Dissertation and beyond: Ph.D. in CS/SE at UTD

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Welcome

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All PhD, All MS Thesis, All PhD as MS
Computer Science at UTD
One of the largest departments in the country (3rd largest)
And one of the best!

Fall 2020 student population ~4,600 students (3,600 BS, 800 MS, 160 PhD)

51 T/T faculty, 40+ Faculty of Instruction, 20+ part-time lecturers

BS, MS, PhD degrees offered in CS, SE, Data Science

~300 course-sections offered each semester (wide variety)

~1000 students graduate each year (more than 1% of US output of CS graduates)

World renowned CS faculty: publish in top conferences & journals

~$9 Million in annual research expenditures (37th in USA)

21st in LinkedIn ranking; #44 in USNWR global rank; #5 in UG AI (Best Value Colleges)
• Ranked #6 in NLP + AI (2009-2019)
• Ranked #5 in Software Engineering (2009-2019)
• Ranked #6 in Real Time Systems (2009-2019)
• Ranked #41 overall (2019-2020)

• Ranked #24 in Top Colleges Providing Cyber Security Programs

• #5 in the nation for Undergraduate Education in AI (Best Value Colleges)
  – Just behind MIT, CMU, UC Berkeley, Georgia Tech

• BS SE ranked #9 in the country by “Best Computer Science Schools”
CS Accomplishments

• 15+ CS faculty members hold the prestigious NSF CAREER award
• Numerous best paper awards & academic honors (many test-of-time awards as well):
  – Dr. Bhavani Thuraisingham, Fellow of the ACM and Fellow of NAI
  – Dr. Zygmunt Haas, Fellow of two European Societies
  – Dr. Latifur Khan, Fellow of the IEEE
  – Dr. Murat Kantarcioglu, Fellow AAAS and IEEE
• CS faculty are excellent teachers: they have won many awards
• Diverse student body:
  – #11 nationally in number of women students
  – #11 nationally in number of Hispanic students
  – #14 nationally in number of African American students
Areas of strength in UTD-CS/SE

- Networking and Telecommunications
  - Wireless networks, protocols, optical networks, distributed systems

- Software Engineering
  - Embedded systems, Verification & testing, Requirements engineering

- Intelligent Systems
  - Artificial intelligence, Computer Vision, Natural language processing, Expert systems

- Cyber Security
  - Data Security and Privacy, Active Malware Defense, Secure Cloud Computing, Data Analytics, Hardware-based Security

- Computer Systems
  - Databases, Computer/Human Interfaces, Multimedia systems, Computer Graphics, Computer security

- Data Science
  - Combines parallel and distributed systems, efficient data management and analytics, and applications of statistics and machine learning.

- Algorithms and Applications
  - Algorithms, Optimization problems, Computational geometry, Computational biology

Surf the faculty home pages !!!

The Erik Jonsson School of Engineering and Computer Science
CS Department: Centers & Institutes

- Cyber Security Education & Research Institute (CSERI)  
  (Director: Dr. Kevin Hamlen)
- Human Language Technology Institute (HLTRI)  
  (Director: Dr. Sanda Harabagiu)
- Inst. for Interactive & Spatial Computing (UT DIISC)  
  (Director: Dr. Balakrishnan Prabhakaran)
- Institute for Data Analytics (IDA)  
  (Director: Mr. Bao Tran)
- Embedded Software Center  
  (Director: Dr. Farokh Bastani)
- Center for Software Testing  
  (Director: Dr. Eric Wong)
- iPerform: Center for Assistive Technology to Enhance Human Performance  
  (Director: Dr. Ovidiu Daescu)
- Center for Machine Learning Research  
  (Director: Dr. Sriraam Natarajan)
- Applied AI and Machine Learning Center  
  (Director: Dr. Doug DeGroot)
- Center for CS Education and Outreach  
  (Director: Dr. Jey Veerasamy)
PhD Program Goals and Timeline
Goals of a Ph.D. program

1. Research which represents original and “substantial contribution to Science”

2. Demonstrate technical “maturity”

3. Acquire expertise on a particular topic and general knowledge of the impact of the topic on related field

Note: Courses are not a goal per se; knowledge learned there to be seen as tools for doing successful research
Goals of a Ph.D. program

1. Research which represents original and "substantial contribution to Science" ⇒ metric:

2. Demonstrate technical "maturity" ⇒ metric:

3. Acquire expertise on a particular topic and general knowledge of the impact of the topic on related field ⇒ metric:
1. Research which represents original and “substantial contribution to Science” ⇒ metric: papers in a top quality journals and conferences

2. Demonstrate technical “maturity” ⇒ metric: ability to critically evaluate other’s technical work; ability to present (orally and in writing) one’s ideas in a clear and coherent way;

3. Acquire expertise on a particular topic as well as knowledge of the impact of the topic on related field ⇒ metric: as evident from student’s quality of research, the reviews of the submitted papers, and the program’s exams.
Timeline

- **Year 1**: Coursework, qualifying exams, exploration of research areas. Find a research adviser.

