Learning goals

1. By the completion of the program, graduates will be able to analyze problems and design or adapt solutions.

2. By the completion of the program, graduates will be able to implement software solutions from scratch or adapt existing software solutions.

3. By the completion of the program, graduates will be able to communicate discipline-specific knowledge to managers and colleagues.

4. By the completion of the program, graduates will be able to assume positions in the computing industry or to further pursue advanced degrees.

Results of our direct and indirect measurements

As a reminder, the Computer Science MS degree is a terminal program preparing students for a professional computation career in the industry. However, some MS graduates opt to pursue a PhD degree after graduation. There are 4 specializations (or “concentrations” — (1) main computer science, (2) data science, (3) computational science and (4) biomedical informatics) within the CS MS program to prepare students for their specific professional career and each specialization require the completion of the following:

- 4 core courses in the specialization
- 3 elective courses in the specialization
- one of the following options:
  - a thesis (for up to 9 credit hours)
  - a project (for up to 6 credit hours) and one more elective course in the specialization
  - three more elective courses in the specialization

The options are provided to accommodate the differing needs of students. Students who wish to pursue a PhD degree can perform a research thesis with a faculty member, while students who desire to further strengthen their programming skill or factual knowledge for an industrial career can pursue the project or the pure course work option.

Our department has identified 4 assessment measures for 2016-2017, both direct and indirect, to evaluate learning outcome. For each measure and learning goal, we note our current findings and where relevant, related upcoming actions, improvement sought, changes or related plans.

Direct assessments
1. Course work.

Courses/lectures are an efficient way to transfer the current state of art knowledge in (computer) science to students. The core courses provide the foundation of the knowledge base and the elective courses provide the depth in the respective specialization area. Students' proficiency in the knowledge transferred through course work is evaluated through homework assignments and/or projects during the semester and written tests (usually one midterm and one final exam). The evaluation score is based on an aggregate score of students’ performance in these tasks. Course work are used to gauge learning goals (1) and (2).

Changes to the MS program: The increase in the quantity and research diversity of the CS faculty members have allowed the department to improve the MS program significantly. The new program was offered for the first time in 2016-2017. The number of area specializations in the CS MS program was increased from two (which were: (1) main computer science and (2) Biostatistics) to four (which are: (1) main computer science, (2) data science, (3) computational science and (4) biomedical informatics). The improved program and an intensive recruitment effort have attracted a larger number of applicants. Consequently, there was a significant increase in the quantity and diversity of MS students.

Findings: Approximately 30 CS MS students across years were enrolled in 22 CS, Math and BioStat courses in 2016-2017. Students’ performance was good with the exception of one student. This student missed many classes and was unresponsive to our repeated inquiries. He finally contacted the department in May 2017 and reported that he was extremely ill. After a lengthy discussion with the students last May, the department has agreed to allow him to enroll in Fall 2017, but with strict supervision by Prof. Cheung — who is overseeing the CS MS program.

The grades achieved by the CS MS students (not considering the student who was ill) taken from their transcripts contain: 110 grades that were A or A−, 70 grades that were B, B− or B+, 13 grades that were C, or C+ and 3 F’s. Although most students perform well in 2016-2017, there were 3 students (again, not considering the student who was ill) who failed 2 different courses in 2016. The courses were CS561 (“Systems Programming”) and CS554 (“Advanced Database System”). These courses were core courses in the CS MS program which were highly technical in nature.

Action Plan: We believe that the following factors may have contributed to the poor performance of some students:

- Insufficient preparation.

The applicants to the CS MS program have a very varied background in education and we have accepted many exceptional applicants with a non-CS degree who have performed very well in our program. The courses where some students are failing require technical knowledge in Computer Science beyond computer programming skills. Specifically: they require knowledge of Data Structure (how information are stored in the computer) and advanced computer algorithms (such
are searching in a graph structure). To ensure that students will be adequately prepared, we impose a minimum admission requirement that students have taken a course in “Data Structure and Algorithm” similar to the course CS323 offered in our undergraduate curriculum.

- Language barrier.
  Many of the applicants are foreign students and we did not have any English requirement in our admission policy. In a meeting, the CS faculty has decided to require TOEFL scores as part of the application. A combined TOEFL score of at least 85 is required.

These requirements have been published in the department’s website at:

http://csi.mathcs.emory.edu/apply.html.

The new MS students (for Fall 2017) were admitted using the additional criteria and we will monitor students’ performance and collect data to measure the effectiveness throughout the next academic year.

2. MS practicum (a.k.a. internship)

The goal of the MS practicum is to better prepare MS students to obtain employment in the highly competitive computer science industry. Each MS student performs a practicum externally under the direction of a computer professional in industry or internally under the direction of a CSI faculty or other Emory affiliate faculty member. MS students will normally complete the MS practicum as an internship during the summer semester after 2 semesters of course work. Student's performance in the practicum will be evaluated by the employer or the responsible faculty member. The MS practicum is used to gauge learning goals (3) and (4) as a successful completion of an industrial internship is often a precursor to employment with the same company.

Findings: The MS practicum is a new course and is offered for the first time in Summer 2017. This course will be mandatory for new students entering in Fall 2017 or later. Continuing MS students can take advantage of the opportunity and 6 students have used this new opportunity and secured external internship in Summer 2017. We expect the MS practicum will enhance the MS curriculum and better prepare future students for their professional career.

Since the MS practicum is a new offering, we do not have any data/result to report. However, anecdotaly, individual internship experience is very varied which make evaluation difficult. We plan to obtain data from students experiences and formulate a set of uniform guidelines to evaluate the effectiveness of the practicum in enhancing student’s learning goals (3) and (4).

Action Plan: We have asked the 6 MS students who are currently doing the MS practicum to ask their (external) supervisors to specify their (job) responsibility and provide a comprehensive evaluation on the performance of the student. After reviewing the responses, we will have an internal discussion among the CS faculty to design a list of topics that must be evaluated in each MS practicum.
**Indirect assessments**

1. Internship Placement

   The purpose of the MS practicum is to improve students’ skills in obtaining employment after completion of the MS program (learning goal 4). To assist students obtaining an internship, the department offers a career development course to help students compose resumes and develop interview and presentation skills.

   *Findings:* As mentioned previously, the MS practicum is offered for the first time in Summer 2017 and 6 of our current MS students are performing the internship with US companies. The companies include BB&T Bank and Facebook.

   *Action Plan:* We have asked the MS students who are currently doing the MS practicum to ask their (external) supervisors to specify their (job) responsibility and provide a comprehensive evaluation on the performance of the student. After reviewing the responses, we will have an internal discussion among the CS faculty to design a list of topics that must be evaluated in each MS practicum.

2. Post graduate placement

   The goal of the majority of computer science MS students is to advance their professional career by acquiring state of art knowledge in software (and hardware) techniques that is beyond the undergraduate level of education. A small number of our MS students pursue an advanced (PhD) degree in computer science. The success in their endeavor can be indirectly measured by their ability to obtain employment in industry and/or admittance into a PhD program. The post-graduate placement is our indirect tool used to measure how effective goals (3) and (4) have been achieved.

   *Findings:* We do not currently have any data on what the MS students do after their graduation.

   *Action Plan:* We will survey each graduation student if he/she is willing to provide us with his/her employment information and if he/she pursues a PhD degree, with the institution where he/she will obtain his/her advanced degree. This exit interview/survey with graduating students will be done before the release of their diploma.