1. Mission

Computer science continues to expand and deepen its already broad impact on the world — in science, health, education, entertainment, business, etc. — making strong engaged computer science departments essential and central elements of a comprehensive research university.

The UI CS Department offers the Doctor of Philosophy (PhD), Master of Computer Science (MCS), and, rarely, Master of Science (MS) degrees. The PhD emphasizes preparation for research, teaching, and scholarly work in academic settings or private, industrial, or government laboratories. The MCS is a non-research, course-based program for students who wish to enhance their industrial careers with advanced knowledge of computer science, while the MS is typically granted only to students working toward the PhD.

2. Admissions Processes and Criteria

Admission into our Computer Science programs is quite competitive; only 10-15% of PhD applicants are admitted each year. Except in special cases (e.g., part-time PhD students who hold jobs), all PhD students are admitted with financial aid in the form of fellowships, RA, or TA-ships. Students can expect to continue to receive aid so long as they are making appropriate progress toward PhD completion.

The MCS program is quite different. The applicant pool is very good, but admissions is not highly selective. The coursework-based MCS is a natural extension of good undergraduate work in computer science and enhances student preparation for computing careers. Typically, our target incoming class size is 20-25, which helps keep relevant class sizes appropriate (adding enrollments to otherwise relatively small advanced graduate classes taken by PhD students and to mixed under-grad/grad electives taken by advanced undergraduates). MCS students are typically not offered financial aid upon admission. While it is difficult to keep track of MCS employment, we do know that a large number of our MCS students hold GRA positions in other departments, either as TAs in computing-related courses or as service-oriented RAs (e.g., programmers for externally supported research in other disciplines, database administrators, webmasters). The CS department employs MCS students as TAs when there are no available PhD students to fill remaining positions.

Application evaluation includes consideration of undergraduate and, if any, graduate coursework (we expect a minimum GPA of 3.0, and coursework that includes data structures and algorithms, software and hardware systems, programming, programming language foundations, and mathematics), GRE scores, TOEFL scores, letters of recommendation, and a statement of purpose.

Women remain substantially underrepresented in computer science. We are making significant efforts to increase the enrollment of women in our PhD program. In recent years, our PhD student body has been approximately 25% women. Though substantially lower than we’d like it to be, it is one of the highest percentages among public CIC CS departments.

Most PhD candidates who are admitted to UI but decline our offer enroll in more highly ranked programs (e.g., Brown, CMU, Georgia Tech). Others enroll at similarly ranked schools that have particular strengths different than ours. At times, we have lost students to equal or lower ranked programs who provide more attractive financial support (e.g., Nebraska, Michigan State, SUNY Buffalo). Part of this might be “just a matter of perception” - the partial tuition scholarship makes direct comparisons with other offers more complex and the bottom line less clear to students.
3. Program Outcomes

**Student progress evaluation, degree completion, and time-to-degree.** The most striking data provided with the Task Force’s report request are CS PhD completion rate of 29% and time-to-degree median of 6.7 years. The provided data covers students entering 1996-2000. This is “old news” for UI CS. In the 90s, it was UI CS’ practice, essentially, to admit most students to the PhD program, understanding that many of those would eventually leave with a Master’s degree. At the time, this was not seen as a problem. Most of those who left, left happily; they typically took exciting, high-paying industry jobs (for which their PhD-turned-Masters-program prepared them quite well). However, by the time of the department’s 2002 self-study and review, it had become clear that we should attend more carefully to these issues. As a result of that review, we made very clear distinctions between MCS and PhD programs, and instituted the yearly evaluation process described below. As a consequence, since 2003 our graduate program has operated much more smoothly and effectively and we are quite confident that new completion rate and time-to-degree data will clearly reflect this.

Since 2003, PhD student progress has been evaluated yearly as part of the August faculty retreat. Evaluation is based on exam/milestone completion status (e.g., qualifying, comprehensive, dissertation proposal), conference and journal publication record, coursework, and narrative progress assessments solicited from both advisor and student. The result of the evaluation is a set of expected milestones for the following academic year. These are communicated to the student in a formal progress evaluation letter. Milestones are tracked by the graduate program secretary, and an updated reminder letter is generated early each spring. Students who fail to meet expected milestones are not considered to be in good standing, and are given a deadline by which they must improve their status or leave the program. This review has resulted in a clear and significant improvement in the productivity of our graduate students, measured not just in terms of departmental milestones reached, but also in terms of external indicators such as papers coauthored, conference presentations, and internships.

