Networking Research, Education, Mentoring and Service: Ten Insights and a Look into the Future

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Overview

Research
Mentoring
Teaching
Service
Top 10 lists: I love them

- “10 pieces of advice I wish my PhD advisor had given me”, CoNEXT, INFOCOM, N2Women student/workshops
- “10 tips for writing a paper”
- “10 tips for writing a proposal,” CRA Career Mentoring workshop
- “Networking Education and the hands-on experience: 10 observations, insights, and advice that I wish someone had told me”
- “10 Networking Papers: Recommended Reading,” ACM CCR 2006

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Observations about past, future: tough!

Past  Future

rose colored glasses  crystal ball
Observations about past, future: tough!

IEEE Infocom Keynote (Hong Kong 2004):

Networking: expanding visions

From 2006 Multimedia workshop (Paris)
(two days after Google acquired YouTube)

Don’t blink, because when you open your eyes, YouTube won’t be around
Observations about past, future: tough!

1995: Jim and Keith approach a publisher, with book idea

We want to write a book, but there will be no printed books by 2000, so ....

Overview

Research

Mentoring

Teaching

Service
Research: what makes a problem interesting?

network measurement, inference: hands-on, rigorous

Packet Loss Correlation in the MBone Multicast Network

Detecting Shared Congestion of Flows Via End-to-end Measurement

Research: what makes a problem interesting?

modeling: models provide and reflect insight

content-caching networks: bounding calculus, approximation algorithms

Packet-switching: queueing networks (Kleinrock, 1963)

more: multicast, video, network calculus, ...
Research: what makes a problem interesting?

sensor networks: deployment, architecture, impact, interdisciplinary

Research: what makes a problem interesting?

network architecture: “big picture” challenges for large scale systems

- Signaling: hard state versus soft state
  - “robustness” (non-fragility)
  - complexity of control
  - maintainability
  - evolvability
  - adaptability
  - reconfigurability
  - security
  - manageability

- MobilityFirst: logically-centralized control plane element for generalized mappings (e.g., name, location)
  - context-sensitive (attribute specific) services
Picking Research Problems: carefully

- what’s the fundamental issue you’re solving?
- will the problem be of interest five, ten years from now?
- how “crowded” is the field?
  - lots of smart people!
  - what’s your advantage?
- focus on fundamentals, solutions that cut across a solution space

A fool can ask more questions in a minute than a wise man/woman (or a Yoda) can answer in a lifetime

solution space

You are here (but maybe shouldn’t be)
Choosing, defining a research problem

- complexity, sophistication are themselves not of interest
- simple is sometimes harder!

[adapted from Hluchyj 2001]

#2

Overview
Teaching

- 50% an acquired art: *can be studied, and learned*
- 50% connecting with students, caring
- Question: what is the value of of “being there”
  - *active learning*: research shows: better learning outcomes
  - you can learn, try it!

Teaching: a prediction

- tomorrow “textbooks”: high quality, highly interactive, high production value
- interactive, with video, interactive animations, problems, reviews, question/answering
- *teaching challenge*: what will be the “value added” by in-class participation?

As teachers, we will need to become increasingly aware of the value we add over technology-based education
Computer Science for All (CS for All)

- Enable all students to have access to high-quality CS education in K-12:
  - knowledge base, capacity for rigorous, engaging CS education
  - foundation in NSF CS10K investments
  - professional development for educators
  - new Computer Science Principles AP exam
- Collaboration: NSF, Dept. Ed., industry, non-profits
- CISE, EHR: $120 million over five years

“In the new economy, computer science isn’t an optional skill — it’s a basic skill…”
President’s Weekly Address 1/30/2016

CS Education

Explosion of interest seems different this time around
- broader interests
- minors, other disciplines
CS Education

- second sea change (tsunami): broadening interest in computing among incoming students
- success of CS10K, CS4All
- CS+X

Overview
Service

- do it because you love it, and you think it needs to be done
  - 1st Infocom student workshop (2005) (with Edmundo de Sousa e Silva)
  - journal EIC positions, PC positions
- service to larger community: your institution, CS community, government (NSF!):
  - good leaders are needed from (and for) our community
- if you do it, do a jrex (a.k.a. amazing) job

Overview

- Research
- Teaching
- Mentoring
  - colleagues
  - grad students
- Service
Mentoring: the *process* of doing research

- research is still a guild
  - grad student = apprentice
  - early career faculty need mentoring also!
- what my former students tell me 1-25 years later:
  - learn research process, how to define/frame problems
  - communication: writing, speaking
- early career faculty, researchers: learning the “ropes”

Learn how to write *really* well

- can *not* overemphasize importance of good writing
  - the most important course?
- “unfair advantage” in paper selection, proposal
- best investment of your time
- study role models

"No tale is so good that it can't be spoiled in the telling” Proverb

http://www.net.cs.umass.edu/kurose/writing/
Recommended reading:

Writing for Computer Science
by Justin Zobel

The Elements of Style
by William Strunk E. B. White
(50 years old – and still a classic!)

Learn how to speak really well

- Can’t overstate importance of good speaking
  - important course to teach/take?
- “unfair advantage” in mindshare
- convey exciting story/message
  - thoughtful
  - engaging
  - clear, concise
- practice, practice practice
  - videotape, critique yourself
  - study role models

#9
Identify role models

- who does something you care about really well?
  - how do they do it?
- many role models:
  - no one does everything
  - find your balance
- get a mentor
- be a mentor

Overview

... a few final observations....
Final observations

*Networking research community:* vibrant!
- SDN, NFV: solving management and control plane challenges; bringing computation to the edge
- Mobility, wireless
- cybersecurity
- data
- cyberphysical systems, IoT
- ....

*More generally:* evolving human-technology frontier
- networking’s key role when computing is embedded on, around, and in us

Final observations

- constant need to “prove” yourself
  - being out of your comfort zone can be hard but ...
  - the need to keep learning
- privileged to be doing what we do
  - working in a discipline that has, and will continue to, profoundly change the world
  - meaningful work, well paid
  - our roles as teachers and mentors are *impactful*
- work we do is great; people matter
"to the amazing PhD students and postdocs I’ve worked with at UMass:

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- Jayanta Dey
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- Timur Friedman
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- Majid Ghaderi
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- Yang Guo
- Dan Gyllstrom
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- Ping Ji
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Chun Zhang
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Mike Zink

... to all of my research collaborators over the years"
THANKS!