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## Sensor Ensemble For Patient Stress Monitoring Using CNT Based Temperature Sensor And GSR Sensor

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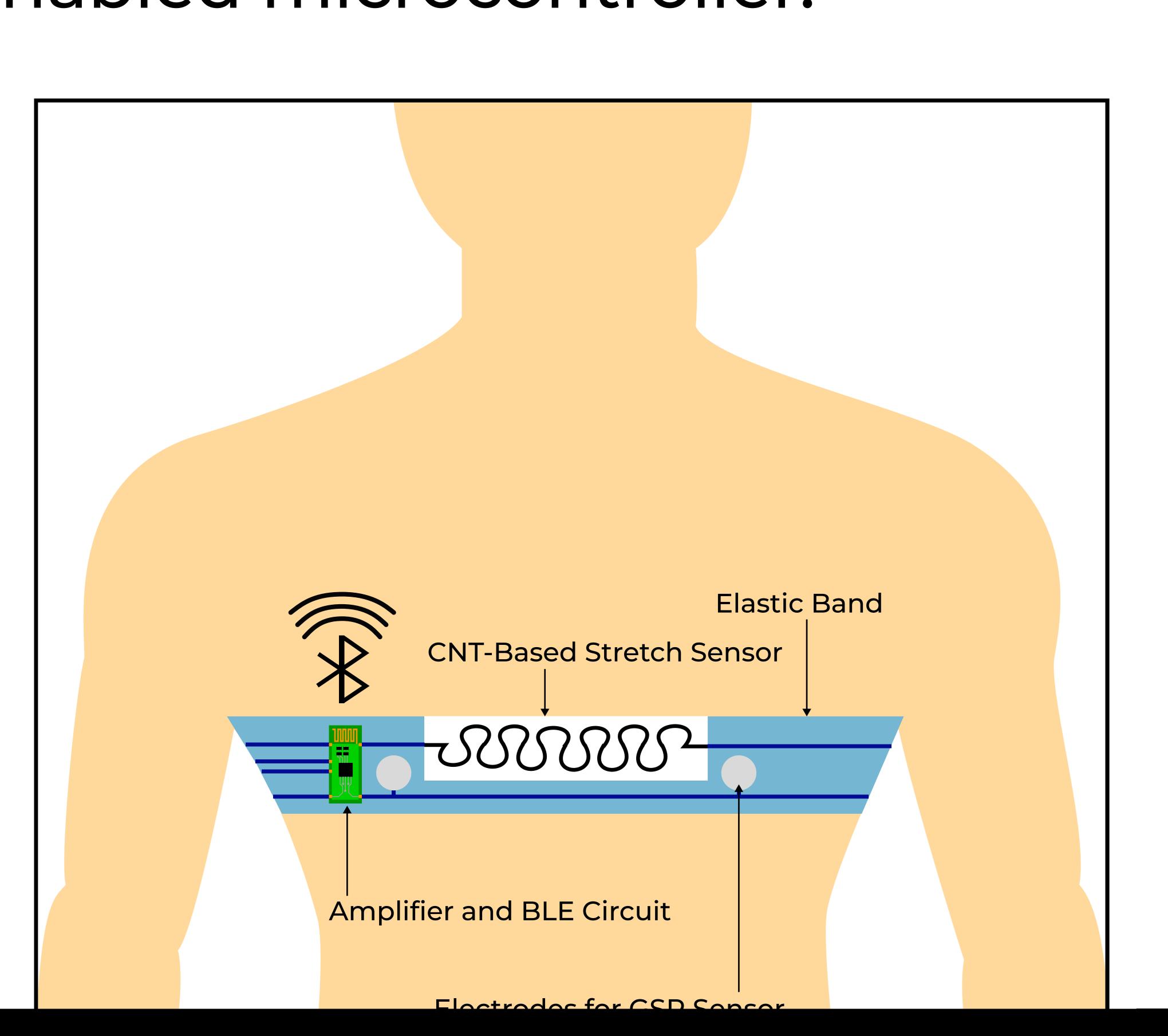
### INTRODUCTION & AIM

