ACM SIGCHI SUMMER SCHOOL ON USER MODELING AND PERSONALIZATION IN URBAN COMPUTING (UMCIT 2019)

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1 Day 1

1.1 Opening presentation and key note

MARCELO G. ARMENTANO

- Exploring the importance of sensors in smart devices for urban sensing.

- How to gather data through crowdsensing mobile sensors and applications.

- Urban computing for solving traffic estimation challenge.

1.2 Mobile Crowdsensing

- Brief history of smartphones and development.

- Gathering data using mobile sensors

    - sensor gathers data of user mobility.
    - gathering information from user like spots/browser history/non-likes etc.
    - purpose is to design recommendation system for large scale use.

1.2.1 Mobile Sensing

- Smartphone sensing

- Sensing via Software APIs

- Mobile Apps

1.2.2 Personal Sensing

- Collecting data for user purpose **ONLY**

1.2.3 Public Sensing

- Collecting data for public purpose. Data can be stored on unprotected cloud servers.

1.3 Discussion on evolution of mobile phones

- discussion on evolution of sensor devices, ranging from first generation smartphones to recently available smartphones ex. bluetooth, infrared, camera, gyroscope, accelerometer, barometer, light sensor, ambient sensor, GPS.

1.4 Components that enable mobile computing

- Apps (personal sensing apps), surveillance, car and bike sensors etc.

1.5   Major talk on sensors

- Motion sensors

  - Accelerometer (for measuring the acceleration of user. very sensitive)
  - Gyroscope (navigational precision. stable)
  - Magnetometer (direction strength)
  - Proximity (distance with respect to destination)
  - Pedometer (steps movements of the legs)

- Environmental sensors

  - Ambient light
  - Barometer

- Radio

  - GPS
  - Cellular radios (not easily available data e.g cell phone antennas)
  - Wifi
  - Bluetooth

- External sensors

  - Car sensors
  - Bike sensors
  - Wearables

1.6   Crowd Sensing

Brief talk on its meaning and applications. Existing application using the concept of crowd sensing.

1.6.1   Environmental application areas

- Common sensing: pollution monitoring

- CreekWatch: monitor water level and creek quality

- MobGeoSen: local environment pollution.

- NoiseTube: monitor noise pollution.

1.6.2   Infrastructural application areas

- MIT Cartel & Microsoft Nericell

- ParkNet

- Traffic Sense

- PetrolWatch

1.6.3 Social application areas

- BikeNet

- Diet Sense

- Party thermometer

- LiveCompare

1.6.4 Road transport application areas

- Picture analysis

- Road quality

- Traffic re-routing

- Large scale patterns of traffic.

  NOTE

- Traffic can be estimated using **accelerometer & gyroscope or GPS location**. Based on the balancing of the car sensors and the average speed of the car.

- Traffic can also be estimated through social media posts ex.twitter report/post (a typical NLP problem.)

1.7 Sensing Classification

1.7.1 Participatory sensing

- Road transport sensing

- Photo & video journalism

- Data sharing on social networks

1.7.2 Opportunistic sensing

- Road

- Traffic

- Parking