Master's Program Assessment Project

Self-Study Report Template

For August 2003 through August 2007

Master of Science in Computer Science
With major in Software Engineering

Basic Information

1. **Type of program: Select all that apply.**

   ☒ Professional

   ☒ Research

   ☐ Interdisciplinary

   ☐ Applied

2. **Date program founded or began**. 1998.

3. **Describe the founding and development of any related centers**.

   The department houses 2 institutes and 1 center. The two institutes are Human Language Technology Research Institute (HLTRI) headed by Professor Sanda Harabagiu and Cyber Security and Emergency Preparedness Insititute (CSEPI) headed by Dr. E. Douglas Harris. CSEPI is a school affiliated center, however, all the faculty members involved in its research are from the Computer Science Department. The center on Embedded Software is headed by Dr. Farokh Bastani. Brief descriptions of the center are given below.

   The **CyberSecurity and Emergency Preparedness Institute (CSEPI)** was created to deal with the rapidly growing Homeland Security problems in cybercrime, information assurance, and emergency preparedness. It is one of only a handful of entities of its kind in the United States, and with its help The University of Texas at Dallas (UT Dallas) has expanded courses offerings in Information Assurance, Cryptography, Biometrics, Intrusion Detection, Cyber Security, Network Security, Data Mining and Multimedia, and Emergency Response Information System. The

Institute builds on the existing areas of current research successes and highly acclaimed system implementations, for ensuring information security and emergency preparedness. Institute expertise garnered in the process is being leveraged to achieve global recognition in areas vital to national and international security. The Institute has three centers: CyberSecurity Research Center, Global Information Assurance Center and Emergency Preparedness Center.

The mission of the Institute is to conduct leading edge research and implement critically needed programs for Homeland Security in the areas of Network Security, Systems and Language Security, Data and Applications Security, Intrusion Detection, Security Theory and Protocols, Security Engineering, Cross Cutting Themes, Information Assurance, and Emergency Preparedness. The institute's goal is to obtain international recognition as a Center of Excellence in several of the major areas of research and system implementation related to cyber security, information assurance, and emergency preparedness and to partner with other universities, government agencies, and corporate entities to complement this goal.

The goal of the **Human Language Technology Research Institute** is to incorporate activities in a broad spectrum of disciplines such as natural language processing, speech recognition and synthesis, knowledge acquired from texts and information extraction. These activities enable computers to interact with humans using natural language capabilities, and to serve as useful assistants to humans by providing services such as automatic text understanding and retrieval, information extraction and question answering, automatic translation and speech recognition. The Human Language Technology Research Institute was established at UT Dallas in February 2002 and serves both the government and private industry as consumers of human language technology. In the institute, professors, researchers and students collaborate in envisioning new solutions for human language technology.

The UTD **Embedded Software Center** was founded by UTD, Alcatel, and Texas Instruments (TI) and is currently investigating advanced techniques for dramatically increasing the development productivity and the overall quality of complex network-centric real-time embedded systems. Embedded software is used to control electromechanical systems not normally identified as computers. Embedded software usually executes on internal micro-controllers or Digital Signal Processors (DSPs) used to control other product components. Typically, such software must be extremely reliable, very efficient and compact, and precise in its handling of the rapid and unpredictable timing of inputs and outputs. Systems that contain embedded software include network routers and switching systems, PBXs, wireless devices & base-stations, consumer electronic systems, avionics and automobile control systems, distributed sensor networks, home automation systems, medical devices, etc.

The center is investigating automated code transformation and synthesis, automated qualification, and a framework for dynamically monitoring and adapting a system to cope with changes in its environment without sacrificing performance. The infrastructure encompasses a comprehensive, pro-active integrated solution that spans the entire product life-cycle. With funding from the National Science Foundation, DoD, NASA, Alcatel, TI, and other funding sources, researchers in the center have developed a software component repository system along with tools for selecting and composing components to rapidly build real-time distributed software systems. At the heart of the approach is the On-line Repository for Embedded Software (ORES), a distributed collaborative web-based repository system connecting application developers with component vendors. The first step in the development process is a new COTS Aware Requirements Engineering methodology that adapts a product concept to maximize the use of existing software in its implementation. Then, a novel aspect-oriented design method is used to decompose the application into a set of independent subsystems. Each subsystem is developed using existing components from the repository along with automated glue-code synthesis tools. The subsystems are then automatically composed together by a framework that is customized for the application. The center is also actively collaborating with several faculty members from UTD as well as SMU, UNT, and UTA to form a consortium in the area of net-centric systems and software engineering. Several

companies, including Lockheed Martin, Raytheon, Metallect, EDS, Samsung, Tektronix, and other companies have participated in the discussions. The core research focus of the consortium is in the area of dependable net-centric systems, especially for real-time applications.

4. **Attach department charter and bylaws**.

Please see Appendix I.

5. Describe resources supporting the program such as libraries, laboratories, etc.

UTD Library Facilities are described in Appendix II. With respect to Lab facilities, the CS department has adequate lab facilities for its educational and research programs. There are many labs that are within the department as well as large general purpose labs that are shared by the EE and CS departments. The CS operated labs are located in the ECSS building, while the EE operated labs are located in the ECSN building.

ECSS 2.103 is a large open lab with over 100 PCs for general use by both EE and CS students. Most projects for the beginning programming classes are done there. Portions can be reserved for specific classes to carry out hands-on instruction. Most software needed for classes are available at this lab including Compilers and Language Development Environments, several tools from Rational, x-SUDS from Telcordia (testing tools), etc. Students also have access to large computer servers that the department owns, and that can be accessed through the workstations in the labs.

Labs in ECSN 3.112, 3.118, 3,120 are shared with Electrical Engineering; they are used to support classes in Digital Systems and Computer Architecture. Circuit design boards and software support are provided. The primary responsibility for maintaining these labs rests with the EE department.

Several other laboratories in the ECSS building are dedicated to instruction and provide advanced environments for specific needs (e.g., UNIX workstations and dual-boot PCs to support CS 3375 and Operating Systems projects, Advanced Software Engineering tools to support senior Software Engineering classes, DSP labs, Labs dedicated to Operating Systems and Networking classes).

The equipment in the labs is rather new since the building is only 4 years old. When the current building was built in 2002, $600,000 was allocated for buying equipment for the various Labs that were set up. These funds were used to buy the equipment in the Labs described previously. The CS computing committee and the CS technical staff have developed and are implementing plans to upgrade equipment on a 3-4 year staggered cycle. Under this plan, some of the equipment in the labs is being replaced.

The general use lab (ECSS 2.103) is open 18 hours a day (the lab is supervised by teaching assistants to prevent theft, vandalism and the availability of the assistants is the only reason the lab is not always open). The other labs in the building are accessible though computer controlled entry and are available anytime to students that are authorized (by virtue of the classes they are registered for) to use them. UTD provides several remote access options (RNA, Pipeline); wireless network access is available in most buildings and in student housing.

