**Title: T5 Model Documentation**

**Introduction:**

The Text-to-Text Transfer Transformer, commonly known as T5, is a powerful natural language processing (NLP) model developed by Google Research. This documentation aims to provide a comprehensive understanding of the T5 model, its architecture, applications, and how to use it for various tasks.

**1. Overview**

T5 is a transformer-based model that approaches all NLP tasks as text-to-text problems. Unlike traditional models, T5 frames input and output for various tasks as sequences of text, allowing for a unified and flexible approach.

**2. T5 model Structure**

**. T5 Model Variants**

There are 5 T5 variants with varying parameters and model sizes.

1. **Base:** Comparable to that of BERT\_base. It is a baseline model with 222 million parameters.
2. **Small:** It is a scaled-down version of the Base model. It only has 60 million parameters with only 6 layers of encoders and decoders.
3. **Large:** Scaled-up version of the base with 770 million parameters.
4. **3B:** Scaled up version of the base with 3 Billion parameters.
5. **11B:** Scaled up version of the base with 11 Billion parameters.

**3. Applications**

T5 has demonstrated exceptional performance across various applications:

**3.1 Text Summarization**

Text Summarization is the NLP task in which a model, given a long text sequence, produces a summarized version of the input. Since I'm a huge fan of One Piece manga, so we will be summarizing a sequence from a One Piece Wikipedia article.

For summarizing we need to add the “summarize:” prefix to the input sequence.

**3.2 Language Translation**

Language Translation is the NLP task in which a model, given a text in one language, produces translated version of the same text in another language. The T5 model was trained on the C4 dataset, which contains the following languages: English, German, French, and Romanian.

Using T5, we can translate between these languages.

Below we are going to translate from English to French. For translation, we need to add the “translate English to French: ” prefix to the input sequence.

Our prompt: “translate English to French: You should definitely watch 'One Piece', it is so good, you will love the comic book.”

**3.3 Text Classification: Textual Entailment**

Textual Entailment is a NLP task in which a model is given two sentences, one being the premise and the other being hypothesis. Based on these two sentences, the output is classified into three classes: entailment, contradiction, and neutral.

For textual entailment, we need to add “mnli premise: ” and “hypothesis: ” to the sentence pairs.

Our prompt: “mnli premise: I love One Piece. hypothesis: My feelings towards One Piece are filled with love.”

**3.4 Linguistic Acceptability**

Linguistic Acceptability is an NLP task in which a model, given a text prompt checks if the sentence is grammatically correct.

For linguistic acceptability, we need to add “cola sentence: ” to the sentence. COLA is the dataset that contains sentences mapped to their acceptability.

Our prompt: “cola sentence: Luffy is a great pirate.”

**3.5 Sentence Similarity**

Sentence similarity is an NLP task in which a model, given two sentence pairs would rate their similarity on a 1 - 5 scale. The output is considered a string value and is found to be incremented by 0.2. This means we can consider this as a text classification task with 21 classes: 1.0, 1.2, … 5.0.

For sentence similarity, we need to add “stsb sentence 1: ” and “sentence 2: ” to the sentence pairs.

