Final Year Project Title

### Project Proposal

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## Supervisor

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[25-12-2024]

**Project Registration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Project ID (for office use) | | |  | | | | |
| Type of project | | | [ ] Traditional [ ] Industrial | | | | |
| Nature of project | | | [ ] **D**evelopment [ ] **R**&**D** | | | | |
| Area of specialization | | |  | | | | |
| **Project Group Members** | | | | | | | |
| Sr.# | Reg. # | Student Name | | CGPA | Email ID | Phone # | Signature |
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| **Declaration:** FYP group members have cleared all prerequisite courses For FYP-I as per their degree requirements. | | | | | | | |

# Plagiarism Free Certificate

This is to certify that, I am \_\_\_\_\_\_\_\_\_ S/D/o \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, group leader of FYP under registration no \_\_\_\_\_\_\_\_\_\_\_\_ at the Computer Science Department, Karakoram International University Gilgit Baltistan. I declare that my supervisor checked my FYP proposal and the similarity index is \_\_\_\_\_\_\_\_% that is less than 20%, an acceptable limit by HEC. The report is attached herewith as Appendix A.

Date: \_\_\_\_\_\_\_\_\_\_\_\_ Name of Group Leader: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_

Name of Supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Co-Supervisor (if any):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Designation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Designation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Project Abstract**

# This project aims to develop an AI-powered mental health chatbot using Google Colab. The chatbot will be trained on a dataset of conversations related to mental health, encompassing basic exchanges, frequently asked questions, classical therapy discussions, and general advice for anxiety and depression. By leveraging Natural Language Processing (NLP) techniques, including intent recognition and response generation, the chatbot will understand user input and provide empathetic and relevant responses. The project will utilize machine learning models, such as Support Vector Machines (SVMs) or deep learning architectures, for intent prediction. Google Colab's computational resources, including GPUs, will facilitate efficient model training and deployment. The developed chatbot has the potential to offer accessible and convenient mental health support to individuals, serving as a virtual companion for emotional guidance and alleviating the burdens faced by those seeking assistance.

# **Introduction**

Building chatbots capable of providing emotional support to individuals experiencing anxiety and depression has become a key focus in the field of artificial intelligence. A crucial component in developing such chatbots is a well-structured dataset, which serves as the foundation for training models to comprehend and respond empathetically to user messages.

The dataset available here is a comprehensive collection of conversations related to mental health. It encompasses various conversation types, including basic exchanges, frequently asked questions about mental health, classical therapy discussions, and general advice given to individuals facing anxiety and depression. The primary objective of this dataset is to facilitate the training of a chatbot model that emulates a therapist, capable of providing empathetic and supportive responses to those seeking emotional solace.

To train the model effectively, the dataset incorporates the concept of "intents." Each intent represents the underlying purpose behind a user's message. For example, if a user expresses sadness, the associated intent would be "sad." Each intent is accompanied by a set of patterns, which are example messages aligning with the specific intent, as well as corresponding responses that the chatbot should generate based on that intent. Through defining multiple intents and their respective patterns and responses, the model learns to identify user intents and generate relevant and compassionate replies.

By utilizing this dataset, researchers and developers can train chatbot models to better understand and support individuals coping with anxiety and depression. The goal is to create a virtual conversational agent that can offer emotional guidance, provide helpful insights, and alleviate some of the challenges faced by those seeking mental health support.

### ****Problem Statement****

The increasing prevalence of mental health issues, such as anxiety and depression, poses a significant challenge to global well-being. Traditional mental health services often face limitations in addressing this growing need. Long wait times for appointments, high costs of therapy, and geographical barriers restrict access to timely and affordable support for many individuals. Furthermore, societal stigma surrounding mental health can deter individuals from seeking help, leading to delayed or inadequate treatment.

This lack of accessible and convenient mental health support contributes to a range of negative consequences, including decreased productivity, strained relationships, and a higher risk of suicide. There is a pressing need for innovative solutions that can bridge this gap and provide timely and effective support for individuals experiencing mental health challenges.

