



**UNDERGRADUATE THESIS**

**DEVELOPMENT OF A WEARABLE DEVICE  
FOR IOT-BASED MONITORING &  
CORRECTION OF SITTING POSTURE USING  
FUZZY TYPE-2 LOGIC AND SUPPORT  
VECTOR MACHINE**

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SURABAYA  
2026**

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Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher education institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

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## ABSTRACT

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The habit of prolonged improper sitting posture is a leading cause of musculoskeletal disorders affecting the spine, neck, and shoulders. This study designs and develops an IoT-based wearable system for real-time sitting posture detection, classification, and correction using an MPU-6500 IMU sensor on an ESP32 microcontroller.

The system processes pitch and roll angles through baseline calibration, Interval Type-2 Fuzzy Logic adaptive filtering, Z-score normalization, and SVM classification with an RBF kernel and One-vs-One strategy across three posture classes: upright ( $0^{\circ}$ – $10^{\circ}$ ), slightly slouched ( $10^{\circ}$ – $20^{\circ}$ ), and slouched ( $>20^{\circ}$ ). Corrective feedback is delivered via a vibration motor with a 3-second temporal validation mechanism, while posture data is monitored through the Blynk IoT platform.

The SVM model achieved 100% testing accuracy and 99.72% average 5-fold cross-validation accuracy. Testing on two subjects showed upright posture increased from 77.3% to 92.3% and from 85.1% to 95.4% after vibration feedback was activated, confirming the system's measurable impact on improving sitting posture habits.

**Keywords:** wearable device, sitting posture, Interval Type-2 Fuzzy Logic, Support Vector Machine, Internet of Things, MPU-6500

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Surabaya, June 10 2026

Author,

A handwritten signature in black ink, appearing to read 'Zandy Qois', with a stylized, cursive script.

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