Faculty have up-to-date PCs and/or Sun Workstations in their offices. In addition, most research active faculty members have set up labs that house any where from 6 to 12 computers that they use for research. In addition, the department has several large and powerful servers that can be

accessed through workstations. A comprehensive list of research and teaching labs is shown below:

- Graduate Students Open Lab
- Computer Software Engineering Open Lab
- CS Tutoring Lab
- Embedded Software Center
- Intervoice Center for Conversational Technologies (Human Language Technology Research Institute)
- Center for Search Engines and Web Technologies (Human Language Technology Research Institute)
- Center for Text Mining (Human Language Technology Research Institute)
- Center for Basic Research in Natural Language Processing (Human Language Technology Research Institute)
- Center for Emerging Natural Language Applications (Human Language Technology Research Institute)
- Security Analysis and Information Assurance Lab/Cyber Security Center
- Digital Forensics and Emergency Preparedness Institute
- Distributed Systems and Internet Computing Lab
- Applied Logic, Programming-Languages and Systems Lab (ALPS)
- Software and Information Visualization Lab
- DSP and Communications Lab
- Wireless information systems Lab
- Multimedia Distance Learning Lab
- Parallel Computation Lab
- Artificial Intelligence Lab
- CAD and Visualization Lab
- Database Laboratory
- Telecommunications Lab
- Computer Vision and Multimedia Systems Lab

- Telecommunications and SE Lab
- Resource Allocation and Scheduling Lab
- Laboratory of Advanced Computer and Network Architectures
- Advanced Networking and Dependent Systems Laboratory
- Multimedia Systems and Networking Lab
- Software Technology Advanced Research
- Compiler and Architecture Research Lab
- NET Lab - Scalable Network Engineering Techniques Laboratory
- Visual Computing
- Formal Method Lab
- Software Architecture Lab
- Advanced Network Research Lab
- Advanced Computation Lab
- Requirements Engineering Lab
- Virtual Reality and Graphics Lab

The Department of Computer Science employees three technical support staff (Brian Nelson, Harold Clark, and Cody Crudgington). They are assisted by several students assigned to them as Assistants or employed on an hourly basis). An additional technical support staff member (Mark Hittenger) maintains machines in the Human Language Technology Research Institute (HLTRI) and is supported by external grant funds.

6. Other information the department would like to provide.

Program Philosophy and Mission

1. What is the mission of the master's program?

The mission of the Master's degree program in Computer Science with major in Software Engineering is to provide students with a solid foundation in theory and practice of software engineering, and to prepare them for productive long-term careers in industry and government. The program prepares graduates to become key contributors in industry and/or academia, and to further their education by entering a doctoral degree program.

2. Is this a published official mission statement? ☒Yes ☐ No

3. How is the program mission related to other key UTD statements, such as:

    a. the university's mission statement

    b. the Academic Plan

As its mission statement says, UTD aspires to be:

- A first-rank public research university with focused centers of excellence, prepared to meet the challenges of a rapidly changing, technology-driven global society
- A global force in innovative, transdisciplinary research and education in emerging areas of technology, science, and learning
- A ground-breaking leader in both framing and answering the questions faced by business, policy makers, healthcare, and the public
- A synergistic partner with local industry, government, and cultural organizations as well as local K-12 schools, community colleges, and universities
- One of the most creative, innovative universities in the nation and world.

The MS program mission ties directly to these aspirations of the University as a whole. The MS program prepares students for not only entering the doctoral degree programs but also for providing skilled manpower to the computer industry. Indeed, the US high-tech industry, in particular, the local industry in the telecom corridor has greatly benefited from UTD CS producing a large number of skilled MS graduates. The MS degree program fulfills its mission remarkably well.

W.r.t. the academic plan, UTD aspires to be a top ranked University in the world, and the CS department aspires to be one of the top 25 departments in the nation in the near future. The MS program produces well trained students who are well prepared to enter a doctoral program and do cutting edge research. Indeed many of our MS students continue into our Ph.D. program and have performed excellent research. Many MS students also undertake to do a Master's thesis, further enhancing the research and education climate at UTD and improving its standing.

4. **Please attach or submit your college or unit academic plan and/or strategic plan when available**.

The Jonsson School endeavors to:

• Deliver a state-of-the art high technology engineering education for Dallas and Collin Counties, the DFW Metroplex, and the State of Texas. This goal is to be achieved by developing highly effective B.S. and M.S. Coursework Degree programs as well as M.S. and Ph.D. Thesis Degree programs. The Jonsson School aspires to impart knowledge in a way that will produce "agile" students with innovative and entrepreneurial skills.

• Create new state-of-the art engineering knowledge through research and technology transfer. The research produced will be the outcome of M.S. and Ph.D. Theses.

• Develop partnerships with government and the private sector to apply new knowledge for economic growth and high tech job creation in order to strengthen existing regional firms, promote the growth of new regional firms, as well as create new high-paying private sector jobs.

• Provide leadership and outreach to nurture tomorrow's leaders in science, mathematics, and high technology education and business.

A concrete goal of the Jonsson School is to be rated one of the top 50 engineering schools in the country within 5 years. Considerable resources and efforts are being invested to reach this goal. This includes the Jonsson School Research Excellence Initiative (JSRE) through which the state of Texas will invest $300 million in education and research in engineering, science, and computer science during the period 2003-2008.

UTD's strategic plan is attached as Appendix III.

5. Is this program regionally or nationally ranked? If so, how and by whom?

   The Ph.D. program is ranked 72 by the National Research Council (ca 1993).

6. Other information the department would like to provide.

Benchmarking

1. Identify three peer programs.

   Ohio State University

   SUNY Stony Brook

   North Carolina State University

2. Identify three aspirational peer programs.

   University of Massachusetts

   University of California, San Diego

   Georgia Institute of Technology

3. Identify any other source from which benchmark or ranking data may be obtained. Please attach this data or provide the website where this information can be accessed.

   http://www.asee.org

   http://www.academicanalytics.com

Program Design

1. What employment opportunities are students in the program being prepared for?

   The students in the Master's program are being prepared for productive long-term careers in industry and government for software and information technology related jobs. Students are being prepared to be skilled programmers,, system designers, and software project managers.

2. What are the requirements of the program?

   b. Fill in : hours in major field; hours in minor or cognate field; statistics or research design; etc.)

   Students need to take 33 credit hours. Of these 3 credits can come from a 5000 level class, all others have to come from 6000 level classes or higher (Classes are numbered 1000, 2000, 3000, and 4000 for undergraduate, 5000 for preparatory-MS classes, and 6000, 7000, and 8000 for graduate classes). Students are also required to demonstrate proficiency in technical coomunication; this proficiency can be demonstrated by taking ECS 5301 (Prof. and Tech. Communication) offered by UTD. Students choosing the MS thesis options can take up to 6 hours of thesis research in lieu of 6 credit hours of courses.

   c. How many credits must be taken at UTD?

