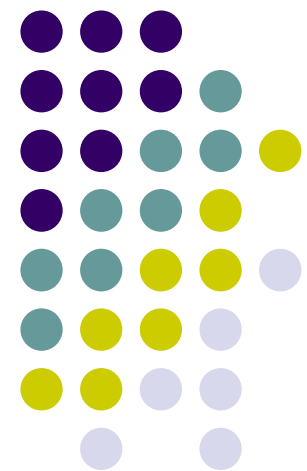


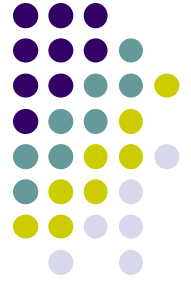
Ubiquitous and Mobile Computing

CS 403x: *BeWell*

Matt Costi
Robert Dabrowski
Evan Polekoff

*Computer Science Dept.
Worcester Polytechnic Institute (WPI)*





Introduction & Motivation

- Our lifestyle choices impact our personal health
- Most practice an unhealthy balance
 - Exercise, but not enough sleep
- How do we monitor and know how we are doing?
- Current health tracking apps are narrow in scope
 - Focus is on physical activity and sleep
 - No current way to monitor mental/social health



The BeWell Vision

- Monitor many wellness indicators using only embedded sensors in mobile phone
 - sleep duration, physical activity, social interaction
- Sensors can be used to make complicated inferences
 - microphone, gps, accelerometer, charging status
- Require no user input
- Visualize and display data in meaningful ways

Related Work

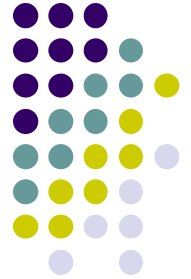
- Activity Tracking Devices
 - Fitbit
 - Android Wear
- Mental Wellness
 - DBSA Wellness tracker
 - MoodTrack Diary
- Diet Tracking
 - Vessyl



Methodology

Mobile Application

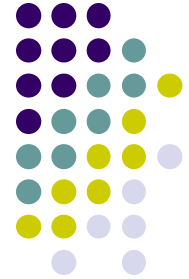
- Sensing Daemon
- Ambient Wellbeing Display
- Mobile BeWell Portal



Methodology

Web Portal & Server

- Desktop BeWell Portal
- Online diary
- Wellness history



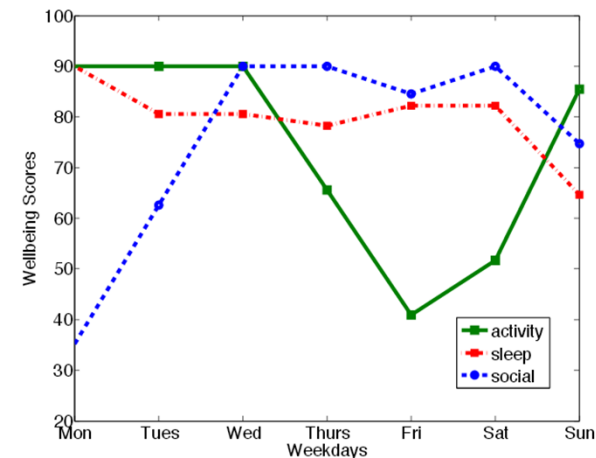


Results

- Max Benchmarks on Nexus One:
 - 31% CPU, 16MB RAM, 15 hours of battery, 3GB space
- Accuracy of app in 5-person study:

	Voicing	Walking	Stationary	Running
Accuracy	85.3%	90.3%	94.3%	98.1%

- Overestimates social interactions by 14% (ie TVs)
- 22% Error in physical activity
- Sleep error of 1.5 hours





Conclusion

- Proves viability of personal wellbeing apps
 - Fitbit
- First in social measurement
- Discretely collects/presents data
 - Minimal user input

