

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

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All PhD, All MS Thesis, All PhD as MS



Computer Science at UTD

The Erik Jonsson School of Engineering and Computer Science

- 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 #3 in SE + Real Time Systems (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 an 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



CSI



UT-DIISC

- 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

- 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

1. Research which represents original and “substantial contribution to Science” \Rightarrow metric:
2. Demonstrate technical “maturity” \Rightarrow metric:
3. Acquire expertise on a particular topic and general knowledge of the impact of the topic on related field \Rightarrow 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.**

- 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

- 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.

- 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 (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 !

- 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

- 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 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!

- 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!

- 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!

- 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

- 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

- 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)

- 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/>
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Any Questions?