

CLEMSON UNIVERSITY
COLLEGE OF ENGINEERING AND SCIENCE
School of Computing

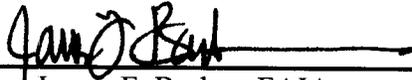
Requesting to Offer a New Degree Program

Doctor of Philosophy

In

HUMAN CENTERED COMPUTING

February 15, 2011



James F. Barker, FAIA
President

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Classification

Program Title	Human Centered Computing
Academic Unit	School of Computing
Designation Type	Doctor of Philosophy (PhD)
Implementation Date	July 1, 2011
CIP Code	11.0104
Program	New
Site	Clemson University
Program qualifies for supplemental Palmetto Fellows Scholarship and LIFE Scholarship awards	NO
Delivery Mode	Traditional

Justification

Statement of the purposes and objectives of the program

Human-Centered Computing (HCC) is a relatively new discipline that solves real world problems through the integration of computing with people, technology, information, policy and sometimes culture. We define HCC as follows:

“Human-Centered Computing (HCC) is focused on understanding how to design, build and evaluate computational technologies as they relate to the human condition and how these technologies affect society.”

As such, HCC researchers design and build computing artifacts and evaluate them through studies with human subjects to measure their usability as well as their affect on society; therefore, HCC researchers often connect computing artifacts with policy.

The interdisciplinary nature of HCC makes it impossible to integrate into our existing PhD degree in computer science. The computer science PhD degree has limited space for adding additional tracks that would incorporate multiple disciplines as required by HCC. This would increase the number of coursework hours significantly to the point that the graduates would be earning multiple degrees. As such, this new degree is being proposed.

The objective of this new HCC PhD degree is to train a new type of researcher that can design, implement and evaluate computing systems/technologies in real world, or applied, context. These graduates will have a computing core that enables them to build computing artifacts and an understanding of how computing relates to people and information. Furthermore, these graduates will understand how to evaluate systems of technology, people, policy, culture, etc. within a specified context.

Discussion of the need for the program in the state, including but not limited to student demand or interest, anticipated employment opportunities for graduates, or demand for services, which must be quantified to the maximum extent possible, cover a reasonable

period in the future beyond the anticipated date of graduation of the first classes, and must include sources of data

With respect to employment opportunities, HCC researchers are needed in industry and the academy. In industry, there is a need for people that can evaluate computing systems for their usability and recently, there's a need for researchers that can actually build systems as well. We have found a growing demand for individuals that can design computing solutions using technology and then evaluate those solutions with respect to usability, costs, etc. Within South Carolina and across the globe, the information technology industry is seeing an increased demand for interdisciplinary researchers, e.g. individuals that have competencies in more than one discipline. In HCC, our graduates will have a strong foundation in computing, an area of the human condition, and research methods. Our graduates will be ideal candidates for these interdisciplinary positions. Furthermore, there is an emphasis in government for more individuals with technical training that can also navigate policy. We will produce graduates that desire to work in government on issues of science and technology. Some of our graduates will emphasize entrepreneurship as their human condition. These graduates will start businesses using their interdisciplinary training. Some of our graduates will work in government and industrial research labs, e.g. Air Force Research Labs, IBM Research, BMW Research, etc. Within the academy, Schools of Information, (also known as iSchools, see <http://www.ischools.org>), are good places for our graduates. Our graduates will also work in library sciences, information sciences, business schools, etc. There are computer science programs that are implementing human-computer interaction and HCC. Our graduates will be great fits for these programs as well. See attached letters of support and job postings that are applicable for our future graduates.

There are only 2 other HCC PhD degree programs in the nation (Georgia Tech and University of Maryland Baltimore County). The demand for HCC training at the PhD level within the HCC Division in the School of Computing is on the rise. Currently there are at least 8 PhD students enrolled in the School of Computing that would serve as the first HCC PhDs. The School of Computing is receiving applications each semester for HCC research. After 3 years of the program's existence, we expect to produce 2 HCC PhD graduates per year for the next 4 years and then 3-5 PhD graduates per year.

