CS-M00 Research Methodology
Lecture 1: Introduction

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http://www.cs.swan.ac.uk/~csetzer/lectures/researchmethodology/12/index.html

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Welcome
Overview over the Module

Research Culture in Computer Science
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Research Culture in Computer Science
Terminology

- In my lectures “dual-specialists” means “MSc in Computer Science”.
- ACS means MSc in Advanced Computer Science (including specialisations),
Handbook

Synopsis

“This module consists in lectures and seminars about
▶ fundamental research methodologies and
▶ good practice in research,
▶ formulation of research questions and hypotheses,
▶ logical reasoning,
▶ literature research,
▶ proper acknowledgement of sources,
▶ principles in carrying out experimental research.”
General Structure

▶ Week 1/2: Introductory lectures (general).
▶ Week 3 - 6: Lectures by the degree scheme coordinates on research methodologies in the areas covered.
  ▶ Typically
    ▶ One lecture of general nature (e.g. “ethics”)
    ▶ One lecture about research in that particular field.
▶ In parallel tutorials led by tutors grouped by schemas (dual specialists, ACS and specialisations).
  ▶ Students will carry out a mini-project (in case of ACS related to their specialisation).
  ▶ Could be an essay, a small program, a small user study.
  ▶ Students write an essay and prepare a presentation.
▶ Week 7 - 9 Student presentations in tutorials.
▶ Week 10 Introduction into Projects and Project Selection.
Timetable

- 3 lecture slots per week:
  - Thursday 11 - 12, Keir-Hardy 152.
  - Friday 10 - 11, Talbot 224.
  - Friday 13 - 14, Grove Extension, 353.
- In first 6 weeks only 2 lectures given.
- Usually lecture Friday 13 - 14 cancelled (maybe changed).
- In week 7 - 9 presentations in the tutorials take place.
- In week 10 2 lectures regarding the projects.
Assessment

- Mini project allocated by tutor:
  - One essay or project report (50 %)
  - One talk (50 %)
Choice of Specialisations

- Students in ACS please hand in by **Monday 8 October** in Student Information Office:
  - **scheme transfer forms** signed by the coordinator of the specialisation you want to move in, **only if you want to change specialisation,**
  - or **confirm** in the student information office if you want to stay on your current specialisation.
- Needed for making tutorial allocation.
Module Selection

- All students please hand in module selection forms signed by the course coordinator by Monday 8 October in the student information office:

- Dual specialists: John Sharp,

- ACS:
  - Open specialisation: Roger Stein,
  - Software Technology: Roger Stein,
  - Safe and secure systems: Anton Setzer,
  - Visual Computing: Jason Xie
  - HCI: Parisa Eslimabnochilar
Tutorials

- Tutorials will be allocated
  - Some for dual specialist MSc.
  - For ACS groups organised by specialisations
    (some specialisations might be grouped together).
Topics in this Module (Lecture 1 - 5)

- Anton Setzer
  1. Introduction (this lecture), Coursework Submission System.
  2. Research culture, publication process.
  4. A taster of `\LaTeX` (Word processing system)
  5. Academic Integrity (by Chris Whyley).
Topics (By Pathway Coordinators, Week 3 - 7)

▶ Anton Setzer
  ▶ Specification and Verification.
  ▶ Time Management.

▶ Roger Stein
  ▶ Project Management and Planning.
  ▶ Project Selection.
Topics (By Pathway Coordinators)

- Parisa Eslimablochilar (TBC):
  - Introduction to HCI
  - Ethics Procedure
  - The Joys of Writing.

- Jason Xie:
  - Research paper critique and review rebuttal.
  - Visual computing research topics & general methodology
Disclaimer

Most of the pictures used in this lecture are downloaded from the internet.
They are not my original work.
Overview over the Module

Research Culture in Computer Science
3 Main Methodologies

- Theoretical Research.
  - Thinking.
  - Foundations of Computer Science.
    - E.g. “What is a program?”.
    - What kind of data types do exist?
  - Developing new ways of solving problems.
    - New algorithms.
    - New programming paradigms.
    - ...
- Mathematical Research.
  - A lot of proofs carried out.
  - E.g.: Prove that algorithm A is better than algorithm B.
  - Prove that it is possible to decide that this program is correct.
3 Main Methodologies (Cont.)