**Placement.** A majority of our PhD recipients become tenure-track faculty members (14/25 = 56% of our PhDs during 1997-2004). This is comparable with corresponding numbers for other departments in Physical/Mathematical sciences at The University of Iowa. The employment of the remaining PhD students is distributed roughly equally between industrial positions, academic research positions, and positions in the government. Most of our PhDs who start tenure-track positions do so at regional colleges (we have noticed high presence of UI CS graduates at regional meetings of small-college faculty to discuss undergraduate CS curriculum issues) and Research II state universities. But we’ve also had at least three recent graduates become successful faculty members in research-oriented CS departments (two ranked significantly above ours) and also had two recent graduates win highly competitive NSF CAREER awards.

4. Program characteristics

The department is the smallest among the public CIC/Big Ten, less than half the size of all but two of them. The two most comparable ones, Indiana and Michigan St. have 24 and 23.25 FTE respectively (though Indiana also has a separate but closely tied Informatics faculty with approximately 30 additional FTE). In this light, it is challenging for UI CS to compete in measures such as national rankings (we have typically been ranked around 60th among more than 150 PhD granting CS departments). Given understandable constraints (Iowa’s population and the need for credible CS departments at both UI and ISU), it is important for UI CS to target a few research
areas rather than attempt to be comprehensive. With this in mind, UI CS is focusing efforts on five areas: algorithms, automated reasoning and verification, distributed systems, graphics/human-computer interaction/virtual environments, and informatics (including especially machine learning, data mining, and information retrieval applied in areas of UI strength, e.g., health sciences, medical imaging, etc.)

UI CS has nationally and internationally recognized faculty in each of these areas, and all faculty in these areas publish regularly in leading journals and conferences. All associate professors and most full professors (except those on phased retirement) have external funding from NSF, NIH, or DARPA. Five current faculty were recipients of NSF Career Awards.

One of the explicit goals in the 2002/3 department review was to substantially increase external funding, doubling it within five years. It took more than five years, but the faculty have responded well and expenditures on externally funded research grants for 09-10 will exceed that mark.

The increased research funding and clear set of focus areas are having substantial positive effects on the graduate program. First, funds for RA positions have increased dramatically. For many years (80s-90s, at least), UI CS operated significantly differently than many peer programs. UI CS had a relatively much higher proportion of students supported as TAs rather than RAs. Computer Science PhD students should typically spend at least half of their program semesters as RAs, doing research, developing as scholars, etc. With the recent funding increase, the Department is finally in a position to fund students in this more appropriate way, as RAs (or on external fellowships) for a significant portion of their PhD program, and a TAs for a smaller portion. Most students do, of course, benefit from some time as a TA, helping them gain teaching experience, etc.

Furthermore, our identified faculty focus areas have helped increase visibility of the department, which will enhance recruitment of the best graduate students in those particular areas. Finally, due to increased attention to applied and interdisciplinary research in the focus areas, we anticipate continued growth of external funding and enhanced ability to recruit top students.

5. Conclusions

UI CS PhD production was approximately two per year in the mid-1980’s, three per year for 1987–92, and more than four per year from 1992-2001. The rate dropped a bit in the early 2000s, corresponding with relatively low PhD entry/interest during the late-90s dot-com boom. Our program revisions, increased interdisciplinary research, and substantially increased funding, have raised the average above five for the first time in our 40+ year history (recent numbers: 5 in 2006, 6 in 2007, 4 in 2008, and 7 in 2009). Steady state, we believe a department of our size should produce five to ten PhDs per year, supported quite substantially by external research funding.

The careful annual graduate student review discussed above has helped revitalize our graduate program. Departmental expectations of good PhD student progress are now clearly communicated to students. Probably most importantly, we make it clear to students that research and scholarship should start early and that this includes completing the qualifying exam before the end of the second year, completing the comprehensive exam before the end of the third year, and striving to publish refereed research articles as soon as possible. This explicit communication of expectations has clearly enhanced student research culture and success.

In closing, our program, despite the challenges posed by its low-for-CS faculty FTE, provides strong value through graduates who become faculty at many regional and national colleges and universities, or researchers, project leaders, or managers in industry. Recent improvements to graduate program administration and to both faculty and student research culture are enhancing productivity, visibility, and attractiveness further, yielding 5-10 PhD and 20-25 Master’s graduates per year, all highly employable.