Discussion of the centrality of the program to the mission of the institution as that mission is currently defined by the Commission

The Human Centered Computing PhD aligns well with the mission of Clemson University.

The mission of Clemson University is to fulfill the covenant between its founder and the people of South Carolina to establish a "high seminary of learning" through its historical land-grant responsibilities of teaching, research and extended public service.

The proposed HCC PhD integrates teaching and research like many PhD programs. Students will receive excellent instruction and the students will complete rigorous research training. However, the HCC PhD is also situated for public service given its applied nature. Students pursuing a HCC PhD will receive applied research training that enables them to apply their skills for the public good. As a result of the applied nature of HCC, Clemson University will have the ability to broaden participation of women and underrepresented minorities in HCC and directly increase their participation in Science, Technology, Engineering and Mathematics (STEM). In their landmark study of male and female computer science majors, Margolis and Fisher found that, while a majority of both men and women cited enjoyment of computing as a motivation for choosing a computer science major, women were five times as likely to cite the beneficial applications of computing [Margolis]. Similarly, Hall and Post-Kammer found that African-Americans stay out of science, technology, engineering, and mathematics (STEM) fields because they have a cultural orientation and expectation to help others, and do not see STEM as helping others [Hall]. Because of the clear societal impacts of much HCC research, Clemson University will be well positioned to recruit and retain women and underrepresented minorities in the School of Computing via the HCC PhD program. Given that South Carolina is more than 25% African-American and 51% female, the HCC PhD degree should make significant impacts in broadening participation in STEM.

Hall, E. R., & Post-Kammer, P. (1987). Black mathematics and science majors: Why so few? *Career Development Quarterly*, 35, 206-219.

Margolis and A. Fisher. (2002). *Unlocking the Clubhouse: Women in Computing*.

Discussion of the relationship of the proposed program to other related programs within the institution, including, if possible, description of strengths and weaknesses of the related programs as documented by evaluative reports of institutional and/or Commission consultants.

As mentioned earlier, there are only 2 other Human Centered Computing PhD programs within the United States of America, Georgia Tech and UMBC. As such, there are no other HCC PhD programs within the State of South Carolina. Within Clemson University, there are several other programs that are partnering with the HCC PhD program. The requirements for the HCC PhD programs specify a cognate area and a people area. These areas are highly interdisciplinary and we will utilize existing courses within other departments, schools and colleges to satisfy this requirement. These departments, schools and colleges include:

- Psychology
 - HCC students will study human factors, experiment design, cognition, etc. from the Psychology department.

- Industrial Engineering
 - Human factors and ergonomics will be the central areas of interests for HCC students in IE.

- Policy Studies
 - HCC students will study policy related matters in the Policy Studies program. Specifically, students will have an option to pursue a certificate in Policy Studies as part of their HCC PhD degree requirements.
- Mathematics & Statistics
 - Research methods will be studied in the math and statistics departments.
- Education
 - HCC students can learn educational theories, research methods, etc. from the College of Education.
- English
 - Research methods, information design and other related topics will be of interest to some HCC students.
- Social Studies
 - HCC students can learn about social theories, research methods, etc. from the social sciences.
- History
 - History and science studies may be of interest to some of the HCC students that are interested in policy related research.

Description of similarities or differences between the proposed program and those with similar objectives offered at other institutions including discussion of similar programs within the state, and especially for graduate programs, the region, and the nation. The discussion should include reference to programs offered by independent institutions headquartered in South Carolina, the Academic Common Market, and web-based institutions.

There are only 2 other Human Centered Computing PhD programs in the nation, Georgia Tech and UMBC. There are no other HCC programs in South Carolina or the nation. The Psychology and Industrial Engineering departments at Clemson University have PhD programs in human factors. These programs are somewhat related to the proposed HCC PhD program in that they teach human-computer interaction, which will be taught in the HCC PhD program. The primary difference between those programs and the HCC program is that the HCC students are required to learn computing, specifically computer programming. They will have a computing core and the Psychology and Industrial Engineering students do not have computer programming as a requirement. The computer science PhD has computer programming, but it does not have human factors training as will the HCC PhD.

