



CSE556: Natural Language Processing Project Final-Evaluation

Mental Health Counselling Summarization

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Introduction

- Rising mental health awareness has increased demand for effective counselling services.
- Counselling dialogues are complex: Include emotional expressions, therapeutic interventions, and reflective insights.
- Summarizing these conversations is challenging due to the need to preserve context and subtlety.

Objective: Summarize counselling conversations effectively.

Motivation:

- ❑ Help professionals quickly understand core content.
- ❑ Reduce cognitive load.
- ❑ Enhance documentation and analysis efficiency.

Related Works

- Dialogue summarization is complex due to:
 - Frequent topic shifts, role-specific utterances, and non-informative fillers.
- **Domain-specific approaches** are emerging to tackle these challenges.
- **Srivastava et al. (2022):**
 - Use mental health knowledge to filter irrelevant content.
 - Focus on clinically meaningful, therapeutic utterances.
- Other studies consider discourse structure, speaker roles, and context embeddings.
- Most models (e.g., T5) treat all utterances equally, **ignoring emotional nuances**.

Our contribution

Incorporate emotional salience to guide content selection and summary generation.

Methodology

Method 1

- **Two-stage process:**
 - **Emotion Tagging:**
 - Use a pre-trained emotion recognition model.
 - Assign emotion tags to each utterance.
 - **Emotion-Conditioned Summarization:**
 - Fine-tune T5/Pegasus on emotion-annotated data.
 - Model learns to associate emotional cues with text.
- **Goal:**
 - Generate summaries that are factually accurate **and** emotionally aware.
 - Enhance relevance, coherence, and human-like quality.

Method 2

- **Multi-dataset fine-tuning approach:**
 - Fine-tune **T5 on GoEmotions** → understand emotional context.
 - Fine-tune **T5 on DialogSum** → learn conversational summarization.
- **Final fine-tuning on MEMO dataset** for domain-specific performance.
- **Low-Rank Adaptation (LoRA):**
 - Used for efficient training on large datasets.
 - Additional LoRA layer added during MEMO fine-tuning for adaptation.
- **Goal:**
 - Build a summarization model that captures **emotional subtext** in dialogues.
 - Enhance expressive, emotionally-aware summaries with efficient training.

Datasets

MEMO Dataset

- 12,900 utterances from 212 **counselling conversations**.
- Each utterance includes:
 - Subtopic (e.g., symptoms, reflecting), speaker type, ID, and emotion (empty).
- Contains **utterances, summaries, primary & secondary topics**.
- Helps identify fillers via subtopics like "inactive" or "patient discovery".

DialogSum

- 13,460 dialogues with human-written summaries & topics.
- Covers **everyday life dialogues** (e.g., shopping, work, school, travel).
- Includes various speakers: friends, customers, service providers, etc.

GoEmotions (Google AI)

- 58,009 **Reddit comments** labeled with emotions.
- 27 emotion categories:
 - 12 positive, 11 negative, 4 ambiguous, 1 neutral.
- Emotion labels include: joy, fear, curiosity, sadness, gratitude, etc.
- Designed for fine-grained emotional analysis.

Results

Model	BLEU4 score	BERT score
T5-baseline	12.20	79.41
Pegasus-baseline	11.39	79.81
T5-emo	0.30	79.71
Pegasus-emo	5.57	86.90
T5-LoRA	0.33	79.78

Generated Summaries

Original summary: The patient's emotional inventory of stress, worry and anxiety is rated three by the patient. The patient feels slightly better than before. The therapist suggests two tasks. One is to give a self talk in the morning when the automatic clock comes up, and next is to note down the automatic thoughts like feelings of anxiety when it occurs in the day. The therapist suggests to maintain a journal so that they can work on the patient's adaptive responses. The therapist assures to set up an appointment for next week and assures patient of their strong ability to overcome this.

Generated summary: The patient is asked to take a emotional inventory of their stress and worry and anxiety. The patient stated that they are less anxious now than they were before but they are still suffering. The therapist requests the patient to apply a self talk in the morning to practice what they are doing. The patient did not find the automatic thoughts to be very helpful. So they are trying to cultivate an awareness in the day when they are having these thoughts. The patient identifies if they are going to do something unpleasant, they might feel the need to do something drastic. The patient further adds that they don't like the feeling of

Figure 1: Pegasus with emotional aspect

Generated Summaries

Original summary: The patient has not been coping well since they have just broken up with their boyfriend. The patient feels there is something wrong with them hence they get rejected. They are not able to sleep or eat. The therapist assures it is gonna be fine in the long term as the patient needs for assurance.

Generated summary: Therapist tells Patient about the problems her boyfriend broke up with and she's hurt. She feels like there's something really wrong with her because people don't just reject her all the time. Therapist also thinks it's important to talk about other stuff that went on during the week other than the breakup.

LoRA with emotional aspects

Original summary: The therapist examines the abdomen and other parts of the body. The therapist pulls down the eyelids and checks for anemia, then for scar signs. The therapist requests to perform shifting dullness test, full lymph retinopathy screen including accelerate and inguinal lymph nodes.

Generated summary: The therapist will examine the patient's abdomen and other parts of body. The patient is asked to take some deep breaths to check for any scars. The patient has completed their examination by performing a shifting dullness test. The therapist also checks for a full lymph retinopathy screen.

T5 with emotional aspects

Insights & Future Directions

- **Emotion Integration Challenges:** Incorporating emotion tags into models like T5 and Pegasus presented challenges; T5-emo showed reduced BLEU4 scores, indicating that naive integration can disrupt summarization capabilities.
- **Model Performance:** Pegasus-emo demonstrated improved BERTScore, suggesting better semantic alignment with reference summaries.
- **LoRA Fine-Tuning:** T5-LoRA did not show significant improvements, highlighting potential limitations in this fine-tuning approach for the specific application.
- **Data Annotation Gaps:** The absence of pre-annotated emotion labels in the MEMO dataset necessitated the use of external emotion recognition models, introducing potential inaccuracies.

Future Work:

Focus on advanced emotion integration techniques, enhancing datasets with emotion annotations, exploring different model architectures, developing real-world applications, and addressing ethical considerations in AI-driven mental health tools.