Events of Interest (EoI) Capture Using Novel Body-worn Fully-passive Wireless Sensors for S&CC

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Project web-portal: https://www.memphis.edu/esarp/nsf_scc/index.php

Project web-server: http://sccmobilehealth.com/

SCC Health Challenges:

- High incidence of chronic disease.
- Utilization of smartphone technology for communication of SCC Health.
- Technological barrier: inability of integrated sensors to collect clinically important physiological signals.

Proposed Objectives:

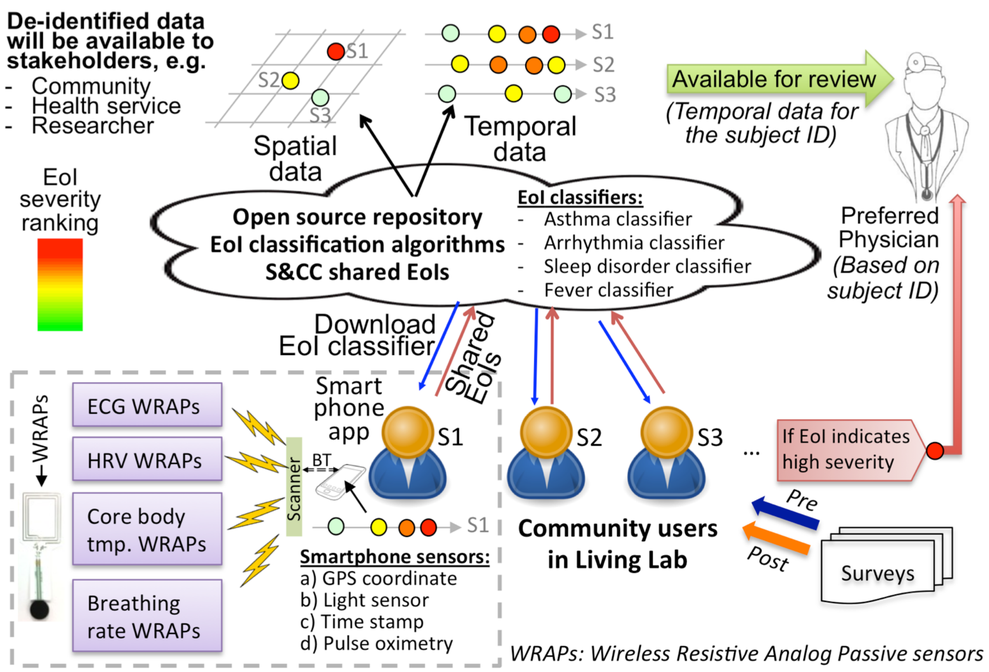
- Design and develop wireless fully-passive body-worn WRAP sensors for multi-modal health data capture.
- Develop an open-source framework for Events of Interest (EoI) classifiers via a smartphone app for self-monitoring and secure knowledge sharing with S&CC.
- Deploy the system in a "Living Lab" pilot study. Data will be collected and classified in real-time to generate EoIs for multiple health conditions (Fig. 1).

Scientific Impact:

- Very low-cost, battery-less, easy-to-use disposable sensors for clinically relevant signal capture.
- EoI algorithms for real-time accurate and sensitive monitoring of disease.
- Open framework, spatiotemporal data.

Broader Impact:

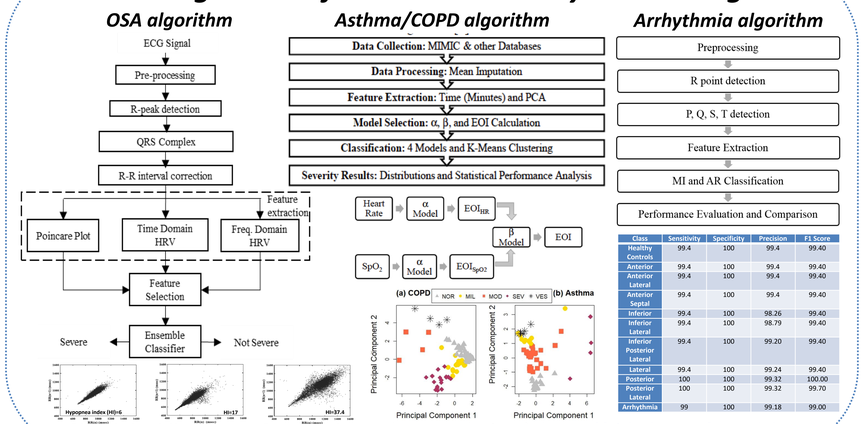
- Better management of chronic diseases and collective sharing of anonymous EoIs with S&CC.
- Possible reduction in frequent and avoidable hospital visits.
- Spatiotemporal EoI visualization for clinical/community decision support.