Enrollment

Discussion of admissions criteria specific to the HCC program.

To receive full admission to graduate study in Human Centered Computing (HCC), a student must have completed an undergraduate degree and have taken computer programming courses through data structures. An applicant with minimal deficiencies may be admitted with prerequisites, while one with several deficiencies may be required to satisfactorily complete prerequisite work as a non-degree student prior to admission as a graduate student. Although formal course requirements for the PhD degree are minimal, a typical program requires two to four years of study beyond the MS degree. Each candidate is required to pass a comprehensive examination, a dissertation proposal and a defense of the dissertation. Applicants are required to submit GRE general test results. Applicants will be accepted for both fall and spring semesters. Given the interdisciplinary nature of the HCC PhD, it is expected students will come from very diverse backgrounds. Currently, we have students from industrial engineering, industrial design, chemistry and psychology interested in the HCC PhD. However, the majority of our students will come from computer science. The general admissions requirements will require GRE/TOEFL scores with a GRE (verbal and quantitative) score of 498 and 756, respectively. The TOEFL (iBT) score for admitted international students should be 102. Any applicant with a V+Q total below 1200 must be able to submit exceptional supporting materials to have a competitive application (transcript, reference letters, etc.).

Table A – Total Enrollment

PROJECTED TOTAL ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2011 – 12	10	130	11	140	2	30
2012 – 13	15	200	16	220	3	45
2013 – 14	18	290	18	290	5	80
2014 – 15	18	290	18	300	8	120
2015 – 16	19	310	18	306	10	160

Note: The first graduates will leave the program in 2012-13, and we expect to have approximately 2 per year after the first group.

The total enrollment figures in Table A were created by counting the existing students that have expressed an interest in the HCC PhD degree that are currently enrolled at

Clemson University, plus the students that have been accepted into the graduate program at Clemson University in the School of Computing that have indicated they would like to pursue the HCC PhD degree. Using the current enrollment and admitted numbers, we were able to predict future enrollment at a comparable rate of 3-7 students per year entering the program with 2 students per year graduating after 2012-13. Summer enrollment numbers will probably vary the most because HCC students will have plenty of summer internship opportunities at government and industry research labs.

Table B – New Enrollment

ESTIMATED NEW ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2011 – 12	4	60	5	70		
2012 – 13	5	70	5	70		
2013 – 14	5	70	5	70		
2014 – 15	5	70	5	70		
2015 – 16	5	70	5	70		

Curriculum

Requirements for Awarding of a Degree

The HCC PhD degree has the following requirements:

- 60 credit hours beyond the Bachelors degree.
- A portfolio (our combined version of the Ph.D. qualifying and comprehensive exams)
- Competency in 4 topic areas (typically demonstrated by coursework; Computing, People, Research Methods and Design, Cognate Area)
- Ability to pursue research (typically demonstrated by a research publication that may be co-authored with your advisor)
- A dissertation proposal on a specific topic
- A dissertation
- A dissertation defense

Students will be required to have a strong computing or computation core with training in areas that emphasize people or the human condition and research methods for studying people, technology, policy and/or information. Each student will be required to take a

first course in the fundamentals of HCC for 3 hours. Students are required to take 12 hours in the computing or computer science track from 600 or 800 level computer science courses, 6 hours from a people or human condition track consisting of courses from psychology, human factors, policy, etc., and 6 hours of research methods. Students are required take a series of at least 9 hours in a cognate or specialty domain under the advisement of their dissertation research advisor with the approval of the HCC graduate program committee. The students are also required to take 6 hours of pre-dissertation (pre-portfolio) research, CPSC 888 Directed Projects in Computing. The students will also take 18 hours of dissertation research (CPSC 991). In summary,

