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## MINING DATA FROM MOBILE DEVICES

Summary & conclusion

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## Recap

- Technology overview
- Algorithms
  - Sensing (localization, activity recognition)
  - Location and context
- Applications
  - Urban
  - Health
  - Social, local
  - Ads
  - Security
- Area is very inter-disciplinary, we *had* to leave several things out

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## Looking forward...

- Mobile phone penetration rapidly increasing
  - For many people, a smartphone will be their first computer
- All of these technologies are becoming mainstream
- Sensors are becoming cheaper and easier to hook up
- So, what's beyond (just) the mobile (smart)phone?

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## Mobile devices

Smartphones

IoT

Network (Cellular, WiFi, Bluetooth, ...)

Sensors

Medical

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## (Mobile) devices: sensors

Withings Smart Body Analyzer

Fitbit

Polar HRM (BLE)

Withings Blood Pressure Monitor

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## (Mobile) devices: medical sensors

LifeScan Glucose Monitor (GM)

MedTronic Continuous GM


Asthmapolis

Seca Bluetooth ECG

<http://www.bluetooth.com/Pages/Health-Wellness-Market.aspx>

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## (Mobile) devices: "IoT"



Lockitron

Electric Imp

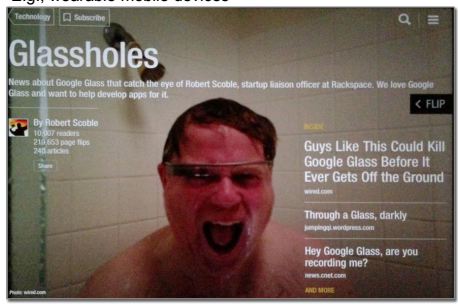
BLEduino RFduino

IOIO

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## Coming everywhere:


E.g., wearable mobile devices



...even in the shower!

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## Cheap...



Today:  
e.g., RFduino

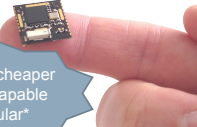
- Nordic ARM Cortex-M0 (32bit)
- Bluetooth 4.0 (BLE)

\$21

Seven years ago:  
Mica Mote (Crossbow)

- Atmel ATmega 103L @4MHz
- 128KB flash / 4KB SRAM
- 916MHz radio transceiver (38.4Kbps)

~\$300 per mote w/sensors



10-15x cheaper  
More capable  
Popular\*

\*raised \$373K out of \$9K goal on Kickstarter

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## Cheap... and ubiquitous

- It's easier than you think!
- Proliferation of open-source, open-hardware tools:
  - Arduino ecosystem (AVR and ARM), mbed, BeagleBone, RasPi, ...
  - Sensors in forms for easy prototyping (breakout boards, etc)
  - Wireless modules (BLE, Xbee, ...)
- Very active hacker (maker) communities
- Cloud platforms (e.g., Imp, Xively, IFTT, Spark Core, ...)
- Some mainstream interest (e.g., Android Accessory APIs)
- Co-design of sensing and analytics
  - Already a trend in mHealth

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## Larger picture: venues

In addition to data mining / web venues:

- Medical health informatics
  - Many...
  - Good collection: <http://mhealth.jmir.org/collection/view/51>
- Ubiquitous computing
  - Mobile sensing workshop
  - Urban computing workshops
  - New urban computing conferences
- Networking
  - PhoneSense
  - MobiCASE
- Many of these areas are starting "analytics" workshops

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