Group 14

Project Planning: Human Activity Recognition using Smartphones.

Goal:

The goal of this project is to develop a robust and accurate model for human activity recognition using data collected from smartphones. This model will classify activities such as walking, sitting, standing, etc., based on the sensor data.

Dataset:

We will utilize the "Human Activity Recognition Using Smartphones Data Set" from the UCI Machine Learning Repository. This dataset contains sensor readings from an accelerometer and gyroscope in a smartphone. It includes features like 3-axial linear acceleration, 3-axial angular velocity, and more.

Dataset Information:

- Source: UCI Machine Learning Repository
- Link: UCI HAR Dataset
- Features: Various sensor readings, labeled with corresponding activities.
- Instances: Approximately 10,299 instances, divided into training and testing sets.

Plan to Solve it:

1. Data Preprocessing:

- Load and inspect the dataset.
- Handle missing or noisy data, if any.
- Standardize or normalize the features.
- Encode activity labels.

2. Exploratory Data Analysis (EDA):

- Visualize the dataset to gain insights into feature distributions and relationships.
- Identify any patterns or correlations.

3. Feature Engineering:

- Select relevant features that contribute to activity recognition.
- Apply techniques like PCA for dimensionality reduction, if necessary.

4. Model Selection:

- Experiment with various machine learning algorithms (e.g., Random Forest, Support Vector Machines, Neural Networks) for classification.
- Evaluate each model's performance using metrics like accuracy, precision, recall, and F1-score.

5. Model Training and Validation:

- Split the dataset into training and validation sets.
- Train models on the training data and fine-tune hyperparameters.
- Validate models on the validation set to prevent overfitting.

6. Model Evaluation:

- Evaluate the models on the test set to assess their real-world performance.
- Compare different models based on performance metrics.

7. Model Interpretation:

- Understand which features contribute most to the predictions.
- Use techniques like SHAP values or feature importance scores.

8. Model Deployment (Optional):

- If applicable, deploy the model for real-time inference on smartphones or in a web application.

9. Documentation and Reporting:

- Document the entire process, including data preprocessing, model selection, training, evaluation, and any insights gained.
- Create a detailed report summarizing the project, methodology, results, and conclusions.

10. Future Improvements:

- Discuss potential improvements, such as collecting more diverse data, exploring advanced modeling techniques, or fine-tuning hyperparameters.