Abstract

Detecting physical motion is an important area with many possibilities for application in fields like security and health. The physical motion detection project aims to develop a robust system for accurately recognizing and classifying human activities based on sensor data from accelerometers, gyroscopes, and gravity sensors. The project focuses on activities such as walking, sitting, jogging, swimming, walking downstairs, and walking upstairs, which are commonly encountered in daily life. To achieve this, a comprehensive dataset comprising sensor readings during different activities is collected and used for model training and evaluation. Various machine learning algorithms, including K-Nearest Neighbors (KNN), Support Vector Machines (SVM), Decision Trees, and Random Forests, are employed to build predictive models. The performance of each model is assessed using evaluation metrics such as accuracy, precision, recall, and F1 score. Different sampling techniques, such as normal sampling and SMOTE sampling, are applied to address class imbalance issues in the dataset. Hyperparameter tuning is also employed to optimize model performance. The results indicate that the Random Forest model achieves the highest accuracy rate in both normal sampling and SMOTE sampling scenarios. The project recommends deploying the trained model through API integration, enabling its integration into various applications such as accessibility, health monitoring, and motion detection systems. This integration allows end users to obtain real-time predictions of their activities using sensor data from smartphones, smartwatches, or IoT devices.