

Proposal for a Ph.D. Degree in Informatics

Contacts

Judith S. Olson
Bren Professor of Information and Computer Sciences
Department of Informatics
Donald Bren School of Information and Computer Sciences
949-824-0080
jsolson@uci.edu

Gillian R. Hayes
Assistant Professor
Department of Informatics
Donald Bren School of Information and Computer Sciences
949-824-1483
gillianrh@uci.edu

November 19, 2012

1 Introduction

1.1 Aims and Objectives

This proposal represents a natural evolution in the field of Informatics (elsewhere called Information or Information Science), a broad term covering a host of subspecialties, including human-computer interaction, social informatics, information economics, information policy, and library and archival science. Complementing our existing offerings, we propose to offer a Ph.D. in Informatics in the Department of Informatics to signify the recognizable “flavor” of the field of study we offer.

Until recently, the department offered four tracks within the Informatics concentration of the ICS Ph.D.:

- Informatics – General
- Informatics – Track in Interactive and Collaborative Technology
- Informatics – Track in Ubiquitous Computing
- Informatics – Track in Software Engineering

A Ph.D. degree in Software Engineering has now been added, replacing the degree currently called Informatics—Track in Software Engineering. This proposal specifies the Ph.D. in Informatics, replacing the three remaining tracks (Informatics-General, Informatics-ICT and Informatics-Ubiquitous Computing). The new arrangement (two Ph.Ds, one in Software Engineering and one in Informatics) mirrors our undergraduate offerings (two B.S. degrees, one in Software Engineering and one in Informatics.) In contrast to our current Ph.D. offering in Information and Computer Science, we believe that the naming of the Ph.D. in Informatics will more accurately reflect the program described below, and reflects our alignment with other programs nationally.

1.2 Historical Development of the Field and the Departments

1.2.1 *Historical Development of the Field*

The field of Information/Informatics covers the following areas, differently balanced at different schools:

- Human Computer Interaction
- Information Policy
- Information Economics
- Information Retrieval
- Library Science
- Archives and Preservation
- Information Architecture and Design
- Social Analysis of Information Systems

In the mid 1990s, there was a movement to develop Schools of Information, sometimes an offshoot of Computer Science and sometimes an offshoot of Library and Information Science. There are now over 30 Schools of Information in North America, Western Europe and Asia. The University of California at Berkeley is the other UC school that has a School of Information, although UCLA's graduate School of Education and Information Studies is also part of the "i-school movement". UC Irvine is the only school that joins the behavioral aspects of computing with Computer Science in the same school. Schools of Information have been established at the following schools, a sampling of members of the i-School Caucus¹:

- UC Berkeley School of Information
- UC Irvine School of Information and Computer Sciences
- UCLA Graduate School of Education and Information Studies
- Carnegie Mellon University School of Information Systems and Management
- Drexel University College of Information Science and Technology
- Florida State University College of Communication and Information
- Georgia Institute of Technology College of Computing
- Humbolt-Universitat zu Berlin Berlin School of Library and Information Science
- University of Illinois Graduate School of Library and Information Science
- Indiana University School of Informatics and Computing
- University of Maryland College of Information Studies
- University of Michigan School of Information
- University of North Carolina School of Information and Library Science
- Pennsylvania State University College of Information Sciences and Technology
- University of Pittsburgh School of Information Sciences
- Royal School of Library and Information Science, Denmark
- Rutgers, the State University of New Jersey School of Communication, Information and Library Studies
- Singapore Management University School of Information Systems
- Syracuse University School of Information Studies
- University of Toronto Faculty of Information
- University of Washington Information School
- Wuhan University, China, School of Information Management

1.2.2 Historical Development of the Department of Informatics

The Department of Information and Computer Science was established in 1968 with founding chair Julian Feldman. At the time, the department was not placed in a school, because it was not clear where computing best fit. In December 2002, the UC Regents approved the transition of the Department of ICS to the School of Information and Computer Sciences. At that time, the former department was also

¹ <http://www.ischools.org/site/about/>

split into two – the Department of Informatics and the Department of Computer Science. In July 2003, the Department of Statistics (established in July 2002) joined the school. In December 2003, local philanthropist Donald Bren provided a major gift to the school, in recognition of which the name was changed to the Donald Bren School of Information and Computer Sciences.

The separation between the Department of Computer Science and the Department of Informatics was partly motivated by the need to better ground the disciplines of Software Engineering, Human-Computer Interaction, Social Computing, and Ubiquitous Computing into an academic unit that is both close to CS but independent of it. This Informatics Ph.D. program proposal, following quickly after the development of the Software Engineering Ph.D. program, represents closure with respect to the original motivation for the creation of the Department of Informatics.

