Introduction to the course

S. M. Ahsan Kazmi

Research Methods

Me:

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Research: 5G and beyond networks, Network virtualization, End to end Slicing, Distributed learning, Smart environments, etc.

Google Scholar: https://scholar.google.co.kr/citations?user=rsAINPYAAAAJ&hl=en

Researchgate: https://www.researchgate.net/profile/Sm_Kazmi

Office Hours: Please contact me by email/telegram to arrange a suitable time if you would like to discuss something about the module.

Outlook

- Objectives of the course and your tasks
- Comments on research and research evaluation
- Sources of information in Computer Science
- How to evaluate a research paper

Slide Credits: Artem Kruglov and Giancarlo Succi

Objectives of the course

- This course aims at:
- Help you in becoming a critical consumer of research
- Abstract away technical details -- focus on principles
- Error model of research
  - It is the researcher's job to
    - IDENTIFY,
    - REDUCE and
    - REMOVE

      sources of error
- Research evaluator's job
- Challenge research by searching for possible errors missed by the researcher

Course Sections & Course grade

- Theory of research
- Research domains and experience
- Students' presentations
  - Proposal presentation (Week 5)
  - Literature Review presentation (Week 8-9)
  - Final presentation (Week 14-15)
- Proposal presentation: 10 points
- Literature review: 35 points
- LR Reviewer: 10 points
- Group Work: 20 points
- Final presentation:25 points

Your job

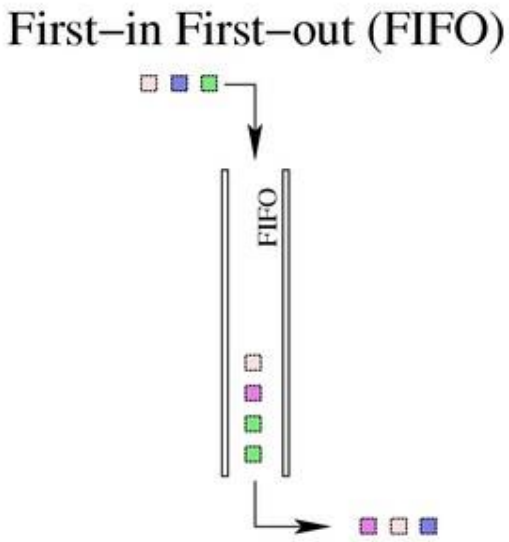
You have to read, study, analyze, summarize and present research papers in an area of your research interest.

- At least five research papers for LR
- At least three papers for group work
- One paper's critical appraisal for the final presentation

"They take the timbrel and harp, and rejoice at the sound of the organ."—*Job* xxi. 12.

How to choose the papers

- You get a list of sources (online journals, …) from which to choose a paper
- FIFO



How to proceed (1/2)

- Read the papers carefully one, two, three, … n times
- If you do not know the area very well, read related literature to get an overview of the state of the art
- Evaluate the content according to the scientific evaluation criteria presented in the next lectures
- Address any issues regarding scientific validity, scientific and practical/industrial impact, methodology used, data presented, …

How to proceed (2/2)

- Write a short LR of the chosen papers and submit it
- Write a short and concise critical appraisal of the paper and submit it by the end of the course
- Give a presentation of the paper, in which you address the *pros* and *cons*, and compare it to the state-of-the-art
- Explain how you would improve the paper
  - What is missing, what is wrong? Is the idea clear? are the conclusions valid and reasonable?

Summary

- *Objectives of the course and your tasks*
- Comments on research and research evaluation
- Sources of information in Computer Science
- How to evaluate a research paper

General Evaluation Criteria (1/2)

- External Criteria -- based on comparison of the article's content with what is already known about the topic.
- How does research compare with everything else you know about the topic
  - do they agree with previous research?
  - do they agree with your firsthand experience?

General Evaluation Criteria (2/2)

- Internal Criteria -- independent of specific subject matter

- These methods are not absolute
  - they can only increase the probability that the research is correct.

What is Research?

