CSE MS and PhD Programs
(+CS PhD & ML PhD, a little)

Ümit V. Çatalyürek
Professor and Associate Chair
CSE Programs Director

Nirvana Edwards
CSE Academic Coordinator

August 14, 2019
Follow along at bit.ly/GTCSE2019

The most important things you need to do this semester:

**MS** — Submit your **Program of Study**

**PhD** — Solidify your **Research advisor relationship**

+ Attend the **CSE Welcome Reception!**
  Thu Sep 5th, 11:30-1pm in CODA - more info is coming.
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CSE offerings this term:

CSE 6001: Intro to CSE PhD — PhD only; meets ethics requirement
CSE 6140: CSE Algorithms
CSE 6643 / MATH 6643: Numerical linear algebra
CSE 6740 / ISYE 6740: Computational data analysis

CSE 6010: Computational Problem Solving
CSE 6230: HPC tools & applications
CSE 6242: Data & visual analytics
CSE 6644: Iterative methods
CSE 8803-DLT Deep Learning for Text Data Analysis
CSE 8803-MIP / ME 8883-MIP: Materials informatics

CSE 8001: CSE Seminar — Department seminar — occasional, watch for announcements

Ignore CSE 6040 and CSE 6748 (for MSA), CSE 6220-O01 and CSE 6250-O01 (for OMSCS).

Need help?

[cse-advisor@cc.gatech.edu](mailto:cse-advisor@cc.gatech.edu)

[nirvana.edwards@cc.gatech.edu](mailto:nirvana.edwards@cc.gatech.edu)
Klaus 1120-D and CODA S1375A

[umit@gatech.edu](mailto:umit@gatech.edu)
CODA S1337

**Master of Science in Computational Science and Engineering**

Georgia Tech's interdisciplinary Master of Science degree in Computational Science and Engineering (CSE) is devoted to the creation, study, and application of computer-based models of natural and

**CSE Current Student Resources**
Follow along at bit.ly/GTCSE2019

What is CSE and why should you care?
Computational Science and Engineering:
The study of computer-based models of natural and engineered systems.
Computational Science and Engineering: The study of **computer-based models** of natural and engineered systems.

Math *(continuous, discrete, statistical)*

Computing

Slow memory

*Q mops*

Fast memory *(total size = Z)*

xPU

W *(fl)ops*

“Domain” *(Application science, engineering, business, social)*
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How do you complete the program?

Find a Home – unit & (if applicable) advisor

Take classes – Core + Computation + Application

Do research – Dissertation

**How** do you complete the program?

Find a **Home** – unit & *(if applicable)* advisor

Take classes – **Core** + **Computation** + **Application**

Do research – **Dissertation**
Note: Because we love confusion, CSE is the name of both the Programs and a School.
How do you complete the program?

Find a **Home** – unit & *(if applicable)* advisor

Take classes – **Core** + **Computation** + **Application**

Do research – **Dissertation**

Follow along at bit.ly/GTCSE2019

Classes – **MS** – 30 hours total

*AE req’d

May pick up an MS en route to PhD
Classes – **MS** – 30 hours total

**Core foundations [12 hours]**
“CSE 101” – Pick any 4 of 5 options

**Home unit minor [12 hours]**
Computation + application specialization

**Electives or Thesis [6 hours]**
More courses or faculty-supervised thesis research

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Classes – MS – 30 hours total

Core foundations [12 hours]
“CSE 101” – Pick any 4 of 5 options

- CSE 6140 – CSE algorithms (Fall)
- CSE 6220 – Intro to high-performance computing (Spring)
- CSE 6643 – Numerical linear algebra (Spring)
- CSE 6730 – Modeling and simulation (Spring)
- CSE 6740 – Computational data analysis (Fall)

Fall/Spring indicates when these courses offered by School of CSE
Classes – **MS – 30 hours total**

