

October 3, 2011

Synopsis: Research areas; finding a research advisor; doing research

1. Finding a research topic: what are you interested in?
 - a. What are the current “hot topics”?
 - i. Is the current “hot topic” superficial or a manifestation of a much deeper problem?
 - ii. Theory vs. framework vs. systems
 - iii. Incremental vs. revolutionary or groundbreaking
 - b. Read, read, read ...
 - i. Papers from leading journals, conferences, workshops
 - ii. Papers from leading researchers, research groups in the area
 - iii. Technical reports, which often give more details than papers or report preliminary findings
 - iv. Reports issued by leading bodies and professional societies in the field (such as NRC, NSF, IEEE, ACM, industry groups)
 - c. Think about what you read, and compare it to what others have written
 - i. What are the assumptions? Are they realistic?
 - ii. If the paper reports on an experiment, was the experiment done correctly?
 - iii. Do you agree or disagree with the interpretation of the results?
 - iv. What are the limits of the results (stated and unstated)?
 - v. What part of the problem did the work *not* answer?
 - vi. Challenge, extend the current paradigms
 - vii. Question, question, question ...
 - d. What are your personal goals?
 - i. Academia (emphasizes theory, using experiments or systems to validate it)
 - ii. Industry (emphasizes systems and practice, using theory to explain or justify it)
2. Finding a research advisor
 - a. Security: network security, system security, formal methods, social networking, mobile security (especially cell phones)
 - b. Theory: computational geometry, computational biology, cryptography, algorithms, optimization
 - c. Systems: programming languages, parallel computation, operating systems, software engineering
 - d. Networking: optical, wireless, ad hoc, sensor, protocols, cognitive, security
 - e. Architecture: VLSI design,
 - f. Graphics: visualization, rendering, animation, geometric modeling
 - g. Databases and information systems: provenance, data sharing, incomplete and probabilistic databases, security Artificial intelligence: machine learning, data mining
3. Doing research
 - a. Time is precious
 - b. This is *your* education—don’t be afraid to push!
 - c. Learn how you work best