

R249

Advanced Topics in Mobile and Sensor Systems and Data Modelling

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UNIVERSITY OF
CAMBRIDGE

A close-up photograph of a hand pressing a button on an elevator control panel. The panel is metallic and features several circular buttons with numbers. The hand is positioned over a button, with the thumb making contact. The background is slightly blurred, showing the interior of an elevator car.

Elevator Pitch

Harvest accurate geographical and behavioural data (efficiently)
Model and analyze fine grained geo temporal data
Feed logic back into applications
(urban, health, service improvement)

The course

- ⊗ The course is about anything to do with mobile systems
 - ⊗ Systems aspects including power, computation
 - ⊗ Sensing aspects
 - ⊗ Mobility aspects
 - ⊗ Modelling and Inference
 - ⊗ Application, Analysis, Inference from Data

The Schedule

- ⦿ 2 Nov (1h) Introduction (TODAY!)
- ⦿ 8 Nov MobileOS, Resource, Privacy and Energy
- ⦿ 16 Nov Activity Recognition with Machine Learning and On Device Learning
- ⦿ 23 Nov Mobile Sensing
- ⦿ 30 Nov Backscatter Communication and Battery Free Devices
- ⦿ 21 Jan Mobile Health
- ⦿ 28 Jan Urban Mobility Modelling
- ⦿ 11 Feb (3h) Applications of Mobile Data Analytics

Assessment

- ⦿ A total of 7 items of assessment:
 - ⦿ 1-2 Presentations
 - ⦿ 5-6 Reports
- ⦿ Each contributing 13%
- ⦿ A contribution of 9% for class attendance and participation
- ⦿ **A class list of attendance will be kept and apologies for absence should be sent to the lecturers prior the lecture.**

Written Reports

- ⦿ Each week a student is not presenting
- ⦿ Student assigned a paper among the ones listed to be presented for the following week.
- ⦿ Write no more than 1000 words (recommendation would be for a 750 words report).
- ⦿ Form Online
- ⦿ Students presenting will submit slides instead of a report

Form

- ⦿ Paper Report Summary of the paper (200 words)
- ⦿ Discussion on novelty of the paper as stated (150 words)
- ⦿ Positives of this Paper (100 words)
- ⦿ Negatives of this Paper (100 words)
- ⦿ Ideas for Future Work, Critical discussion of potential impact and context setting (200 words)

How to Read a Paper

- ⊗ Is this an important problem?
 - ⊗ Does it have applications and does it matter if it does not?
 - ⊗ Is it novel?
 - ⊗ What are the good bits of this work or line of work?
 - ⊗ What is not said in the paper and should?
 - ⊗ What are the negatives of this work
 - ⊗ Where can this work go?
 - ⊗ Can this work be applied to other areas?
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- ⊗ Consider the paper age
 - ⊗ Consider the paper implications

How to Write a Report

- ⦿ Write concisely and precisely
- ⦿ Answer the headings
- ⦿ Use scientific arguments

Presentation

- ⦿ Each student will present 1-2 times
- ⦿ No report when presenting (just submission of slides with same deadline) in PDF
- ⦿ Students assigned randomly each week
- ⦿ Presentations will be assessed for technical content, clarity, engagement, timeliness and question answering.

What do I put in the slides?

- The slides should
 - Introduce the problem the paper tackles
 - Describe the motivation of the work as in the paper and perhaps beyond
 - Describe pros and cons of the work
 - Illustrate and discuss future directions

Report and Slides Deadlines

🎬 Michaelmas Term Deadlines:

- 🎬 Assignment 1 due Thursday 8 November, noon
- 🎬 Assignment 2 due Thursday 15 November, noon
- 🎬 Assignment 3 due Thursday 22 November, noon
- 🎬 Assignment 4 due Thursday 29 November, noon

🎬 Lent Term Deadlines:

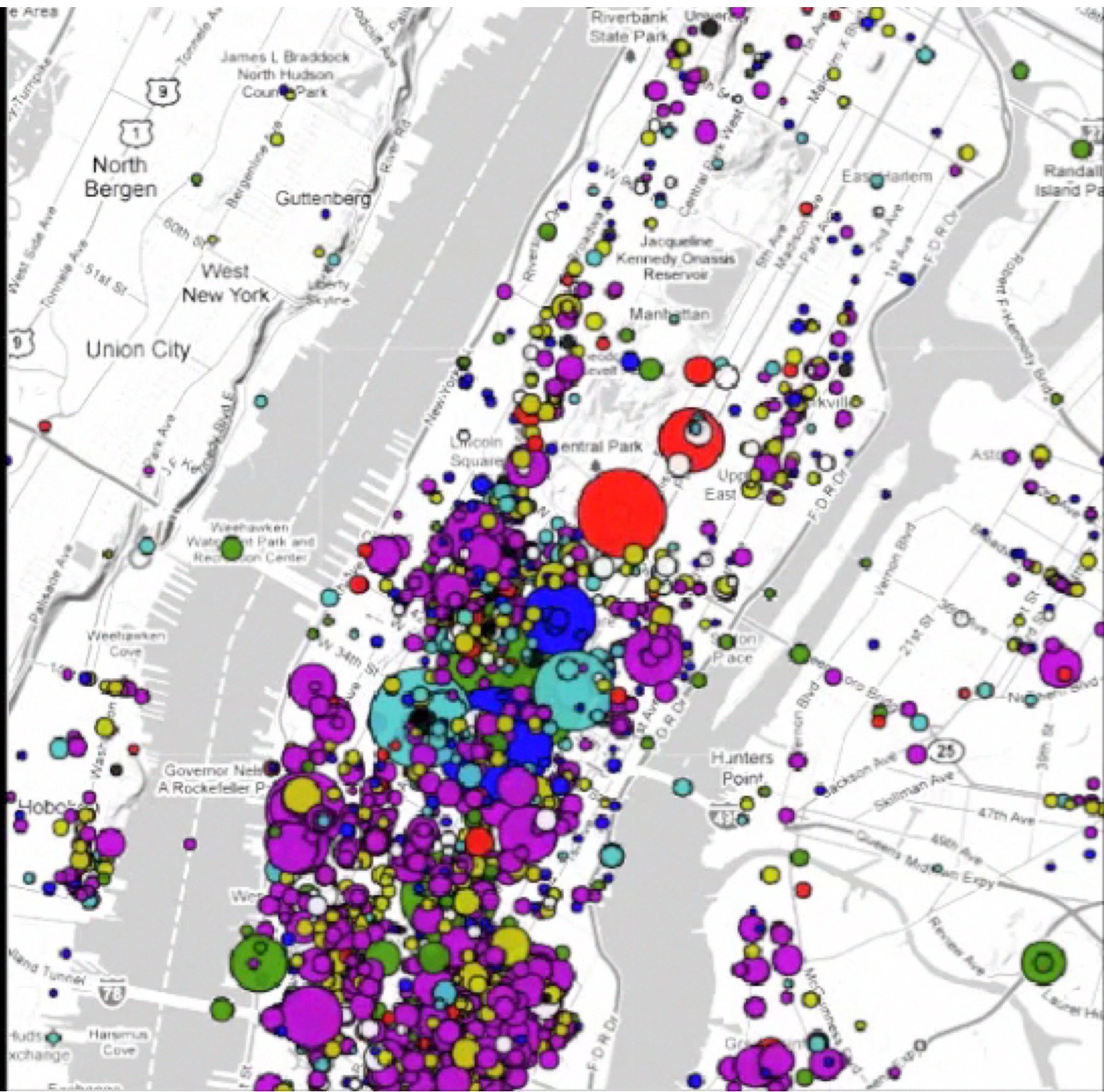
- 🎬 Assignment 5 due Friday 18 January, noon
- 🎬 Assignment 6 due Friday 25 January, noon
- 🎬 Assignment 7 due Friday 08 February, noon

The Papers!

- ⦿ <http://www.cl.cam.ac.uk/teaching/1819/R249/materials.html>
- ⦿ <http://www.cl.cam.ac.uk/teaching/1819/R249/paper-assignment.txt>

