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AI-Driven Monitoring of Parkinson's Tremors Using Wearables

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Abstract: *An extremely common neurodegenerative disease is Parkinson's disease (PD), which impacts motor functions, with tremor being one of its most debilitating symptoms. Accurate detection and classification of tremors are crucial for diagnosis, treatment monitoring, and rehabilitation. Traditional assessment methods—clinical observations and patient self-reports—are subjective, prone to bias, and lack real-time applicability. To overcome these limitations, this study proposes an intelligent tremor detection system leveraging wearable sensors and artificial intelligence.*

Recorded tremor-related motion signals (accelerometer and gyroscope) were preprocessed and segmented for extracting time-resolved information. Time- and frequency-based wavelet features were computed from which both deep learning models and machine learning models were trained. the TPCNNs and MLP for the comparative analysis networks, novelNameRandom Forest, Support Vector Machine (SVM), Naïve Bayes, ConvolutionalNeural Networks (CNN) and Long Short Term Memory (LSTM).

The experimental results showed that LSTM obtained the best classification accuracy which was attributed to its excellent performance in temporal dependency learning for biomedical signals. Random Forest also performed well with good interpretability, followed by relatively modest CNNs and MLPs.

The conclusions are verified and it can be observed that deep learning-based models such as LSTM can offer reliable, real-time tremor detection which is eligible for using in wearable healthcare devices.

The proposed system provides a feasible answer to the need for continuous, objective monitoring of tremor that is between subjective clinical assessments and automatic intelligent systems. It offers hope for provident medical care over the lifetime, targeted curative treatments and successful remote healthcare monitoring..

Keywords*:* Parkinson's disease, tremor detection, wearable sensors, accelerometer, gyroscope Deep learning, machine learning, and random Forest, Long Short-Term Memory (LSTM), Convolutional Neural Network (CNN), Support Vector Machine (SVM), Multi-Layer Perceptron (MLP), biomedical signal processing, healthcare monitoring, IoMT stands for Internet of Medical Things

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