3 hours of HCC 831: Fundamentals of Human-Centered Computing
12 hours of Computing courses, CP SC 600 and 800 level
6 hours from the people track
6 hours of research methods
9 hours of a cognate or specialty area
6 hours of pre-dissertation research, CPSC 888 Directed Projects
18 hours of dissertation research, CPSC 991

Totaling: 60 hours

HCC PhD Degree Courses

- Computing (School of Computing) – 3 hours of HCC 831 Fundamentals of Human-Centered Computing
 - HCC 831 Fundamentals of Human-Centered Computing 3(3,0)
Fundamental concepts in human-centered computing including; interface design, usability evaluation methods, software programming, information technology tools, ethics, policy, and current problems of interest to human-centered computing. Preq: Graduate standing in Human-Centered Computing, Digital Production Arts, Computer Science or Instructor Permission.

- Computing (School of Computing) – 6 hours of CPSC 888 Directed Projects

4 Concentration Areas

- Computing (School of Computing) – 12 hours from 600 and 800 level Computer Science courses, excluding seminar courses

- People - 6 hours from the following courses
 - CPSC 612 Eye Tracking Methodology and Applications
 - CPSC 614 Human Computer Interaction
 - AP EC 822 Contemporary Public Policy
 - PO ST 822 Policy Analysis and Political Choice
 - PO ST 842 Ethics and Public Policy
 - PO ST 843 Organization Theory and Public Management
 - HIST 691 Studies in the History of Science and Technology

- THRD 613 Contemporary Technological Problems
 - PSYCH 840 Usability Analysis and Crew Assessment
 - PSYCH 833 Advanced Cognitive Psychology
 - PSYCH 835 Advanced Human Factors Psychology
 - PSYCH 837 Ergonomics for Applied Psychology
 - IE 800 Human Factors Engineering
 - IE 801 Design / Analysis of Human Machine Systems
 - IE 802 Design of Human Computer Systems
 - RCID 805: Rhetorics, Communication, and Information Technologies
 - RCID 811: Perspectives in Information Designs
 - HLTH 630: Health Promotion of the Aged
 - ELE 600: Technology Entrepreneurship
 - ELE 800: Special Topics in Technology Entrepreneurship
 - MBA 845: Technology and Innovation Management
 - MBA 872: Entrepreneurship Finance
 - MBA 875: Enterprise Development
 - MBA 899: Selected Topics in Creativity and Innovation
- Research Methods & Design - 6 hours from the following
- EX ST 801 Statistical Methods I
 - EX ST 805 Experimental Design II
 - EX ST 803 Regression and Least Squares Analysis
 - PSYCH 810 Research Design and Quantitative Methods I
 - PSYCH 811 Research Design and Quantitative Methods II
 - PSYCH 813 Research Design and Quantitative Methods III
 - SOC 803 Survey Designs for Applied Social Research
 - ED F 778 Experimental and Nonexperimental Research Methods in Education
 - ED L 855 Applied Research and Evaluation in higher Education
 - RCID 802: Cultural Research Methods
 - RCID 803: Empirical Research Methods
 - MTHSC 600: Theory of Probability
 - MTHSC 603: Introduction to Statistical Theory
 - MTHSC 605: Statistical Theory and Methods II
- Cognate Areas – 9 hours of graduate coursework under the advisement of the dissertation advisor
- **Sample Cognate Areas**
 - Public Policy
 - PO ST 822 Policy Analysis and Political Choice
 - PO ST 842 Ethics and Public Policy
 - PO ST 843 Organization Theory and Public Management
 - Human Factors
 - IE 800 Human Factors Engineering
 - IE 801 Design / Analysis of Human Machine Systems
 - IE 802 Design of Human Computer Systems
 - IE 893 Human Factors in Healthcare

- Entrepreneurship (Certificate in Technology Entrepreneurship will be awarded)
 - ELE 600: Technology Entrepreneurship
 - ELE 800: Special Topics in Technology Entrepreneurship
 - MBA 845: Technology and Innovation Management
 - MBA 872: Entrepreneurship Finance
 - MBA 875: Enterprise Development
 - MBA 899: Selected Topics in Creativity and Innovation

Assessment Plan

Outcome 1 A PhD graduate has the background and capability to conduct human-centered research (meaning research involving humans, computing, information, culture) within a specific area of concentration.

