Department of Computer Science
Computing and Information Science Graduate Program Self-study
2013 - 2014

I. Program Profile

- Mission of program – briefly describe the unit's mission, vision, goals, and objectives. How does this align with the university's Strategic Plan? What is the unique role your unit plays or contributions it makes to the university, state, and/or region?

  The Department of Computer Science currently offers three degree programs (concentrations) at master level: Computing and Information Science (CIS), Digital Forensics (DF), and Information Assurance and Security (IAS).

  Mission: the Department of Computer Science at Sam Houston State University (SHSU) is a community of faculty, staff and students, centered in the computer science disciplines and in particular, CIS, DF, and IAS. The Department of Computer Science is dedicated to providing the highest quality education to its graduate and undergraduate students through excellence in teaching and excellence in research, and most importantly integrating these two academic aspects into our students' learning environment. The department is committed to furthering the pursuit of knowledge and meeting the needs of a diverse society.

  The Department of Computer Science seeks to provide an environment that encourages innovative thinking, academic rigor and the pursuit of scholarship in an atmosphere that promotes high ethical and moral values and mutual respect, embracing diversity, and working towards a goal of instilling a life-long love of learning. [1]

  Vision: CIS program will maintain its high quality teaching and research and promote its national and international recognition while providing more scholarship and increasing student diversity in nationality and ethnicity. DF program will continue to be one of the leading DF programs in the nation to prepare digital forensics investigators and professionals with concurrent knowledge and skills, and will provide a solid foundation for proposed future doctoral DF program. Our online IAS program will increase its instructional and scholarly influence to attract diverse security-related professional personnel from the state of Texas, the nation, and the world. The three graduate programs complement and support one another. [2]

  Goals and Objectives: All three graduate programs share the same goals – graduates with a master degree will have a strong technical foundation, that is, to develop and demonstrate knowledge of theoretical materials, and computational and technical skills relevant to corresponding concentration.

  The main objectives of our CIS program are to produce Computing and IT professionals who not only understand the fundamentals of Computer Science and Information Technologies, but also are capable of applying these knowledge and skills in real work environments. Upon graduation, our CIS students are expected to comprehend all essentials in all core areas of CS. Our graduates are also equipped with programming and project development capabilities.

  These goals and objects are outlined in SHSU Online Assessment Tracking Data Base (OATDB). [3]

Aligning to university's Strategic Plan: SHSU's Strategic Plan states that our university's mission is to provide high quality education, scholarship, and service to qualified students for the benefit of regional, state, national and international constituencies. The mission, vision, goal and objective of the Department of Computer Science as well as the three graduate degree programs all perfectly align with university's strategic plan by emphasizing best quality education, advancing scholarships and research, and devoting in services to qualified students. [4]

Unique role: each of our three graduate degree programs has its own unique role as further described below.

Our CIS program is the only program in the university providing the essential and core education of computer science and information technologies. Compared to other graduate programs, such as MIS and Math, offered by the college of business and department of math, our program focuses on the study of the theories, mechanisms, and applications of computer systems and networks, as well as the retrieving, processing, and presenting of information. Our course content and research are not limited to business environments or pure intensive computation, but can be extended to and serve almost all other fields in hard core sciences or social science.

- History of program

  History: the Department of Computer Science became an independent department from a division under the Math and Statistics Department in the year of 2003. The CIS, DF, and IAS programs started in 1990, 2006, and 2008 respectively. In last ten years, the total number of graduate students in the department has increased from 23 in 2005, to 45 in 2006, to 52 in 2008, and to 83 in Fall 2013. Starting in 2007, the CS Department has successfully hired seven tenure-track assistant professors, all of whom serve as core or supporting faculty in one or more of these three programs.

  Back in 1990, the CIS master degree program was approved after a state legislator visited Dr. David Burris and Dr. John McCoy in the Math and Statistics Department. The expressed goal approved by the legislative representatives was to provide an industry oriented program designed to attract students. The program specialized in taking students with degrees in engineering and the sciences who wanted to improve their position in the workforce. Most of our graduates went into the petrochemical industry in the Houston area. The program also had a significant number of Registered Nurses in the early years. Their best job offers were to work for hospitals but not a single nurse ever went back to hospitals. In addition to the above, we also retrained a large number of air traffic controllers who were fired for participating in a strike. Most of them went into the aerospace industry as they knew how to work with professional pilots well as air traffic control centers. The full time graduate faculty were Dr. Burris with Ph.D. in Computer Science, Dr. Jon McCoy with Ph.D. in Electrical Engineering, and Bernie Poetker with master's degree in Computer Science. We also utilized several faculty members from math to teach introductory programming. The enrollment has fluctuated between just below 20 and 40 since the program started.

- Program demographics (e.g., number of students/classes, number of degrees conferred annually, number of core faculty, etc.)

We have experienced a relatively steady increase in the total enrollment of all three programs in the department, from 23 in Academic Year (AY) 2005, to 45 in 2006, to 52 in 2008, to 63 in 2011, to 83 in Fall 2013 (refer to Table 1). In AYs 2009 through 2012, total annual number of degree conferrals has been around 20. Table 1 also shows the annual enrollment and number of degree conferrals for each of the specific programs.

	All three programs combined		CIS		DF		IAS	
	Enrollment	Degree Conferred	Enrollment	Degree Conferred	Enrollment	Degree Conferred	Enrollment	Degree Conferred
AY 2005	23	5	23	5	0	0	0	0
AY 2006	45	3	28	3	17	0	0	0
AY 2007	43	19	21	7	22	12	0	0
AY 2008	52	10	32	7	18	3	2	0
AY 2009	54	19	35	15	16	4	3	0
AY 2010	52	21	29	12	16	1	7	8
AY 2011	63	19	38	12	12	4	13	3
AY 2012	58	22	24	15	10	3	24	4
F-13	83	15	26	2	20	0	37	1

Table 1. Enrollment and Degree Conferred in AY 2005 through Fall 2013.

