Data Centric Networking

Session 1: Introduction to R202 Data Centric Networking

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Welcome and Introduction

- Welcome to R202
- First introduce yourselves
  - Tell about yourself
    - Your name and where you studied before ACS
    - What modules have you taken in Michaelmas term
    - What is your research interests
    - What is your ACS project
    - Why are you interested in data centric networking

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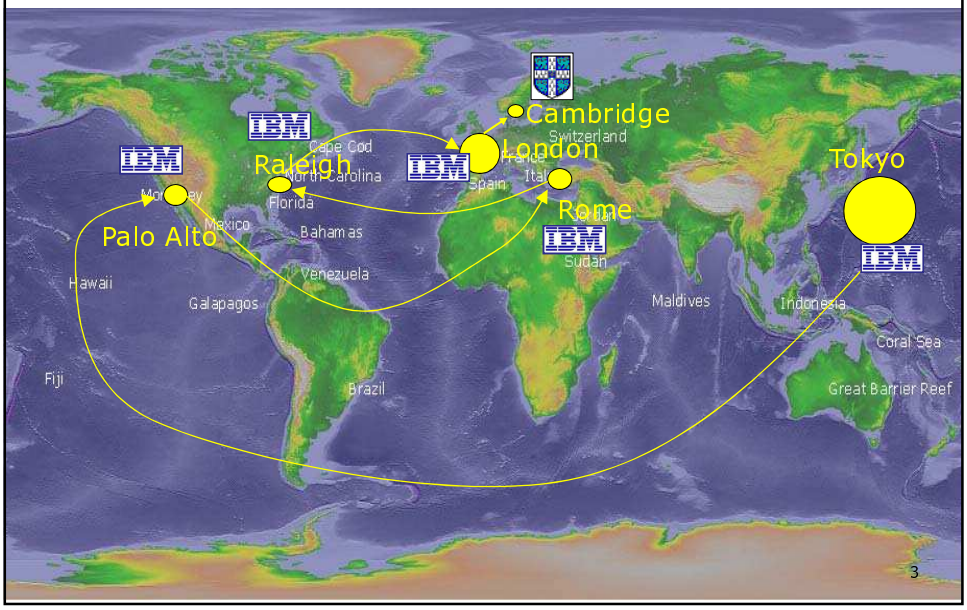
My Trajectory



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My Background

- EPSRC Research Fellow
  - R&D Engineer in IBM
  - Return to Academia
    - PhD on Data Centric Asynchronous Communication
    - Postdoc on Delay Tolerant Networking (EU Haggle)
    - Awarded EPSRC Fellow in 2009
- Research interests
  - Distributed Systems and Networking
    - Multi-point communication
    - Content distribution
  - Data Driven Declarative Networking
  - Complex and Time-dependent Networks
    - Social networks
    - Bio-inspired networks

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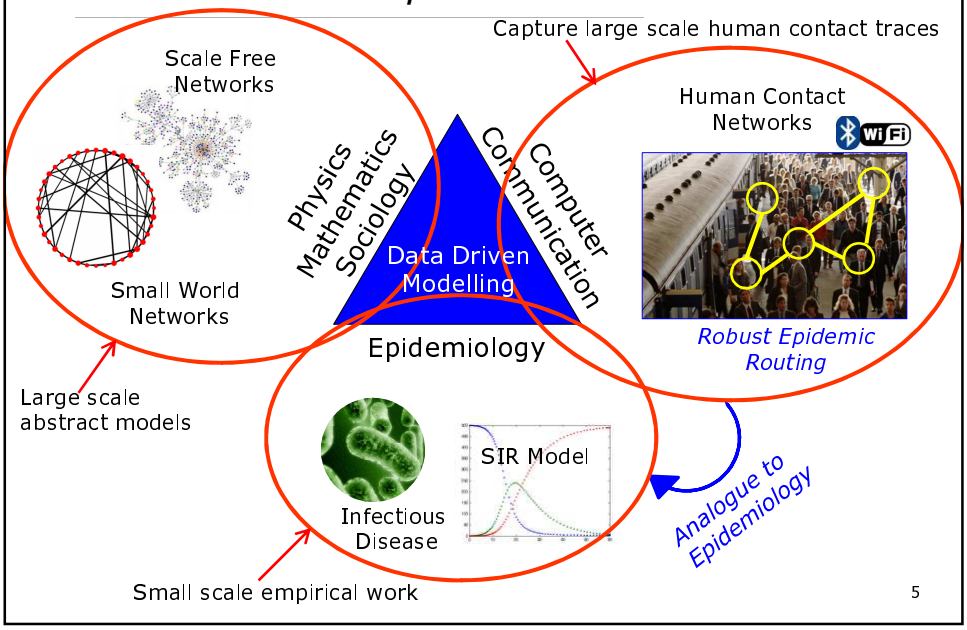
Data Driven Complex Network Research