Means of Assessment

The background and capability to conduct HCC research for PhD students will be evaluated using a rubric during the student's portfolio evaluation. The rubric will be filled out by the HCC Graduate Affairs Committee, and the HCC Division Chair will collect the results.

Criteria for Success

We will be successful when 80% or more of the PhD students are scored as “competent” or higher on all categories in the rubric.

Means of Assessment

The background and capability to conduct HCC research for PhD students will be evaluated using a rubric during the student's proposal presentation. The rubric will be filled out by the student's committee members, and the HCC Director of Graduate Affairs will collect the results.

Criteria for Success

We will be successful when 80% or more of the PhD students are scored as “competent” or higher on all categories in the rubric.

Outcome 2 A PhD graduate has extended the frontier of knowledge in at least one area of computing as it relates to a human condition or concern by way of innovative research.

Means of Assessment

The research results of PhD students will be evaluated using a rubric during the student's dissertation defense. The rubric will be filled out by the student's committee members, and the Director of Graduate Affairs will collect the results.

Criteria for Success

We will be successful when 80% or more of the PhD research results are scored as “significant” on all categories in the rubric.

Means of Assessment

The research results of PhD students will be evaluated by counting the number of conference and journal papers accepted or published. The research results of PhD students will be evaluated by the extent by which their research transfers into practice or the real world.

Criteria for Success

We will be successful when 90% of the PhD students who have graduated in the previous academic year have published or have had accepted for publication a paper that presents results from their research.

NEW COURSES

There will be 1 new course created called HCC 831: Fundamentals of Human-Centered Computing.

HCC 831: Fundamentals of Human-Centered Computing

This course covers the fundamental concepts in human-centered computing including: human subjects, interface design, usability evaluation methods, software programming, information technology tools, ethics, policy, and current problems of interest to human-centered computing.

Topical Outline

- (3 hrs) Introduction to HCC
 - (2.5 hrs) Human Subjects and IRB
 - (12 hrs) Human-Computer Interaction, Usability, Design, Analysis
 - (7.5 hrs) Ethics, Policy and Current issues in HCC
 - (13 hrs) Computing – Interface Programming and Class Project
 - (4 hrs) In-Class Presentations and Demos
 - (2 hrs) Final Exam
- Total: 44 hrs.

Faculty

Table C: Faculty List

List Staff by Rank (e.g. Professor #1, Professor #2, Associate Professor #1, etc)	Highest Degree Earned	Field of Study	Teaching in Field (Yes/No)
Assistant Professor #1	PhD	Human-Centered Computing	Yes
Assistant Professor #2	PhD	Computer Science	Yes
Assistant Professor #3	PhD	Computer Science	Yes
Assistant Professor #4	PhD	Computer Science	Yes
Associate Professor #1	PhD	Visual Computing	Yes
Associate Professor #2	PhD	Computer Science	No
Associate Professor #3	PhD	Computer Science	No
Associate Professor #4	PhD	Computer Science	Yes
Associate Professor #5	PhD	Computer Science	Yes
Associate Professor #6	PhD	Computer Science	No
Associate Professor #7	PhD	Visual Computing	Yes
Associate Professor #8	PhD	Computer Science	Yes
Associate Professor #9	PhD	Computer Science	No
Associate Professor #10	PhD	Human-Centered Computing	Yes
Associate Professor #11	PhD	Computer Science	Yes
Associate Professor #12	PhD	Human-Centered Computing	Yes
Associate Professor #13	PhD	Computer Science	Yes

