Evaluating Sensor Configurations for Human Activity Recognition Using Machine Learning

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Developing accurate models that can recognize daily human movements and actions is significant in fields of rehabilitation, robotics, and assistive technology, where systems must be able to classify and monitor physical activity with high accuracy. Previous studies demonstrate a limited understanding of the relationship between sensor count, sensor placement, and classification accuracy. This research aims to understand the relationship between the quantity of sensors and precision of models, investigating how many sensors are required to accurately recognize and characterize different human actions. Understanding the minimal viable sensor configuration and identifying which body placement contributes most to accurate classification can be used to increase data efficiency and increase comfort for users. This project will be explored in two phases: data collection and model development. Data collection includes collecting a dataset of ten human actions, such as picking up an object or placing an object on a surface, obtained through SparkFun OpenLog Artemis IMU sensors. Sensors will be worn by a participant to emulate body parts, specifically on hands, upper arms, torso, and head. The second phase involves developing robust machine learning models to recognize and classify the human motions through classification algorithms, such as support vector machines and decision trees, and using the collected data for training, testing, and validating. Model performance will be assessed on accuracy, evaluating the quantity of sensors required and their correlation, which can contribute to developing more efficient and user-comfortable recognition systems.