Starting in 2007, the CS Department has successfully hired seven tenure-track assistant professors, with three of these faculty members dedicated exclusively to the areas of Digital Forensics and Information Assurance and Security. Table 2 shows the average class size and number of core faculty of the three programs in Fall 2013.

	CIS	DF	IAS
average class size	15	12	16
number of core faculty	4	4	5

Table 2. Average class size and number of core faculty in 2013-2014.

- Faculty/Student ratio

Faculty/Student ratios is 1/5 for CIS.

- Alignment of program with stated program and institutional goals and purposes – How does the program align with the program goals and the university goals? In the next several years, what factors will impact the demand for what you do? How can you position the unit to respond to changes in demand?

  As outlined in the earlier section on the mission of our program, we strive to align our program goals and objectives with that of SHSU and our Department's mission and vision. Strong technical competency for each of our graduate student is the goal of our three programs. The design of curricular and implementation in course content as well as in classroom all emphasize technical theories and practices, which serve to prepare our graduate students with solid technical foundation for their current and future career. We aim to produce graduates who are exceptionally well trained in the field of computer science, digital forensics, and information assurance and security, and are evidenced by the fact that many of our students have been able to find jobs in their desired fields and industry sectors before graduation or within a relatively short period after. To this end, the mission, vision, goal and objective of the Department of Computer Science, as well as the graduate degree programs, all perfectly align with university's strategic plan by emphasizing high quality education, advancing scholarship and research, and service to qualified students as required by the SHSU strategic plan.

  The Texas Workforce Commission's "State of Texas Information and Computer Technology Cluster Assessment (2005)" [5] citing the AeA Cyberstates 2005 Report identified Texas as ranking 2nd in the nation for employment in high tech workers, 2nd also in employment in telecommunications and engineering, and 3rd in technology oriented venture capital investments. These rankings remain same in the year of 2013 and very likely 2014. With the exponential growth of amount of information, uses of computers, networks and the cloud, as well as the increasing need for information processing, computer and network security, and digital forensics for handling legal evidence and court presentation, we expect to see and experience consistent growth in demand in all three areas of graduate studies. In order to respond to the increases in demand, the Department of Computer Science has been requesting necessary budget and resources to hire new faculty and facilitate more classes in the future.

II. Program Administration

- Administrative processes including admission processes, etc. – evaluate the effectiveness of the procedures and describe any planned changes.

  The processes of admission, supervision, and management of the program are overall effective and efficient. All applications and admission paperwork and processes are handled completely online electronically. Most responsibilities of admission, supervision, and management of graduate programs are taken by the graduate advisor, who also serves as the chair of Graduate Curriculum Committee. On average, a complete application spends less than five business days from arriving at the College Dean's Office then going through admission committee (Graduate Advisor and Department Chair) and finally returning back to Dean's Office for final notification to the applicant. The graduate advisor utilizes various ways

for communications with applicants, existing students, and faculty and Department Chair, including emails, individual meetings, group meetings, phone calls, online meetings, presentations and orientations, among others.

- Administrative policies – what are the academic, structural and administrative barriers in your unit? How are you reducing them?

  The College of Sciences (CoS) and the university provide great support to our graduate programs. We have been supported and encouraged to apply for the doctoral program of Digital Forensics.

  Within the department of Computer Science, currently there is no noticeable academic, structural and administrative barrier.

- Mentoring and academic advising – how are advisors assigned? Who monitors the student's progress?

  The graduate advisor is recommended by the Department Chair, agreed by department graduate faculty, and assigned and finally announced at department meeting by the Department Chair. Currently the graduate advisor Dr. Lei Chen is responsible for providing general advising to all students. This does not include supervising final master projects, which is provided by each student's project supervisor and committee. Dr. Chen provides advising to each student starting from when a student is accepted into one of our three programs by giving department new student orientation as well as individual advising for class registration and preparation. Dr. Chen also gives advice to each student along their graduate study, e.g. on study plans, class registration, preparation for comprehensive exams, possible project areas, recommending supervisor, committee of final master projects. Each student, depending on their areas of research interests, initiates the contact with a graduate professor who potentially agrees to serve as the project supervisor (or chair of the student's final master project committee). The project supervisor recommends two other graduate faculty members to serve in the same project committee. The entire project committee, especially the supervisor, monitors and is responsible for keeping track of the student's progress of the project and all relevant steps and paperwork till the student has successfully defended the project and submitted final project documentation and paper manuscript. The graduate advisor calls regular graduate faculty meetings to keep track of all kinds of advising.

III. Curriculum

- Description of curriculum (e.g. program length, degree plan, specializations, etc.) – describe major curriculum changes in the last several years. Discuss proposed changes to the curriculum and what evidence led to the changes.

  The program requires a total of 36 credits hours, with 18 credits of core courses, including 5 main 3-credit-subject courses and a 3-credit master project capstone course. A full time student (9-credit per Fall and Spring semester) may complete all requirements towards degree in two years, while the maximal allowed length of continuous study is 6 years.

  Each of our three programs has its unique study plan with specialization and focus area. Appendix A contains the degree plan for each student. The required undergraduate STEM

work is a requirement for regular admissions, and accepted applicants with admission conditions are required to complete all STEM work listed before graduate courses can be taken. Students are required to take all the core courses, which offer them a firm footing in the topics in the program. Students may then choose to pursue an agenda or advanced specialization within the program by electing to study elective courses. For complete details, please refer to the degree plan in Appendix A.

In the past two years, the graduate advisor, along with department graduate faculty, have proposed and implemented a number of changes to our graduate curricula and processes. The major changes and rationality are listed and explained below.