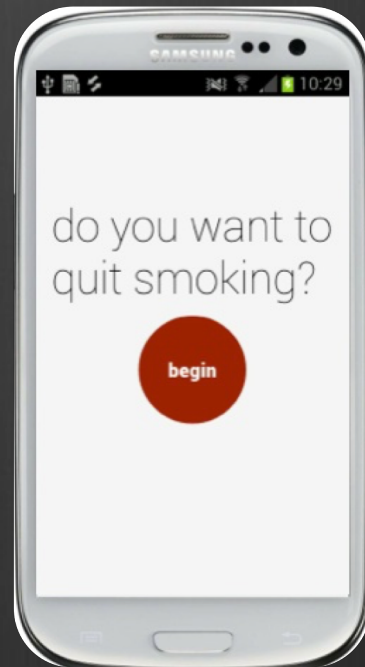
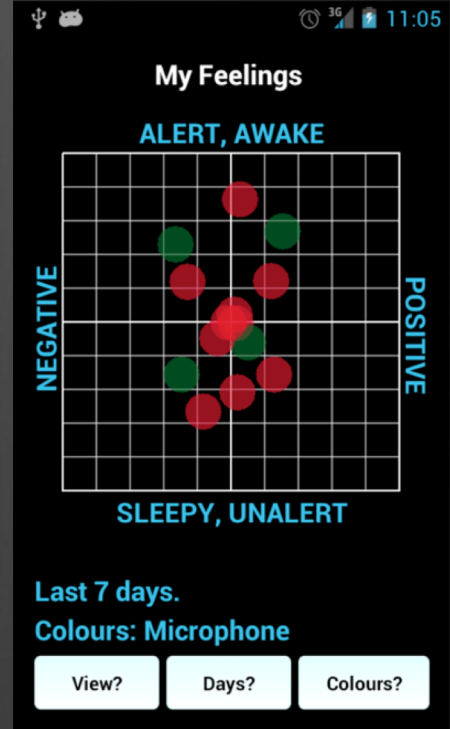
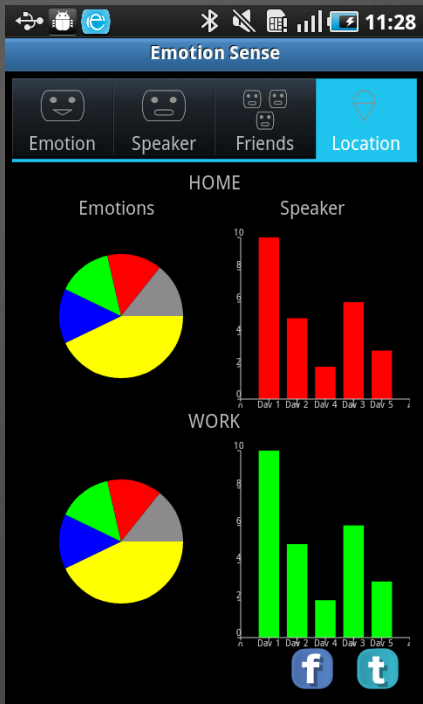
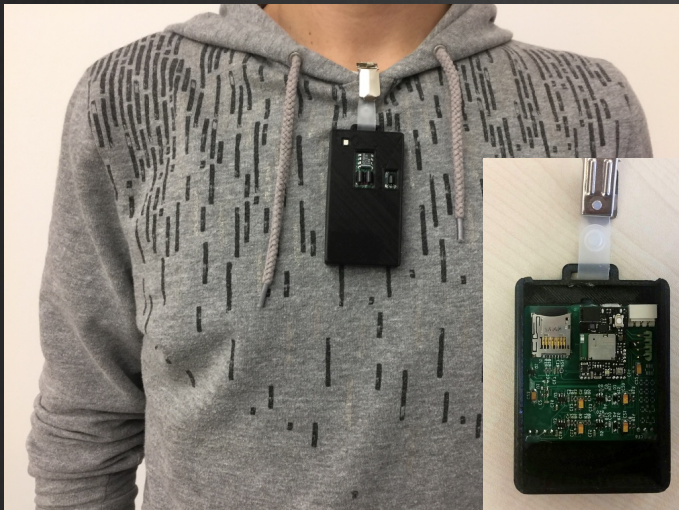
About the group's research...

FOURSQUARE CHECK-INS
SHOW THE PULSE OF
TOKYO



Our Stance at Urban Data Science

- ⊗ Can analysis of mobility data help understand trends and urban space use?
 - ⊗ Understand urban mobility, urban growth
- ⊗ Can we predict and help development of urban space?
 - ⊗ Help new venue placement to succeed
 - ⊗ Forecasting business closure
- ⊗ Can we relate policies for regeneration with factual changes in the mobility data (human behaviour changes)?
 - ⊗ cultural regeneration, neighbourhood gentrification and IMD
- ⊗ Can we provide services to users to improve their urban experience?
 - ⊗ Recommendations
 - ⊗ Taxi routes and load at waiting stands

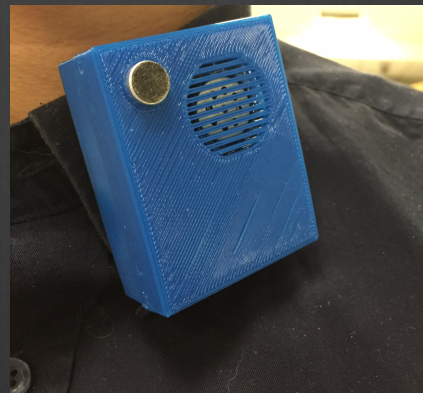
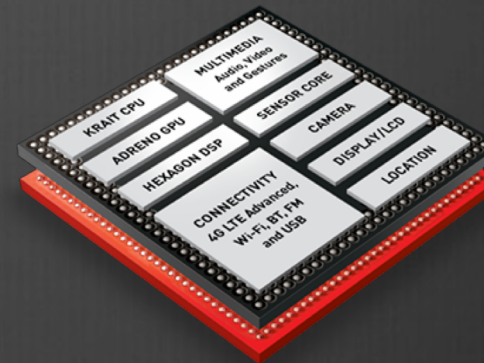