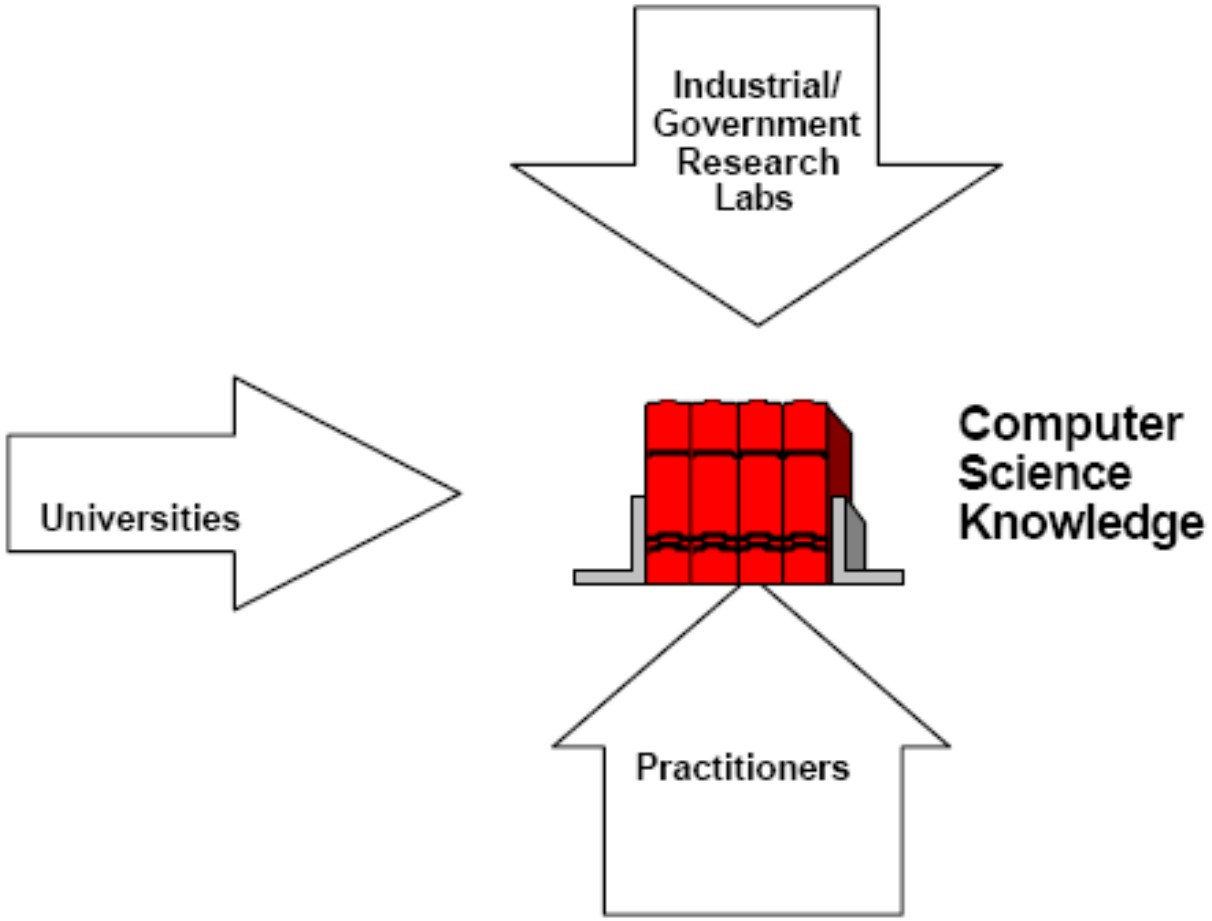
"Systematic inquiry into a subject in order to discover or check facts."

Random House Dictionary

Types of Computing Research

- Mathematical Proofs
  - P=NP (an exercise for the reader)
- Experimental Methods
  - The 1966 experiment of Grant and Sackman on the productivity differences between developers (wrong research design led to wrong conclusions)
- Simulation
  - Model of traffic flow
- Build Systems
  - Cray computers
- Creating New Tools and Methods

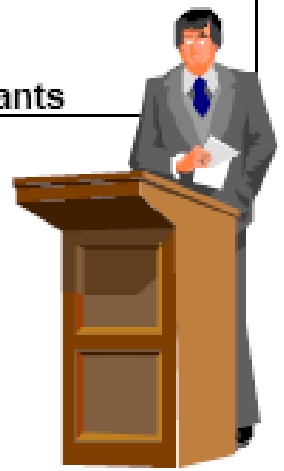
Research Sources



Who are the producers?

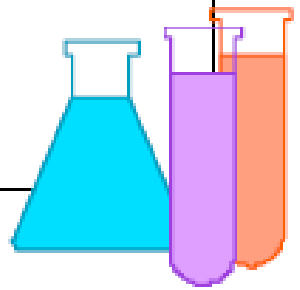
University - e.g. Virginia Tech

- Full Professors
- Associate Professors
- Assistant Professors
- Lecturers
- Graduate Assistants



Industrial Research Lab

- President
- Vice-president
- Exec. Director
- Director
- Department Head
- Supervisor
- DMTS
- MTS



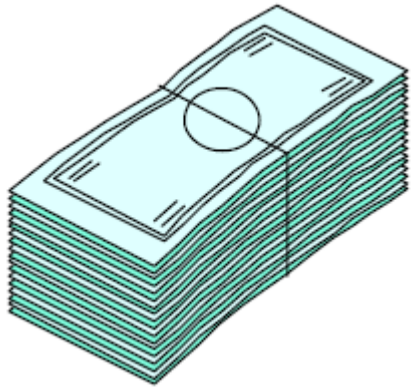
Who are the consumers?

- Teaching Universities
- Industry
- Government
- General Public
- Technology Transfer is a key problem

The Funders

- Russian Science Foundation (RSF)
- European Space Agency
- MITI (Japan)
- EU – Infrastructural programs, FPn
- NASA

…



How is research quality measured?

- Duration of results
- Novelty
- Research utility
- Practical utility
- Correctness
- Scope
- Funding
- Publications

End of Lecture