Since its creation, the Department of Informatics has grown from 12 to more than 20 faculty members, recruiting several junior faculty as well as three Full Professors under the prestigious Bren Chair-ship. In its short history, it secured funding from the Department of Education and from the National Science Foundation for developing an undergraduate major.

UCI/ICS has been among the leaders in research, innovation, and education in the information sciences and informatics for the past 30 years. It is informally recognized as one of the top schools in human-computer interaction and social computing, and data, including a published publication-based ranking, our funding record, organizational involvement, graduate student placement, and number of faculty in the area, confirms this recognition.

1.2.3 Historical Development of the PhD in Informatics

Prior to the formation in 2002 of separate departments of Informatics and Computer Science, ICS offered a single PhD program in Information and Computer Science. Upon the creation of separate departments, efforts began to create separate and distinctive programs associated with the specific intellectual areas associated with the departments. A self-contained Ph.D. in Computer Science was established in 2007, and is now thriving. Now that the Computer Science department has switched its doctoral enrollment over to that program, the only doctoral students enrolled in the PhD in Information and Computer Science are students in the Informatics specializations with that degree.

Further, a Ph.D. in Software Engineering was established in 2011 to serve the particular needs of those students conducting research in that area, which had previously been subsumed as a specialization within the ICS degree. This further narrowed the pool of students in the broadly-titled ICS degree.

The Department of Informatics voted in 2010 to create, alongside the PhD in Software Engineering, a PhD program that would more precisely match the needs of the remaining doctoral students currently being served by the PhD program. This

would achieve two ends. First, it would allow us more easily to target the pedagogical style and academic content of the program towards those students; and second, it would unite the administrative and enrollment units for the program. After considering several alternatives, we concluded that the name "Informatics" was the most appropriate name for the program, for several reasons, including national recognition, confluence with the name of our department, flexibility for future developments, and the broad scope of research to be carried out within the program.

1.3 Timetable for Development of the Program

The program restructures an existing program and adds no new courses. When approved, we will advertise broadly, and hope to admit the first students in Fall 2014. Students currently enrolled may also elect to follow these requirements, with perhaps some substitution from activities they have already undertaken (*e.g.*, a previous taken course to substitute for a new course).

1.4 Relation to Existing Programs on Campus

This program replaces three tracks (General, Interactive and Collaborative Technologies, and Ubiquitous Computing) within the current ICS Ph.D. concentration in Informatics.

Comparison with the Software Engineering degree: The two programs draw upon a very different audience, and therefore are rooted in a quite different set of courses. While courses pertaining to one program may sometimes be used as electives in the other program, no significant overlap exists. A particularly distinguishing feature of the Informatics program is that its courses regularly draw enrollments with aligned programs elsewhere on campus, including Visual Studies, Anthropology, Women's Studies, Studio Art, Planning Policy and Design, and Business; we expect this to continue and, as the program develops, will seek appropriate alignments through graduate emphases and similar mechanisms.

Comparison with the Computer Science degree: The two programs are quite different. In terms of course requirements, the focus of the proposed PhD is on human and social aspects of computing and technology, and all core courses are offered by the Department of Informatics. Similarly, the CS degree core courses are all offered within the CS department. However, students interested in Informatics sometimes will take 1 or 2 electives in the Department of Computer Science (as they do in Business, Anthropology, etc. when the courses are relevant to their dissertation research), and they will continue to be able to do so under this program. Similarly, the CS degree's elective courses include a few courses offered by Informatics.

Comparison with the Statistics degree: There is essentially no overlap with this program.

1.5 Interrelation with Other UC Programs

This program is most similar to the UC Berkeley program in Information. Our program, however, sits in a school that also houses Computer Science, whereas the Berkeley school does not. Their program has grown from a professional Library Science program, and thus has more of a professional focus. Ours is has a more technological orientation, particularly in areas such as ubiquitous computing and HCI.

1.6 Administration of the Program

The degree will be administered by the same people who administered the programs that we are phasing out: Our chair, vice chair for graduate affairs, the department manager, and the school-wide Student Affairs Office. Students are selected by a panel of faculty (the admissions committee) and mentored by an advisor and the other faculty with whom the student works.

A member of the Informatics faculty will be designated as Director of the Informatics program, with primary responsibility – in cooperation with the chair and vice chair for graduate affairs – for managing program processes (*e.g.*, annual student evaluations), overseeing course offerings, approving course choices (along with individual advisors) and maintaining a consistent and cohesive program.

1.7 Evaluation Plan

UCI has a policy of periodically reviewing graduate programs. The Informatics program will be reviewed as part of the normal review process.

2 Program

2.1 Undergraduate Preparation for Admission

Students applying to the program may have degrees in any field, though preference will generally be given to those with a technical or social science background.