Projects I am involved in...

- Infer social interaction, opinion dynamics, and cognitive behaviour – apply to computer systems
  - *EU FP7 Recognition: Cognition for Self-awareness in Content-Centric Networks*
  - EU FP7 Socialnets: Harnessing Adaptive Human Social Structures
- Network Modelling for Epidemiology
  - *EPSRC Data Driven Network Modelling for Epidemiology*
- D^{3}N: Data Driven Declarative Networking
  - *Programming meets networking*
- Modelling Epidemic Spread in Africa
  - *Understanding behaviour to infectious disease outbreak - social and economic influences*
- Haggle: Autonomic opportunistic Communications networks EU FP6 Haggle (2007-2010)
- Digital Economy Hub EPSRC Horizon (associated with)

R202: Data Centric Networking

- Shift of Communication Paradigm
  - From end-to-end to data centric
  - Data as communication token
  -
- Integration of complex data processing with networking
  - A key vision for future computing
- Different aspects of data centric approaches

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R202 Course Objectives

- Understand key concepts of data centric approaches
- Understand how to build distributed systems using data centric communication
- Research skills
  - Read systems/networking papers
  - Establish basic research domain knowledge in data centric networking
  - Obtain your view of research area for thinking forward

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Course Structure

- Reading Club
  - 2-3 Paper (poss. 4) review presentations and discussion per session (~=15 minutes each)
  - Each of you will present about 2 reviews during the course
    - You can use your own laptop or USB key with your PowerPoint or PDF file
    - Revised (if necessary) presentation slides needs to be submitted on the following day
  - *Review_Log*: minimum 1 per session
    - w/o section 6&7 by noon on Thursday
    - w/ section 6&7 by 17:00 by Friday
  - Active participation to review discussion!

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Review_Log

Paper Review Log: Session 1 (2011/01/20)

Name and (orsid):

Paper Title and Authors

1. Paper Summary (<100 words)
Describe a brief summary (extract essentials).

2. List other papers you read or skimmed for understanding this paper

3. Long Paper (<260 words):
What is the significant contribution?
What is the difference from the existing work?

5. What didn't you understand? (<100 words)
Crystallise what you did not get from the paper and describe your potential questions to the presentation/discussion. Do you have any major criticism to the authors?

6. What did you learn from the presentation? (<260 words)
Describe what you gained from the presentation and discussion including your notes from the session if applicable.

7. What paper do you want to read next as a follow on?

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Course Work: Reports

- Review report on full length of paper (2500 words)
  - Describe the contribution of paper in depth with criticism
  - Crystallise the significant novelty in contrast to the other related work
  - Suggestion for future work
- Survey report on sub-topic in data centric networking (3500 words)
  - Pick up to 5 papers as core papers in your survey scope
  - Read the above and expand your reading through related work
  - Comprehend your view and finish as your survey paper

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Course Work: Reports

- Report on project study and exploration of a prototype (3500 words)
  - What is the significance of the project in the research domain?
  - Compare with the similar and succeeding projects
  - Demonstrate the project by exploring its prototype
  - Project selection by February 5, 2011
  - Project presentation on March 10, 2011
  - Final report on the project study on March 21, 2011

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Study of Open Source Project

