**[Introduction] (0:00 - 2:00)**

**Introduction:** Hello everyone, my name is Deepit Amin, a Bachelor student in Computer Science Engineering at Manipal University Dubai. Today, I am thrilled to share with you a groundbreaking project aimed at revolutionizing the way we detect and understand depression using advanced AI technologies.

**[The Problem: Understanding Lucy's Struggle] (2:00 - 4:00)**

**Story of Lucy:** Meet Lucy, a 24-year-old woman who has been feeling increasingly disconnected from her daily life. She experiences trouble sleeping, persistent low energy, and finds little joy in activities she once loved. Despite these struggles, Lucy is hesitant to seek help, fearing judgment and unsure if her feelings are severe enough to warrant professional attention.

**(Diagram 1: Common Symptoms of Depression)**

**The Challenge:** Lucy’s story is not unique. Many individuals suffer in silence, unsure about their mental health and fearful of the stigma surrounding it. Current methods for detecting depression often rely on self-reported symptoms, which can be subjective and unreliable.

**[Why Psych AI is Needed] (4:00 - 5:00)**

**The Need:** To help people like Amy, we need a better way to spot signs of depression. Using AI to look at facial expressions, voice tones, and body language might be a more accurate and less intimidating way to understand if someone needs support. This could make it easier for people to get help get early signs and reduce the stigma around mental health and can be used in a clinical setting

**Depression is a pervasive mental health disorder, affecting over 264 million people globally, according to the World Health Organization (World Health Organization, 2023). Despite its prevalence, diagnosing depression remains challenging due to its subjective nature and reliance on self-reported symptoms, which can often be inaccurate or incomplete. Traditional methods of diagnosis, such as clinical interviews and standardized questionnaires, are limited by their dependence on the patient's ability to articulate their emotions and the clinician's subjective interpretation.**

**Lets see how I tend to approach this**

**[Methodology: The Multimodal Approach] (5:00 - 7:00)**

**Data Collection:**

1. **Audio Data:** Captures voice tonality, pitch, and speech patterns during therapy sessions.
2. **Visual Data:** Records facial expressions and body language through video.
3. **Text Data:** Transcripts of therapy sessions are obtained via speech-to-text algorithms.

**Data Processing: (Demo on each Process)**

1. **Audio Processing:** We use Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks to analyze audio features. RNNs are ideal for sequential data like audio because they can maintain context over sequences. LSTMs improve upon RNNs by addressing the vanishing gradient problem, enabling the model to capture long-term dependencies and better understand speech patterns and emotions conveyed through voice.
2. **Visual Processing:** Convolutional Neural Networks (CNNs) are applied to process visual data, identifying facial expressions and body language. CNNs are highly effective for image and video analysis because they can automatically and adaptively learn spatial hierarchies of features. This capability is crucial for recognizing subtle changes in facial expressions and body movements that may indicate depression.
3. **Text Processing:** Transformer-based architectures and Natural Language Processing (NLP) techniques are utilized for text analysis. Transformers, such as BERT and GPT, excel at understanding context and meaning in text, making them perfect for analyzing therapy session transcripts. They can identify linguistic patterns and emotional cues, contributing to a comprehensive assessment of the patient’s mental state. (Diagram 3: Data Collection and Processing Pipeline)

**(Diagram 3: Data Collection and Processing Pipeline)**

**[Creating the Database and Integration] (10:00 - 12:00)**

**Data Fusion and Feature Extraction:**

* Integrate audio, visual, and text data into a comprehensive model.
* Extract significant features correlating with depressive symptoms.
* Use transformers to convert the data into vectors stored in a vector database.
* Formulate query translations to create a hypothetical document for better assessments.

**Example Architecture:**

* Display a block diagram illustrating the flow from data collection to prediction.

**(Diagram 7: Integrated Data Fusion Architecture)**

**Results:**

The integrated multimodal AI model for depression assessment, combining facial expression analysis, voice tonality analysis, body language analysis, and textual information analysis, was evaluated on a comprehensive dataset of [number of participants]. The results demonstrate a significant improvement in accuracy and reliability compared to individual models.

**Analysis of Imperfect Accuracy and the Need for Improvement**

**Complexity of Depression:** Depression is a complex and heterogeneous condition with varying manifestations. Capturing the full spectrum of depressive symptoms through multimodal data remains a challenge.

**Individual Variability:** Individuals express emotions and behaviors differently, even within the context of depression. This variability can introduce noise and ambiguity in the data, hindering perfect accuracy.

**Data Limitations:** The available datasets may not fully represent the diversity of realworld depression cases. Limited data on underrepresented populations can lead to biases and inaccuracies in the model's predictions.

**[Applications and Use Cases] (12:00 - 14:00)**

**Clinical Settings:**

* AI can assist therapists in making more informed diagnoses.
* Use in telehealth to provide remote support.

**Early Detection:**

* Schools and workplaces can implement this for early intervention.
* Self-assessment tools for individuals.

**Research and Data Analysis:**

* Enhanced research capabilities with comprehensive data sets.

**[Future Directions and Impact] (14:00 - 15:00)**

**Future Directions:**

* Improving model accuracy with continuous learning.
* Personalized models for individual differences.
* Real-time monitoring and integration with wearable technology.
* As well as chatbot for the patient to interact with an AI such that it can gather data and be more precise with its analysis

**AI Assistant for Therapists:**

* Develop an AI tool that can assess therapy sessions in real-time.
* Provide feedback and suggestions to therapists.
* Allow patients to interact with an AI companion between sessions to gather more data and offer support.

**Data Privacy and Security:** Ensuring the privacy and security of sensitive data is crucial, especially when dealing with mental health information. Researchers must implement robust data protection measures and obtain informed consent from participants.

**Bias and Fairness:** AI models can be biased if trained on non-representative or skewed datasets. Ensuring that models are fair and unbiased across different populations is essential for ethical and accurate depression detection.

**Interpretable Models:** While AI models can achieve high accuracy, their decision-making processes are often opaque. Developing interpretable models that provide insights into how decisions are made can increase trust and acceptance among clinicians and patients.

**Real-World Application:** Translating research findings into practical clinical tools requires rigorous testing and validation. Ensuring that AI models perform well in real-world settings is crucial for their successful adoption in clinical practice.

**Impact:**

* Early detection and intervention can significantly improve mental health outcomes.
* Reduced stigma and increased awareness around mental health.
* Scalable solutions for broad application across various settings.

**Closing:** Thank you for your time.I aim to make mental health support more accessible, objective, and effective, helping countless individuals like Lucy live healthier, happier lives.