      Students can transfer up to 15 credits from an outside institution. The transferred credits are carefully evaluated to ensure that they meet UTD's standards of rigor and depth.

   d. If there are consortium arrangements with other universities, how is this requirement achieved?

      There is no consortium that UTD CS is part of at present.

3. How are the requirements of the program designed to ensure fulfillment of the mission?

   The program requires students to take courses in which they learn advanced software engineering subjects. Thus the core courses consist of: Advanced Software Engineering (CS 6354), Software Architecture (CS 6362), Requirements Engineering (CS 6361), Software Testing (CS 6367) and Software Project Planning and Management (CS 6388). The program ensures that students have excellent professional and technical writing and communication skills as well. Many courses have a programming project, where the students further learn advanced problem solving and advanced programming skills. MS students can also opt to do a thesis, which helps them to train in performing research, and in learning advanced programming as well as problem solving techniques.

4. Are key elements of the curriculum made available on a schedule that facilitates timely completion of the program by students? Attach course rotation schedules for the previous three years.

   Yes. All core courses are offered at least once every year. Most are in fact offered every semester, and in many cases, multiple sections of the course are offered. Sufficient number of electives are offered as well. In fact, UTD CS course offerings are perhaps one of the largest in the nation (90+ courses every semester). List of all courses offered by the CS department for the last 3 years is showin in Appendix IV.

5. a. If UTD offers a similar program at the undergraduate level, how is the post- baccalaureate program progressively more advanced in content?

- The Courses are taught at a much more advanced level. The syllabus of graduate courses that bear the same name as undergraduate courses is significantly more advanced.

b. If there are courses of similar name or similar substantive content, how are the graduate courses progressively more advanced than those offered at the undergraduate level?

The content of graduate courses is significantly more advanced. More advanced techniques are covered in significantly greater depth. The amount of work assigned as well as expected from the student is well beyond that expected/assigned to an undergraduate student in an undergraduate level course.

c. Are there any situations in which undergraduates and graduate students are co-enrolled in their respective courses at the same time with the same instructor?

This situation arises only for MS preparatory courses that in-coming MS students take to fulfill their deficiencies. These 5000 level courses are co-taught with 4000 level courses (at present, this is true of Computer Networks, Automata Theory and Operating Systems). In such a case, the graduate students are assigned extra work. Note that only one 5000 level class can count towards a students' MS degree program. In such cases, however, both the Undergraduate Dean as well as the Graduate Dean have to approve the course. Sample documentation that is filed by the instructor in such a case is included in the Appendix V.

If so, how is the learning experience more advanced for the graduate students?

Typically, the graduate students will be assigned advanced reading material and extra work in such a course. As an example, please see the sample documentation filed by the instructor in the Appendix V.

- Describe how the program and curriculum are reviewed and updated to maintain currency in the field.

The program is overseen by the Graduate Curriculum Committee, which reports to the whole faculty. The Graduate Curriculum Committee is assisted by the Department Head, The Associate Department Head and the Assistant Department Head. The Graduate Curriculum Committee meets at least once every semester. In practice it meets more often. Changes to the program are usually initiated by individual faculty members who propose a change based on some observation or feedback from students or industry or the prevailing climate for computing. The Graduate Committee, which consists of tenure-track graduate faculty members from within the department, reviews the material submitted by the faculty member, discusses it and then makes a recommendation to the faculty. The faculty will then discuss the proposal in its full faculty meeting and finally vote upon it. The proposal is adopted if it passes the vote. Any changes that are needed to be made to the catalog are then forwarded to the Graduate Dean.

The CS department faculty member constantly keep proposing changes to keep up with the times. The most common request is to introduce a new graduate course, or to change the syllabus of course. Occasionally new tracks are also introduced in the MS degree program. An example of this is the introduction of the Bioinformatics track in the MS program.

- Do program requirements include courses in which students gain knowledge of literature of the discipline? If so, which courses?

  The program requirements do not formally include courses in which students gain knowledge of literature. However, students can enroll for independent study courses, and in fact many do. Students can also opt for doing a Master's thesis, where again a literature review is needed. Most students do register for an independent study class which gives them an opportunity to do a literature review.

- Does program require students to be engaged in research, professional practicums, or similar training experiences? If so, what are they and how is this requirement structured?

  No. M.S. thesis, independent study courses, as well as co-op programs are optional.

- Other information department would like to provide.

Program Faculty

1. List all faculty who are providing instruction for the program by name, rank, tenure or tenure-track status, gender, years at UTD, year doctoral program was completed, institution granting the degree. Provide an updated CV for each person.

   All faculty CVs are also included in the Appendix at the end.

2. Provide the following data regarding the instructional activities of <u>core faculty</u>:

   a. --Number of dissertations (Doctoral) chaired.

   b. --Number of Thesis (Master's) chaired.

   c. –Number of dissertation committee memberships

      For a, b, and c. please see the table in the Appendix V.

   d. --**Number of organized classes taught**

      Each tenured/tenure-track faculty member is required to teach 4 coures per year. However, faculty members who are actively supervising Ph.D. students can reduce their course load by 1 course per year. Thus, effective teaching load for research-active faculty members is 2+1. Each faculty member is required to teach at least one undergraduate course during each calendar year, regardless of the tenure-status or rank of the faculty member. Faculty members with administrative duties (Head, Associate head, and Assistant Head) teach 2 courses per year (1 per semester). Faculty members can buy out at most one course during each semester.

      The number of organized classes taught by core faculty is also shown in the table in Appendix V.

   e . --Expected average number of organized classes taught by core faculty per academic year

Expected average number of classes taught by core faculty (research-active) is 3 per academic year. One of these 3 classes must be an undergraduate class. All our graduate faculty members, bar one or two, are research-active.

g. -**Other courses (internship supervision, clinical supervision, studio, research, dissertation, Thesis, etc.)**

Please See Appendix the table in Appendix VIII.

3. Provide the following data comparing your program's faculty to three of the program's benchmark institutions and three of the aspirational peer groups:

Number of core (i.e. full time masters, tenured and tenure-track faculty) by rank, ethnicity, and gender in the program.

Number of publications (i.e. peer-reviewed publications in excellent or highly respected journals and publishing houses) per full-time faculty equivalent (FTFE) of core faculty per year.