Sensing and Inference Efficiency for Continuous Sensing

Snapdragon 800 MDP/S

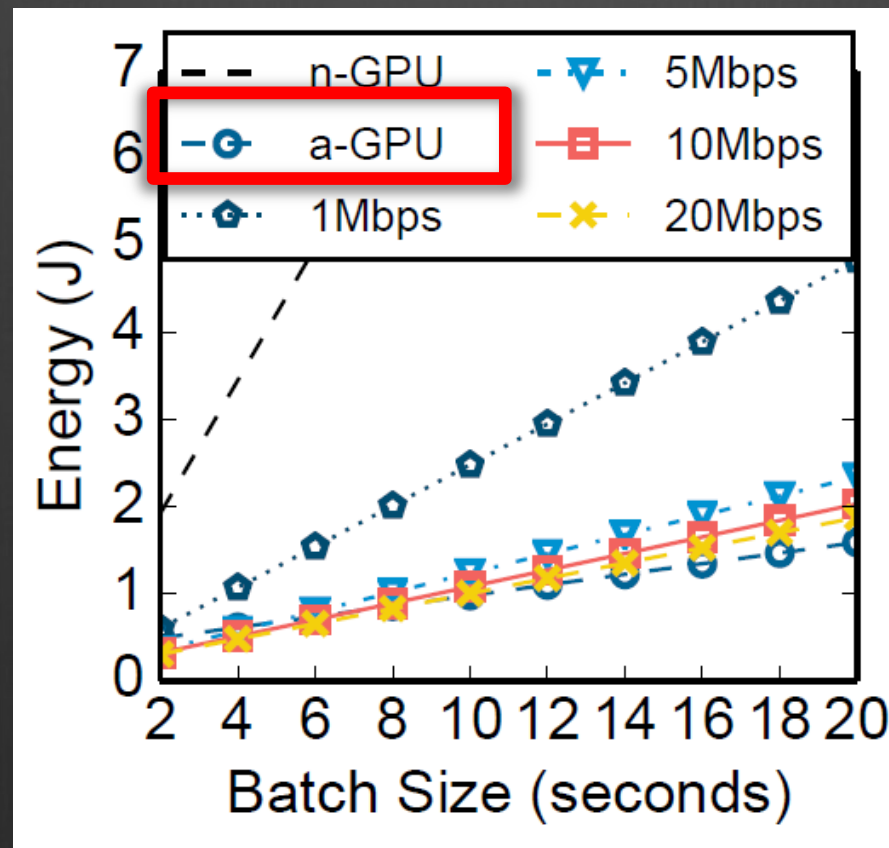


Qualcomm Hexagon DSP

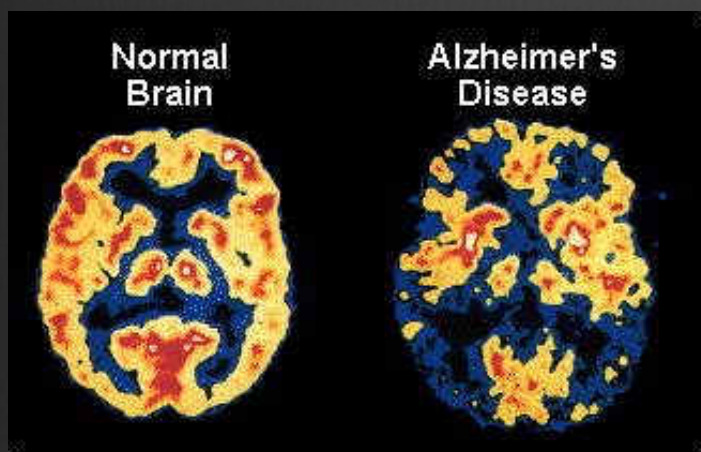
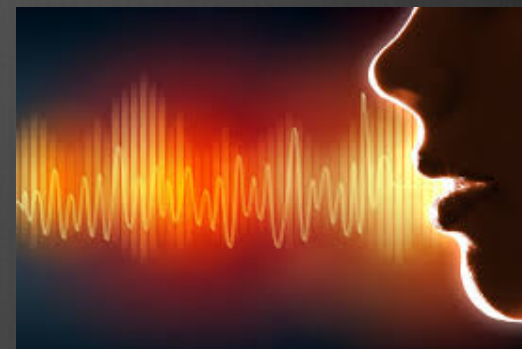


Optimized GPU is Efficient

Optimized GPU with batching outperforms cloud energy-wise



What's next...



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