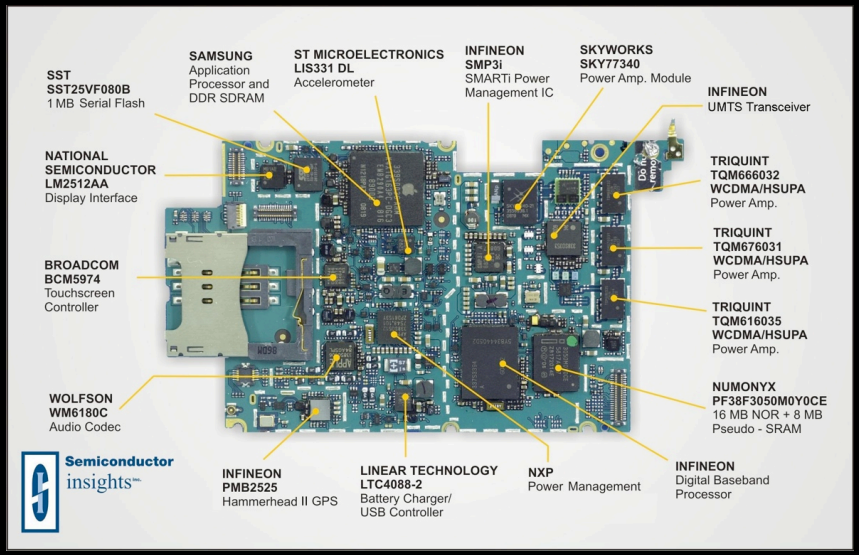
smartphone sensing

how are you feeling android?

Andrew T. Campbell, Dartmouth College

Workshop on Using Smartphones as Mobile Sensing Devices: A Practical Guide for Psychologists to Current and Potential Capabilities, SPSP 2012

smartphone madness



accelerometer

emotion

gyroscope

air quality

compass

near-field

barometer

proximity

light

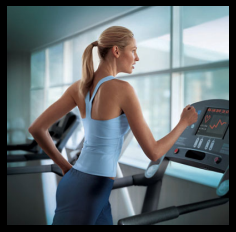
radios

microphone

location

front/back cameras

why is this important to us?



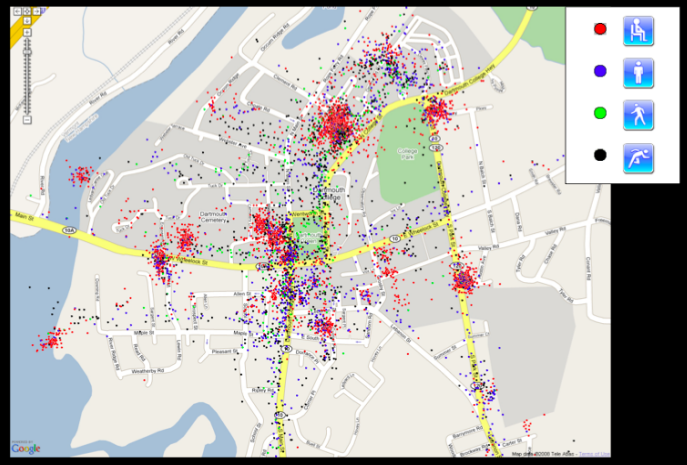
physical, emotional and cognitive health

radically new tool for social and behavioral scientists to conduct unobtrusive experiments at very large scale

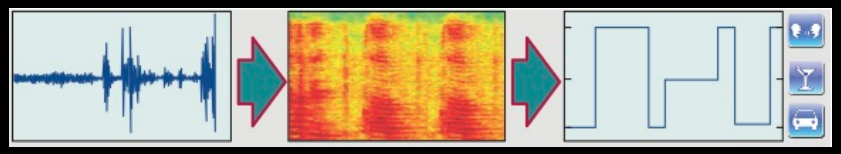
let's look at the capability of a single sensor

accelerometer

what is the influence of location on people?



