Graduate education in computer science and its relationship to industry

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There are a number of different focal points which characterize various graduate programs in computer science. Some of these programs are theoretical and mathematically oriented. Some programs are organized around management or business applications, some around computer systems, some around information storage and retrieval, and so forth. Many examples of these and other orientations for graduate computer science programs can easily be provided.

At Ohio State we have decided to build a broad base for our various programs in computer and information science, the name we have chosen as most descriptive of our program at Ohio State. This broad base encompasses most of the various possible focal points for computer science. It is only with such a broad interrelated set of programs and objectives that graduate students can be adequately educated to solve general industrial types of problems. Furthermore, the breadth of the programs and faculty makes for an exciting and dynamic environment not otherwise found.

We have developed fourteen fields of specialization which our Ph.D. students can use either as major or minor areas of specialization. These are:

1. General theory of information.
2. Information storage and retrieval.
4. Artificial intelligence.
5. Pattern recognition.
6. Computer programming, including system programming.
7. Theory and processing of programming languages.
8. Digital computer architecture and organization.
10. Man-machine interaction and systems.
11. Formal and computational linguistics.
12. Management information and systems.
14. Social, economic, and psychological aspects of information production and processing.

Students can also choose minor areas of specialization from other appropriate departments having common interests with the Department of Computer and Information Science.

Ohio State University is a large, diversified university, and furthermore it is the only State University in Ohio which gives a wide range of Ph.D.'s. Accordingly, the Department of Computer and Information Science has a sizable graduate program of slightly less than 200 students. Roughly 75 percent of these graduate students enter the program with the objective of earning a Master's degree and then leaving to take employment. We consider these students to be professionally oriented and thus consider our degree program at the M.S. level to be primarily a professional degree. The total number of students who have been graduated with Master's degrees now number well in excess of 250. These graduates have taken employment, mostly in systems type of work in one form or another, with many different industrial, governmental, and non-profit organizations around the country and even abroad.

The Master's students currently have seven different options which they can pursue and which define their objectives. These are:

1. Theoretical Foundations
2. Information Systems
3. Computer Systems
4. Numerical Analysis
5. Operations Research
6. Biomedical Computing and Information Processing
7. Administrative Science

All students, regardless of the option selected, are required to take a set of courses chosen from a prescribed core. The student then completes his course of study with about 15 quarter hours of electives from a group of courses specific to each particular option. Courses in the core include:

1. Mathematical Foundations of Computer and Information Science
2. Advanced Seminar in Computer and Information Science
3. Principles of Man-Machine Interaction
Although we know academic positions are now plentiful in computer science, I feel that this situation will change in the near future as universities undertaking new and expanded computer science programs complete their staffing. Accordingly, we recognize that most of our Ph.D. graduates must expect to find employment in industry or government. Thus far, in the three years that we have been offering Ph.D. degrees, we have had 92 percent of our Ph.D. graduates find employment in industry or government.

We believe that the type of broad program which we have developed in computer and information science with a good fundamental component, yet with considerable involvement with applications, is of particular interest to industry. Our students know the basic fundamentals and are, as well, involved with and understand many applied problems and general applications. These students generally have the breadth and the understanding to solve problems. This is the type of graduate that industry is looking for. What is more, they should be prepared to solve many different types of problems, not only narrowly defined problems.

One of the main ways that a program such as ours can interface with industry is through the recruiting process—our graduates will be hired by industry. However, in a relatively large urban setting there are many other ways to establish relationships. For example, a number of our students are able to find part-time employment in local industrial and non-profit organizations while they are studying. In many cases we are able to fill these jobs through the Department as a type of graduate assistantship. In some cases, these part-time positions lead to full-time jobs after graduation. Furthermore, additional interactions take place through employees of many industrial organizations in the area who enroll in our graduate program.

Other interactions which take place with industry include consulting on the part of our faculty and the use of adjunct faculty from industry to help us teach some of our courses. The adjunct faculty are important to the educational program in a number of different ways, but there are two in particular that we feel are most important. Foremost is the fact that adjunct faculty can bring to our students the real industrial problems and we try, where it is possible and mutually agreeable, to develop courses for the adjunct faculty that emphasize these problems. It is primarily through courses of this type that our students can learn about the real world. Unfortunately, because of their responsibilities in their own organizations, it is not always possible to find available faculty who are able and willing to teach on a regular basis.

A second way in which adjunct faculty from local industry can be very helpful is in helping to staff our evening program. Many of our students who are employed in local industry find that it is most convenient to take courses in the evening. Accordingly, we have developed a growing evening program and are able to use adjunct faculty from local industry to help staff this program. This arrangement turns out to be mutually satisfactory to all parties concerned. The adjunct faculty are generally more available in the evening.

Finally, other important relationships which are most useful in fostering an interaction are: inviting industrial people to present colloquium talks on current areas of interest and developing short courses for industry as the need occurs either on the university campus or at the industrial site.

In summary, we believe that the interaction with industry is essential for both our Master's and our Ph.D. students. We believe that preparation for industrial positions is essential for most of our graduate students, and a part of our curriculum is geared in that direction. A broad and dynamic graduate program enhances this type of education. Further interactions of importance both to the university and to industry take place through the use of adjunct faculty to teach courses and the use of our faculty for consulting. Enrollment in our courses of students from local industry is another important catalyst.

REFERENCE