

Project Title: Implementing wearable sensors and Artificial Intelligence to automatically detect Parkinson's Disease symptoms

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Project Summary:

Parkinson's disease (PD) is characterised by bradykinesia (slowness of movement), rigidity (stiffness in movement), resting position tremor and postural/gait impairment. When drugs are used to control PD symptoms, their effects on movement can vary daily, and within each day. Patient observation diaries are used to perceive these effects, but they rely on good patient recall and observer experience of symptoms.

Some PD symptoms such as rigidity, hand movement and gait can be used to detect its early onset. This project proposes to assess slowness of movement in upper and lower limbs through examination of rapid repetitive movement of the hand, and examination of gait speed and cadence. PD gait is characteristically slow and low amplitude arm swinging is a common symptom, as is a decrease in gait speed, step length and stride length.

The proposed smart technology will be able to assess changes in the patient's typical movement patterns and help to inform their drug treatment plan.

We propose to detect hand, arm sway and gait movement using a data fusion approach combining Inertial Measurement Unit sensors, textile stretch/bend and pressure sensors, and Artificial Intelligence techniques. Several studies have used wearable sensors to study gait and posture of PD patients, but there is limited research examining simultaneous hand and gait movement. We propose a low-cost smart data glove and sensorised insoles to detect PD symptoms in the home environment. Dynamically monitoring movement within a patient's natural environment can help optimise PD quality of care and assist with evaluation and optimised treatment of PD.

Candidate Qualifications/Requirements:

Candidates should have achieved 1st class or 2:1 BSc Hons in Computer Science or a related discipline. Software programming experience is essential in a well-known language such as C#, Java, Unity or Python. Ideally the candidate should have previous experience applying wearable technology and/or sensors to record movement for a specific use case and have configured and controlled sensor output using a software system they've developed.

The successful candidate will be offered the opportunity to transfer at the end of the MRes to PhD mode of study if their research progresses as expected by the project supervisors.