Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	1 December 2023
Team ID	591674
Project Name	**Predicting Mental Health Illness Of Working Professionals Using Machine Learning**
Maximum Marks	4 Marks

Introduction :

Project Overview: Predicting Mental Illness in Working Professionals using Machine Learning

Problem: Mental illness among working professionals is a significant concern with detrimental impacts on individual well-being and organizational productivity. Early identification and intervention are crucial for improved outcomes.

Solution: This project aims to develop a web-based platform that utilizes machine learning algorithms to predict mental illness risk in working professionals based on their online activity and self-reported information.

Technical Approach:

1. Data Collection: User data will be collected through the platform's interface, including self-reported questionnaires, social media activity, and wearables data (optional).
2. Data Pre-processing and Feature Engineering: User data will be pre-processed and transformed into features suitable for machine learning analysis. Feature engineering techniques like sentiment analysis and linguistic analysis will be employed.

3. Model Training and Deployment: Ensemble machine learning models, like Logistic Regression and Random Forest, will be trained on the extracted features to predict the risk of mental illness.
4. User Interface: A user-friendly web interface will be developed for professionals to access the platform, complete assessments, and receive personalized feedback on their mental health risk.

Expected Outcomes:

- Early Identification: The project aims to identify individuals at risk of mental illness early, allowing for timely intervention and support.
- Improved Awareness: The platform will raise awareness about mental health issues among working professionals and encourage individuals to seek help.
- Enhanced Productivity: Early detection and intervention can help improve individual and organizational productivity by reducing absenteeism and presenteeism.

Next Steps:

- Prototype Development: Develop a functional prototype of the platform with core functionalities.
- Evaluation and Testing: Conduct pilot studies with working professionals to evaluate the accuracy and effectiveness of the model.

Refinement and Deployment: Refine the platform and model based on feedback and pilot testing results. Deploy the platform for broader use by working professionals.

LITERATURE SURVEY

Objectives:

- Analyze existing research on mental illness prediction using machine learning.
- Identify relevant features and machine learning techniques used for prediction.

- Assess the accuracy and limitations of existing solutions.

Scope:

- Research papers published in the last 5 years focusing on predicting mental health in working professionals using machine learning.
- Focus on features derived from online activity, self-reported information, and wearable data.
- Include studies utilizing various machine learning algorithms and architectures.

Methodology:

1. Conduct a comprehensive literature search using academic databases (e.g., PubMed, Google Scholar) with relevant keywords.
2. Screen and select relevant research papers based on inclusion/exclusion criteria.
3. Analyze the selected papers to extract key information, including:
    - Data sources and features used
    - Machine learning algorithms employed
    - Prediction accuracy and performance metrics
    - Limitations and challenges identified
4. Synthesize the findings and identify common trends, gaps, and opportunities in existing research.

Expected Outcomes:

- A comprehensive understanding of existing research on mental illness prediction using machine learning.
- Identification of promising features and machine learning techniques for predicting mental health risk in working professionals.
- Critical insights into the strengths, weaknesses, and limitations of current approaches.

Diagram:

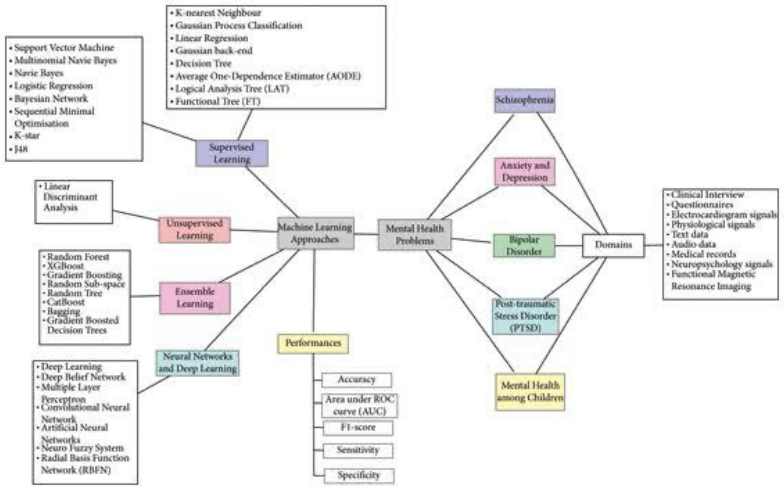

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI, Mobile App, Chatbot	HTML, CSS, JavaScript (React or Angular), React Native
2.	Application Logic-1	Pre-processing and cleaning of user data	Python libraries (e.g., pandas, scikit-learn)
3.	Application Logic-2	Feature engineering and extraction (e.g., sentiment analysis, linguistic features)	NLP libraries (e.g., spaCy, NLTK)
4.	Application Logic-3	Training and deployment of machine learning models for prediction	TensorFlow, PyTorch
5.	Database	Store user data, preferences, and historical information	MySQL or NoSQL (e.g., MongoDB)
6.	Cloud Database	Store and retrieve data from the cloud	AWS DynamoDB, Google Cloud Firestore, Azure

7.	File Storage	Store necessary files or documents securely	Cloud-based storage (e.g., AWS S3, Google Cloud
8.	External API-1	Integrate external services for additional data	Relevant APIs (e.g., mental health survey APIs)
9.	External API-2	Integrate external services for additional data	Aadhar API, etc.
10.	Machine Learning Model	Train a model on relevant features to predict mental health	Python, scikit-learn, TensorFlow, PyTorch
11.	Infrastructure (Server / Cloud)	Deploy on local servers or cloud	Local servers, AWS, Google Cloud, Azure, Docker, Kubernetes

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Utilize open-source frameworks for development	Django, Flask (backend), React, Angular (frontend)
2.	Security Implementations	Implement strong security measures.	Encryption (SSL/TLS), RBAC, Compliance standards.
3.	Scalable Architecture	Design for scalability (Microservices, Load balancing)	Microservices, Load balancing (Nginx)
S.No	**Characteristics**	**Description**	**Technology**
4.	Availability	Ensure high availability through redundancy and failover	Load balancers, Distributed server architecture
5.	Performance	Optimize for quick and reliable predictions	Caching mechanisms, CDN (Content Delivery Network)

IDEATION AND PROPOSED SOLUTION

Ideation Phase:

1. Brainstorming and Problem Analysis:
    - Identify the key challenges and pain points associated with predicting mental illness in working professionals.
    - Conduct brainstorming sessions to generate innovative ideas for solutions.
    - Evaluate potential solutions based on feasibility, effectiveness, and impact.
2. User Research and Requirements Gathering:
    - Conduct surveys and interviews with working professionals to understand their needs and expectations for a mental health prediction system.
    - Identify user personas and user stories to define the system's functionalities and features.
    - Prioritize features based on user needs and feasibility constraints.
3. Concept Development and Iteration:
    - Develop initial prototypes and mockups of the proposed solution.
    - Gather feedback from stakeholders and users to refine and iterate on the concept.
    - Define the overall system architecture and identify key technologies required.

Proposed Solution:

- Machine Learning-based Mental Health Prediction Platform:
    - Develop a web-based platform where working professionals can access mental health assessments and receive personalized feedback on their mental health risk.
    - Utilize machine learning models trained on data from online activity, self-reported information, and potentially wearable data to predict the risk of mental illness.

- Integrate with existing mental health resources and provide users with personalized recommendations for further support.

Key Features:

- Self-assessment tools and questionnaires
- Secure data storage and privacy protection
- Personalized risk assessment reports
- Educational resources and coping mechanisms
- Integration with external mental health services

Differentiation from Existing Solutions:

- Focus on working professionals and their specific needs
- Utilize multiple data sources for comprehensive risk assessment
- Employ advanced machine learning algorithms for high accuracy
- Offer personalized recommendations and support resources
- Prioritize user privacy and data security

Expected Benefits:

- Early identification of individuals at risk of mental illness
- Increased awareness and understanding of mental health
- Improved access to appropriate mental health services
- Enhanced well-being and productivity for working professionals