- Comprehensive exams changed from oral to written format starting in Fall 2012. Graduate faculty have developed review question list as a base, and designed each subject comprehensive exam in each semester. The review question list and written exams show a unanimously agreed body of knowledge and unified and transparent grading standards across various core subjects. Written exams are also more suitable for increased enrollment compared to individual oral exams.
- Starting in Fall 2013, final master project proposal changed from group (each graduating student in turn briefly presents their research ideas and plans in front of all graduate faculty in a group meeting) presentations to individual presentations (each graduating student presents a much more detailed proposal in front of individual project committee). Length of proposal presentation has increased from 5-10 minutes to 30-60 minutes. In the past, a number of master projects were not proposed well and consequently delayed the following implementation. We expect to see improved overall quality of proposals in Spring 2014 and future semesters.
- Courses proposed to be added in curriculum (final university forms approved in Fall 2013): quantitative foundations of CS, computer science core topics, machine learning, File System Forensics, multimedia forensics, and wireless network security.

  The first two new courses are required, replacing current STEM requirements in study plan, for all new graduate students who do not have sufficient STEM work background coming into our CIS program. This will prepare and ensure all our new graduate CIS students to have a solid foundation for a smooth transition into the graduate program as well as help solve the coordination problems in scheduling for students taking both undergraduate and graduate classes. Machine learning is added to meet the growing demand of smart and intelligent information retrieval and processing from vast amount of data, which is important to all three programs.

  Through the recent years of teaching and research in digital forensics, our graduate faculty has recognized the increasing importance of forensic investigations in file systems and multimedia data and agreed that they should be added into our DF and IAS curricula. Wireless technologies become more important in everyday life and work. The new wireless network security course targets the security issues and solutions in all kinds of common wireless networks and technologies. This course addresses the growing demand and research in mobile and wireless networks, devices, and applications.
- We have merged network security I and II into a single network security course, and merged risk assessment and financial system security and disaster recovery with new title business continuity management. This new course will solve all content overlapping issues in the old courses and provide a better business oriented graduate course to meet our student needs. This course will enable students to engage in more hands-on practical

experience in varied Information Assurance and Digital Forensics practical application domains.

- Appropriateness of curriculum (e.g. content comparison and duration comparison with accrediting standards and peer and aspiration institutions)

  The required core curriculum of CIS program includes the study in the areas of Operating Systems, Software Engineering, Programming Languages, Database Systems, and Data Structures and Algorithm Analysis. All of these core courses are a standard program of study in most computer science graduate programs. CIS elective courses encompass the various aspects of information computing and processing. For example, parallel computing, network and data communications, and microcomputer interfacing help give the curriculum more strength on how information can be processed and transmitted within systems and in networks. Neural networks, data mining, and artificial intelligence courses deal with how information can be processed in smart, intelligent, and efficient ways. Database security, operating system security, network security, cryptography and steganography, and malware all provide intensive and extensive knowledge and practices regarding the security and privacy of information and systems. Most of these elective security courses are shared among all three graduate programs, especially between DF and IAS programs.

  To our best knowledge, there is no generally recognized accreditation body for computer science graduate programs (Accreditation Board for Engineering and Technology, or ABET, does not accredit graduate programs in computer science at this time).

- Description of comprehensive exams and dissertation/thesis processes

  Each student is required to pass all five subject tests of the comprehensive exams, covering all core course contents in the corresponding program. All comprehensive exams are given in both Fall and Spring semesters at around week #5. Students graduating in Summer semesters have the chance to take the exams towards the end of the Spring semester prior to the Summer.

  Well before taking the exams, CIS students are given a review question list which includes most important and common questions and problems. CIS students are given paper exams and monitored by the graduate advisor.

  Each subject test is carefully designed by faculty member who teaches the corresponding core course. All completed exams are graded carefully by faculty members who designed the exams. Passing score is 70 out of 100 for each subject, and a high-pass is 85+. A student will have a second chance to retake the subject(s) failed in the first try, and will be terminated if any of the previously failed subjects failed again at second time.

  While we do offer thesis option, all our previous and current students took the project option route. Each student, depending on their areas of research/project interests, initiates contact with a faculty member, who potentially agrees to serve as the major advisor/supervisor or chair of the student's final project committee. The project supervisor then recommends two other graduate faculty members who may agree to serve in the student's project committee. The entire committee, particularly the supervisor, is responsible for the student's progress of the project and monitor's and reports the student's progress to the graduate committee during scheduled meetings and guides their students to proposals and eventually their final Master's

project presentations. A graduating student is required to pass the project proposal, complete and submit project midterm report, pass final project presentation (defense), and complete and submit all project documentation and deliverables, e.g. program source code and manual. To emphasize and promote research experience and outcomes, each student is also required to complete and submit a technical research paper to a recognized conference or journal before graduation.

- Accreditations

  Please refer to "appropriateness of curriculum" section above.

IV. Faculty

- Credentials

  Full-time tenure and tenure-track faculty active in graduate program(s) hold Doctoral degree in Computer Science or closely related disciplines (refer to their short bio in following sections).

  - Appropriateness of degrees

    All faculty teaching CIS program courses hold the terminal degree in Computer Science.

  - Publications/external grants/presentations/artistic endeavors – describe new research initiatives and discuss how they address the citizens, government, economy, and environment of the state of Texas. Are faculty members competitive in receiving external grants? What constraints to faculty productivity are you facing? Are you competitive (assistants, start-up funds, administrative processes, etc.) with other graduate programs in your discipline at similar institutions? How are you enhancing faculty productivity and competitiveness?

    Our graduate faculty on average published more than 20 papers at various recognized international venues and journals every year. On average each graduate faculty presents their research work at two conferences, one domestic and one international.

    Our graduate faculty has made continuous efforts and success in scholarly publications in the forms of journals, conferences, books, chapters, and magazines. In each of the past few years, our faculty have secured multiple internal research grants and submitted multiple grant proposals to National Science Foundation (NSF) and National Institute of Justice (NIJ). Dr. Qingzhong Liu has secured in the past 3 years two external grants, one from NSF and the other from NIJ, with a total amount close to $600,000. Most of each graduate faculty members travel and give multiple presentations at international conferences or venues.

