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