

Natural Language Processing - Assignment 2

December 26, 2025

1 Question 5: Sentiment Analysis

1.1 Part (a) - T5 Paper Research

1.1.1 GitHub Repository

The GitHub repository for the T5 project is:

`https://github.com/google-research/text-to-text-transfer-transformer`

Source: T5 Paper, page 1, footnote 1.

1.1.2 Models Made Publicly Available

The authors released five pre-trained T5 model variants with different sizes:

- **T5-Small:** 60 million parameters
- **T5-Base:** 220 million parameters
- **T5-Large:** 770 million parameters
- **T5-3B:** 3 billion parameters
- **T5-11B:** 11 billion parameters

Source: GitHub README.md, section “Released Model Checkpoints”.

1.1.3 Dataset for Sentiment Analysis Benchmark

The dataset used to benchmark sentiment analysis in the T5 paper is **SST-2 (Stanford Sentiment Treebank-2)**, which is part of the GLUE benchmark suite. SST-2 is a binary sentiment classification task.

Source: T5 Paper, Section 2.3 “Downstream Tasks”, GLUE benchmark description.

1.1.4 Evaluation Metric

The evaluation metric used for the sentiment analysis task (SST-2) is **Accuracy**. The model’s predictions are compared against the ground truth labels, and the percentage of correct predictions is reported.

Source: T5 Paper, Table 1 (results table), column header “SST-2: Acc”.

1.2 Part (b) - T5-Small Model Fine-tuned on SST2

1.2.1 Selected Model

The selected model for this assignment is:

`lightsout19/t5-sst2`

This model is a T5 variant that has been fine-tuned on the SST-2 dataset for sentiment classification.

Source: Hugging Face Model Hub - <https://huggingface.co/lightsout19/t5-sst2>

1.2.2 Model Details

- **Base Architecture:** T5 (Text-to-Text Transfer Transformer)
- **Fine-tuning Dataset:** SST-2 (Stanford Sentiment Treebank-2)
- **Task:** Binary sentiment classification
- **Framework:** Transformers library (PyTorch/TensorFlow compatible)
- **Usage:** Can be loaded using `AutoTokenizer` and `AutoModelForSequenceClassification`

1.2.3 Alternative Models Considered

During the model selection process, the following alternatives were also identified:

1. `hyyoka/t5-small-finetuned-sst2`: A T5-Small model (60.5M parameters) specifically fine-tuned on SST-2. This model exactly matches the T5-Small size specification.
2. `google/flan-t5-small`: An improved version of T5-Small (77M parameters) that has been instruction fine-tuned on 1000+ tasks. While not specifically fine-tuned on SST-2, FLAN-T5 shows improved performance across many NLP tasks including sentiment analysis.

Source: Hugging Face Model Hub searches for “t5-small sst2” and “flan-t5-small”.