CitiSense and MetaSense: Challenges & Technologies for Mobile Participatory Sensing for Air Quality

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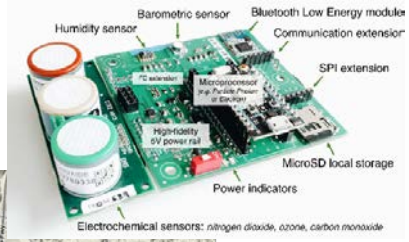
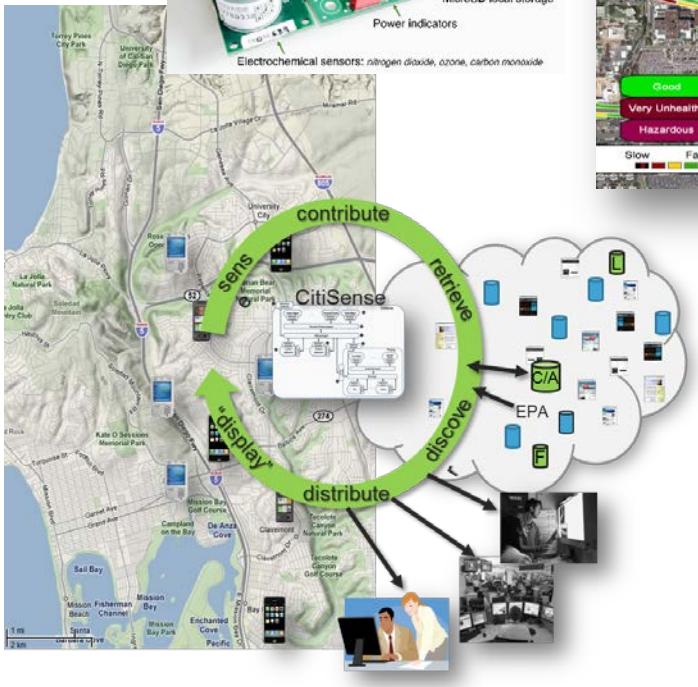
NSF CitiSense: Mobile Personal Air Quality Monitoring



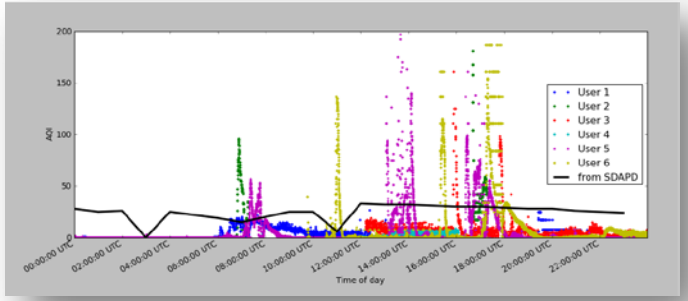
THE WALL STREET JOURNAL.

Bad Air at State and Main

Need advance warning of ozone at the n
air-quality sensors that feed data to sm
and others to avoid the heaviest concent



- Sensors and phones given to commuters using various transportation means throughout San Diego area
- Individual exposure varied widely from EPA AQI
- Affected attitudes and behavior



MetaSense: Improving Accuracy

- Low-cost sensors have proven difficult to calibrate
  - Calibration parameters from manufacturer are inadequate
  - Sensors are affected by many factors besides pollutants
- Idea: *field calibration*
  - Design a new board with the latest low-power sensors
  - Co-locate mobile monitors at regulatory sites, gather data
    - In 2016 we did an initial study in Los Angeles
  - Build machine learning models of sensor and environment
    - effectively we are doing pollutant estimation

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San Diego Deployment'17

- Rotating monitors through 3 ref. sites
- Benchmarked non-linear ML techniques and used environmental variables
  - Decisio

Crowdsourcing mobile sensing with machine learning can give more accurate exposure maps via in-field calibration

Sen

- CO, NO_2, O_3 (electrochemical)
- O_3 (metal oxide)
- VOC (PID, Mox 2x)
- CO_2 (NDIR)

- El Cajon – NO_2, O_3, CO
- Shafter DMV – O_3, TNMHC, CO_2