- **Year 2**: Read papers, identify problems to solve, start working on research

- **Year 3**: Form dissertation committee, complete dissertation proposal, start publishing papers

- **Year 4**: Continue publishing papers, write and defend dissertation, look for a job

Caveat: There is a ten-year window limit on completing a PhD (see graduate catalog)
Qualities of an excellent Ph.D. student (a wish list (😊)):

- Self-starter
- Original thinker
- Motivated to succeed
- Excited to learn new technologies
- Hard-working
- Values excellence
- Strong technical background
Coursework
Course work

- 5 Core classes from a chosen MS track plus
- CS 6382: Theory of Computation plus
- at least 5 courses at the 6000 level and
- 2 approved 7000 level CS/SE courses
- Other classes and research/dissertation hours approved by your adviser
- Total of 75 hours beyond B.S. degree
  - Excluding Pre-requisite graduate hours
- Up to 36 hours can be transferred from M.S. degree from other institutions; if approved.
Prerequisites

- All prerequisites marked in your admission email corresponding to the chosen M.S. track (of core courses) must be completed within the first year of study.
- Apply for waiver of prerequisites that you believe have been completed in your prior coursework.
- Transfers/waivers are processed only once each semester (around the second month of each semester). Watch for email announcements.
- All requests for transfers/waivers must be made in the first two semesters.
Qualifying exams

Qualifying exams (QE) for any 3 core areas:

- Object Oriented Software Engineering (6329)
- Performance of Computer Networks (6352)
- Database Design (6360)
- Software Architecture and Design (6362)
- Computer Algorithms (6363)
- Artificial Intelligence (6364)
- Software Testing, Valid’n & Verific’n (6367)
- Advanced Programming Languages (6371)
- Machine Learning (6375)
- Advanced Operating Systems (6378)
- Advanced Computer Networks (6390)

Must take the 3 QEs within first 2 long semesters.
- See rules at https://cs.utdallas.edu/education/graduate/phd-qualifying-exams/
- No QE in the summer semester.

Plan your QE schedule carefully.

Prepare well and pass the exams in the first attempt.

Each core course is guaranteed to be offered once every academic year, and once every calendar year in the evening, but NOT guaranteed once every semester.

Learn to structure your answers well: intuitive explanation followed by a full analysis.
Research !
Choosing an area of study & adviser

- Choose an area based on your interests, strength, and career prospects.

- You are likely to work in this area for the next 10 years, if not 30-40 years.

- Don’t decide solely based on who is able to offer an assistantship.

- Choose a compatible adviser, who is a good match to your working style.
Getting started in your research

- Literature survey: study the results in your area. You cannot create new knowledge without knowing what is already known
- Find new, interesting problems in which you can do research. Guidance of your adviser is very important in choosing the “right” problem
- Learn to read research articles quickly
- Continue to read new papers in journals and conferences in your area regularly
- Keep looking for new problems to solve
You are making good progress if ...

- You are publishing in:
  - reputed journals (ACM / IEEE / SIAM)
  - reputed conferences

- Your work is cited by other leading researchers

- Your work spawns follow-up papers

- Balance quality and quantity

- Your Faculty Supervisor says so!
Balance quality and quantity

- Publish good quality work, often
- Always have several problems on which you are working
- Spend a lot of time (in concentrated doses) working on your research
- Discuss your ideas with your colleagues
- Keep on the lookout for new papers/ideas/problems

Publish or Perish!
Improving the chances of getting an Assistantship

- Get good grades
- Make steady progress
- Pass 3 qualifying exams (QEs)
- Publish papers in reputed conferences and journals
- Try to graduate in 4 years
- Find a Faculty Supervisor who is not over extended!
Finding an academic job

- It may be better to find a postdoc position first in a reputed place.
- Need publications in prominent places, in areas where there are openings.
- Meet other people in conferences and workshops and make friends (network!)
- Give invited talks in other universities, labs
Steps Review

- Course work
- Qualifying exams
- Choosing area of research and adviser
- Getting started on research
- Dissertation committee
- Dissertation proposal
- Dissertation defense and submission
- Finding a (academic) job
Useful Skills

- Time management
- Speed-reading of technical articles
- Deep understanding of state-of-the-art and current methods
- Formulation of new problems
- Quick evaluation of new problems and solution methods (to decide if they are worth pursuing)
Getting more information

- Dean of graduate studies:
  http://www.utdallas.edu/ogs/
- Graduate catalog
  http://www.utdallas.edu/student/catalog/index.html
- CS Department Web site
  http://cs.utdallas.edu/
  https://cs.utdallas.edu/education/graduate/
- Ph.D. information in CS Web site:
  http://catalog.utdallas.edu/now/graduate/programs/ecs/
- Frequently Asked Questions
  http://cs.utdallas.edu/education/graduate/graduate-faq/
- Dr. Jorge Cobb (cobb@utdallas.edu)  ECSS 4.208
Any Questions?