accelerometer + location (e.g., GPS)
= activity map



raw sensor data

extracted features

classification inference

making sense of data

machine learning is key to building robust, personalized behavioral models

learning, big data, mining, apps

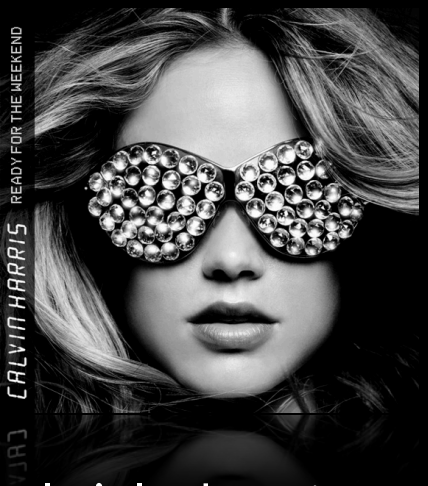
- sensing
- feature extraction
- inference
- learning/adaptation
- app specific
- privacy

we want to push intelligence to the phone

where is this leading?

smartphones are getting smarter;
at some point they will:

- understand our behavioral patterns, emotional and mental state
- anticipate our every move
- help us navigate our day
- become integrated into the fabric of our lives
- new apps in health, social science, psychology
- radically change how we study human, community and population behavior



social networks app
sound diary app
well-being app
stress app
safety app
neural app

let's look at six sensing apps developed with Tanzeem Choudhury (Cornell)

cenceme

facebook

twitter

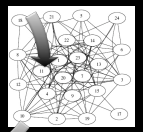
myspace
a place for freedom

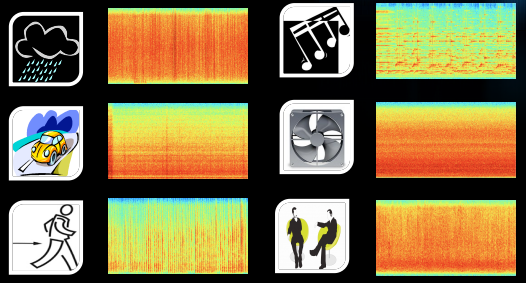
cenceme web

"Sensing Meets Mobile Social Networks: The Design, Implementation and Evaluation of the CenceMe Application", ***ACM SenSys 2008***

two microphones

how do social "conversation networks" evolve?