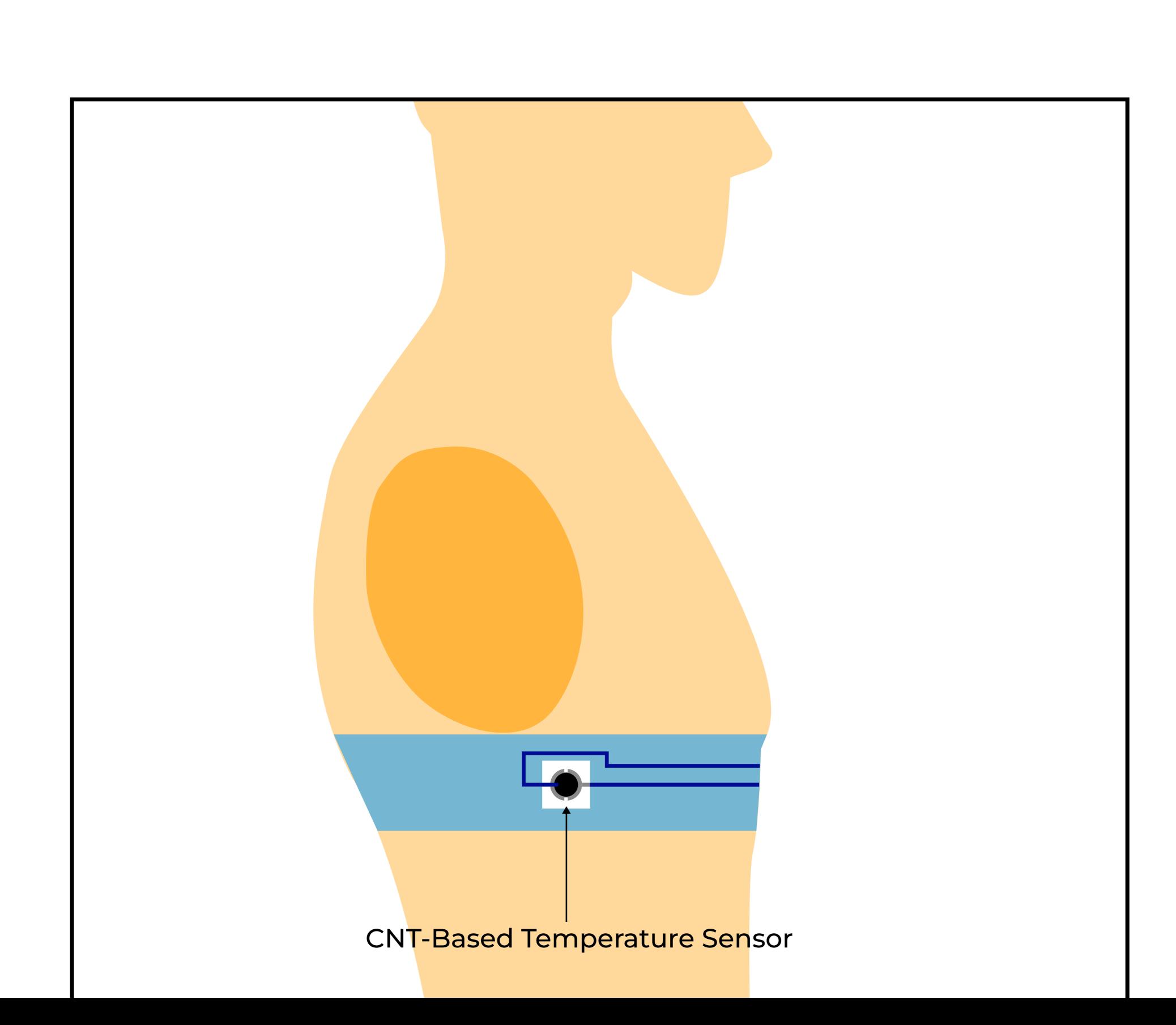
Multi-Parameter Tracking Is A Reliable Approach For Monitoring Patient Conditions, But Traditional Hospital Systems Are Bulky And Require Frequent Adjustments. This Project Proposes A Sensor Ensemble Integrated With A Microcontroller For Efficient, Automated Patient Monitoring With Minimal Intervention.

