

# Next utterance prediction for mental health counseling

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## Abstract

This project works on next utterance prediction for mental health counseling dialogue using transformer models. The aim is to produce empathetic, contextually relevant replies provided a conversation history between patient and therapist. The system will be trained on counseling conversations and tested based on BLEU and BERTScore. The method involves preprocessing data, fine-tuning models such as GPT or BART, and maximizing fluency and relevance.

## 1 Introduction

Conversational modeling has made a significant progress with development of large pre-trained language models. Yet, using such models in sensitive fields such as mental health counseling poses distinct difficulties. This activity not only requires comprehension of the context and purpose of earlier statements but also makes it important to generate responses that are empathetic as well as contextually relevant. The aim of this project is to contribute to smart dialogue agents for assisting therapists or creating scalable mental health support tools.

## 2 Problem Definition

The objective of this project is to create a system able to predict the next utterance in a mental health counseling session. For a dialogue history between a patient (P) and a therapist (T), the system should produce the next suitable response that continues the dialogue in such a way that it is empathetic and contextual in accordance with the previous conversation.

The problem statement requires that the model should be capable enough to learn the conversation context, identify the roles and the emotional tone of the conversations. Performance is to be evaluated based on the BLEU and BERTScore metrics.

## 3 High Level Plan

- Data Preprocessing:** Load and clean the data set as per the instructions provided. Tokenization and sequence padding will be performed.
- Model Selection:** Choosing some generative transformer-based model to generate the next utterance of the conversation.
- Training and Fine-Tuning:** Train the selected model on the dataset, with different training parameters.
- Evaluation:** Model performance will be evaluated using some metrics scores to measure fluency and contextual relevance.
- Optimization:** Fine-tune hyperparameters to improve model accuracy.

## 4 Approach

- Dataset Preparation:** Tokenization according to model, handling missing values, and sequence padding to ensure compatibility with the model.
- Model Selection, Implementation and Training:** Transformer-based models like GPT, BART or other Encoder-Decoder structures, fine-tuned specifically for next-utterance generation.
- Additional Layer:** applying an additional layer of summarization that summarizes the previous context to form a new context for better and concise prediction.
- Evaluation, optimization and Finetuning:** BLEU and BERT scores will be used to evaluate the output fluency and contextual appropriateness. Hyperparameter tuning will be performed using grid search or Bayesian optimization to improve model performance.