- Open Source project normally comes with new proposal of system/networking architecture
- Understand the prototype of proposed architecture, algorithms, and systems through running an actual prototype
- Any additional work
  - Writing applications
  - Extending prototype to another platform
  - Benchmarking using online large dataset
- Present/explain how prototype runs
- Some projects are rather large and may require extensive environment and time; make sure you are able to complete this assignment

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Candidates of Open Source Project

http://www.cl.cam.ac.uk/~ey204/teaching/ACS/R202/opensource_projects.html

- List is not exhausted and discuss with me if you find more interesting one for you
- Expectation of workload on open source project study is about intensive 3 full days work except writing up report
- One approach: pick one in the session topic, which you are interested in along your survey report

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Important Dates

- February 5 (Saturday)
  - Project selection
- February 18 (Friday)
  - Review report or Survey report
- March 4 (Friday)
  - Review report or Survey report
- March 21 (Monday)
  - Open source project study report

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Assessment

- The final grade for the course will be provided as a letter grade or percentage and the assessment will consist of two parts:
- 25%: for a reading club (presentation, participation and *review_log*)
- 75%: for the three reports
  - 20%: Intensive review report
  - 20%: Survey report
  - 35%: Project study

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Topic Areas

- ***Session 1***: Introduction to Data Centric Networking
- ***Session 2***: Content-Based Networking (CBN) and Content Distribution Networks (CDN)
- ***Session 3***: Content-Centric Networking (CCN) and Named Data Networking (NDN)
- ***Session 4***: Programming in Data Centric Environment + Guest lecture
- ***Session 5***: Stream Data Processing and Data/Query Model + Guest lecture
- ***Session 6***: Network holds Data in Delay Tolerant Networks (DTN)
- ***Session 7***: Network Structure/Characteristics and Contexts + Guest lecture
- ***Session 8:*** Project study presentation

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Reading Papers

- Scope of DCN is wide
- ...includes distributed systems, OS, networking, middleware, programming language, database…
- Understand where DCN functionality resides and how whole system works
- Type of papers
  - Building a real networking component and system
  - Proposing algorithm/mechanism on routing or architecture design
  - New idea (w/ or w/o simulation)

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Critical Thinking

- Reading a research paper is not like reading a text book
- But the most important one is that the paper is not necessary the *truth*
  - there is no right and wrong, just good and bad
  - There are inherently subjective qualities…but you can't get away with just your opinion: must argue
- Critical thinking is the skill of marrying subjective and objective judgment of a piece of work

First Let's Argue for…

- What is the problem?
- What is important?
- Why isn't it solved in previous work?
  - Why CCN? Current Internet naming is not good enough?
- What is the approach?
  - DHT for multicast
- Why is this novel/innovative?

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And Now against…

- Problem is overstated (or oversold)
  - CCN – does flat name scale?
- Problem does not exist
- Approach is broken
  - Functional programming language too difficult for regular programmers?
- Solution is insufficient
  - Only works when data rate is lower than …
- Evaluation is unfair/biased
  - ZebraNet only uses 5 nodes for evaluation…can it be applied on the general case?

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So Which is RIGHT Answer?

- There isn't one!
  - Most of arguments are mostly correct…
- Your judge on what is valuable on topic
- In this course, we'll be reviewing a selection of +20 papers (3-4 per week)
  - Cover 6 different aspects of data centric networking
  - All of these papers were peer-reviewed and published
  - However you can pick your opinion on papers!

Reviewing Tips & Tricks

- Identify a core paper for the topic
- Read *related work and/or background* section and read key other papers on the topic
- Capture the author's claim of contribution in *introduction* section and judge if it is delivered
- Identify major idea from main section, normally described at beginning
- Understand the methodology to demonstrate paper's approach
- Capture what authors evaluate and judge if that is a good way to evaluate the proposed idea
- For theory/algorithm paper, capture what it produces as a result (rather than how)

Elements in Review Comments

- Paper Summary
  - Provide a brief summary of the paper
  - At this stage you should try to be objective
- Problem
  - What is the problem? Why is it important? Why is previous work insufficient?
- Solution or Approach
  - What is their approach?
  - How does it solve the problem?
  - How is the solution unique and/or innovative?
  - What are the details?
- Evaluation is unfair/biased
  - How do they evaluate their solution?
  - What questions do they anser?
  - What are the strength/weakness of the system and evaluation itself?

