

# Project Report: Mental Health Prediction using Neural Networks

## 1. Introduction:

The project titled "Mental Health Prediction using Neural Networks" focuses on using machine learning, specifically a simple feed-forward neural network, to predict an individual's mental health status based on structured data such as survey responses or health records. This addresses a critical real-world problem, helping organizations and professionals intervene early in mental health issues.

## 2. Objective:

- Load and preprocess a real-world mental health dataset.
- Design a neural network using TensorFlow/Keras.
- Train the model using backpropagation.
- Evaluate the model using accuracy and loss curves.
- Tune hyperparameters like learning rate and batch size to improve performance.

## 3. Dataset Used:

We used a structured dataset consisting of responses from individuals regarding their workplace mental health. This includes attributes such as age, gender, work environment, family history, etc.

## 4. Steps Performed:

### Step 1: Data Loading and Preprocessing

- Loaded the dataset using pandas.
- Cleaned and encoded categorical variables.
- Normalized numerical features.
- Split into training and test sets.

## Step 2: Neural Network Design

- Built a feed-forward neural network with 3 layers:
  - Input layer with ReLU activation.
  - Hidden layer with Dropout to prevent overfitting.
  - Output layer with sigmoid activation for binary classification.

## Step 3: Model Training

- Trained the model using backpropagation.
- Visualized accuracy and loss over epochs.

## Step 4: Hyperparameter Tuning

- Adjusted learning rate, number of units in hidden layers, and batch size.
- Achieved improved test accuracy and reduced loss.

## 5. Final Results:

- Final Test Accuracy: 70.24%
- Final Test Loss: 0.6079

## 6. Improvements and Future Work:

- Integrate more complex architectures like CNNs or RNNs for time-series data.
- Use a larger and more diverse dataset.
- Add NLP to process open-ended survey responses.
- Deploy the model via a web or mobile app for real-time predictions.

## 7. Importance and Advantages:

- Early prediction of mental health issues can lead to timely support and intervention.

- Useful for HR departments, psychologists, and mental health organizations.
- Promotes awareness and proactive mental health care.
- Scalable to various domains (schools, companies, public health).

#### 8. Tools and Libraries Used:

- Python, pandas, NumPy
- TensorFlow and Keras for model building
- Matplotlib for visualization

#### Conclusion:

This project demonstrates the practical application of deep learning in the healthcare domain. With enhancements, it holds potential to make a real impact on individual well-being and organizational productivity.