  - Awards/recognitions

    Multiple faculty members received best paper awards at various conferences. Please refer to faculty C.V. for more details.

  - Service to the profession

    Almost every graduate faculty member has been providing professional service to the academia and research organizations as conference/workshop organizer, Technical Program Committee (TPC) member, journal/book editor, editorial advisory board member, etc.

  - Professional experience

All our tenure-track graduate faculty members were hired as fresh doctoral degree holders, except Dr. Qingzhong Liu who had three years research faculty at his previous institution. Except Dr. Peter Cooper, who had experience as college educator in U.K., and Dr. Timothy McGuire, who had work experience with multiple institutions in the U.S. before joining SHSU, all other tenured graduate faculty had all their career years with SHSU.

- Teaching load

  Tenure-track and tenured faculty members in the Department are expected to teach 3 courses per Fall or Spring semester, and summer teaching is offered depending on the demand from students. Teaching load of adjunct and pool faculty depends on demands. Up to two-course release is allowed each semester when the faculty member is assigned with extra service loads, e.g. graduate advisor and department chair, or buys out using fund from external grants.

- Diversity

  The Department of Computer Science is proud to have very diverse faculty and student body. Our faculty members were originally from at least seven different countries in three continents, with 11 male and 4 female in gender. In addition to the ethnicity and gender diversity, our faculty have diverse research interests and backgrounds, e.g. data mining, machine learning, pattern recognition and forgery detection, digital forensics, information and network security, data quality and cleanness, sensor networks, parallel computing, and programming languages, just to name a few.

- Program responsibilities (e.g., dissertation/thesis committees/comps, etc.)

  Please refer to previous section “Description of comprehensive exams and dissertation/thesis processes”.

- Program faculty profile

  - Core faculty

  CIS has core faculty Drs. Jiahuang Ji, Qingzhong Liu, Timothy McGuire, and Gary Smith.

  Each core faculty member’s short bio is listed below.

  Dr. Jiahuang Ji is a tenured Associate Professor in the Department of Computer Science. She received B.S. in Mechanical Engineering from Huazhong University of Science and Technology (China) in 1976, M.S. in Computer Science from Nanjing University (China) in 1983, and Ph.D. in Computer Science from University of Houston in 1990. She joined SHSU as Assistant Professor in 1990, and was promoted to Associate Professor in 1996. Her research areas include image processing, data mining, and computer networks and communications.

  Dr. Qingzhong Liu is a tenure-track Assistant Professor in the Department of Computer Science and he obtained Ph.D. in Computer Science from New Mexico Institute of Mining and Technology in 2007. Liu’s research interests include information security, digital forensics, and the applications of machine learning and data mining techniques to cyber-security and forensics study. He has published over 80 peer-reviewed papers with citations over 800 by Google scholar. His work on steganalysis and forgery detection on multimedia data has been published by the prestigious conferences such as ACM Multimedia and International Joint

Conference on Artificial Intelligence, and by leading journals such as Pattern Recognition, IEEE Transactions on Information Forensics and Security, ACM Transactions on Intelligent Systems and Technology, ACM Transactions on Multimedia Computing, Communications and Applications, and Information Sciences. He is the PI of external grants from NIJ and NSF (close to $600,000 combined).

Dr. Timothy McGuire is a tenured Associate Professor in the Computer Science Department. Dr. McGuire specializes in parallel computing and computer science theory. Since joining the department in September 1999, he has authored or co-authored numerous peer-reviewed scholarly works in various journals and conference proceedings. He served as the editor of the ACET Journal of Computing Education and Research from 2002 to 2005. He is a board member of the Consortium for Computing Sciences in Colleges and also is a Program Evaluator for ABET's Computing Accreditation Commission. He has taught a wide variety of courses at SHSU in both the undergraduate and graduate program.

Dr. Gary Smith is a tenured Associate Professor and supervises the Graduate Teaching Assistants in the department. Dr. Smith obtained his Ph.D. in Computer Science from Texas A&M University in 1998. Dr. Smith has extensive experience in Real-Time, Networking and GIS applications. He has been Principal Investigator or Co-Principle Investigator on three external grants totaling over $800,000. He has also been an investigator on three other externally funded grants and two internal grants. Recently he has been extensively involved with the development of the CRIMES police dispatch, data management, reporting and AVL systems used by over 50 Texas police agencies. Among the many courses taught at SHSU, he mainly focuses on Programming Languages, Compilers, and Operating Systems.

- Support faculty

CIS support faculty includes Drs. Hyuk Cho, Narasimha Shashidhar, and Cihan Varol.

Support faculty's short bios (except for those appeared in section "Core Faculty" above) are listed below.

Dr. Hyuk Cho is a tenure-track Assistant Professor in the Department of Computer Science. He received B.E. degree in Computer Engineering from Chonbuk National University, Korea; M.A. in Computer Science from Korea University, Korea; and both M.S. and Ph.D. in Computer Sciences under Dr. Inderjit S. Dhillon from The University of Texas at Austin. Dr. Cho used to be a member of DB & Data Mining Lab at Korea University and Data Mining Lab(DML) and Data Mining Group(DMG) at UTCS. His research interests include Data Mining, Statistical Pattern Recognition, Machine Learning, Data Science, and related topics. His dissertation focuses on Co-clustering Algorithms and their Extensions and Applications to various tasks in Text Mining, Bioinformatics, and Pervasive Computing. Previously, he worked on Soft Computing, including Neural Networks, Evolutionary Computation, Fuzzy/Rough Set Theory, and Linear Matrix Inequality.