#### METHOD

Our ensemble includes a temperature sensor, a stretch sensor and a galvanic skin resistance sensor. The temperature sensor and the stretch sensor were fabricated by stencil printing CNT ink and Carbon black respectively onto a paper substrate. CNT is sensitive to temperature and has a negative temperature coefficient while carbon black exhibits a measurable change in conductivity under varying levels of the temperature sensor's resistance was recorded across a range of temperatures to evaluate its sensitivity and performance. The resistance of the stretch sensor was measured as the paper substrate subjected to elongation. The GSR module's response to varying levels of perspiration was tested. With the results obtained during testing, the ensemble was standardised to report on basal body temperature, breath rate, skin conductivity- to measure perspiration rate.

The collected data is transmitted to a smart device by a Bluetoothenabled microcontroller.





### RESULTS AND DECLARATION

All three sensors were fitted into an elastic band and tested. We observed that all three sensors in the ensemble successfully transmitted collected data, and that all of the data was coherent with the physical conditions of the subject.

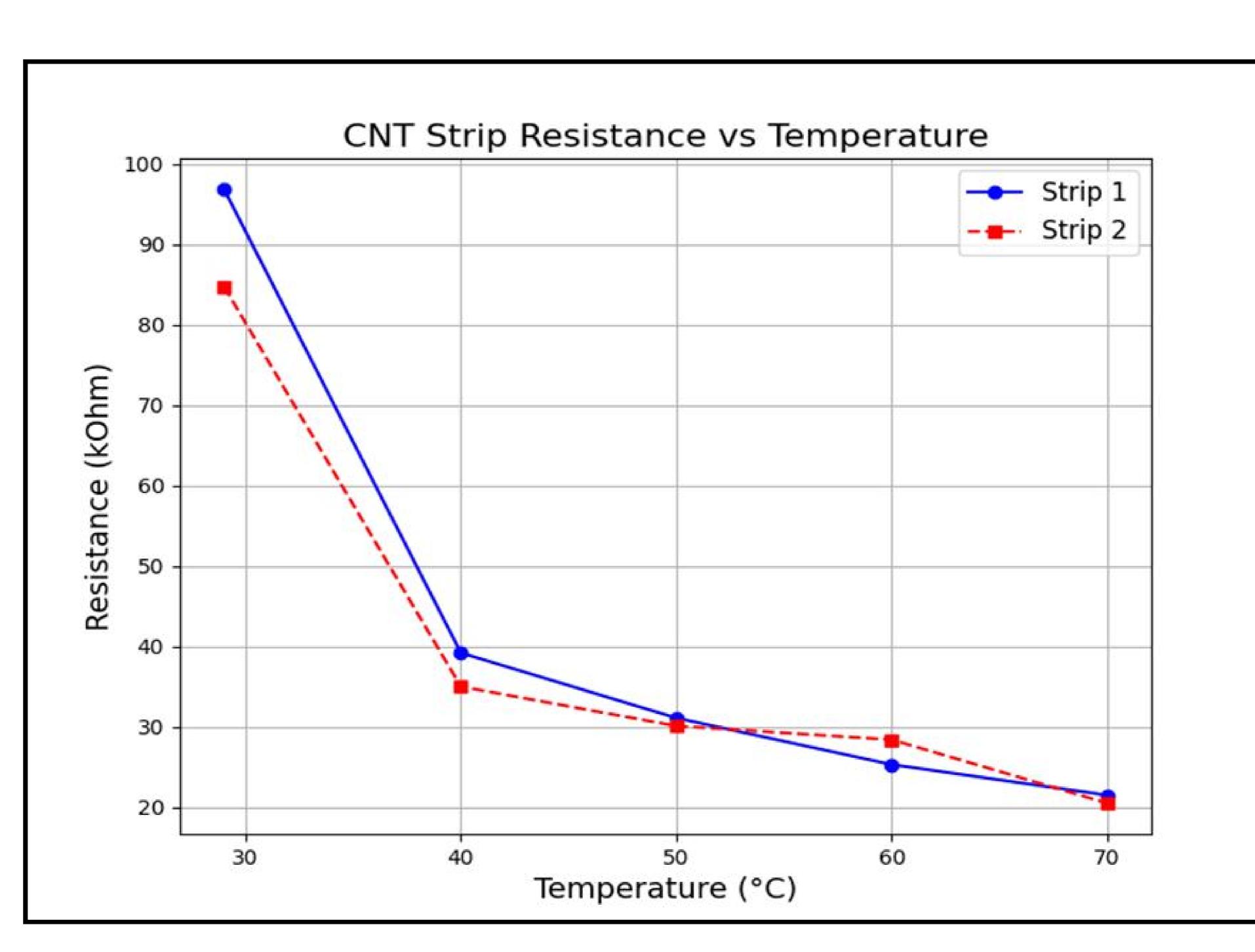
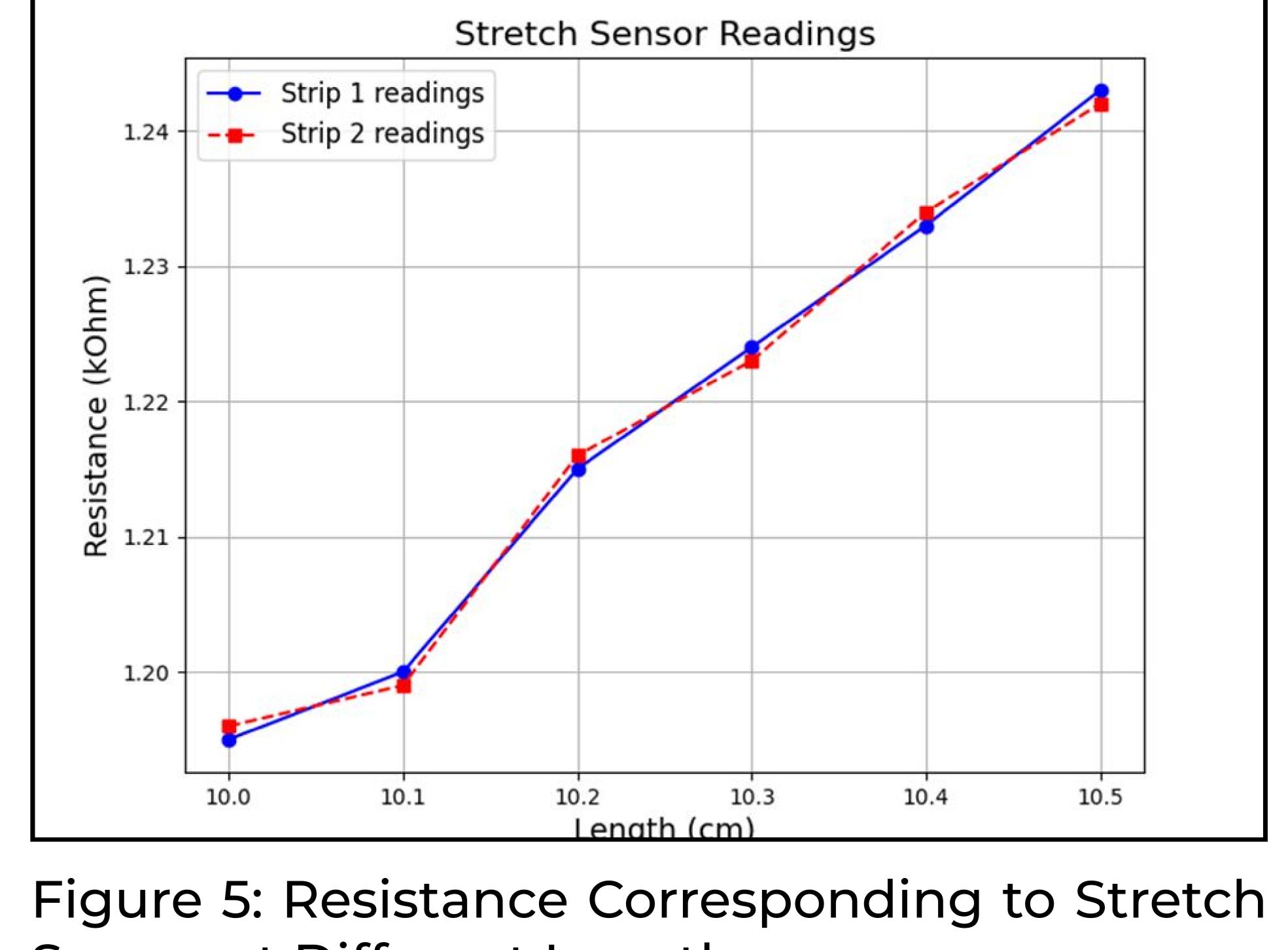


