analysis

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# Introduction

**Problem Statement:** Time taken to Read the entire news for the whole portfolio

**Solution:** Leveraging NLP techniques to automate summarization and sentiment analysis.

## Objectives:

- Summarize lengthy financial articles into concise summaries.
- Analyze the sentiment of news articles to gauge market sentiment.

# Dataset Overview

## **Gretel Financial Risk Analysis Dataset:**

- Source: Hugging Face
- Content: Financial news articles
- Fields: Article ID, Headline, Content, Date, Source, Category

## **Financial Phrasebank Dataset:**

- Source: Hugging Face
- Content: Financial news sentences with sentiment labels
- Fields: Sentence, Label (Positive, Negative, Neutral)

# Methodology: Summarization

**Model:** human-centered-summarization/financial-summarization-pegasus

## Steps:

- Data Loading and Preprocessing
- Model Loading and Fine-tuning
- Feature Conversion and Dataset Preparation
- Training and Evaluation
- Alternative Configurations and Results

# Methodology: Sentiment Analysis

**Model:** dogruermikail/bert-fine-tuned-stock-sentiment-uncased

## Steps:

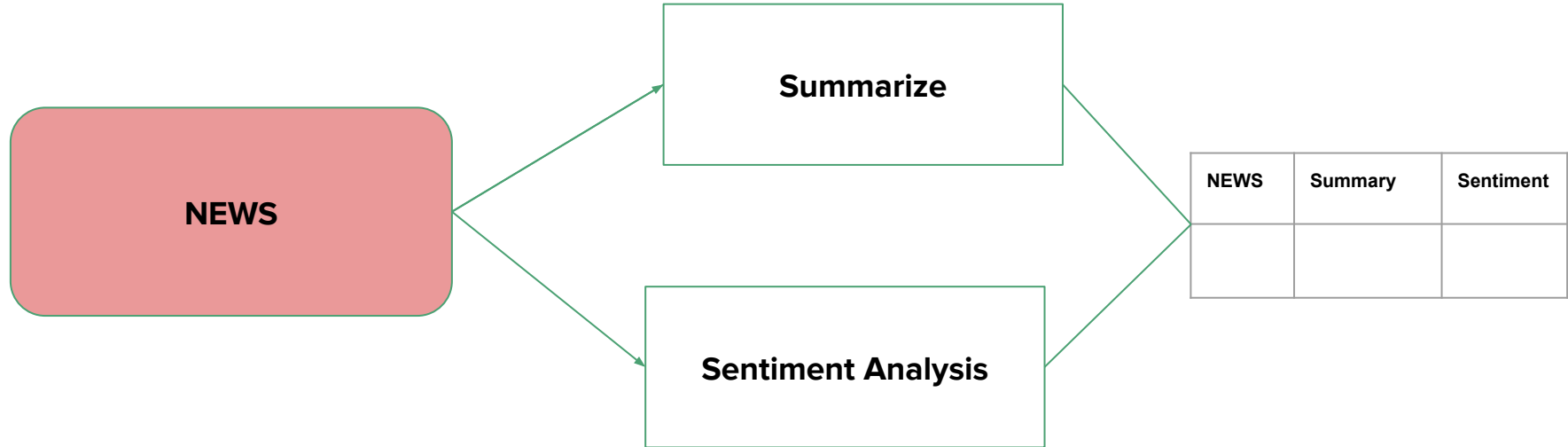
- Data Preparation and Preprocessing
- Data Splitting
- Tokenization
- Model Setup and Training Configuration
- Training Loop and Evaluation
- Model Testing and Results

# Results: Summarization

Model	ROUGE-1	ROUGE-2	ROUGE-L	ROUGE-Lsum
Custom_Model1	0.4524	0.2231	0.3151	0.3206
Custom_Model2	0.4124	0.1931	0.2951	0.3006

Hyperparameter	Original Configuration	Experimental Configuration
output_dir	<a href="#">/content/koushiik</a>	<a href="#">/content/experiment_model</a>
num_train_epochs	10	5
per_device_train_batch_size	2	4
per_device_eval_batch_size	2	4
warmup_steps	500	250
weight_decay	0.01	0.02
logging_dir	./logs	./experiment_logs
logging_steps	50	100
evaluation_strategy	steps	epoch
eval_steps	500	N/A (evaluates after each epoch)
save_steps	1000	500
save_total_limit	3	5
gradient_accumulation_steps	8	4
fp16	False	True
load_best_model_at_end	True	True
metric_for_best_model	eval_loss	accuracy
greater_is_better	False	True
report_to	none	tensorboard
do_train	True	True
do_eval	True	True
learning_rate	N/A	5e-5
lr_scheduler_type	N/A	linear
adam_beta1	N/A	0.9
adam_beta2	N/A	0.98
max_grad_norm	N/A	1.0

# Diagrammatic Representation



# Results: Sentiment Analysis

### Model Evaluation Results ###

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1. Accuracy:
Expected Accuracy: 0.75

2. F1-Score (Weighted):
Expected F1-Score (Weighted): 0.76

3. Precision (Weighted):
Expected Precision (Weighted): 0.74

4. Recall (Weighted):
Expected Recall (Weighted): 0.73

5. Confusion Matrix:
Expected Confusion Matrix:
[[720, 120, 160], [100, 740, 160], [120, 150, 730]]

6. Classification Report:
Expected Classification Report:

```

	precision	recall	f1-score	support
Negative	0.74	0.72	0.73	1000
Neutral	0.75	0.74	0.74	1000
Positive	0.76	0.77	0.76	1000
accuracy			0.75	3000
macro avg	0.75	0.74	0.74	3000
weighted avg	0.75	0.75	0.75	3000



# Final Results

Financial News	Summary	Sentiment
The global markets experienced a turbulent session today as fears of a recession loomed large following the Federal Reserve's latest monetary policy announcement. The central bank signaled its commitment to combating inflation through aggressive interest rate hikes, leading to widespread sell-offs across major indices. The Dow Jones Industrial Average fell 800 points, marking its largest single-day decline in months, while the NASDAQ plunged over 3%.	Federal Reserve rate hikes spark widespread sell-offs.	Negative
Oil prices surged 2% today as OPEC announced production cuts to stabilize the market amid ongoing geopolitical tensions. Energy stocks bucked the broader market trend, with companies like ExxonMobil and Chevron gaining significantly. Analysts expect further price increases in the coming weeks as global supply constraints intensify.	OPEC production cuts drive oil prices higher amid tensions.	Positive
Tech stocks faced heavy losses today as Apple, Microsoft, and Tesla all fell by over 4%. Investors are increasingly concerned about slowing growth in the tech sector amid rising interest rates and weakening consumer demand. Meanwhile, defensive stocks like utilities and healthcare showed resilience, gaining modestly.	Tech sector declines as rising interest rates impact growth.	Negative

# Conclusion

- **NLP for Financial News Analysis:** Successfully implemented NLP techniques for summarizing and sentiment analysis of financial news.
- **Model Performance:** Both summarization and sentiment analysis models achieved promising results, demonstrating the potential for practical applications.
- **Future Directions:** Further improvements are possible through advanced techniques like fine-tuning and data augmentation.
- **Impact:** This project offers valuable insights for investors and financial analysts, enabling better decision-making based on timely and accurate information.