WRAPs: Wireless Resistive Analog Passive sensors

Fig. 1. The SCC Health project framework for disease severity monitoring.

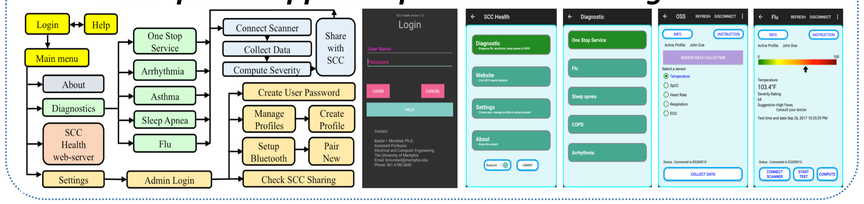
EoI algorithms for disease severity monitoring



Class	Sensitivity	Specificity	Precision	F1 Score
Healthy Controls	99.4	100	99.4	99.40
Anterior	99.4	100	99.4	99.40
Anterior Lateral	99.4	100	99.4	99.40
Anterior Septal	99.4	100	99.4	99.40
Inferior	99.4	100	98.26	99.40
Inferior Lateral	99.4	100	98.79	99.40
Inferior Posterior Lateral	99.4	100	99.20	99.40
Lateral	99.4	100	99.24	99.40
Posterior	100	100	99.32	100.00
Posterior Lateral	100	100	99.32	99.70
Arrhythmia	99	100	99.18	99.00

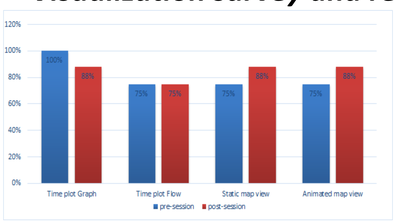
Github (public access of app codes and sensor designs): https://github.com/esarplab

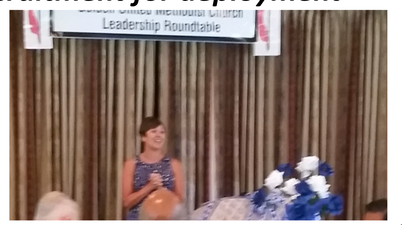
Smartphone app to implement the EoI algorithms



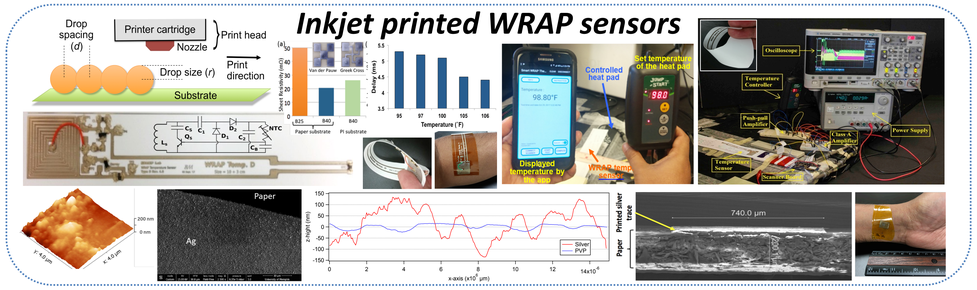
Web-server and spatiotemporal visualization

Visualization survey and recruitment for deployment

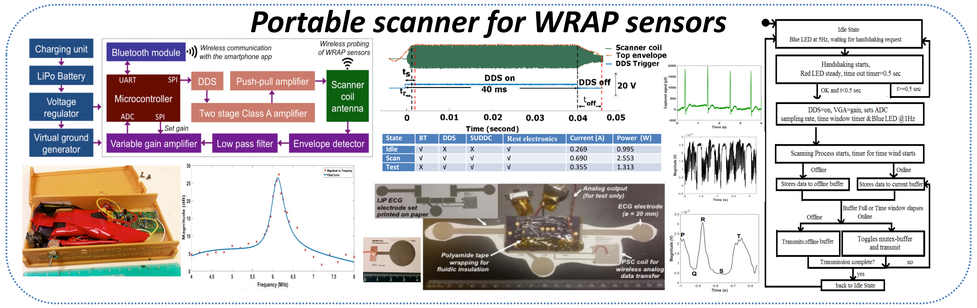




Inkjet printed WRAP sensors



Portable scanner for WRAP sensors



SCC Health Memphis Project

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Institution: The University of Memphis

THE UNIVERSITY OF MEMPHIS

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