Dr. Narasimha Shashidhar is a tenure-track Assistant Professor in the Department of Computer Science and he obtained Ph.D in Computer Science and Engineering from University of Connecticut in 2010. Dr. Shashidhar's research interests include Cryptography, Information Hiding, Steganography, Electronic Voting and Security, Digital Forensics, Peer-to-Peer and Sensor Network Security. He served as a reverse-engineer and penetration tester

for the Voting Technology and Research Center (VoTeR) at the University of Connecticut where he advised the State of CT on the security and deployment of electronic voting machines. He has over 25 conference/journal publications and also serves in the editorial advisory/review board and the Technical Program Committee (TPC) of a number of books, journals and conferences.

Dr. Cihan Varol is a tenure-track Assistant Professor in the Department of Computer Science and he obtained Ph.D. in Applied Computing from University of Arkansas at Little Rock in 2009. His research interests are in the general area of information (data) quality and digital forensics. These studies have led to various peer-reviewed journal and conference publications, two book chapters, and research grant to detect illusive records within the Law Enforcement database, and recent research proposals that were submitted by him to well recognized federal agencies and private corporations such as NSF, NIH and Acxiom. He has been invited to several talks related with Live Forensics and VoIP Forensics. He is an executive conference committee member of International Symposium on Digital Forensics and Security (ISDFS). He organized a workshop on Live Forensics systems in 2013 at Firat University. Also he has been an external reviewer for numerous prestigious journals, including IEEE Transactions on Automation Science and Engineering (IEEE TASE) and ACM Journal of Data and Information Quality (ACM JDIQ).

V. Students

- Admission criteria

  For regular admission, a CIS applicant must have 3.0+ undergraduate GPA, preferable in Computer Science or closely related fields, with bachelor degree conferred by an accredited institute (except for foreign students). Starting in 2014, our new GRE requirement is 300 (increased from 294). An international student must have TOEFL score 79+ or IELTS score 6.5+ for consideration for admission. If an applicant, while meeting all other admission requirements, does not have sufficient undergraduate CS background (when compared to the undergraduate STEM work requirements in Study Plan attached), he or she will be given admission with condition to complete (with B or better grades) all lacking background courses in the first one or two semesters before start taking graduate courses.

- Number of applicants/admits/enrolled

  CIS program applications, admissions, new enrolled students, and acceptance and enrollment rates are shown in Table 3.

Applicants	Accepted	Enrolled	% Applicants Accepted	% Accepted Enrolled	Applicants	Accepted	Enrolled	% Applicants Accepted	% Accepted Enrolled	Applicants	Accepted	Enrolled	% Applicants Accepted	% Accepted Enrolled
Fall 2012					Spring 2013					Summer 2013				
21	19	4	90.5%	19.0%	19	11	4	57.9%	21.1%					
Fall 2011					Spring 2012					Summer 2012				
Fall 2010					Spring 2011					Summer 2011				
25	16	7	64.0%	28.0%	37	28	11	75.7%	29.7%					
Fall 2009					Spring 2010					Summer 2010				
21	16	11	76.2%	52.4%	20	14	7	70.0%	35.0%	1	1	1	100.0%	100.0%
Fall 2008					Spring 2009					Summer 2009				
26	21	13	80.8%	50.0%	13	12	4	92.3%	30.8%	2	2	1	100.0%	50.0%
Fall 2007					Spring 2008					Summer 2008				
11	11	4	100.0%	36.4%	28	25	10	89.3%	35.7%	2	2	1	100.0%	50.0%

Table 3. CIS applications, admissions, new enrolled students, and acceptance and enrollment rates.

- Demographics (to include ethnicity and gender)

  Out of the 26 CIS students enrolled in Fall 2013, 18 were from Asian/Pacific Islands (14 Indians, 3 Chinese, and 1 Vietnamese), 6 were American Caucasians, 1 was American Latino, 1 was from Africa. Four were female and the rest were male.

  Out of the 314 CIS students ever enrolled in Fall 2007 – Spring 2013, 200 were from Asian/Pacific Islands, 8 were African Americans, 1 was Hispanic, and 60 were Caucasians, the rest are unknown or with two or more races. 78 were female and 236 were male.

- Profile of admitted students
  - Demographics – please refer to section above.
  - Full-time/part-time

  It is required by the U.S. immigration law that international students must register and maintain their full-time student (9 credit hours) in Fall and Spring semesters. Out of the 314 CIS students ever enrolled in Fall 2007 – Spring 2013, 188 (60%) were full time, and the rest 126 (40%)were half time, less than half time, or part time.

  - Description of assistantship responsibilities

  Assistantships in the Department are classified into teaching and research assistantships. Teaching assistants are tasked with assisting their supervising faculty members with creating and setting up computer labs, classroom activities, grading and occasionally lecturing or proctoring tests and exams. Research assistants are typically engaged in the research activities of their supervising faculty and are responsible for collecting data, conducting experiments and computer simulations, among other things.

- Student funding
  - Percentage of full-time students with financial support

  While we were not able to obtain statistical data regarding financial support from Institutional Effectiveness or the Office of Graduate Studies at SHSU, we tried to keep a recent record within the department on graduate assistantships and College Special Scholarship.

  As of Fall 2013, the CS Department provides 9 graduate assistantship (GA, as teaching assistantship) positions with waiver of out-of-state tuition (tuition drops to in-state) and a monthly stipend. Five out of the 9 GA positions 5 are given to full-time CIS students, 3 are given to full-time DF student, and 1 is given to full-time IAS student. Note that more positions are given to CIS students due to the in-class (vs. online) nature of their program with their GA job duty. College of Sciences provides College Special Scholarship with $1,000 one-time award and waiver of out-of-state tuition (tuition drops to in-state). The selection of this scholarship is based on equally weighted GRE scores and GPA.

  Two other CIS students are supported by the College Special Scholarship with $1,000 one-time award and waiver of out-of-state tuition (tuition drops to in-state). Two students work as GA in other department at SHSU. Out of the 18 full-time CIS students, 9 (50%) of them have financial support.

- Average support per full-time student

  The CS Department GA provides out-of-state tuition waiver (tuition drops to in-state, saving at least $4,000 per 9-credit-hour semester), with a monthly stipend around $1,000 before tax.

