Topics Covered

• **Word Embeddings:** Dense vector representations were used to encode semantic meaning and contextual similarity between words, enabling improved model understanding. Both randomly initialized and trained embeddings were analyzed to observe how meaning is captured.

• **TF-IDF and Bag-of-Words:** Classical text representation techniques were explored to establish baseline performance for NLP tasks and to understand frequency-based text modeling.

• **LSTM-based Sentiment Classification:** Long Short-Term Memory networks were implemented to handle sequential dependencies in text data, allowing the model to learn from word order and long-term context.

• **Embedding Visualization:** Dimensionality reduction techniques such as PCA and t-SNE were applied to visualize word embeddings and understand how similar words form clusters.

• **Model Evaluation:** Performance metrics such as accuracy were used to compare traditional machine learning models with deep learning-based approaches and analyze their effectiveness.