**Aims and Objectives**

#### ****Aims:****

#### The primary aim of this project is to develop an AI-powered mental health chatbot that provides accessible and convenient support for individuals experiencing anxiety and depression. The chatbot will serve as a virtual companion, offering emotional guidance, answering frequently asked questions, and providing general advice.

#### ****Objectives:****

1. **Develop a robust intent recognition system:** The chatbot will be trained to accurately identify user intents, such as expressing sadness, seeking advice, or asking questions about mental health.
2. **Implement an empathetic response generation mechanism:** The chatbot will generate appropriate and empathetic responses based on the predicted user intent. Responses will be tailored to provide support, guidance, and relevant information.
3. **Integrate the chatbot with Google Colab:** Leverage Google Colab's computational resources and machine learning tools for efficient model training and deployment.
4. **Evaluate the chatbot's performance:** Assess the accuracy of intent recognition, the quality of responses, and user satisfaction through testing and feedback.
5. **Ensure user privacy and data security:** Implement measures to protect user data and maintain confidentiality.

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**Scope of the Project**

This project focuses on:

**Developing an AI-powered mental health chatbot**

**Intent recognition and response generation**

**Utilizing a pre-existing mental health conversation dataset**

**Leveraging Google Colab for development and deployment**

**Focusing on anxiety and depression**

**Basic emotional support and information provision**

**Evaluation through testing and feedback**

### ****Methodology****

This project will follow a structured methodology encompassing the following phases:

**1. Data Collection and Preprocessing:**

* **Dataset Acquisition:** Utilize a publicly available mental health conversation dataset, such as the one you have already identified.
* **Data Cleaning:** Preprocess the dataset by removing irrelevant information, handling missing values, and converting text to lowercase.
* **Intent and Entity Annotation:** If necessary, annotate the dataset with user intents and entities (e.g., emotions, topics) to train the chatbot's understanding.

**2. Intent Recognition Model Development:**

* **Feature Extraction:** Transform text data into numerical representations using techniques like TF-IDF or word embeddings (e.g., Word2Vec, GloVe).
* **Model Selection:** Choose a suitable machine learning or deep learning model for intent classification (e.g., SVM, Random Forest, BERT).
* **Model Training and Evaluation:** Train the selected model on the annotated dataset and evaluate its performance using metrics like accuracy, precision, recall, and F1-score.

**3. Response Generation:**

* **Rule-based or Retrieval-based Approach:** Implement a system for generating responses based on predefined rules or retrieving relevant responses from a knowledge base.
* **Template-based Responses:** Create templates for different intents and fill them with dynamic content based on user input.
* **Generative Models:** Explore the use of generative models (e.g., sequence-to-sequence models) for generating more natural and diverse responses.

**4. Chatbot Integration and Deployment:**

* **Google Colab Integration:** Integrate the trained intent recognition and response generation modules within a Google Colab notebook.
* **User Interface Development:** Create a simple user interface for interacting with the chatbot within Google Colab.
* **Testing and Refinement:** Conduct thorough testing to ensure the chatbot's functionality and responsiveness. Gather feedback from users and make iterative improvements.

**5. Evaluation and Reporting:**

* **Performance Evaluation:** Evaluate the chatbot's performance using metrics and user feedback.
* **Usability Testing:** Assess the chatbot's ease of use and user satisfaction.
* **Reporting:** Document the project's methodology, results, and conclusions in a comprehensive report.