  The College Special Scholarship helps to save at least $4,000 per 9-credit-hour semester to out-of-state students with $1,000 one-time award.

- Graduation rate

  The graduation rates for CIS cohorts starting in AYs 2006 – 2010 are shown in Table 4.

2-Year Graduation Rates Fall Cohorts-Master			3-Year Graduation Rates Fall Cohorts-Master			2-Year Graduation Rates Spring Cohorts-Master			3-Year Graduation Rates Spring Cohorts-Master		
Cohort #	Graduated #	Graduation Rate	Cohort #	Graduated #	Graduation Rate	Cohort #	Graduated #	Graduation Rate	Cohort #	Graduated #	Graduation Rate
F10 Cohort Graduated through Summer12			F09 Cohort Graduated through Summer12			S11 Cohort Graduated through F12			S10 Cohort Graduated through F12		
7	3	43%	11	11	100%	11	6	55%	7	4	57%
F09 Cohort Graduated through Summer11			F08 Cohort Graduated through Summer11			S10 Cohort Graduated through F11			S09 Cohort Graduated through F11		
11	5	45%	13	10	77%	7	3	43%	4	3	75%
F08 Cohort Graduated through Summer10			F07 Cohort Graduated through Summer10			S09 Cohort Graduated through F10			S08 Cohort Graduated through F10		
13	7	54%	4	4	100%	4	2	50%	10	4	40%
F07 Cohort Graduated through Summer09			F06 Cohort Graduated through Summer09			S08 Cohort Graduated through F09			S07 Cohort Graduated through F09		
4	0	0%	12	6	50%	10	2	20%	3	3	100%
F06 Cohort Graduated through Summer08			F05 Cohort Graduated through Summer08			S07 Cohort Graduated through F08			S06 Cohort Graduated through F08		
12	3	25%	9	5	56%	3	1	33%	9	5	56%

Table 4. Graduation rates for CIS cohorts starting in AYs 2006 – 2010.

- Time to completion

  A graduate student has up to six years to complete all requirements towards master degree. If a student is not able to complete all requirements within this maximal allowed length of study, the student will be terminated without degree.

- Student retention rates

  Student retention rates for all three programs with cohorts starting in AYs 2007 – 2011 are shown in Table 5.

Degree, Major and CIP Code	1-Year Retention Rate Fall Cohorts		1-Year Retention Rate Spring Cohorts	
	Retained #	Retention Rate	Retained #	Retention Rate
Fall 11-Spring 12-Summer 12	**F11 Cohort Retained F12**		**S12 Cohort Retained S13**	
MS Digital Forensics Forensic Science and Technology (DFSC, SFS, 111003)	2	66.7%	2	66.7%
MS Information Assurance and Security (CSIA, IAS, 111003)	7	58.3%	5	83.3%
MS Computing and Information Science (CISC, CIS, 111003)				
Fall 10-Spring 11-Summer 11	**F10 Cohort Retained F11**		**S11 Cohort Retained S12**	
MS Digital Forensics Forensic Science and Technology (DFSC, SFS, 111003)	4	100.0%	2	100.0%
MS Information Assurance and Security (CSIA, IAS, 111003)	1	33.3%	4	80.0%
MS Computing and Information Science (CISC, CIS, 111003)	6	85.7%	11	100.0%
Fall 09-Spring 10-Summer 10	**F09 Cohort Retained F10**		**S10 Cohort Retained S11**	
MS Digital Forensics Forensic Science and Technology (DFSC, SFS, 111003)	4	80.0%	1	33.3%
MS Information Assurance and Security (CSIA, IAS, 111003)	0	0.0%	1	100.0%
MS Computing and Information Science (CISC, CIS, 111003)	11	100.0%	4	57.1%
Fall 08-Spring 09-Summer 09	**F08 Cohort Retained F09**		**S09 Cohort Retained S10**	
MS Digital Forensics Forensic Science and Technology (DFSC, SFS, 111003)	7	77.8%	3	60.0%
MS Information Assurance and Security (CSIA, IAS, 111003)				
MS Computing and Information Science (CISC, CIS, 111003)	11	84.6%	4	100.0%
Fall 07-Spring 08-Summer 08	**F07 Cohort Retained F08**		**S08 Cohort Retained S09**	
MS Digital Forensics Forensic Science and Technology (DFSC, SFS, 111003)	2	100.0%	2	50.0%
MS Information Assurance and Security (CSIA, IAS, 111003)				
MS Computing and Information Science (CISC, CIS, 111003)	4	100.0%	4	40.0%

Table 5. Student retention rates for all three programs with cohorts starting in AYs 2007 – 2011.

- Graduate licensure rates (if applicable)

  Not applicable.

- Employment profile upon graduation (i.e. employment or further education/training)

  Currently this data is unavailable. Our Department is working on building our alumni database with employment profile.

- Student publication and awards

  Many of our graduate students are active in research activities and publications. For example, in the past three years, more than 10 graduate students have presented and published 20+ papers at international conferences. These students are from all three graduate programs,

and these conferences include the International Workshop on Cyber Crime in conjunction with IEEE Symposium of Security and Privacy, IEEE International Conference on Computing, Networking, and Communications (ICNC), and The World Congress in Computer Science, Computer Engineering, and Applied Computing (WORLDCOMP).

VI. Resources and Finances

- Travel funds

  Research active department faculty members (and graduate students) are well supported with travel funds. For example, a productive faculty member normally can secure two travels to conferences to present their scholarly works with average total annual travel budget around $5,000. Student travels are limited; however, high quality scholarly works published at top tier level venues are given higher priority than others on travel funds allocations. In the case department is unable to allocate funds for a travel that deserves to be supported, Department Chair will seek for possible support at college or university levels.

