

NSP Based Sentence Coherence Checker

By
Sudip Das

Objective

Writing coherent sentences can be challenging for children and English learners.



NSP helps provide feedback on sentence flow




Project Architecture

- Extract dataset: WikiParagraphs (coherent vs. incoherent)
- Fine-tune BERT for Next Sentence Prediction
- Prompting-based NSP (zero-shot & few-shot)
- Retrieval-Augmented NSP (RAG)
- Tiered integration with confidence fallbacks

Extract & Sample Dataset

WikiParagraphs dataset.
(50% coherent/incoherent)



Original size 25M train,
3M val, 3M test



Sampled 70k train, 15k val,
15k test



Fine-tune BERT NSP

Setup and hyperparameters:

- Model: bert-base-uncased
- LR: 2e-5, Epoch 1, Weight decay: 0.01

Results

- Test Accuracy: 0.7113
- Test Precision: 0.7124
- Test Recall: 0.7074
- Test F1 Score: 0.7099

Prompting- Based NSP

Model used: Flan-T5-base

Standard Prompt:

Accuracy: 0.51,
Precision: 0.4878,
Recall: 0.4167, F1: 0.44

Few-Shot Prompt:

Accuracy: 0.56,
Precision: 0.5476,
Recall: 0.4792, F1: 0.51

RAG Based NSP



Text extracted from Wikipedia using Wiki Text Extractor



Split into sentences to form coherent and incoherent pairs



Sentence encoder using all-MiniLM-L6-v2



FAISS index built on encoded sentences



Sample test accuracy: 56.0%, F1: 45%

Combined NSP Approach

- Combining the 3 approaches is not practical due to different functionalities
- Fallback logic based on confidence:
 - Tier 1: Fine-tuned NSP with confidence ≥ 0.8
 - Tier 2: Few shot prompt using FLAN-T5-Large

RAG based approach skipped due to no definitive context for Wiki paragraph dataset

Model Results

Accuracy: 63.33%, Precision: 73.73%,
Recall: 41.26%, F1: 52.91%

Example

Sentence A: The dog chased the ball into the yard.

Sentence B: It brought the ball back to its owner.

Prediction : coherent

Chosen tier: Fine-tuned NSP (confidence=0.873)

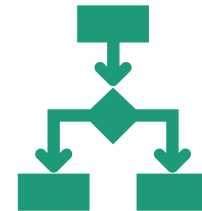
User Interaction Demo

- Simple input cell allows users to type two sentences and check coherence

Example: `input()` → `combined_predict` → prints verdict (Coherent vs Incoherent)

Ideal for children & beginner English learners

Can be added to a website or educational application



Thank You!