**Core foundations [12 hours]**
“CSE 101” – Pick any 4 of 5 options

**Home unit minor [12 hours]**
Computation + application specialization

**Electives or Thesis* [6 hours]**
More courses or faculty-supervised thesis research

* AE req’d
## Courses and Technical Electives

<table>
<thead>
<tr>
<th>Prefix and Num</th>
<th>Course Name</th>
<th>Hours</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 200</td>
<td>Example Course</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>CSE 6140</td>
<td>CSE ALGORITHMS</td>
<td>3</td>
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<tr>
<td>CSE 6220</td>
<td>HIGH PERF COMP</td>
<td>3</td>
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<tr>
<td>CSE 6730</td>
<td>MODELING AND SIM</td>
<td>3</td>
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<tr>
<td>CSE 6740</td>
<td>COMPUTATIONAL DATA AN</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CSE 6230</td>
<td>High Performance Parallel Computing</td>
<td>3</td>
<td></td>
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<tr>
<td>CS 6240</td>
<td>Web Search &amp; Text Mining</td>
<td>3</td>
<td></td>
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<tr>
<td>CS 6365</td>
<td>Enterprise Computing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CSE 8803</td>
<td>Special Topics Massive Graph Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOL 6150</td>
<td>Genomics and Appld Bioinformatics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOL 8803</td>
<td>Programming for Bioinformatics</td>
<td>3</td>
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</tbody>
</table>

Submit draft to home unit for approval by end of 1st term.
### Computation Specialization and Application Courses and Technical Electives

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<td>CSE Algorithms</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>CSE 6730</td>
<td>Modeling &amp; Simulation</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>CSE 6740</td>
<td>Comp. Data Analysis</td>
<td>3</td>
<td>A</td>
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<tr>
<td>ISYE 6230</td>
<td>Economic Decision Analysis</td>
<td>3</td>
<td>B</td>
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<tr>
<td>ISYE 6783</td>
<td>Financial Data Analysis</td>
<td>3</td>
<td>B</td>
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<tr>
<td>ISYE 6413</td>
<td>Design &amp; Analysis of Experiments</td>
<td>3</td>
<td>A</td>
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<tr>
<td>ISYE 6650</td>
<td>Probabilistic Models</td>
<td>3</td>
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<tr>
<td>CS 6340</td>
<td>Software Analysis &amp; Testing</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>CS 8803 (Special Topics)</td>
<td>Simulation of Biological Systems</td>
<td>3</td>
<td>A</td>
</tr>
</tbody>
</table>
Classes – **MS** – 30 hours total

**Core [12 hours]**
“CSE 101” – Pick any 4 of 5 options

**Home Unit Minor [12 hours]**
Computation + application specialization

**Electives or Thesis* [6 hours]**
More courses or **faculty-supervised thesis research**

* AE req’d
MS Thesis Option

1. Find a thesis advisor. Get topic approved as part of program of study.
2. Sign up for CSE 7000 units (6 hours).
3. Write and submit a thesis document.
4. Defend thesis to a faculty committee. (3 faculty – 1 CoC, 1 Co{S,E})

Advice: Start early!

Electives or Thesis* [6 hours]
More courses or faculty-supervised thesis research

* AE req’d
# MS – Courses only

<table>
<thead>
<tr>
<th></th>
<th>Fall 2019</th>
<th>Spring 2020</th>
<th>Fall 2020</th>
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</thead>
<tbody>
<tr>
<td>Specialization</td>
<td>Specialization / minor [3]</td>
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MS – Courses only
# MS – Thesis option

<table>
<thead>
<tr>
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<th>Fall 2019</th>
<th>Spring 2020</th>
<th>Spring 2020</th>
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<tr>
<td>Specialization / minor</td>
<td>[3]</td>
<td><strong>CSE 7000 (thesis) [3]</strong></td>
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</tr>
<tr>
<td>Specialization / minor</td>
<td>[3]</td>
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</table>
MS – Other notes

“Special problems” – CS or CSE 89xx
Up to 3 hours of faculty-supervised independent study