- Assistantships

  As of Fall 2013, the CS Department provides 9 graduate assistantship (GA, as teaching assistantship) positions with waiver of out-of-state tuition (tuition drops to in-state) and a monthly stipend. Five out of the 9 GA positions 5 are given to full-time CIS students, 3 are given to full-time DF student, and 1 is given to full-time IAS student. Note that more positions are given to CIS students due to the in-class (vs. online) nature of their program with their GA job duty.

- Scholarships

  College of Sciences provides College Special Scholarship with $1,000 one-time award and waiver of out-of-state tuition (tuition drops to in-state). The selection of this scholarship is based on equally weighted GRE scores and GPA.

- Program budget

  Other than the budget for allocating assistantships (see student assistantship in previous bullet) and faculty and student travels, there is no separate budget for each program.

- Clerical/administrative support

  The department has one department chair and no assistant to the chair or vice chair. Our department currently has one secretary, Ms. Kathryn Williams, who helps the department chair in various businesses, such as scheduling and documentation among others. The secretary also helped graduate advisor on student registration. Most of department resources and faculties are maintained by Andy Bennett, the director of the Center of Excellence in Digital Forensics, along with multiple student workers.

- External funding

  Department faculty has been putting efforts in seeking external funding. For example, Dr. Peter Cooper was the PI of three external grants totaling more than $1.5 million from US Department of Justice and Bureau of Justice Administration. Dr. Qingzhong Liu has secured

two external research grants from NIJ and NSF totaling close to $600,000. Many other faculty members submitted multiple external grant proposals every year.

- Faculty

  Each newly hired tenure-track assistant professor obtained a start-up research funding which can be used towards equipment purchasing for their research. The amount of this start-up funding is around $20,000 on average and is a result of negotiation at initial employment. Faculty travel funds are allocated by the department chair based on the quality of the paper/presentation, the level of the venue, and the need (e.g. tenure-track faculty may potentially need more travels compared to tenured faculty).

VII. Facilities and equipment

- Facilities

  The Department of Computer Sciences has two computer lab classrooms with capacity 20+. In addition to these labs, we also have two other classrooms with capacity 40+. The department also has a conference room that can hold more than 20 people.

  The Center of Excellence in Digital Forensics (CEDF) maintains a number of flexible laboratories, testing, and work spaces for researchers and analysts to carry out their work. These facilities include a hardware forensics and processing room, a malware analysis suite, a cyber-threat analysis lab, a robotics and fabrication lab, a networking and network security lab, a general research lab with support team, two datacenters, two virtual machine oriented technology integrated training classrooms, a modular enterprise mock up lab, a conference room, and secure inventory storage rooms.

- Technology

  The CEDF Center maintains an expansive array of up to date hardware and software to support research, education, and work in security and investigative topics that arise in the digital era. From drone reconnaissance and robotics, to malware analysis and penetration testing, CEDF has the flexible and capable facilities via a virtualization system to simulate and test any type of system architecture for efficiency and or security. The “Virtual Farm” is capable of running thousands of virtual computers and networks to facilitate training and research side by side at any scale required. CEDF also runs one of the few video game forensics programs in the world, a biometric systems program is spooling up with the most recent purchases of a host of biometrics equipment including: retinal scanners, thermal imagers, EKGs, EEGs, finger print readers, and more. Regardless of the project and or need, CEDF has worked to ensure that the foundation to support the work is in place.

- Other equipment

  The CEDF Center, founded in 2004, is actively involved with local-, state-, and national- level organizations including the Federal Bureau of Investigation (FBI), Department of Homeland Security (DHS), High Tech Crime Investigators Association, Infragard, and the National White Collar Crime Center (NW3C), among others. Founding CEDF members, Drs. Cooper and Murff (left SHSU in 2011), were involved in setting the agenda for Digital and Cyber Forensics education and training for NW3C and their curriculum formed the basis for this nationally prominent training program.

In 2011, newly installed CEDF Director Bennett immediately began developing and advancing new training, and research agendas. CEDF has since established a host of new industry and public partnerships which have been pivotal in expanding CEDF's sphere of influence and access to information, resources, and research opportunities. The Center has already established local, state and national prominence that is continually expanding. Our Master's program and the proposed doctoral program work hand-in-glove with CEDF to further research into the computational and scientific basis for forensic technology by engaging the faculty and students in projects and partner initiatives that would have a direct impact on digital and cyber forensics as whole.

The Forensics Science Center is scheduled to house a new state funded crime laboratory, initially for identification of controlled substances, toxicology samples and latent print requests but eventually to encompass all forensics fields.

VIII. Assessment efforts

- Alumni surveys

  In late Fall semester 2013, we sent out a survey for the demand for a doctoral program in Digital Forensics to all our DF and IAS alumni. There is currently no other alumni survey.

- Employer surveys

  Our department currently does not conduct employer survey for graduate programs.

- Clinical supervisor surveys, if appropriate

  Not applicable.

- Student learning outcomes

  Currently we do not have assessment on student learning outcomes.

- Dissertation/thesis quality

  Not applicable – all students chose project option, stead of thesis option.

- Student publications/grants/presentations

  Currently each graduate student is required to submit a paper to a recognized international conference or journal before graduation. In fact, quite a number of our graduate students published multiple research works before graduation, for example, current IAS student Brittany Wilbert has published two papers with Dr. Chen at two different international conferences.

- Recognition/awards

  Please refer to previous sections.

- Internships, if appropriate

  Currently there is no internship data in the department.

- Other

IX. Recruitment and marketing efforts

- Demand for graduates, including specific market trends and indicators for the program

  We expect to see a growing educational and vocational need for Master's programs in computing and information science, digital forensics, and information assurance and security.

  With the ongoing recovery U.S. and world economy in 2014 from previous IT bubble and recession, along with the growth in online social media networks and applications, cloud computing and Big Data, the government, industry, as well as military will have increasing demand for well trained professionals in computing, information, security, and digital forensics related fields.

- Geographical location from which students come

  About 70% of our CIS students are from Asian countries, especially from India. The rest are from the U.S., especially from the greater Houston area.