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Elements in Review Comments

- What do YOU think?
  - Where you finally get to explain your opinion!
  - You should aim to give *a judgement* on the work
  - Your judgement should be backed by your argument
- Questions for the authors

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2. List other papers you read or skimmed for understanding this paper

3. Long Paper (<260 words):
What is the significant contribution?
What is the difference from the existing work?

4. Short Paper (<260 words):
What is the novel idea?
What is required to complete the work?

5. What didn't you understand? (<100 words)
Crystallise what you did not get from the paper and describe your potential questions to the presentation/discussion. Do you have any major criticism to the authors?

6. What did you learn from the presentation? (<260 words)
Describe what you gained from the presentation and discussion including your notes from the session if applicable.

7. What paper do you want to read next as a follow on?

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Review_Log

1. Paper summary (<100 words)
   - Describe a brief summary
   - Aim: you have read and extracted essentials
2. List other papers you read or skimmed for understanding this paper
3. Review full length paper (<250 words)
   - What is the significant contribution?
   - What is the difference from the existing works?
4. Review short length paper (<250 words)
   - What is the novel idea?
   - What is required to complete the work?

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Review_Log

5. What didn't you understand? (<100 words)
   - Crystallise what you did not get from the paper and describe your potential questions to the presentation/discussion
   - Do you have any major criticism to the authors?
6. What did you learn from the presentation? (<250 words)
   - Describe what you gained from the presentation and discussion including your notes from the session if applicable
7. What paper do you want to read next as a follow on?

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How to Review a Paper Aid…

- S. Keshav: How to Read a Paper, ACM SIGCOMM Computer Communication Review 83 Volume 37, Number 3, July 2007.
- T. Roscoe: Writing Reviews for Systems Conferences, 2007.
- Simon Peyton-Jones: How to write a great paper and give a great talk about it, Microsoft Research Cambridge.
- David A. Patterson: How to Have a Bad Career in Research/Academia, 2001.

See course web page for the paper links.

Structure of Presentation

- Cover 3 things in your presentation

1. Background/context
   - What motivated the authors?
   - What else was going on in the research community?
   - How have things changed since?
2. What is problem to be tackled?
   - What is the problem they tried to solve?
   - What are the key ideas?
   - What did the authors actually do?
   - What were the results?
3. Your opinion of the paper
   - What you agree and what you disagree?
   - What is the strength and weakness of their approach?
   - What are the key takeaway?
   - What was the impact (possible impact)?
4. Papers' bibliography

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Preparing…

- Not too much basics: remember, everyone will have read the paper

  - Brief overview
  - Do not make exact repeat of the paper
- Aim: generate discussion – spit your straight opinion about the paper to stir the discussion
  - Explore the arguments they make and the conclusions they draw. What is your opinion on it?
  - When you argue, state clearly the point of argument

Presenting…

- Practice beforehand to ensure length of your presentation

- Getting nervous is normal!
  - We are in the same boat and we help each other to understand the paper
  - Presentation is a tool to provide a discussion forum
- Try not to get defensive or angry at questions
  - It is not your paper !

Listening Presentation…

- You need to get involved

- Ask questions from your review – bring your *review_log* copy
- Always be respectful of the speaker

How to write Survey paper

- Demonstrate a summary of recent research results in a novel way that integrates and adds understanding to work in the research area
- Must expose relevant details associated, but it is important to keep a consistent level of details and to avoid simply listing the different works
- For example:
  - Define the scope of your survey
  - Classify and organize the trend
  - Critical evaluation of approaches (pros/cons)
  - Add your analysis or explanation (e.g. table, figure)
  - Add reference and pointer to further in-depth information

Summary

- R202 course web page:

  http://www.cl.cam.ac.uk/~ey204/teaching/ACS/R202

- Slides of presentation, forms, other information will be on the web

- Enjoy the course!