“Special topics” – CS or CSE 88xx
No hard limit

Program of study
(GPA ≥ 3.0) and (letter grades when offered)
Classes – **MS** – 30 hours total

May pick up an MS en route to PhD

**Core** [12 hours]
“CSE 101” – Pick any 4 of 5 options

**Home Unit Minor** [12 hours]
Computation + application specialization

**Electives or Thesis** [6 hours]
More courses or faculty-supervised thesis research
Classes – PhD – 31 hours total

May pick up an MS en route to PhD

Core [13 hours]
“CSE 101” – Pick any 4 of 5 options
CSE 6001 – Intro to CSE [1 hour]

Computation [9 hours] + Application [9 hours]
Separate requirements; must do both!
Also: Minor (9 hours) + Special problems (3 hours)

Dissertation research [required; hours = Ω(1)]
Faculty-supervised research
+ quals, thesis proposal, final defense
Classes – **PhD – 31 hours total**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CSE 6001</td>
<td>Intro to Comp. Sci. &amp; Eng.</td>
<td>1</td>
</tr>
<tr>
<td>HS 6101</td>
<td>Intro to Comp. Sci. &amp; Eng.</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 6101</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>CSE 6740</td>
<td>Comp. Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CS 7495</td>
<td>Computer Vision</td>
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</tr>
<tr>
<td>CEE 8813</td>
<td>Spatial Visual Sensing Civil Infra.</td>
<td>3</td>
</tr>
<tr>
<td>CEE 8813</td>
<td>Constr. Health and Safety</td>
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<tr>
<td>CEE 8813</td>
<td>Project Planning and Monitoring</td>
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**Computation Specialization – 9 hours**

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<tr>
<td>ISYE</td>
<td>Linear Opt</td>
<td>3</td>
</tr>
<tr>
<td>CSE 6740</td>
<td>Comp. Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CS 7495</td>
<td>Computer Vision</td>
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**Application Specialization – 9 hours**

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**Semester Hours in Required CSE courses**
- 13

**Semester Hours in Computation Specialization**
- 9

**Semester Hours in Application Specialization**
- 9

**Semester Hours in Minor Area**
- 9

**TOTAL Semester Hours for Degree**
- 31

“Intro to the PhD” (CS: take 7001)

“Coherent”
For more ideas, see the handbook.

### Classes – PhD – 31 hours total

**Coherent**

<table>
<thead>
<tr>
<th>Number</th>
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</tr>
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<tbody>
<tr>
<td></td>
<td><strong>Required CSE Courses (Core) – 13 hours</strong></td>
<td></td>
<td></td>
<td><strong>Computation Specialization – 9 hours</strong></td>
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<tr>
<td>CSE 6001</td>
<td>Intro to Comp. Sci. &amp; Eng</td>
<td>1</td>
<td>CSE 6230</td>
<td>High Performance Parallel Computing</td>
<td>3</td>
</tr>
<tr>
<td>CSE 6140</td>
<td>CSE Algorithms</td>
<td>3</td>
<td>ISYE 6416</td>
<td>Computational Statistics</td>
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<tr>
<td>CSE 6220</td>
<td>High Performance Computing</td>
<td>3</td>
<td>MATH 6014</td>
<td>Computational Linear Algebra</td>
<td>3</td>
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<td>CSE 6643</td>
<td>Numerical Linear Algebra</td>
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<td></td>
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<tr>
<th>Number</th>
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<tbody>
<tr>
<td>BIOL 401</td>
<td>Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 711</td>
<td>Molecular Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 6700</td>
<td>Biostatistics</td>
<td>3</td>
</tr>
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</table>

**Student ID Number**

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*For more ideas, see the handbook.*
PhD – Qualifying exam ("quals")

Offered twice a year
- Fall: the Friday before the start of classes,
- Spring: the second Friday of the semester

Take at the start of 2nd year.

**Part 1: Written exam** to show "core competency"
Declare intent and committee at ~ end of first year.
Choose 2 of 5 “core” areas — course + reading list.
Take a day-long written exam (with free lunch).

