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**Data analysis on :**

# University Mental Health Monitoring Using IoT

**Dataset from : Kaggel**

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# University Mental Health Monitoring Using IoT

**Overview**

**This project explores the use of IoT (Internet of Things) to monitor and improve the mental health of university students. It integrates real-time data collection through smart devices and applies data analysis techniques to detect stress, anxiety, and depression symptoms. The ultimate aim is to assist institutions in identifying at-risk students early and providing necessary mental health interventions.**

**Project Objective:**

- **To use IoT devices and sensors to gather physiological and environmental data indicative of mental health status.**
- **Analyze this data to detect patterns that may signal mental health issues like stress, anxiety, or depression.**

**Technologies Used:**

- **Python programming**
- **Libraries: pandas, matplotlib, seaborn, sklearn**
- **Jupyter Notebook for data visualization and modeling**
- **Machine Learning models for classification (e.g., logistic regression, random forest)**

**Facts and Observations**

- **IoT data can be a non-intrusive and continuous method of monitoring students' well-being.**
- **Accuracy of machine learning models is promising, depending on the dataset and features selected.**
- **Factors like lack of sleep, abnormal heart rate, and environmental stressors can be early signs of mental distress.**
- **Early detection is crucial for effective mental health support.**

**Analyzed Data Summary**

📁 **Dataset Description**

**The project uses a dataset that simulates physiological and environmental data collected from university students via IoT devices. This data is used to assess their mental health status.**

🗒️ **Features in the Dataset**

**The data includes a mix of biometric and lifestyle-related features such as:**

- **Heart Rate (bpm) – to detect physical stress or anxiety.**
- **Body Temperature (°C) – variations may indicate stress or illness.**
- **Sleep Duration (hours) – sleep deprivation is linked to poor mental health.**
- **Physical Activity Level – daily steps or movement can signal well-being.**
- **Environmental Factors:**
    - **Noise Level – excessive noise is a stressor.**
    - **Light Exposure – affects circadian rhythm and mood.**
    - **Ambient Temperature – comfort level affects mental state.**
- **Mental Health Status – target variable (e.g., "Normal", "Stressed", "Depressed")**

🔍 **Important Observations**

🧠 **Mental Health Status Correlations**

- **Stress Level → 0.83** ✅
  **➤ Strong positive correlation — as stress increases, mental health worsens.**
- **Air Quality Index → 0.47**
  **➤ Moderate positive correlation — poor air quality is linked to poorer mental health.**
- **Noise Level → 0.19**
  **➤ Weak positive correlation — higher noise may slightly affect mental health.**
- **Sleep Hours → -0.36** ✅
  **➤ Moderate negative correlation — less sleep is associated with worse mental health.**
- **Mood Score → -0.33**
  **➤ Negative correlation — lower mood corresponds to poor mental health.**

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📉 **Other Notable Correlations**

- **Stress Level ↔ Air Quality Index → 0.56**
  **➤ Poor air quality increases stress levels.**

- **Stress Level ↔ Sleep Hours → -0.44**
  ➤ **Less sleep increases stress.**
- **Stress Level ↔ Mood Score → -0.41**
  ➤ **High stress leads to lower mood.**

📈 **Model Performance Analysis**

**Below is a detailed interpretation of the classification results of your mental health prediction model:**

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✅ **Overall Accuracy**

- **Accuracy: 0.995 (99.5%)**
  ➤ **The model correctly predicts the mental health status for 99.5% of the test data — this is very high accuracy.**

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📊 **Classification Report Breakdown**

| Class | Meaning | Precision | Recall | F1-Score | Support |
|---|---|---|---|---|---|
| 0 | Healthy | 1.00 | 1.00 | 1.00 | 101 |
| 1 | At Risk | 0.99 | 1.00 | 0.99 | 98 |
| 2 | Affected | 0.00 | 0.00 | 0.00 | 1 |

🔍 **Key Points:**

- **Classes 0 (Healthy) and 1 (At Risk) are predicted extremely well — almost perfect scores.**
- **Class 2 (Affected) has 0 precision, recall, and F1-score, meaning the model failed to detect this class.**
  - **Likely due to severe class imbalance (only 1 instance of class 2 in the test set).**