DL Assignment 2 Report

Network Details

Objective

The goal of this project was to design and evaluate NLP architectures that can determine semantic similarity between pairs of legal clauses. Two baseline models were implemented and trained from scratch (no pre-trained transformers):

- A BiLSTM Siamese network, to capture sequential and contextual dependencies.
- A Pure Attention Encoder, a lightweight transformer-style model focusing on contextual relationships through self-attention.

Model Architectures

BiLSTM Network

- **Embedding Layer:** 20,000 vocabulary size, 128-dimensional embeddings
- **Encoder:** Shared Bidirectional LSTM (128 units) with dropout = 0.3
- **Similarity Module:** Absolute difference of left/right encodings → Dense(64, ReLU)
- **Output Layer:** Sigmoid neuron for binary similarity classification
- **Optimizer:** Adam (lr = 1e-3)
- **Loss:** Binary cross-entropy
- **Metrics:** Accuracy, Precision, Recall, F1-Score, ROC-AUC

Pure Attention Encoder

- **Embedding Layer:** 20,000 vocabulary size, 64-dimensional embeddings
- **Positional Encoding:** Static sinusoidal encoding for sequence positions
- **Encoder:** 1 Transformer-style block (2 heads, FF-dim = 128, dropout = 0.1)
- **Pooling:** Global Average Pooling.
- **Similarity Module:** Absolute difference → Dense(64, ReLU)
- **Output Layer:** Sigmoid activation
- **Optimizer & Loss:** Adam, binary cross-entropy
- **Metrics:** Same as BiLSTM

Training Settings

Parameter	Value
Epochs	10
Batch Size	32
Sequence Length (max_len)	120 (BiLSTM), 80 (Attention)
Train/Validation/Test Split	75% / 10% / 15%

Dataset Splits

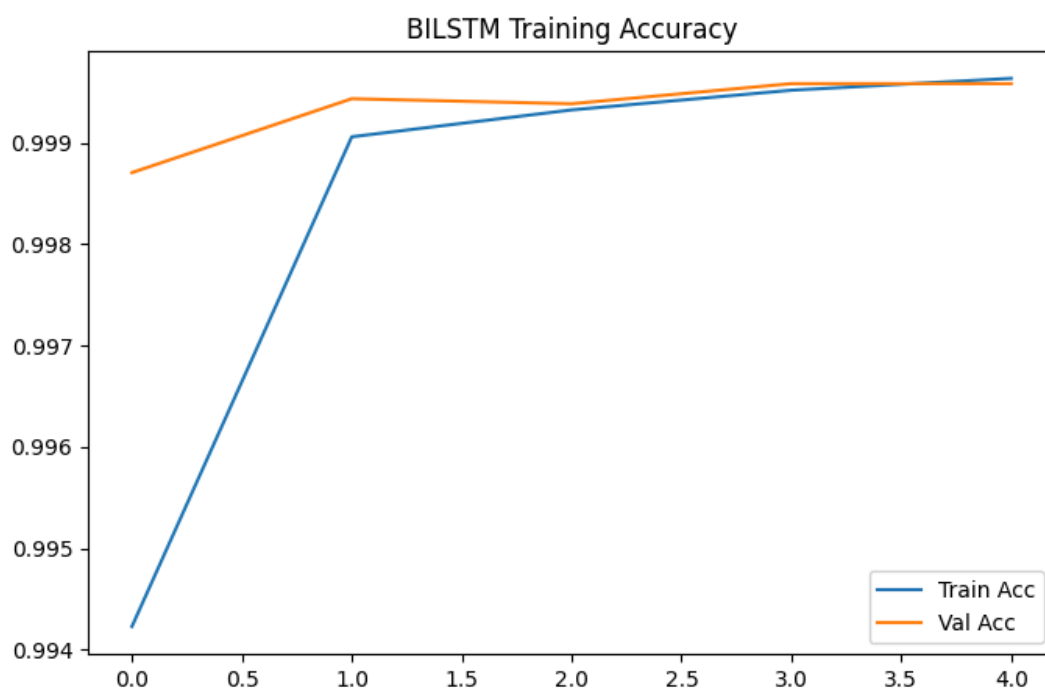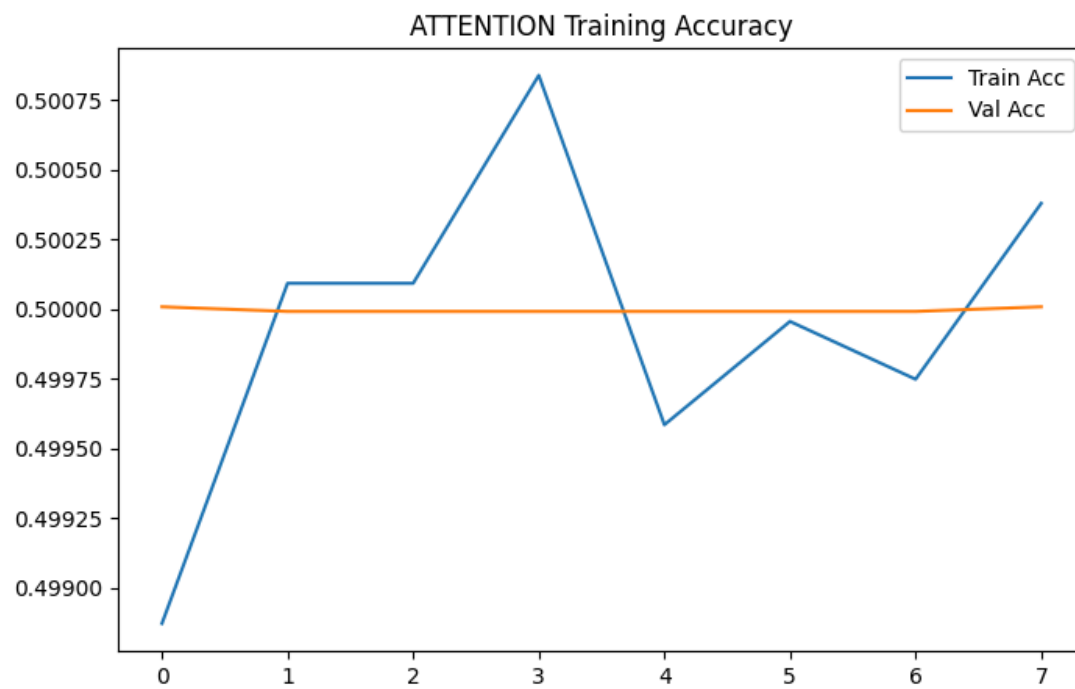Total Clauses: ~510,000 entries across multiple clause categories.
After pairing:
- Training Pairs: 452,642
- Validation Pairs: 60,353
- Test Pairs: 90,529

Each pair labeled as:
- 1 → Similar (same clause type)
- 0 → Not Similar (different clause type)

Training Graphs

ATTENTION Training Accuracy

BILSTM Training Accuracy

Performance Measures

Metric	BiLSTM	Attention Encoder
Accuracy	0.99	0.50
Precision	0.99	0.52
Recall	0.99	0.51
F1-Score	0.99	0.50
ROC-AUC	0.99	0.50
Training Time (10 epochs)	~ 30 min	~ 20 min