Professor #1	PhD	Visual Computing	Yes
Professor #2	PhD	Visual Computing	Yes
Professor #3	PhD	Computer Science	No
Professor #4	PhD	Human-Centered Computing	Yes
Professor #5	PhD	Visual Computing	Yes
Professor #6	PhD	Computer Science	No
Professor #7	PhD	Human-Centered Computing	Yes
Professor #8	PhD	Computer Science	Yes
Professor #9	PhD	Computer Science	No
Professor #10	PhD	Visual Computing	Yes

Table D						
UNIT ADMINISTRATION/FACULTY/STAFFSUPPORT						
YEAR	NEW		EXISTING		TOTAL	
	Headcount	FTE	Headcount	FTE	Headcount	FTE
Administration						
2011 – 12	0	0	1	1	1	1
2012 – 13	0	0	1	1	1	1
2013 – 14	0	0	1	1	1	1
2014 – 15	0	0	1	1	1	1
2015 – 16	0	0	1	1	1	1
Faculty						
2011 – 12	0	0	27	26	27	26
2012 – 13	0	0	27	26	27	26
2013 – 14	0	0	27	26	27	26
2014 – 15	0	0	27	26	27	26
2015 – 16	0	0	27	26	27	26
Staff						
2011 – 12	1	1	7	7	8	8
2012 – 13	0	0	8	8	8	8
2013 – 14	0	0	8	8	8	8
2014 – 15	0	0	8	8	8	8
2015 – 16	0	0	8	8	8	8

Physical Plant

The School of Computing (where the Human-Centered Computing PhD will be housed) is located in McAdams Hall, a \$3.9 million 44,000 sq. ft. facility encompassing both new

and renovated space housing department offices, graduate student space, instructional, general use and research labs. The department provides numerous labs equipped with Unix and Windows systems to support instruction, research and general use. Over 120 Unix-based systems running either the Sun Solaris or Linux operating system are available. Lab systems include several multiprocessor systems that are used for computationally intense applications and instruction in concurrent programming, and systems with high-end graphics capabilities to support graphics and virtual reality courses. Several department servers provide extensive file, web, print and network services. Other department laboratories provide over 50 Windows-based systems. Several Windows-based servers are also available to support instruction in Windows-based database management systems, web-based services, .Net development and distributed applications. Students have 24 hour access to a diverse set of school facilities that range from workstations, graphics systems, virtual reality systems, networking labs, video production equipment, motion capture, and computer clusters. The department maintains a Beowulf cluster of 24 nodes that is used for instruction and research in distributed processing and cluster computing. Wireless and high-speed networking are available throughout our facilities and across campus. The closely allied Digital Production Arts program provides extensive additional resources to support graphics, digital animation and virtual reality courses. Both the college and the university also maintain extensive facilities for both classroom and general use. The existing facilities will be adequate for the proposed HCC PhD program for the next 5 years.

Equipment

There are no additional major equipment items needed to support the proposed Human-Centered Computing PhD degree.

Library Resources

The proposed Human-Centered Computing PhD degree integrates existing units/courses across campus to form a unique degree program. As such, the library resources required for the proposed HCC PhD are already in place; therefore, there is no need for additional library resources.

Accreditation, Approval, Licensure, or Certification

The proposed Human-Centered Computing PhD is not subject to specialized or professional accreditation or approval by any state agency other than the Commission.

Articulation

The proposed Human-Centered Computing PhD degree is a terminal degree. The proposed degree will be the first of its kind within the state for South Carolina. At this time, we do not have any direct collaboration with other state institutions.

Estimated New Costs

The proposed Human-Centered Computing PhD degree integrates existing units/courses across campus to form a unique degree program. As such, there are no new costs associated with the proposed degree.