Note: Written exam is the same regardless of home unit.

**Part 2: “Artifact” defense** — details vary by home unit

*Example: CSE rules*
Schedule oral exam to take place ~ during 5th—9th weeks of same semester.
Submit a 30-page written summary of your artifact.
Take oral exam — written exam follow-up + presentation of your artifact.

Note: Can take at most twice; may exit to MS.
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Note: Can take at most twice; may exit to MS.
Courses are important, but the **real reason** you are here is to do a deep **research** project that creates new knowledge in CSE.
PhD – Thesis Proposal Defense
Defend preliminary research & propose new work in ~ 2nd or 3rd year.

Write and submit a proposal, then defend it in front of a faculty committee.

Note: The secret to passing is to bring good snacks!
**PhD – Final Defense**
It’s the last milestone to your PhD! Usually ~ 1-2 years after proposal.

Write and submit a dissertation, then defend it in front of a faculty committee. (Typically same committee as proposal.)

Note: The secret to passing is (still) to bring good snacks!
Computer Science (CS) PhD

http://www.cc.gatech.edu/phd-computer-science

Courses
Take 5 courses from 15 areas of CS, one must be from the Theory area. Students must earn an A or B in all of these courses, and more As than Bs total.

Programming Proficiency course.

Also, fulfill GT’s minor requirement (9 hours) and take CS 7001 (Intro to PhD, 5 hours).

Research
Quals, thesis proposal, and thesis defense are similar. One small difference is the timeline for quals, which is “looser” than the CSE timeline.
Machine Learning (ML) PhD

Courses

Core - 5 courses: Mathematical Foundations of ML; Intermediate Statics (pick 1/3); ML Theory and Methods (pick 1/4); Probabilistic Graphical Models; Optimization (pick 1/5)

Electives - 5 courses: choose 2 out of 5 areas: Statistics and Applied Probability; Advanced Theory; Applications; Computing and Optimization; Platforms. (up to 6 hours special topics can be used to satisfy this requirement).

Also, fulfill GT’s minor requirement (9 hours) and take RCR course (PHIL 6000, CSE 6001, CS 7001, etc.).

Research

Quals, thesis proposal, and thesis defense are “similar”.

ML PhD Orientation: Thursday, August 15 at 11AM in CODA 1115
The Ph.D. Grind

A Ph.D. Student Memoir

Summary


So far, over 100,000 people—professors, research scientists, current and prospective Ph.D. students, and professionals in a variety of fields—have read it and collectively sent me hundreds of heartfelt [email responses](#).

If you don't mind spoilers, read the 10–20 minute [summary of the book](#).
PhD (& MS thesis) – Now what?

Goal 1: Solidify an advising relationship
Approach faculty about research! Talk to more than one. Use class projects & “special problems” to explore areas & ideas.

Goal 2: Meet your peers
Look to your left and to your right — these people will become your lifelong friends and colleagues!

Goal 3: Learn your “research community”
Read lots of papers, go to conferences, learn “who’s who.”

Goal 4: Enhance your “soft” skills
The field will judge your research from what you write, what you say, and with whom you work — you can never get too much practice!
Follow along at bit.ly/GTCSE2019

Fall 18 New Student Permits

- Online check-in. Use the QR Code (https://b.gatech.edu/33wJ2iU)
- Survey is open ONLY until 6PM ET today (Wednesday, 8/14/18).
- Thursday morning, the caps will be raised, you will have time until Friday noon.
- PhD students may request TWO courses. MS students may request FOUR courses.
- If you miss the submission deadline, you will have to wait until Friday when the permit restrictions are removed (and any CoC student can register).
- Major restrictions come off on Monday.
- Students are responsible for ensuring that there are no time conflicts or major restrictions. For more information about major restrictions, please visit https://www.cc.gatech.edu/academics/college-advising/regdates
Follow along at bit.ly/GTCSE2019

For more info see: CSE Current Student Resources

Need help? cse-advisor@cc.gatech.edu

Please do not email large documents/scans etc. to this email.