- Marketing and recruitment efforts and their effectiveness

  The Department faculty has put in efforts in marketing and recruitment. For example, we have attended all recruitment events hosted by the university and Graduate Studies Office and had two or more faculty members help advertising and explaining our programs and projects in each of the events. Our department has printed graduate booklets and flyers for distributions at various events and venues. Multiple faculty members, especially Drs. Peter Cooper, Lei Chen, Jiahuang Ji, Cihan Varol, Qingzhong Liu, and Narasimha Shashidhar, have travelled to, China, India, European countries, and various states within the U.S. for recruitment and possible exchange programs.

  Most of our Indian students in CIS program are direct results of our recruitment efforts. We expect to see more students from China, Turkey, and Korea in the near future.

- Current markets

  Refer to first bullet in this section.

- Potential new markets

  The department faculty, especially Drs. Cooper, Chen, Varol, and Liu, are working with universities in China and Turkey for establishing possible new exchange programs that will help increase our enrollment and diversity.

- Enrollment plan for the next 5 years

  We expect small increase in enrollment in 2014-2015. With possible new exchange programs with universities in China and Turkey established in 2015, we expect major increments, especially in our CIS program, starting AY 2015 through AY 2018.

- Alumni and donor relations

  Since our programs, especially DF and IAS, are relatively new, we have not received donation from our alumni as most of them are still in the starting years of their careers. We are in the

process of building a relatively complete alumni database and expect to have more interactions with our alumni in the future.

X. Outreach

- Distance education

  CIS program does not have distance education component.

- Service learning or community engaged learning

  Currently there is no service learning or community engaged learning in the program.

- Internships

  Students are encouraged to take internship at a company or institution. Normally this happens in summer semesters. A student planning to take the internship must first request a formal letter from his/her supervisor at work site clearly describing the title, description, and tasks of the internship. This letter must be received and approved by the graduate advisor and department chair well before (e.g. at least 2 weeks in advance) the internship actually starts. The student must register COSC/DFSC 5340 Special Topic for internship purpose in the semester of the internship being taken. The student will also need to periodically (e.g. every two weeks) report to graduate advisor in a formal way (formal reports via email). The credit hours of COSC/DFSC 5340 for internship purpose will not be counted towards the 36 credit hours required for master degree.

- Professional outreach (providing professional services, such as consulting, etc.)

  Currently there is no faculty providing professional outreach services.

XI. Program specific issues

- This could include issues such as licensure, specific accreditation requirements, or other issues relevant to just that program.

  Current there is no accreditation bodies accrediting graduate computer science programs.

XII. Program strengths and recommendations for improvement (Data-driven decisions)

Our CIS program attracts students from various countries.

Each of the three programs may have a more diverse study body (please refer to the student demography in previous sections). We are in the process of establishing exchange programs with universities in China and Turkey to extend the perspectives of students as well as increase our enrollment.

References

[1] http://www.shsu.edu/graduate-catalog/2013-2015/computer-science/

[2] reference/source: http://www.shsu.edu/~pre_www/documents/StrategicPlan Final8%201%2011%20-%20Aug%202011.pdf

[3] Sam Houston State University (SHSU) Online Assessment Tracking Data Base (OATDB). http://www.shsu.edu/dept/academic-planning-and-assessment/assessment/oatdb.html

[4] SHSU Strategic Plan. http://www.shsu.edu/dept/office-of-the-president/documents/StrategicPlanSummaryComplete10+2012.pdf

[5] http://www.texasindustryprofiles.com/PDF/twcClusterReports/TexasITCluster.pdf

Appendix A. Degree (Study) Plan – Computing and Information Science (CIS)

Department of Computer Science

1803 Avenue I, Suite 214, Academic Building One | Huntsville, Texas, P.O. Box 2090 • 77341-2090 | Tel (936) 294-3846, Fax (936) 294-4312

GRADUATE STUDY PLAN – Computing and Information Science

SAM HOUSTON STATE UNIVERSITY
Huntsville, Texas 77341

Student's Name: _____ SAM ID: _____ SHSU email: _____

Phone: _____ Major: CIS Minor: PL2

GRE score: _____ (Verbal _____, Quantitative _____)

TOEFL score: _____ IELTS score: _____

Semester of Admission: _____ Research Supervisor: Dr. _____

Degree Plan: Master of Science in Computer Science (36 credit hours in total)
Major Subject: Computing and Information Science (36 credit hours in total)

DESIGNATION OF COURSES

	Required Undergraduate Stem Work (no graduate degree credit)	Senior Courses for Graduate Degree Credits	18 credits from Required Core Courses	18 credits from Elective Courses
Major	**COSC 1436** Programming Fundamentals I **COSC 1437** Programming Fundamentals II **COSC 3318** Database Management Systems **COSC 3319** Data Structures and Algorithms **COSC 4318** Programming Languages **COSC 4327** Computer Operating Systems **MATH 2385** Fundamentals of Calculus **STAT 3379** Statistical Methods in Practice	**COSC 4316** Compiler Design and Construction **COSC 4319** Software Engineering	**COSC 5318** Database Systems **COSC 5319** Data Structures **COSC 5327** Operating Systems **COSC 6318** Programming Languages **COSC 6319** Software Engineering **COSC 6347*** (3 credits)	**COSC 5310** Cryptography and Steganography **COSC 5313** Artificial Intelligence **COSC 5321** Parallel Computing **COSC 5322** Microcomputer **COSC 5325** Operating System Security **COSC 5326** Networks and Data Communications **COSC 5335** Database Security **COSC 5340** Special Topics ** **COSC 6313** Neural Networks Interfacing **DFSC 5319** Network Security I, or other approved CS 5000 and 6000 level courses
Minor				

*COSC 6347: Master Project and Comprehensive Exams
**COSC 5340: Special Topics: up to 6 credits toward degree

_____ Student Signature and Date

_____ Graduate Advisor / Department Chair Signature / Date