COMPUTER SCIENCE, MS

Overview
The Master’s Program in Computer Science is offered in coursework and thesis tracks. The coursework option requires both breadth and depth requirements. The breadth requirement ensures students obtain a solid foundation in core computer science areas, while the depth requirement allows students to design a sequence of courses to target a particular area of interest. The thesis track further allows students to conduct research in a chosen area of interest. The Master’s degree can also be pursued in a 4+1 format in conjunction with the Coordinate major in Computer Science.

Requirements
The M.S. program requires 30 credit hours of graduate coursework. Coursework requirements vary slightly depending on the chosen track, but consist of 12 credits of breadth coursework and 12-18 credits of depth coursework. Below we outline these degree tracks with their associated course requirements and provide some example curricula. We note that some of these example curricula do not have full-time enrollment in all semesters. Additional electives can be added in these slots as needed for full-time requirements.

Coursework and Degree Tracks
At the high level, the course requirements for the M.S. can be thought of as having a core requirement and an elective requirement. The core requirement is identical to that of our Ph.D. program, which requires of one core course from each of three breadth areas (Algorithms, Systems and Artificial Intelligence/Machine Learning), for a total of three courses counting for 9 credit hours. Currently the Algorithms area requirement is fulfilled by CMPS 6610 Algorithms (3 c.h.) (Algorithms), the Systems area is fulfilled by CMPS 6750 Computer Networks (3 c.h.) or CMPS 6760 Distributed Systems (3 c.h.) (Distributed Systems), and the AI/ML area requirement is fulfilled by CMPS 6620 Artificial Intelligence (3 c.h.) (Artificial Intelligence) or CMPS 6720 Machine Learning (3 c.h.) (Machine Learning). The available degree tracks are the coursework, project and thesis tracks; each of these can also be completed in the 4+1 format for existing coordinate majors.

Depending on the chosen option, the remaining 21 credit hours can be fulfilled by some combination of CS electives and thesis work. A CS graduate elective is any CS course that is 6000-level or higher, other than CMPS 7010 Research Seminar (3 c.h.) (Research Seminar). Core courses not counted toward the core requirement also can count toward elective requirements. A comprehensive list of current courses can be found here. Finally, thesis work can be conducted by taking CMPS 9980 Masters Research (0 to 3 c.h.) (Master’s Thesis) over two semesters for a grade. In both the coursework and thesis options we seek to encourage elective choices that are coherent enough to provide a specialized area of study, but flexible enough that students can explore different areas of computer science. Below we give examples of each track with sample curricula.

Coursework Track: AI/ML Focus

<table>
<thead>
<tr>
<th>Course ID</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CMPS 6140</td>
<td>Intro Artificial Intelligence (*)</td>
<td>3</td>
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<tr>
<td>CMPS 6160</td>
<td>Introduction to Data Science</td>
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</tr>
<tr>
<td>CMPS 6610</td>
<td>Algorithms (*)</td>
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<tr>
<td>CMPS 6720</td>
<td>Machine Learning</td>
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<td>CMPS 6360</td>
<td>Data Visualization</td>
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<td>CMPS 6750</td>
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<td>Multi-agent Systems</td>
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<td>CMPS 6740</td>
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Coursework Track: Data Science Focus
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<tr>
<th>Course ID</th>
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<tr>
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<td>CMPS 6160</td>
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<tr>
<td>Semester 2</td>
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<tr>
<td>CMPS 6610</td>
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<tr>
<td>CMPS 6350</td>
<td>Intro to Computer Graphics</td>
<td>3</td>
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<tr>
<td>CMPS 6300</td>
<td>Software Studio</td>
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<tr>
<td>CMPS 6760</td>
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<td>CMPS 6720</td>
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<td>CMPS 6150</td>
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## Coursework Track: Algorithms and Theory Focus

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<tr>
<td>Semester 1</td>
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<tr>
<td>CMPS 6610</td>
<td>Algorithms (*)</td>
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<td>Information Theory</td>
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<td>CMPS 6250</td>
<td>Math Found Comp Security</td>
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<td>Advanced Algorithms</td>
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<td>CMPS 6740</td>
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While the M.S. program is split into coursework and thesis, students can also pursue project work via the coursework track using independent study and research courses. Project work can consist of research activities, or an independently chosen course of student supported by a faculty mentor (i.e., the Independent Study instructor). Project requirements do not rise to the level of a thesis but require that the project goals and progress be clearly evaluated in the syllabi of the courses taken. Here is a sample curriculum with a Data Science focus:

### Project-based Coursework Track, Data Science Focus

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<td>CMPS 6360</td>
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<tr>
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<td>Intro to Computer Graphics</td>
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<td>CMPS 6280</td>
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<tr>
<td>Semester 3</td>
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Thesis Track.
The thesis option requires the completion of a Master's Thesis supervised by an advisor chosen by the end of the 2nd semester. This option requires 6 credit hours of a thesis course (for a grade) and 15 credit hours of CS electives. Students must also form an M.S. Thesis Committee by the end of their 2nd semester. The M.S. Thesis Committee will consist of an advisor, one CS faculty member and one other SSE faculty member. The final thesis must be presented and approved by the committee prior to the end of their 4th semester.

**Thesis Track, AI/ML Focus**

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<td>Semester 1</td>
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<td></td>
<td>CMPS 6280: Information Theory</td>
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<td>CMPS 6150: Multi-agent Systems</td>
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<td>Semester 3</td>
<td>CMPS 6730: Natural Language Processing</td>
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<td>CMPS 9980: Masters Research</td>
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<tr>
<td>Semester 4</td>
<td>CMPS 6740: Reinforcement Learning</td>
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<td></td>
<td>CMPS 9980: Masters Research</td>
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4+1 Track.
SSE allows at most 6 credit hours to be counted toward both undergraduate and graduate degrees. In our department, advanced undergraduate electives are “mezzanine” courses that can count for undergraduate or graduate credit. For the 4+1 degree program, undergraduate students can count 6 credit hours of these courses toward both the CS coordinate major as well as an M.S. degree. Additionally, up to 6 additional credit hours of graduate coursework completed during the undergraduate degree (beyond the 120 credit hour requirement for undergraduate degrees) may also be counted toward the 4+1 degree. We give two sample curricula below.

**4+1 Track: Data Science Focus**

Here, we assume that 2 undergraduate CS electives have been taken that will count toward the 4+1 degree.

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<td>CMPS 6150: Multi-agent Systems</td>
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**Project-based 4+1 Track: AI/ML Focus**
As with the coursework-based M.S. track, it is possible to incorporate a project into the 4+1 degree program by pursuing project work over the summer.

<table>
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<tbody>
<tr>
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<td><strong>Summer 1</strong></td>
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<tr>
<td><strong>Summer 2</strong></td>
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