## College of Artificial Intelligence (El Alamein)

# PROJECT EMPATHY-GPT: Emotionally Aware Dialogue Agent for Mental Health Support Using Multilingual Emotion Recognition + Memory-Augmented Chatbot .

*Natural Language Processing (IN321): Final Project Proposal*

**Name: Sarah walid Mohamed Sabry**

**Registration number:221000282**

Feb 2024

## 1. Project Description:

This project introduces EMPATHY-GPT, a multilingual, emotionally intelligent chatbot designed for mental health support scenarios. The system integrates advanced NLP techniques such as multilingual emotion detection, memory-augmented dialogue, and empathetic response generation. The chatbot will understand user emotions in both English and Arabic, track emotional progression through the conversation, and generate emotionally aware responses. It also includes features like sarcasm and emoji understanding, voice input, and guided support suggestions like calm mode prompts. A dynamic GUI will allow users to interact seamlessly through text or voice, and visualize emotion trends and empathy scores, making the chatbot not only functional but truly engaging.

## 2. Problem Statement:

Most current chatbots lack emotional intelligence and fail to adapt responses based on user mental state, which is especially problematic in emotionally sensitive contexts like mental health. Additionally, existing models are often monolingual, forget previous interactions, and struggle with real-time emotion recognition from complex inputs (e.g., sarcasm, emojis, tone of voice). EMPATHY-GPT aims to bridge these gaps by:

- Accurately detecting emotions across English and Arabic texts.
- Recognizing and handling sarcastic or emoji-rich text.
- Tracking emotional states across conversation turns.
- Responding empathetically, with optional calm-mode support.
- Offering a real-time, user-friendly interface with visual emotional feedback.

## 3. Methodology:

- **Emotion Detection**: Fine-tune XLM-RoBERTa on GoEmotions (English) and ArSEL (Arabic) for multilingual emotion classification.
- **Sarcasm & Emoji Handling**: Use pretrained models (e.g., Twitter-RoBERTa) to interpret tone and emojis.
- **Dialogue Memory**: Implement a lightweight memory module to store recent emotion states and conversation history.
- **Response Generation**: Use DialoGPT or fine-tuned GPT-2 with context tracking for coherent, emotion-aware replies.
- **Voice-to-Text Input**: Integrate OpenAI Whisper for optional spoken input and tone analysis.
- **Empathy Scoring**: Apply a hybrid model (lexicon-based + ML) to classify response empathy level.
- **GUI Development**: Use Streamlit to build an interactive web app with:
    - Text + voice input options
    - Real-time chat
    - Mood timeline visualization
    - Empathy score display
    - Calm mode activator (guided breathing or journaling prompts)

## 4. Data:

- **GoEmotions** (58k English samples, 27 emotion labels)
- **ArSEL** or similar Arabic emotion corpora
- **EmpatheticDialogues** and **DailyDialog** for training response models
- Optional: Sarcasm detection corpora and emoji-enriched social media datasets
- **Preprocessing**: Tokenization, lemmatization, emoji normalization, bilingual alignment, and embedding harmonization

## 5. Evaluation Metrics:

- **Emotion Detection**: Accuracy, F1-score, Precision, Recall
- **Dialogue Generation**: BLEU, ROUGE, Human Evaluation
- **Empathy Score**: Model-based score vs. human empathy rating

## 6. Expected Results:

- Functional bilingual chatbot with real-time emotion-aware replies
- GUI interface with voice and text input, emotion charting, and empathy visualization
- High performance in emotion recognition and empathetic dialogue metrics
- Practical value for mental health support and language-inclusive chatbot design

## 7. References:


- Demszky et al., "GoEmotions: A Dataset of Fine-Grained Emotions"
- Zhang et al., "DialoGPT: Large-Scale Generative Pre-training for Conversational Response Generation"
- ArSEL Dataset (Arabic Sentiment and Emotion Lexicon)
- OpenAI Whisper API
- HuggingFace Transformers Library
- https://huggingface.co/datasets/empathetic_dialogues
- https://github.com/JustAnotherArchivist/snscrape