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### Individual Tasks

### ****Timeline****

|  |  |  |
| --- | --- | --- |
| **Phase** | **Duration** | **Activities** |
| Project Planning | Week 1 | Literature review, requirement analysis |
| Data Collection | Weeks 2-3 | Sourcing and preprocessing data |
| Model Development | Weeks 4-6 | Training and optimizing machine learning models |
| Model Evaluation | Week 7 | Testing and validating models |
| Application Design | Weeks 8-9 | Creating a user-friendly interface |
| Final Report | Week 10 | Documenting results and preparing presentation |

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| --- | --- | --- |
| **Team Member** | **Activity** | **Tentative Date** |
| Nisar Ahmad | Literature review, requirement analysis | Month 1, Week 1 |
|  | Data collection and preprocessing | Month 1, Week 2 |
| Nisar Ahmad | Feature selection, initial model setup | Month 1, Week 3 |
|  | Training machine learning models | Month 2, Week 1 |
| Nisar Ahmad | Model optimization and testing | Month 2, Week 2 |
|  | |  |  | | --- | --- | |  | Application design and interface setup | | |  |  | | --- | --- | |  | Month 3, Week 1 | |
| Nisar Ahmad | Model evaluation | Month 3, Week 2 |
|  | Final report preparation | Month 3, Week 3 |

# **Gantt Chart**

Here’s an overview of the tasks with their duration and dependencies:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Task** | **Team member** | **Start date** | **End date** | **duration** | **dependencies** |
| Literature Review, Requirement Analysis | Nisar Ahmad | Month 1, Week 1 | Month 1, Week 1 | 1 Week | None |
| Data Collection and Preprocessing |  | Month 1, Week 2 | Month 1, Week 3 | 2 Weeks | Literature Review, Requirement Analysis |
| Feature Selection, Initial Model Setup | Nisar Ahmad | Month 1, Week 3 | Month 2, Week 1 | 2 Weeks | Data Collection and Preprocessing |
| Training Machine Learning Models |  | Month 2, Week 1 | Month 2, Week 2 | 1 Week | Feature Selection, Initial Model Setup |
| Model Optimization and Testing | Nisar Ahmad | Month 2, Week 2 | Month 2, Week 3 | 1 Week | Training Machine Learning Models |
| Application Design and Interface Setup |  | Month 3, Week 1 | Month 3, Week 2 | 2 Weeks | Model Optimization and Testing |
| Model Evaluation | Nisar Ahmad | Month 3, Week 2 | Month 3, Week 3 | 1 Week | Application Design and Interface Setup |
| Final Report Preparation |  | Month 3, Week 4 | Month 4, Week 1 | 2 Weeks | Model Evaluation |

### ****Expected Outcomes****

1. **Functional AI-powered mental health chatbot.**
2. **Accurate intent recognition**.
3. **Empathetic and informative responses.**
4. **Improved access to mental health support.**
5. **Increased awareness and understanding of mental health.**
6. **Valuable learning experience.**
7. **Potential for future development.**

### ****Tools and Technologies****

* **Programming Languages:** Python
* **Google Colab**
* **Natural Language Toolkit (NLTK)**
* **Libraries/Frameworks:** Scikit-learn, Pandas, NumPy, Matplotlib, Seaborn
* **TensorFlow or PyTorch**
* **Rasa or Dialogflow (optional)**

### ****Conclusion****

In conclusion, the availability of a well-structured dataset encompassing various conversations related to mental health provides a valuable resource for training chatbot models to offer emotional support to individuals dealing with anxiety and depression. By utilizing intents, patterns, and responses, the models can learn to understand user messages and generate empathetic and relevant replies.

The use of such models in chatbot frameworks holds great potential for providing accessible and compassionate support to those in need of mental health assistance. By simulating the behavior of a therapist, these chatbots can offer guidance, answer frequently asked questions, and provide general advice to individuals experiencing anxiety and depression.

By leveraging the insights and knowledge gained from this dataset, researchers and developers can contribute to the development of chatbots that serve as virtual companions, offering emotional solace and alleviating some of the burdens faced by individuals seeking mental health support.

Overall, the dataset and the subsequent training of chatbot models enable the creation of innovative tools that bridge the gap in mental health care, providing individuals with a readily available resource for emotional support and guidance.