Figure 4: Resistance Curve of CNT-Based Temperature Sensor



Sensor at Different Lengths

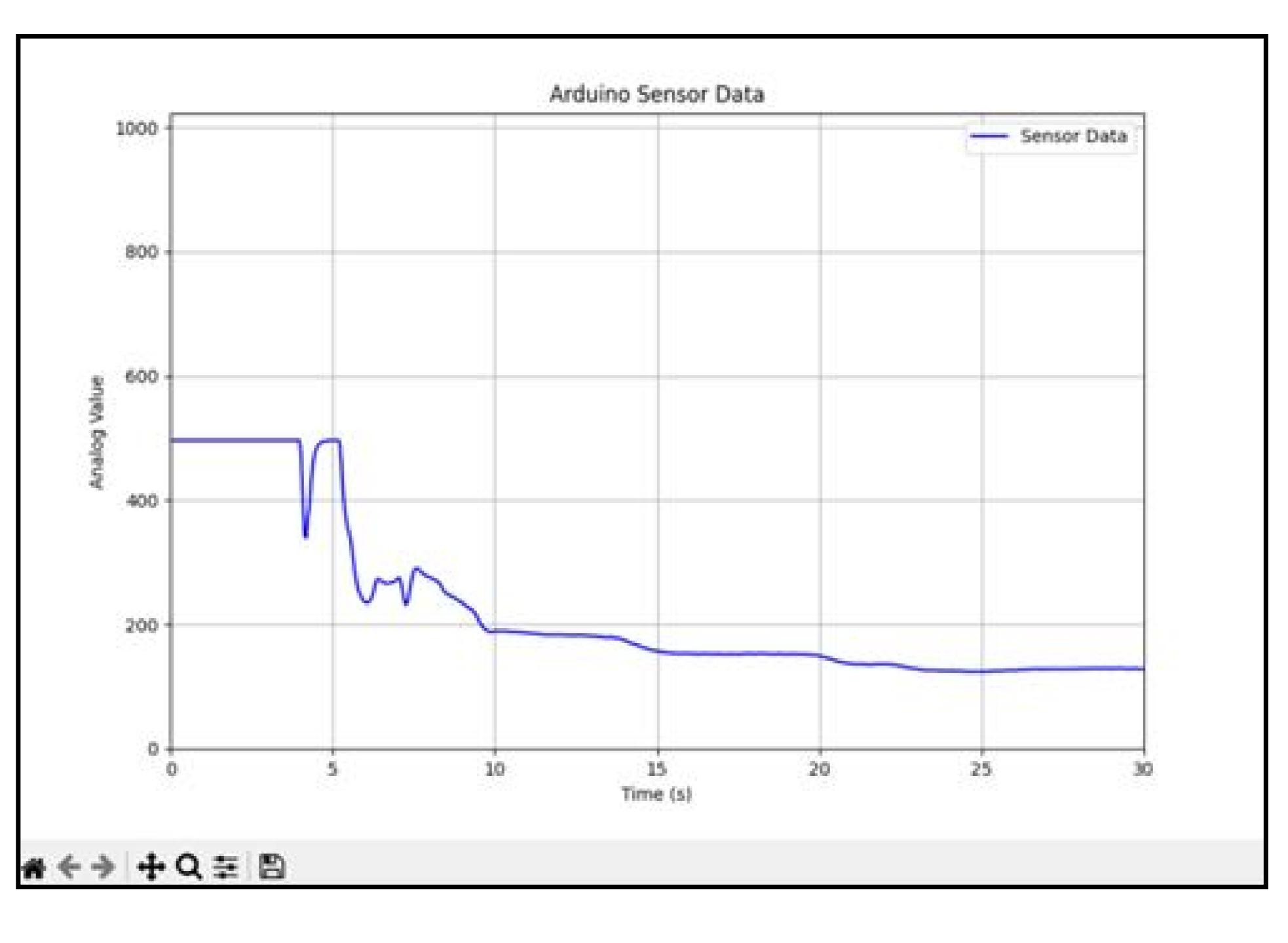


Figure 6: Input from GSR Electrode Array Through BLE Transmission



Figure 7: Data Transmission Through BLE on Android Platform

The developed system offers a simple yet effective solution for patient monitoring, particularly in settings lacking advanced equipment. By wirelessly tracking body temperature, breath rate, and electrolyte profile, it provides essential data for assessing patient stress and overall health, improving accessibility and patient comfort.