

## Master Thesis

### Design and Evaluation of a Wearable Feedback Device for Posture Correction in Parkinson's Disease Patients

Parkinson's patients often exhibit a stooped posture due to perceptual deficiencies, which negatively affects their gait and can cause back pain. However, patients can usually correct their posture when reminded. In a review by Muthukrishnan et al. (Muthukrishnan, Abbas, Shill, & Krishnamurthi, 2019), the authors recommend developing a closed-loop wearable device that provides real-time feedback during daily activities. According to Dang et al. (Dang, Seo, Pham, & Chee, 2019) the C7-SAR which is a measure for the stopped posture correlates with the upper back angle. Our goal is to create a chest strap with a motion sensor that reliably detects stooped postures and provides feedback, such as a vibration, to prompt the patient to adjust their posture. The design process will involve direct input from patients to ensure usability. Additionally, the device will be tested on patients to assess its effectiveness in improving posture and reducing back pain.



#### Task Description

1. Hardware Setup
  - a. Design and build at least one prototype of a wearable device that detects a stooped posture and reminds the patient to correct it
2. Software Setup
  - a. Test different settings to reduce power consumption
  - b. Log data on the device and implement an evaluation script
3. Evaluation
  - a. Test the device on multiple participants
  - b. Evaluate the collected data
4. Documentation and presentation of results.

#### Prerequisites

- Studying mechatronics, medical engineering, computational engineering, electrical engineering, autonomy technologies, or similar
- Experience with microcontrollers and basic python skills
- Experience with CAD would be beneficial

#### References

Dang, Q. K., Seo, H. G., Pham, D. D., & Chee, Y. (2019). Wearable sensor based stooped posture estimation in simulated Parkinson's disease gaits. *Sensors*, 19(2), 223.

Muthukrishnan, N., Abbas, J. J., Shill, H. A., & Krishnamurthi, N. (2019). Cueing paradigms to improve gait and posture in Parkinson's disease: a narrative review. *Sensors*, 19(24), 5468.

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