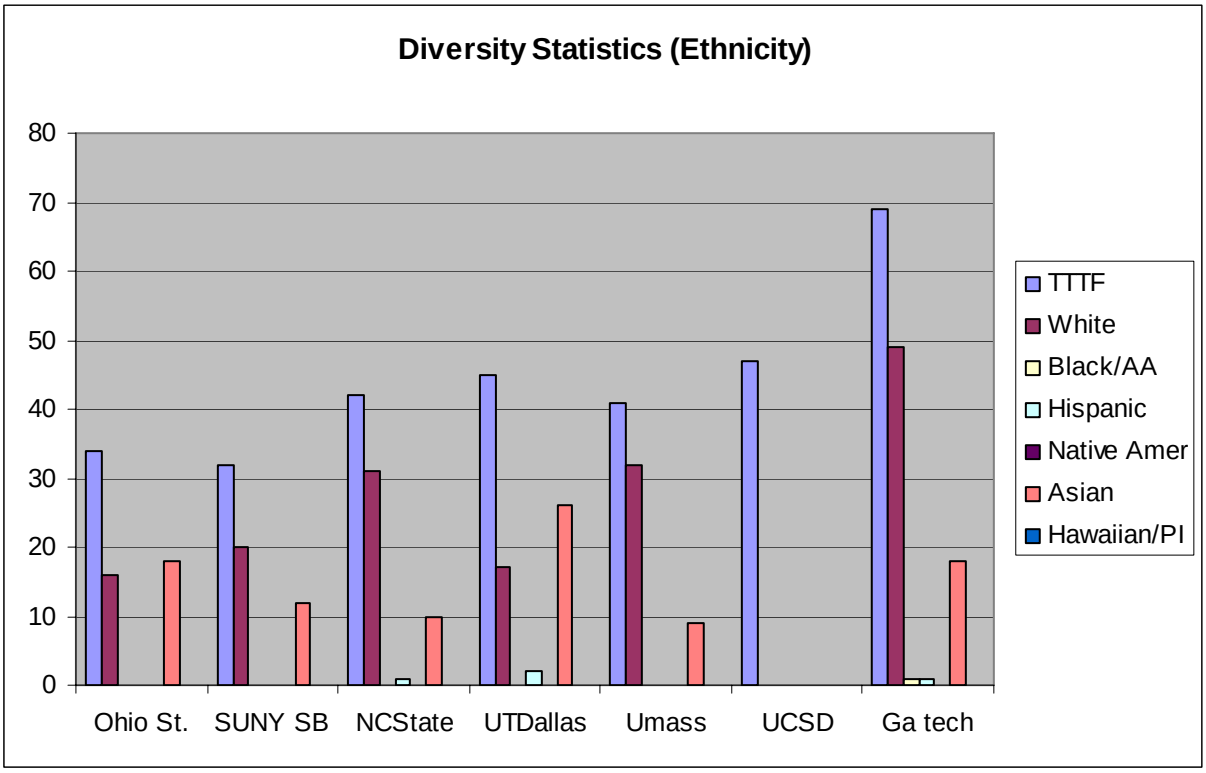
Total dollar amount of research expenditures and dollar amount of research expenditures per FTFE of core doctoral faculty.

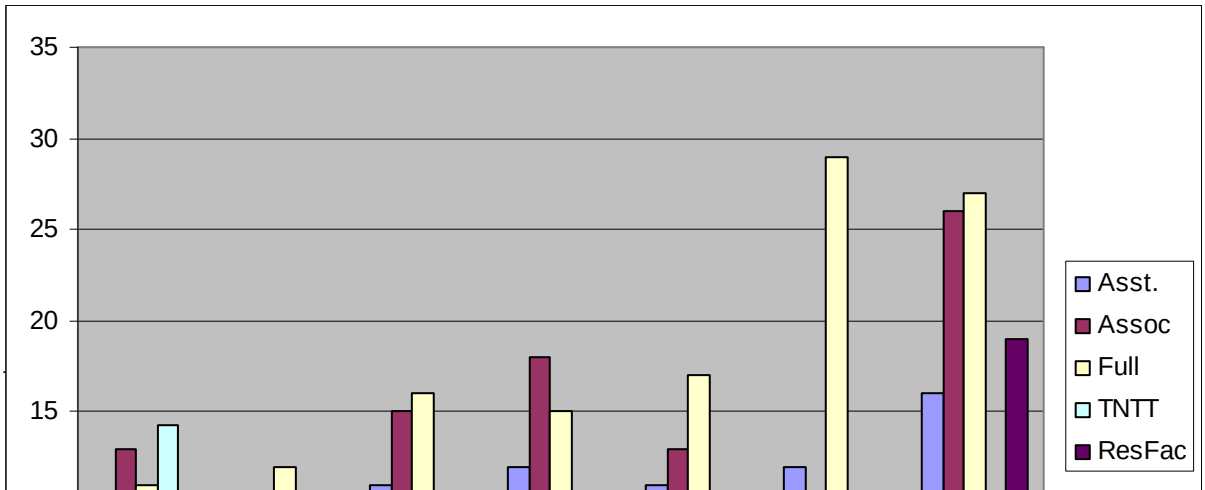
This information is shown in the tables and graphs below. Note that:

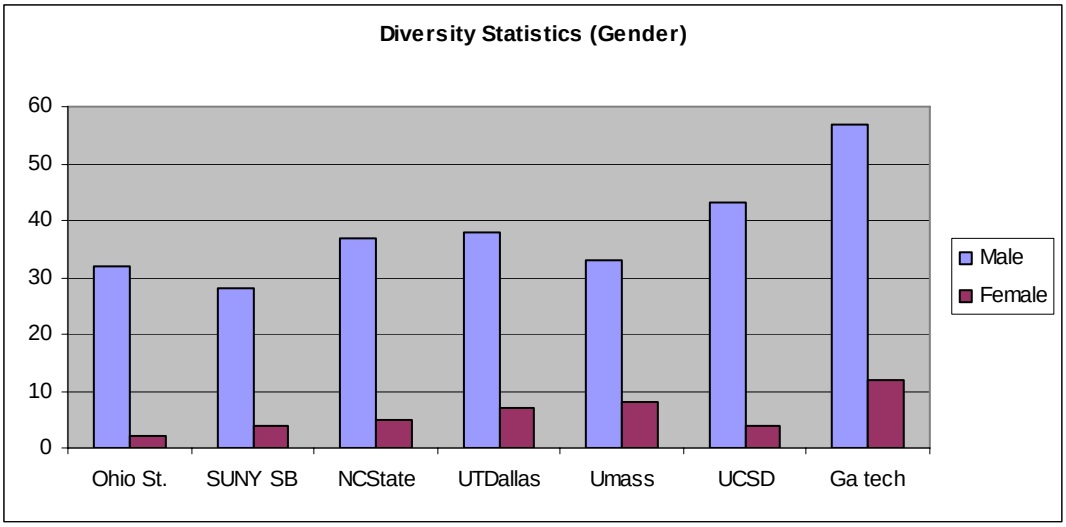
1. Full-time Faculty Equivalent (FTFE) of all faculty members has been reported
2. Only tenured and tenure-track faculty members have been considered. Diversity statistics are available for only T/T faculty members.
3. Diversity statistics were unavailable for UCSD.

