

Adaptive Mobile Sensing: Leveraging Machine Learning for Efficient
Human Behavior Modeling
(Technical Report)

Wearable Health Devices: The Unintended Effects of Continuous Health
Monitoring
(STS Research Paper)

An Undergraduate Thesis Portfolio
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by

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Preface

How can mobile monitoring be improved? Personal monitoring devices have grown in popularity and utility in recent years, but persistent problems make improvements necessary.

How can we use personal smart devices to identify human behavior? To develop robust contextual models, a three-week study was conducted to collect data through a mobile crowdsensing application. Participants used multiple sensing strategies, ranging from infrequent to continuous sampling, to determine the effect of each on data integrity and battery life. The study concluded with a dynamic data collection strategy that uses a machine learning model to forecast user activity and trigger sensor sampling accordingly. Results include 1) extraction of efficient sensing model features, 2) implementation of context-driven modeling of user smartphone data, and 3) customization of a time-series database for optimized data queries used in metadata visualizations. Models produced could be used in large population studies that examine patterns of behavior over extended periods to identify disease indicators.

How are patients, physicians, technology companies, insurance companies, and advocacies responding to the implications of wearable health devices? Healthcare systems have sought to implement wearable health devices (wearables), but barriers impede adoption, including perceived and actual problems of data privacy, security, accuracy, and delivery. Through regulation, public policy can diminish these barriers.

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