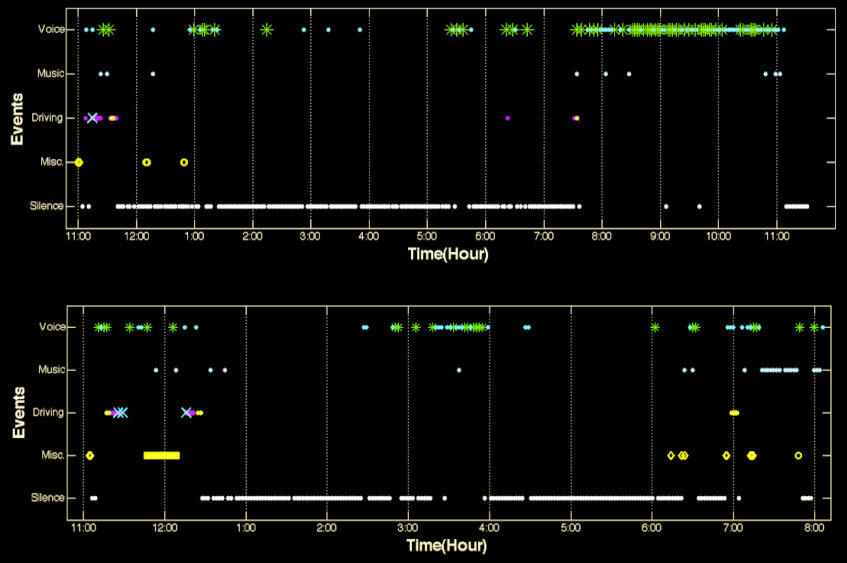




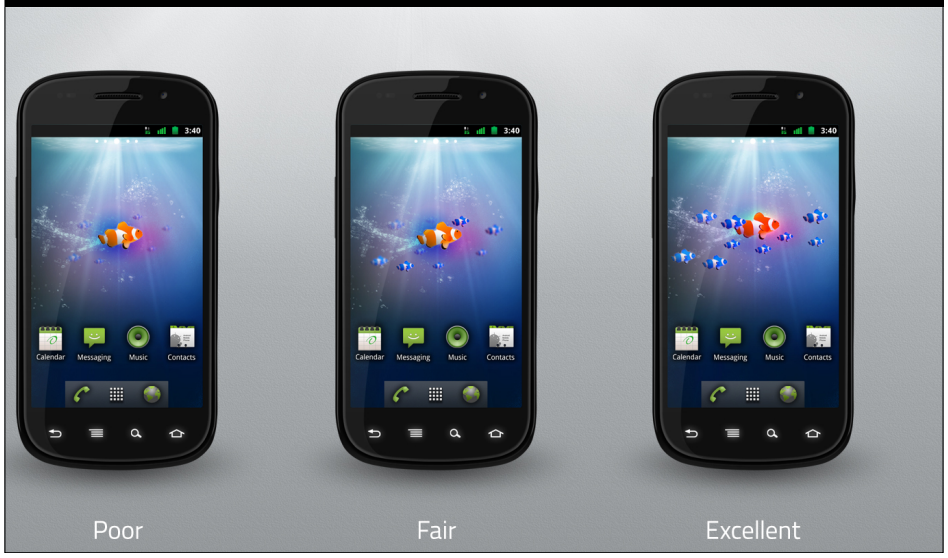
SoundSense

Hong Lu, Wei Pan, Nicholas D. Lane, Tanzeem Choudhury, Andrew T. Campbell

SoundSense diary: discovering life patterns



BeWell App

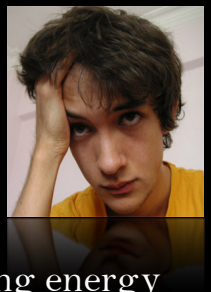


Infer meaningful attributes of interaction

speaking time & interruptions	⟺	status, dominance & roles
speaking rate, changes in loudness & pitch	⟺	emotional state
differences in speaking rate	⟺	bi-polar disorder, depression
intonation, turn-taking	⟺	autism, sociability
turn-taking, loudness, interruptions	⟺	conversation types

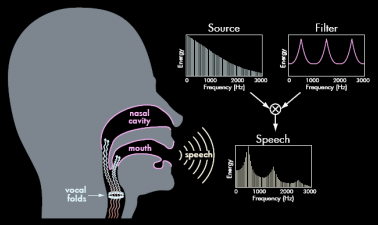
Voice

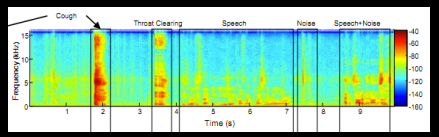
StressSense: stress from voice



Pitch plays a prominent role

Other important features are those using energy and spectral slope





front and back cameras

WalkSafe:

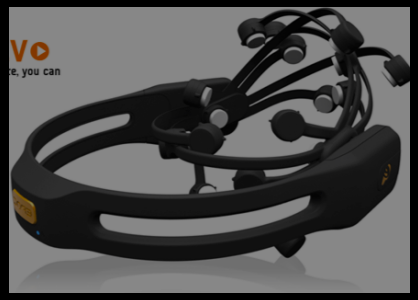
a pedestrian safety app for mobile users who walk and talk while crossing roads

Tianyu Wang, Giuseppe Cardone, Antonio Corradi, Lorenzo Torresani, Andrew T. Campbell

Dartmouth College University of Bologna

while out jogging on day ....

can brain signals drive smart phones?



Brain to Mobile Phone Interface

Andrew T. Campbell, Tanzeem Choudhury, Shaohan Hu, Hong Lu,
Matthew K. Mukerjee*, Mashfiqui Rabbi, Rajeev D. S. Raizada

"NeuroPhone"

* Contact Author

we need a new smartphone tool for social and psychological experiments

some of the pieces exist

http://www.pacoapp.com/

creation of experimental trackers and interventions

experiential sampling (ESM)

allows users to explore and ask questions about their data

sensor collection and data analysis

what is missing?

open source, robust behavior models for phones

feed back, intervention mechanisms and data visualization

data analysis tools and data repository

phone issues
-- energy, robustness, scaling, privacy

SDK for putting it all together (has to easy)

Many people to thank

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