Criterion	Ohio St.	SUNY SB	NCState	UTDallas	Umass	UCSD	Ga tech
FTFE	50.5	41	52.2	57.25	48.1	56	98.5
TTTF	34	32	42	45	41	47	69
White	16	20	31	17	32	n/a	49
Black/AA	0	0	0	0	0	n/a	1
Hispanic	0	0	1	2	0	n/a	1
Native Amer	0	0	0	0	0	n/a	0
Asian	18	12	10	26	9	n/a	18
Hawaiian/PI	0	0	0	0	0	n/a	0

Male	32	28	37	38	33	43	57
Female	2	4	5	7	8	4	12
Asst.	10	10	11	12	11	12	16
Assoc	13	10	15	18	13	6	26
Full	11	12	16	15	17	29	27
TNTT	14.25	9	4.14	10.25	1	7.5	10.5
ResFac	2.25	0	6.06	2	6.1	1.5	19
Npub/Fac	n/a	n/a	2.75	7.71	n/a	n/a	5.31
ResExp	$5,214,000	$4,169,780	$7,123,000	$6,398,868	$12,182,389	$9,478,435	$11,294,472
ResExp/TTTF	$153,353	$130,306	$169,595	$142,197	$297,131	$201,669	$163,688







Average number of organized classes (both Graduate and Undergraduate) taught by core faculty for academic years 03-04, 04-05, and 05-06.

Ohio St.	SUNY SB	NCState	UTDallas	Umass	UCSD	Ga tech
3	3	3	3	2	2.5	3

Number shown represents number of classes taught per academic year.

4. List special honors that have been received by the program faculty during the last 3 years.

See details in Faculty CV attached. As a highlight, it should be mentioned that faculty members and their students received a number of best paper awards at conferences. These include:

- Best paper award at HICSS 2006 (January 2006) for a paper co-authored by faculty member Dr. Ravi Prakash and student Mansoor Mohsin.

- Best paper award, IEEE Globecom 2005 Symposium on Photonic Technologies for Communications for a paper authored by Dr. Jason Jue.

- Best paper award, ECOWS'05 European Conference on Web Services to Professor Gopal Gupta, and students Ajay Bansal, Vidya Kona, Ajay Mallya and Luke Simon.

5. Other information the department would like to provide.

Students

1. **From which universities do the new admits come?**

   The list of Universities is attached in Appendix VI.

2. Describe the admission standards and the process of selecting applicants for admission to the program used during the previous three years. Programs with approved holistic processes should also include this current selection procedure.

   The Computer Science faculty have established the following guidelines, in addition to University graduate admission requirements, for students applying for admission to the MSCS program:

   • An undergraduate preparation equivalent to a baccalaureate in computer science

   • A grade point average in upper-division quantitative course work of 3.0 or better on a 4-point scale, and

   • GRE examination scores of at least 500, 700 and 600 for the verbal, quantitative and analytical components respectively, or at least 1800 for the total score, are desirable based on experience with student success in the program.

   Applicants must submit three letters of recommendation from individuals who are able to judge the candidate's probability of success in pursuing a program of study leading to the master's degree. Applicants must also submit an essay outlining the candidate's background, education and professional goals. Students from other engineering disciplines or from other science and math areas may be considered for admission to the program; however, some additional course work may be necessary before starting the master's program. Undergraduate leveling courses (numbered 4xxx or below) cannot be counted for graduate degree credit.

   The admission process flows as follows. Graduate CS application packets and documents are received by the Office of Enrollment Services (OES). When received, OES assigns a student ID number and all materials are scanned into OnBase (a software system recently purchased by UTD). OES processes the files and when finished these applications are made available to the Graduate CS Admissions staff in On Base. A complete file contains the application, official GRE scores, official TOEFL scores (if applicable), 3 letters of recommendation, a narrative, and all official transcripts. Graduate CS staff (currently 2 full-time staff members) processes the files and submits them to the Graduate CS Admissions Committee, consisting of about 8 faculty members, for review. This committee decides who is and isn't accepted into the program. The files are returned to Grad CS staff who enter the decisions into OnBase. The electronic file is automatically sent back to OES. OES admits or denies the applicant and mails out the admission or rejection letter.

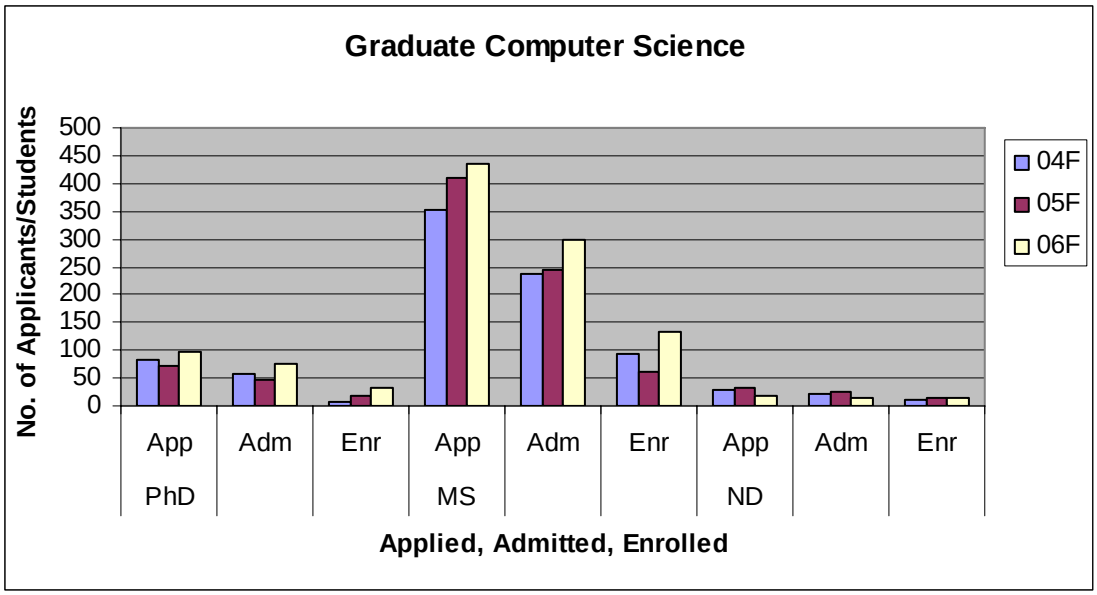
3. **Provide data for the last 3 years on:**

i. The number of applicants to the program for each year.

ii. The number and percentage admitted to the program each year compared with the number of applicants.

iii. The number and percentage of new admits who enrolled compared with the number who were admitted.

This information is shown in the table below.



iv. The number of students who completed the degree program each year .

Master's Degrees Awarded by Gender -- 2002-2003				
	Male	Female	Unknown	TOTAL
CS	190	75	0	**265**
SE	35	44	0	**79**

Master's Degrees Awarded by Gender -- 2003-2004				
	Male	Female	Unknown	TOTAL
CS	155	63	0	**218**
SE	41	38	0	**79**

Master's Degrees Awarded by Gender -- 2004-2005				
	Male	Female	Unknown	TOTAL
CS	109	55	0	**164**
SE	26	25	0	**51**

Master's Degrees Awarded by Gender -- 2005-2006				
	Male	Female	Unknown	TOTAL
CS	85	43	0	**128**
SE	31	16	0	**47**

4. Provide the number and percent of full-time and part-time doctoral students by gender and ethnicity (cross-tabs) for the last three years.