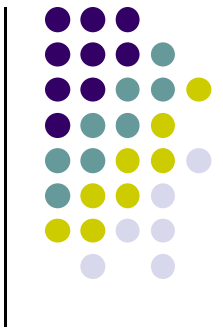
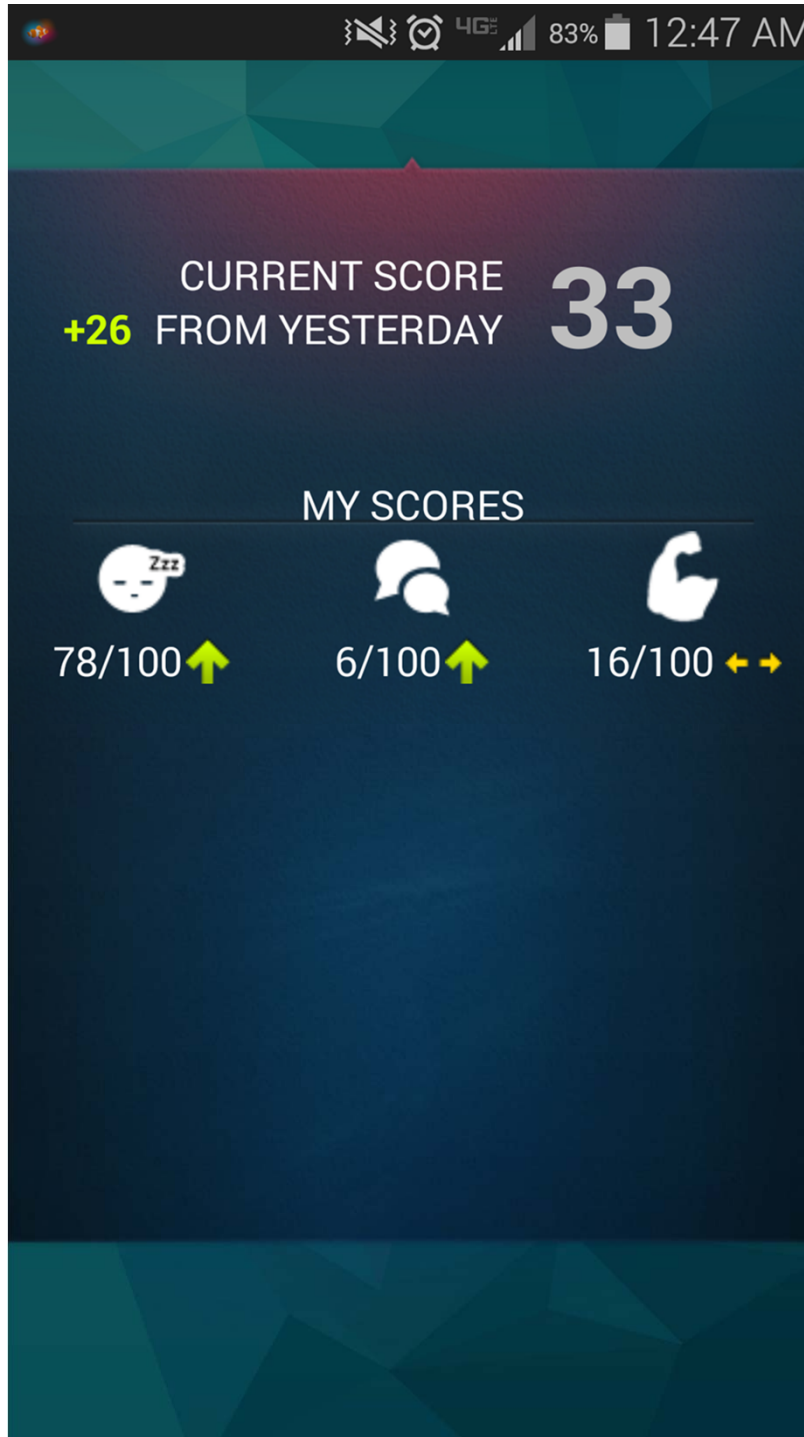




Future Work

1. Broadened activity inferences
2. Techniques for calculating expended energy
3. More robust conversation recognition
4. Wider range of health based inferences

Rob's Heath

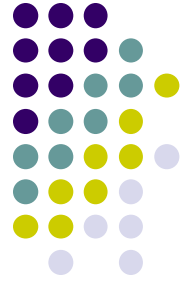


References



- Nicholas Lane, Lin, M., Rabi, M., Yang, X., [Doryab, A.](#), Lu, H., ... Berke, E. (2011). [Bewell: A smartphone application to monitor, model and promote wellbeing](#). In *5th ICST/IEEE Conference on Pervasive Computing Technologies for Healthcare*. IEEE Press.
- **DBSAWellness:** http://www.dbsalliance.org/site/PageServer?pagename=wellness_tracker
- **MoodTracker:** <https://itunes.apple.com/us/app/moodtrack-diary-social-mood/id549251057?mt=8>

Discussion



- Are wearables really that obtrusive?
 - Gaining a lot of popularity (watches, fitbit, glasses)
 - Always on the person and exposed
 - More sensors (heart rate)