- Experimental Research.
  - User Studies.
  - Software Experiments.

- Software Production.
  - Usually experimental software
  - Trying out new algorithms, paradigms, programming languages.
However most of it is

Thinking Thinking Thinking Thinking
Ideas

▶ Creative Process.
▶ Ideas usually have roots in other ideas.
▶ Inspirations from others.
▶ Inspiration from other fields inside computer science, outside computer science.
▶ Or even arts, travelling.
Example: Greek Philosophy

- Greek philosophy origins from colonies close to Turkey, exposure to other cultures.
- Many researchers have been exposed to different cultures in early childhood.
  - Parents moving to other countries.
  - Being part of a minority in a country.
Most Important

Exchange of Ideas
Overview over the Module
Research Culture in Computer Science

Conferences
Conferences, Workshops

- A lot of research happens at conferences, workshops.
- From two to several thousands participants.
- Small workshops, large conferences.
- Some high prestigious by invitation only.
  - Oberwolfach (Germany)
  - Dagstuhl (Germany)
  - NII Shonan Meeting (Japan)
Social Events more Important than Lectures

Most happens during coffee breaks, lunches, dinners. Coffee breaks often more important than lectures.
My own experience

- Good lectures give rise to new ideas even if I don’t understand what the lecturer is talking about.
Other Forms of Collaborations

- Sabbaticals.
- Visits to Research Institutes.
  - Institute for Advanced Studies (Princeton).
  - Newton Institute (Cambridge).
  - Mittag-Leffler Institute (Stockholm).
  - ...
- Research visits.
  - Between 1/2 day and several years.
- Seminars, colloquia.
Scientific Journals

- Typically called
  - Journal of ... (Journal of Symbolic Logic)
  - Annals of ... (Annals of Pure and Applied Logic)
  - Archive of ... (Archive of Mathematical Logic)
  - Transactions of ... (ACM Transactions on Human-Computer Interaction).
  - Acta ... (Acta Informatica)
  - Many more.
Scientific Journals

- Most published by scientific publishers.
  - E.g. Elsevier, Springer, ...
  - Subscriptions very expensive.
  - Access to electronic subscriptions at Swansea
    - On campus.
    - Off campus through Athens.

- Increasingly open access journals.
  - Produced by the scientific community.
  - Reason: Most articles submitted in directly publishable form.
    No need for process of editing.
  - Why pay if publishers don’t add much to it.
Proceedings

- Proceedings of Conferences
  - Often published in
    - Springer Lecture Notes in Computer Science.
    - Electronic Notes in ... (e.g. Electronic Notes in Theoretical Computer Science).
    - Many other outlets.
  - Usually refereed.
  - Often highly competitive (acceptance rates e.g. 20 %, 10 %).
Referee Process

- Submission of article to an Editor.
- Editor sends it to Referees.
- Referees write anonymous reports.
- Editor decides about
  - Revised version required
  - Rejection
  - Acceptance.
Festschrift

- Festschrift = German for “Festive publication”.
- Proceedings in honour of somebody famous.
  - Typically 60th, 65th, 70th, 75th, ... birthday
  - or retirement
- Sometimes not of highest quality (no thorough referee process).
- Sometimes very high quality.
Good Way of Searching Quality Scientific Articles

Enable “Get it at Swansea” in Settings
Look for Doi pages (Document Object Identifier)
Identifying Electronic Versions of Scientific Articles

Look at pages of publishers

- Springer: Springer Link.
- Elsevier: Science Direct.
- ACM: ACM Digital Library.
Main Motivation for Doing Research

- It’s fun.
- Enthusiasm.
- Being amongst highly creative people.
- Going to the limit of human consciousness.
- It benefits society.
  - Top universities are hot beds for innovative companies.
Research and Teaching

- Research and teaching go hand in hand.
- Although research often beyond what is taught, it influences teaching.
- A researcher often shows not so much by what s/he is teaching, but how s/he is teaching, behaving, acting, thinking ...
Be Inspired