Diversity: White, African American, Hispanic, Native American, Asian, Alaskan-Pacific Islander

U. S. Citizen, Permanent Resident, International

Male; Female

These respective tables are shown below (Note Foreign students are shown under category "For" in the ethnicity table below):

Master's Degrees Awarded by Student Ethnicity								
2002-2003	Afr	Asi	His	Nat	For	Cau	Oth	Tot
CS	1	20	0	0	223	16	5	265
SE	0	10	2	0	60	6	1	79
2003-2004	Afr	Asi	His	Nat	For	Cau	Oth	Tot
CS	0	24	2	0	170	22	0	218
SE	1	13	2	1	54	8	0	79
2004-2005	Afr	Asi	His	Nat	For	Cau	Oth	Tot
CS	2	15	0	0	124	23	0	164
SE	2	7	0	0	30	12	0	51
2005-2006	Afr	Asi	His	Nat	For	Cau	Oth	Tot
CS	1	12	1	0	96	18	0	128
SE	1	10	2	0	26	8	0	47

Master's Degrees Awarded by Gender -- 2002-2003				
	Male	Female	Unknown	TOTAL
CS	190	75	0	**265**
SE	35	44	0	**79**

Master's Degrees Awarded by Gender -- 2003-2004				
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CS	155	63	0	**218**
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Master's Degrees Awarded by Gender -- 2004-2005				
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CS	109	55	0	**164**
SE	26	25	0	**51**

Master's Degrees Awarded by Gender -- 2005-2006				
	Male	Female	Unknown	TOTAL
CS	85	43	0	**128**
SE	31	16	0	**47**

5. Provide the number and percent of full-time and part-time master's students with fellowships, scholarships, research assistantships, or teaching assistantships /teaching fellowships.

The number of Master's students who are RAs or TAs is very small, as most of the departments TA/RA resources go towards supporing Ph.D. students. The number of MS students RAs/TAs is about 10 for each semester. The data for all graduate students who are RAs and TAs is shown below. (F = fall; S = spring; U = summer).

SEMESTER	# of TAs	# of RAs
01F	48	37
02S	79	52
02U	64	46
02F	71	48
03S	69	46
03U	57	41
03F	66	60
04S	68	58
04U	36	39
04F	54	53
05S	60	55
05U	33	56
05F	57	73
06S	35	79
06U	43	66
06F	50	85
07S	45	96

6. Describe the types of financial support and dollar amounts provided to master's students in the program.

Fellowships:

Fellowships levels are $1,950/mth, $2,000/mth, and $2,050/mth. Level I is reserved for M.S. students. Level II for students past the qualifying exam, while Level III is for students who have finished everything except their dissertation.

Scholarships

In addition to the fellowships/TA/RA, the department provides about 10 $1,000 scholarships to graduate students. These typically go to M.S. student and unsupported Ph.D. students (if any).

TA

TA levels are are $1,950/mth, $2,000/mth, and $2,050/mth. Level I is reserved for M.S. students. Level II for students past the qualifying exam, while Level III is for students who have finished everything except their dissertation.

RA

RA levels are are $1,950/mth, $2,000/mth, and $2,050/mth. Level I is reserved for M.S. students. Level II for students past the qualifying exam, while Level III is for students who have finished everything except their dissertation.

7. How many students receive tuition support? Where does this support come from?

All TAs and RAs receive full tuition support. That is, they don't pay a single dollar for tuition. Out-of-state and foreign students who receive $1,000 scholarships are eligible for in-state tuition.

8. Provide the number of master's student scholarly activities (peer-reviewed publications; presentations, exhibitions, or performances at national or international platforms or highly recognized state or regional venues).

Most MS student who pursue the thesis option end up publishing their research. The number of papers published by MS and Ph.D. students combined in 2006 is more than 200.

9. Describe major accomplishments, honors, etc. among the program's master's graduates.

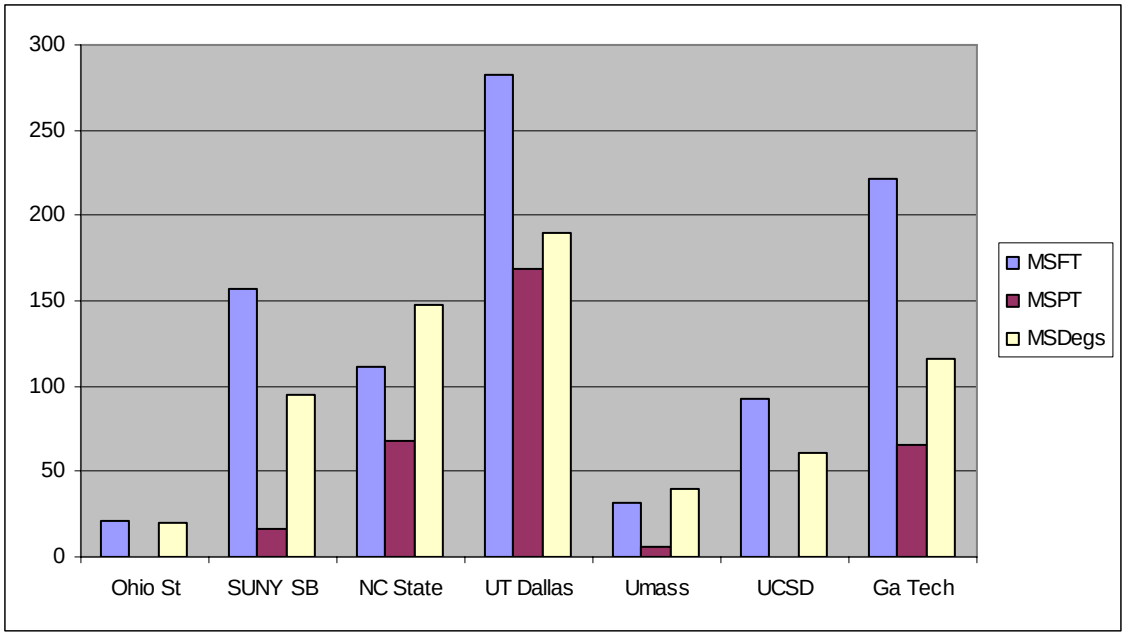
Our graduate students have won programming/design competitions as well as published their MS thesis research papers in highly prestigious conferences.

10. Provide the following data comparing your program's master's students to three of the program's benchmark institutions and three of the program's aspirational peers.

