# PC-GNN: Pearson Correlation-Based Graph Neural Network for Recognition of Human Lower Limb Activity Using sEMG Signal

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**Abstract:**
Artificial intelligence has a plethora of applications in the realm of biomedical sciences, such as pattern recognition, diagnosis of disease, human–machine interaction, medical image processing, robotic limbs, or exoskeletons. Robotic limbs, or exoskeletons, are widely employed to assist with lower limb movement. To increase the exoskeleton's flexibility in the lower extremities, it is critical to recognize the diverse motion intents of the lower limbs of the human body. In this investigation, sEMG signals from lower limb muscles are used for a computer-aided recognition system to correctly identify the lower limb activities because these signals can identify movement ahead of time and enable faster detection of signal fluctuation than other wearable sensors. Several types of noise are introduced into the signal during collection. A multistage classification strategy is proposed to overcome the processing challenges associated with these sEMG signals. Initially, nine time-domain handcrafted features are retrieved using a hybrid of wavelet denoising and ensemble empirical mode decomposition approach with a sliding window of 256 ms and a 25% overlap. Next, a Pearson correlation-ba IN).
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**I. Introduction**

The research on monitoring human activities using sensor devices has been attention-grabbing for the past decade. Human activities recognition (HAR) uses sensors to monitor data that has been learned and performed in the relevant context to detect a person's activity. There are several uses for HAR in various fields, including teleimmersion, healthcare monitoring, and smart homes with aided surveillance [1]. Usually, the HAR procedure is attainable by employing various steps, from working on the recorded data, utilizing various sensors, to finally classifying the activity to be performed. An HAR system using various sensory devices can track the lower limb activities of humans. To identify human posture, physical activity state, and behavioral activities, HAR technology often uses multiple multimodal data originating from numerous hardware sensors. Currently, HAR research can be broadly categorized into several situations supported by various technologies, including video, wearable, mobile phone sensors, social networks, and wireless signal [2], [3], [4].



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