Developing a Human-Computer Interface to Assist Patients With Parkinson’s Disease to Improve Motor Function

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Parkinson’s disease is a common progressive neurodegenerative disorder that is known to affect movement and coordination. It causes debilitating motor symptoms, including tremor, bradykinesia (slowness of movement), rigidity, and postural instability. These symptoms severely affect quality of life, making it necessary for patients to undergo long-term physical therapy. While exercise is proven to slow the progression, patient adherence is low due to the challenges of consistent and expensive in-person clinical supervision. This research creates a computer interface built upon an NVIDIA Jetson Orin to help Parkinson’s disease patients improve motor symptoms. By utilizing computer vision, specifically YOLOv8 pose estimation optimized with TensorRT, the algorithm analyzes the patient’s pose and provides real-time feedback to help them mimic the target pose. This kind of training targets muscle memory and allows patients to fix their postures and poses over time. Since every patient is different, the interface is customizable to different poses that would best help the individual. The interface was tested on three separate poses, and then evaluated for analyzing correct poses and incorrect poses. After a total of 360 trials, it was concluded that the system achieved a 91.11% average accuracy for detecting correct poses and 99.44% for detecting incorrect poses. This approach offers the non-invasiveness of a camera-based system, as well as holistic pose analysis that was previously restricted by wearable sensors. Ultimately, this system is a scalable solution that can transform physical therapy into a portable interface that can be used in different environments.

Awards Won:
London International Youth Science Forum CIC: Full scholarship to attend the London International Youth Science Forum, and a $1,500 cash stipend for travel expenses.