Table E: ESTIMATED COSTS BY YEAR						
CATEGORY	1st	2nd	3rd	4th	5th	TOTALS
Program Administration	\$130,000	\$130,000	\$130,000	\$130,000	\$130,000	\$650,000
Faculty Salaries	\$3,186,955	\$3,186,955	\$3,186,955	\$3,186,955	\$3,186,955	\$15,934,755
Graduate Assistants	\$410,000	\$410,000	\$410,000	\$410,000	\$410,000	\$2,050,000
Clerical/Support Personnel	\$278,064	\$278,064	\$278,064	\$278,064	\$278,064	\$1,390,320
Supplies and Materials	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$625,000
Library Resources	0	0	0	0	0	0
Equipment	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$300,000
Facilities	0	0	0	0	0	0
Other (Identify)	0	0	0	0	0	0
TOTALS	\$4,190,019	\$4,190,019	\$4,190,019	\$4,190,019	\$4,190,019	\$20,950,095
SOURCES OF FINANCING BY YEAR						
Tuition Funding *	\$82,520	\$123,780	\$148,536	\$148,536	\$156,788	\$660,160
State Funding						
Reallocation of Existing Funds**	\$2,188,630	\$2,066,239	\$2,041,483	\$2,041,483	\$2,033,231	\$10,371,066
Federal Funding	\$1,918,869	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$9,918,869
Other Funding (Endowment, Auxiliary etc.)						
TOTALS	\$4,190,019	\$4,190,019	\$4,190,019	\$4,190,019	\$4,190,019	\$20,950,095

*Tuition is based on total enrollment and \$4126/semester cost.

** This program requires no new funds. The department has the resources—for faculty, staff, and materials to offer the degree program. Many of the courses for the degree are offered within other doctoral programs, which helps to eliminate the need to add faculty. The collaboration across campus is extremely beneficial for all the departments. The budget shown is for the School of Computing which will support the PhD program.

Institutional Approval

Clemson University Board of Trustees approved the Human-Centered Computing PhD planning proposal on July 15-16, 2010.

The College of Engineering and Science Curriculum Committee approved the Human-Centered Computing PhD on November 11, 2010.

The Graduate Curriculum Committee approved the Human-Centered Computing PhD on January 14, 2011.

Provost, July 2010

President, July 2010

Board of Trustees, July 2010

External Evaluation from Georgia Tech and UMBC



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Sunday, October 10, 2010

Recommendation Letter for the Human-Centered Computing Ph.D. program at Clemson University

To Whom It May Concern:

I am delighted to write this recommendation letter in support of the proposed Human-centered computing Ph.D. To set context, I am an Associate Professor in the College of Computing, and my research focuses on Human-Computer Interaction and the application of empirical methods to inform the design and evaluation of technologies. Prior to joining the faculty at Georgia Tech, I was an industrial researcher working at Bell Laboratories and Xerox PARC. At Georgia Tech I have served as the Program Coordinator (lead administrator) for Georgia Tech's Human-Centered Computing (HCC) Ph.D., and also as Associate Dean for Graduate Affairs for the College of Computing, the academic unit in which the HCC Ph.D. is housed.

The Georgia Tech Human-Centered Computing Ph.D. was designed as a response to an emerging area of intellectual inquiry, that that sat squarely at the intersection of computing and humanity. While our Computer Science Ph.D. remains extremely good at training a generation of future researchers and scientists who want to tackle fundamental problems associated with Computer technologies, the HCC Ph.D. emerged as a recognition that these were not the only skills required to solve human-centered research problems. The resulting program was designed to provide a broad exposure in both classes and research to both Computing and Human-Centered (e.g., the social sciences, humanities) skills required to understand human-centered problems and design appropriate technological interventions.

Georgia Tech's Human-Centered Computing Ph.D. was approved in 2005, and since then has enrolled over 40 students and has also begun to graduate students who have taken appointments in academia as faculty and post-docs. We also expect graduates to enter industry positions, and many of our HCC Ph.D. students have taken internships with a variety of industrial corporations. Since its inception and approval by the University System of Georgia's Board of Regents, the National Science Foundation has also reorganized their programs to create a Human-Centered computing research area. Additionally, other Universities such as the University of Maryland, Baltimore County, and the University of Colorado, Boulder have created areas of research focused on Human-Centered Computing. This is indicative and reflective of the increasing ubiquity of technology within the population and its ability to support interventions that can help people.

