

IST-052
**Context Aware Mobile Computers Utilizing Portable Sensors and Unsupervised
Machine Learning**

Asim Smailagic

Research Professor, Institute for Complex Engineered Systems, Director of Laboratory
for Interactive Computer Systems and Wearable Computers, Carnegie Mellon University,
Pittsburgh, PA

Daniel Siewiorek

Director Human-Computer Interaction Institute, Buhl University Professor of Electrical
and Computer Engineering and Computer Science, Carnegie Mellon University,
Pittsburgh, PA

Marvin Sirbu

Professor, Departments of Engineering and Public Policy,
Industrial Administration, and Electrical and Computer Engineering, Carnegie Mellon
University, Pittsburgh, PA

Industry Participants

James Beck

Inmedius, Pittsburgh, PA

Ivo Stivoric

BodyMedia Inc., Pittsburgh, PA

David James

R J Lee Group, Monroeville, PA

Abstract

This project will employ unsupervised machine learning techniques to combine real time data from multiple sensors into a model of behavior that is individualized to the user. We will develop a novel prototype context-aware cellular telephone or portable digital assistant, and demonstrate user attention management. We will evaluate the context aware system by comparing results to user self reports about disruptiveness and by studies to characterize user performance improvements enabled by context awareness. Our eWatch™ wearable computing and sensor platform provides a unique advantage for this project.

Our approach to context sensing eliminates the calibration and hand-tuning problem. The system determines which patterns of data correspond with particular user behaviors. This is far more flexible and robust than predetermining, that the system shall decide that a user is in a conversation by looking only at data from a microphone, as it allows the system to automatically take advantage of information provided by multiple sensors that a human would not have predicted would be relevant. Furthermore, it simplifies the notion of context, requiring the system only to identify previously seen patterns, rather than having to label every user state.