

# HUMAN ACTIVITY RECOGNITION (HAR) USING SMARTPHONE SENSOR DATA

## Project Summary

This project aims to classify human activities using smartphone sensor data. Motion data from accelerometers and gyroscopes is collected and analyzed using machine learning models to recognize activities such as *walking*, *standing*, *sitting*, *lying down*, and *stair movement*.

## Dataset Overview

Source: UCI.csv

Size: 10,299 rows × 562 columns

Features: Various statistical metrics (mean, std, min, max, skewness, etc.)

Class Distribution: Slight imbalance among activity types

Missing Values: None

## Data Preprocessing Steps

- Handling missing values
- Encoding categorical variables
- Removing outliers (Z-score method)
- Feature scaling
- Removing duplicates

## Exploratory Data Analysis (EDA) Insights

- Class Imbalance: Detected in some activity classes
- Sensor Correlations: Strong relationships among acceleration features
- Outliers: Observed in accelerometer data
- Key Visualizations: Histograms, correlation heatmaps, PCA plots, and activity trends

## Next Steps: Model Training

- Applying *Random Forest*, *SVM*, and *Neural Networks*
- Evaluating models using *accuracy*, *F1-score*, and *precision-recall*
- Optimizing with **hyperparameter tuning**
- Deploying the final model for **real-time activity classification**

## Repository Structure

📁 HAR\_Project

- └ 📁 data (raw & processed datasets)
- └ 📁 notebooks (EDA, preprocessing, modeling)
- └ 📁 scripts (training models)
- └ 📁 visuals (plots & reports)
- └ 📄 README.md, final\_report.pdf

## Contributors

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- Visualization & Storytelling: Moris Gachanja
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## License

This project is open-source under the MIT License.