Like Georgia Tech's HCC Ph.D. program, the Clemson proposal makes an important distinction between Human-Computer Interaction and Human-Centered Computing. While Human-Computer Interaction is one discipline that informs Georgia Tech's program it is far from the only one. It brings an important perspective on usability, but the goal of HCC is to explore the human-centered computing terrain of research problems more comprehensively. At Georgia Tech this has led to focus in Cognitive Science, Learning Sciences and Technologies, and we continue to push towards incorporating policy perspectives (for example in research focused on technologies for the developing world, where understanding the regulatory environment is an essential part of designing effective interventions).

Rebecca E. Grinter, School of Interactive Computing, College of Computing, Georgia Institute of Technology

The structure of the Clemson proposal is very similar a number of ways to the HCC PhD at Georgia Tech. It emphasizes both computing and non-computing based teaching in its classes. It draws on a variety of opportunities that Clemson provides to structure the concentration areas. A number of those classes mirror electives that we recommend within the Human Centered Computing PhD at Georgia Tech, such as those that come from Psychology in Human Factors and Cognitive Psychology.

With that structuring, if Georgia Tech's experience is anything to go by, it will draw and serve students well. The Georgia Tech HCC PhD is an educational opportunity that has strong appeal to many students, and by comparison with our Computer Science PhD, it draws substantial numbers of domestic students. It also draws women, and at times the HCC PhD has been minority-majority women. From what I have read, and my interactions with the faculty at Clemson, I see no reason why Clemson's HCC PhD will not repeat these experiences.

If you have any questions, please do not hesitate to contact me.

Sincerely,



Rebecca E. Griner



AN HONORS UNIVERSITY IN MARYLAND

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October 11, 2010

Dr. Juan Gilbert
Division of Human-Centered Computing
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Dr. Gilbert

I am pleased to have the opportunity to provide input regarding your proposal for a Ph.D. in Human-Centered Computing at Clemson University. I have been directly involved in establishing several new graduate programs, including an M.S. and a Ph.D. in Human-Centered Computing at UMBC. I will not provide a detailed analysis here, but would be happy to provide more detailed comments if that would be useful. I'd like to share my observations on two issues: opportunity and content.

While there are a number of institutions that offer related degrees, only two universities in the US currently offer a Ph.D. in Human-Centered Computing, and these programs have experienced significant growth in recent years. Georgia Tech's Ph.D. program has increased from approximately 10 students five years ago to approximately 45 this year. UMBC's program, which is newer, has grown to approximately 10 Ph.D. students in less than three years. These data highlight the interest that exists in this field, and the limited number of existing programs suggests an opportunity for Clemson to join UMBC and Georgia Tech in defining what it means to earn a Ph.D. in Human-Centered Computing. Of course, growing a new Ph.D. program in this area will depend on local demand or the ability to attract students from other areas of the US or international students.

With regard to the proposed content, I appreciate the inclusion of a fundamentals course to provide students with a common grounding in the discipline. The research methods courses are critical, and given the variety of approaches HCC researchers employ, it is good to see that students will have access to courses that address a variety of methodological perspectives. It is also good to see that students will take courses that provide insights into both computing and people as HCC researchers must understand not only the technologies involved, but the people that will be using the technologies and the environments and organizations in which these interactions will occur. Depending on how they are defined, the cognate areas have the ability to provide a valuable opportunity for HCC students to gain additional expertise in an area that is directly related to their research interests.

In summary, while UMBC is one of the few universities currently offering a Ph.D. in Human-Centered Computing, I believe there is tremendous opportunity for growth in this area. At present, I believe it is more common for graduates from comparable programs to go into industry. However, as the number of HCC programs grows, and the iSchool movement continues to mature, I anticipate that a larger number of graduates with a Ph.D. in Human-Centered Computing will also find their way into faculty positions.

Sincerely,

Andrew Sears
Professor and Chair