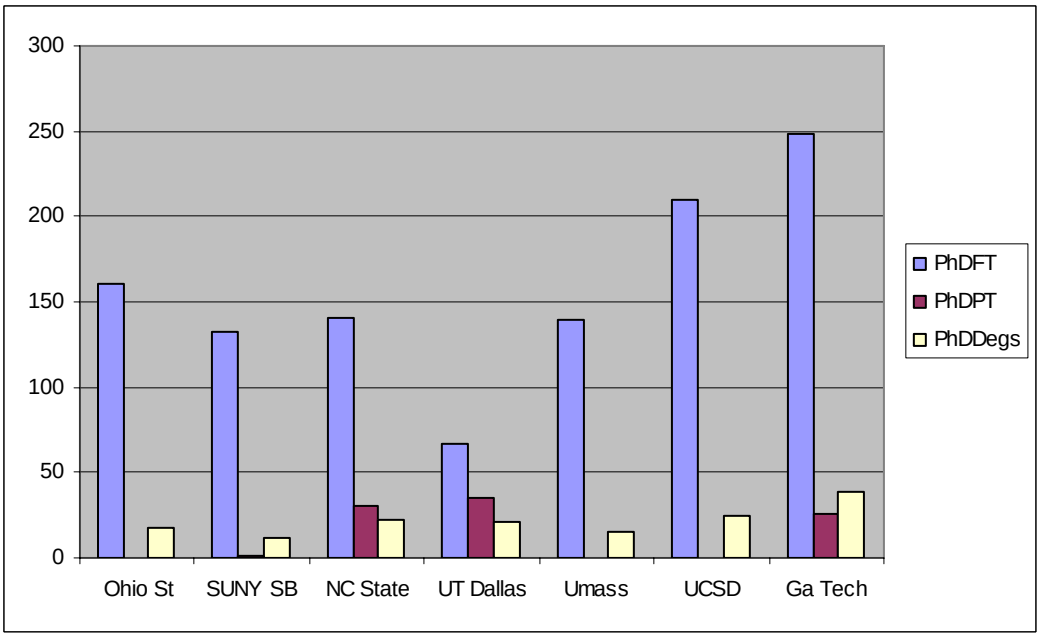
i. Average dollar amount of financial support (fellowships, TA's and RA 's) for master's students.
ii. Percentage of master's students receiving tuition waivers or tuition scholarships.
iii. Graduation/attrition rates
iv. Number of master's degrees conferred

This information is shown in tables and graphs below. Note: MSFT = MS full-time; MSPT = MS Part time; MSDegs = MS degrees Granted; PhDFT = PhDs Fulltime; PhDPT = PhDs Part time; Most of the data comes from asee.org. The data for Georgia Tech is for Electrical and Computer Engineering (CS data is n/a).

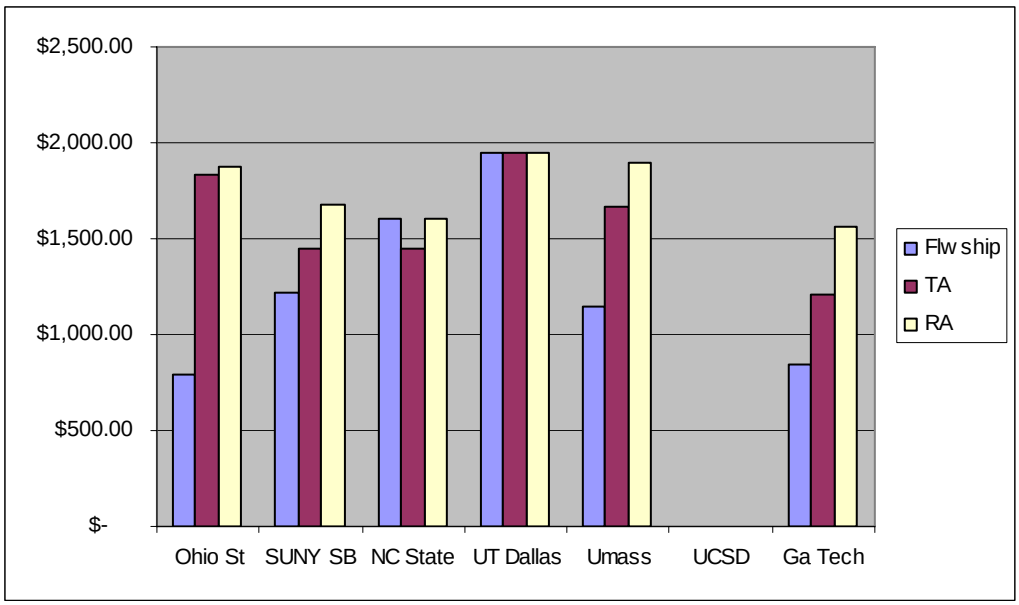
	Ohio St	SUNY SB	NC State	UT Dallas	Umass	UCSD	Ga Tech
MSFT	21	157	111	283	32	92	222
MSPT	0	16	68	169	6	0	66
MSDegs	20	95	148	190	40	61	116
PhDFT	160	132	141	67	140	210	249
PhDPT	0	1	31	35	0	0	26
PhDDegs	17	12	22	21	15	25	39
Average Fianancial Aid Amounts							
Flwship	$ 796.00	$1,221.00	$1,600.00	$1,950.00	$1,150.00	n/a	$ 848.00
TA	$1,832.00	$1,447.00	$1,450.00	$1,950.00	$1,667.00	n/a	$1,204.00
RA	$1,874.00	$1,682.00	$1,600.00	$1,950.00	$1,894.00	n/a	$1,559.00



M. S. Degree Enrollments



Ph.d. Degree Enrolments



Average Amounts of Financial Aid

- Other information or data that the department would like to provide.

The department highly encourages MS students to participate in the School's industrial practice program that places students in industry for obtaining practical experience in the discipline. This curricular practical training helps significantly in producing graduates who are better prepared to fulfill their job duties upon employment. The table below show the number of students placed in industrial co-op position for each semester:

			CS				SE	
YEAR	**SEMESTER**	**UGRD**	**GRD**	**TOTAL**		**UGRD**	**GRD**	**TOTAL**
06-07	**FALL**	**28**	**51**	**79**		**8**	**15**	**23**
05-06	FALL	**49**	**87**	**136**		5	16	**21**
	SPRING	**40**	**36**	**76**		4	13	**17**
	SUMMER	41	52	**93**		5	12	**17**
	TOTALS	**130**	**175**	**305**		**14**	**41**	**55**
04-05	FALL	33	69	**102**		3	12	**15**
	SPRING	36	49	**85**		3	12	**15**
	SUMMER	49	93	**142**		6	20	**26**
	TOTALS	**118**	**211**	**329**		**12**	**44**	**56**
03-04	FALL	20	53	**73**		4	11	**15**
	SPRING	24	34	**58**		3	6	**9**
	SUMMER	38	56	**94**		3	12	**15**
	TOTALS	**82**	**143**	**225**		**10**	**29**	**39**

Outcomes

1. What are the key learning outcomes that have been identified for the program?

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(a)  an ability to understand and use advanced concepts in theory of
        software engineering
(b)  an ability to understand and use advanced concepts in applications of
        software engineering;
(c)  an ability to formulate and analyze problems in computing and solve
        them;
(d)  an ability to learn and analyze emerging concepts in theory and
        applications of software engineering;
(e)  an ability to design and conduct experiments as well as to analyze
            and interpret data; and,
(f)  an ability to function in teams and to communicate effectively.
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2. What methods are used to determine whether students have achieved the key learning outcomes of the program?

