Assignment 5:
Transformer Model for Text Classification

Group 4
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Objective

The objective of this assignment is to implement a Transformer-based text classification model that categorizes text samples into predefined classes. We used the AG News dataset for training, validation, and testing.

Dataset

The AG News dataset consists of news articles labeled into four categories:

- World
- Sports
- Business
- Sci/Tech

The dataset was loaded using the Hugging Face `datasets` library and split into:

- **Training Set:** 80% of the original training data
- **Validation Set:** 20% of the original training data
- **Test Set:** The original test set

Model Architecture

We implemented a Transformer-based text classification model. The architecture includes:

- **Embedding Layer:** Converts tokenized inputs into dense vector representations.
- **Transformer Encoder:** Multi-layer Transformer encoder with self-attention mechanism.
- **Fully Connected Layer:** A linear layer for predicting class probabilities.
- **Hyperparameters:**
  - Embedding Dimension: 128
  - Hidden Dimension: 256
  - Number of Layers: 2
  - Number of Attention Heads: 4
  - Dropout: 0.1
  - Learning Rate: 0.001

Training and Validation Process

The training process included:

- Splitting the dataset into training and validation sets.
- Using CrossEntropyLoss for optimization.

Below are the training and validation loss/accuracy curves over epochs:

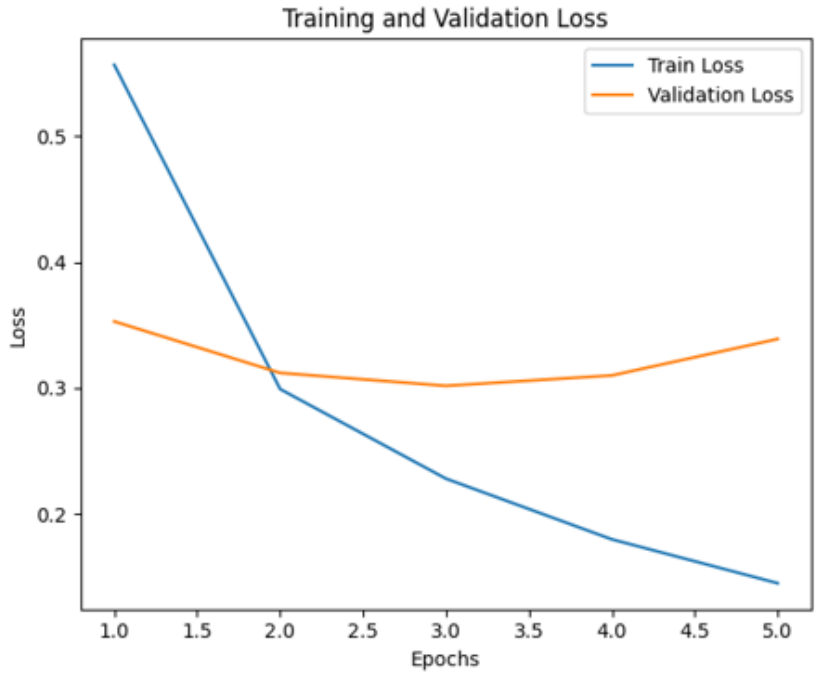

Figure 1

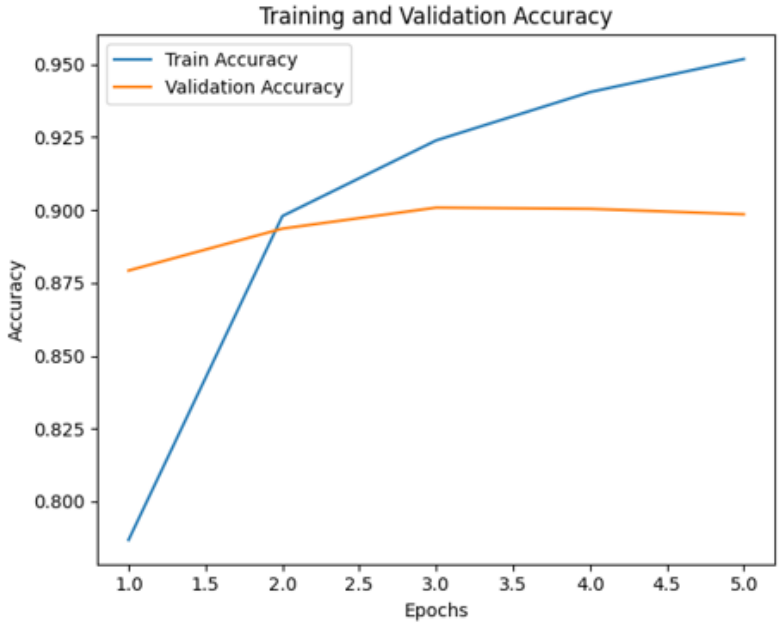

Figure 2

Evaluation Metrics

The model was evaluated on the test set using the following metrics:

- **Accuracy:** 0.8888
- **Precision:** 0.8894
- **Recall:** 0.8888
- **F1-Score:** 0.8887

Hyperparameter Tuning and Results

- Batch size changed to 32
  - **Accuracy:** 0.8818
  - **Precision:** 0.8850
  - **Recall:** 0.8818
  - **F1-Score:** 0.8817
- Learning rate changed to 0.01
  - **Accuracy:** 0.8893
  - **Precision:** 0.8916
  - **Recall:** 0.8893
  - **F1-Score:** 0.8893