   Course learning objectives have been designed for each course. Please see http://www.utdallas.edu/~gupta/sacs/grad for list of CLOs for all CS graduate level courses. At the end of each semester, each faculty member fills out the self assessment form where they assess how effective the learning process was for students in that class. Based on this assessment, faculty members identify fixes and improvements. All faculty members who are teaching a particular course in a particular academic year get together (typically during a faculty-wide meeting specially organized for this purpose) and identify changes and improvements to the course. These changes are implemented the next time the course is offered.

   Feedback is also obtained from our Industrial Advisory Board and our representatives of the local industry. This input is also used for making changes to the program as well as introducing new tracks, certificates and programs.

   For measuring if key learning outcomes have been achieved, the department also plans to use alumni surveys in the future. Alumni surveys have been routinely conducted by the department for assessing BS education, but not for Master's degree education. The department plans to change that in the future.

3. How many graduates are employed in a position in their field within one year of completing their master's degree programs? Where have the graduates been employed?

   While data is not available, this percentage is close to 100%. Most of our M.S. students obtain immediate employment upon graduation due to high demand in the job market. In fact, many students have multiple offers at the time they graduate, or even prior to graduation. Graduates are mostly employed by established high tech companies such as QualComm, Microsoft, Tektrnonix, Intel, Texas Instruments, etc., as well as start-up high-tech companies.

4. Summarize improvements to the program that were based on assessment results for the 3 years.

   The M.S. program has been running extremely smoothly and our graduates are well revered and sought after in the industry. A number of improvements have been made based on the assessment

- The Programming Languages class and Databases classes were significantly upgraded to add more advanced contents.

- Based on feedback from our students, alumni, fellow researchers, as well as our industrial advisory board the track of *Intelligent Systems* was introduced in the M.S. program.

- Based on feedback from our students, alumni, fellow researchers, as well as our industrial advisory board the track of *Bioinformatics* was introduced in the M.S. program.

- Based on faculty feedback, the Software Engineering track is being reviewed for changes. The faculty is considering revising the course contents of the Advanced Software Engineering (CS 6354 class) as well as revising the list of core courses that are required to be taken for the Software Engg. Track.

- Many new electives have been recently introduced based on our assessment of the job landscape, student demand, and feedback from industry, our alumni, and our colleagues at other Universities.

- Additionally, software engineering faculty members are currently reviewing the syllabus of each core course to reconfirm that it is significantly more advanced than the corresponding undergraduate courses.

5. What is the placement record for students who have graduated in the last three years?

   The department doesn't keep track of this data, however, anecdotally, the placement record is close to 100% due to high demand for CS graduates, especially MS students. Job creation in the high tech industry has been particularly high in the last 3 years.

6. In what ways is this program distinctive from similar programs at other universities in Texas, and elsewhere?

   The program is distinctive from other programs in Texas and elsewhere in the following ways:

   - UTD Computer Science Department has a large number of faculty members (45 graduate faculty) who offer a large number of advanced graduate courses which gives the students an opportunity to choose from a wide variety of courses. Almost every area of expertise is found among UTD faculty, allowing students to learn that expertise as well.

   - UTD's location in the Telecom corridor which has the 2nd highest concentration of high-tech industry provides ample opportunity to our students for pursuing co-op work in the industry. A large number of our MS students avail of this co-op opportunity to obtain industry experience. The UTD Engineering School, of which the CS department, is a part, runs the 5th or so largest industry co-op program in the nation.

   - UTD CS's MS in SE is one of the few Master's programs in the country that is completely focused on software engineering.

7. Other outcome information the department would like to provide.

Budget

1. What is the approximate proportion of the total departmental budget that is dedicated to master's program support? Describe the areas of support.

   Approximately 40% of the budget is dedicated to supporting the large Master's Program that UTD Computer Science has. The money is mostly spent in faculty and staff salaries.

2. Describe budgetary challenges that the department has dealt with to support the master's program.

   The enrollment in the MS program was quite healthy until 2002, when it started to decline due to the dot-com bust. It has been significantly increasing since then. A significant percentage of the Master's students are International students who pay full out-of-state tuition. Thus, given the large number of M.S. students, budgetary challenge to the programs have been quite limited. An area of challenge has been to raise funds to award scholarships to M.S. students so that UTD CS can attract higher quality students to join the M.S. program. Many excellent students do not choose UTD CS MS program due to the fact that the department does not provide TA, RA or fellowship support to M.S. students.

Departmental Conclusions and Recommendations

1. Describe the area(s) of the master's program that you (the department) consider excellent.

   (i) The program is particularly strong in providing in-depth education in areas of theory, systems, artificial intelligence, networks, software engineering, and bioinformatics. (ii) The wide array of choices that are available to students when it comes to selecting courses. (iii) The location of the department in the high-tech Telecom corridor that allows students ample chance for obtaining curricular industrial experience. (iv) Our highly experienced and productive graduate faculty that is very active in research.

2. Describe the area(s) of the master's program that you (the department) consider areas of limitation or challenge.

   The ares of challenge are: (i) improving the quality of students joining the program. (ii) ensuring that students do not cheat on home assignments for various graduate courses. (iii) providing more programming experience for students through more course projects and programming assignments in graduate courses. (iv) Recruiting senior faculty members who can provide leadership in education and research within the department; recruitment of senior faculty members has been a difficult task.

3. If you (the department) were provided with additional funding each year for master's education that consisted of an amount equal to 5% of your total departmental budget, what would your (i.e. the department's) priorities be for spending the increase?

   This funding will be most likely used for providing scholarships to M.S. students, so that we can attract the best and the brightest students to our M.S. program.

4. List and explain the department's recommendations for improvement of its master's program.

    - Recruiting experienced faculty members in computer science, particularly in areas of software engineering, intelligent systems and bioinformatics.

    - Encouraging the very best M.S. students to take up M.S. thesis in order to expose them to research (our hope is that these students will join the Ph.d. program).

5. Other conclusions and/or recommendations that the department would like to provide.

    In surmmary, the M.S. program has been a highly successful program, that has made significant contributions by enhancing the University's reputation and by providing highly skilled man power to local and national high tech companies. Our M.S. program is one of the largest in the nation, yet it has been organized, run and managed very smoothly. Perhaps among all programs within the CS departments, the M.S. program has been the most successful.