2.2 Foreign Language

There is no foreign language requirement.

2.3 Program of Study

2.3.1 Specific fields of emphasis

The broad field of informatics incorporates a variety of specific academic research areas, including human-computer interaction, computer supported cooperative work, ubiquitous computing, software design, software studies, medical informatics, assistive technology, educational technology, and software and technology studies. The program is designed around a series of principles and desiderata.

First, we would like to emphasize research (theory and skills) throughout the program and to make student research the central component of evaluation.

Second, we would like to ensure that students get a broad introduction to informatics research to avoid both premature specialization and tying students to just a single research group.

Third, we would like to connect to disciplinary areas outside of Informatics, particularly those that are important application areas for people's research or areas of methodological specialization.

Fourth, we would like to incorporate regular assessment by the faculty as a whole.

2.3.2 Plan

This degree program will lead to a Doctor of Philosophy in Informatics.

2.3.3 Unit Requirements

This degree program requires 70 units of coursework, including 30 units of core requirements, 16 units of guided research as part of independent study, and 24 units of electives. We expect that many students will enroll in additional independent study and doctoral thesis supervision units as well.

2.3.4 Required and recommended courses, including teaching requirement

Pre-Candidacy Course Requirements

Required Core Courses

INF 261: Social Analysis of Computing

INF 232: Research in Human Computer Interaction

INF 209S: Seminar in Informatics (twice, usually in first year)

Research Methods Core

INF 201: Research Methods

INF 203: Qualitative Methods

INF 205: Quantitative Methods

INF 207S: Doctoral Seminar on Research and Writing (twice, usually after first year)

Research Experience

INF 299 (Independent Study): Four quarters required pre-advancement, recommended at least two quarters per year in each of the first two years.

Electives in Informatics (6 Ph.D. level classes)

A set of six elective courses. The selection of courses should form a coherent educational plan to be approved by the student's faculty advisor and by the Informatics PhD program director. A written record of this plan and its approval must be filed with the PhD program director prior to advancement. Although the courses may be chosen from any PhD level courses on campus, it is recommended that at least three be chosen from within the school of ICS.

Teaching Requirements:

To enhance their education and experience in teaching, all students will be required to work as readers or TAs for at least two quarters. Additionally, before or during the first quarter in which they are working in this capacity, all students will enroll in ICS 398A, a two-unit seminar. Those students wishing to gain more instruction around their teaching may also enroll in ICS 398B, the advanced teaching seminar, which is also a two-unit seminar.

Summary of Course Requirements:

	Core courses	Independent Study	Electives	Total Units
<i>Courses (units)</i>	Inf201 (4) Inf 203 (4) Inf 205 (4) Inf 261 (4) Inf 232 (4) Inf 207s (2*2) Inf 209s (2*2) ICS398A (2)	16 (Inf 299 taken four times at 4 units each time)	24 (6 4-unit courses)	70
<i>Total Units</i>	30	16	24	

2.3.5 Licensing

Not Applicable.

2.4 Field Examinations

There will be no formal field evaluations. However, each year, students will be evaluated individually and given written feedback about their progress (for first year students, this evaluation will take place before the end of Spring quarter; for continuing students, it will take place before the end of Fall quarter.) In preparation, students will write a statement about their progress and meet with their advisors who give some feedback and complete a form reporting their assessment of the student’s progress. The program faculty as a whole will then meet to discuss all the students, with a letter written to the student summarizing the assessment and, if necessary, deadlines for specific activities to be finished or goals to be achieved. This evaluation letter will state either that the student is making good progress or has been given cautionary status. The students who have certain activities to finish will be reviewed again 6 months after this evaluation. A second cautionary review constitutes formal failure to make adequate progress within the program.

2.5 Qualifying Exams

At the end of the student’s second year: The student develops an appropriate reading list to fit his/her areas of interest within Informatics, co-developed with the advisor.

The student then writes a paper synthesizing this literature and noting the areas that are currently interesting and under-researched. The paper serves as the basis for an oral examination, generally in the Spring quarter of the second year.

At the end of the third year: The student will be evaluated by an assessment of a research portfolio. A portfolio should comprise three papers of publishable quality, as judged by the faculty. These papers might well be expansions or developments from term papers developed in class; the goal is to determine the student's capacity to produce research writing of publishable quality. Student may work on papers collaboratively, but the portfolio as a whole must demonstrate writing ability through single-authored or lead-authored work. (Collaboratively written papers will be accompanied by a statement of contributions signed by all authors.)

The students are encouraged to report on projects conducted with at least two different faculty members. Advancement to candidacy is on the basis of an oral defense of the research portfolio, normally in the Spring of the third year. The advancement committee is formed in accordance with UCI campus regulations.

2.6 Doctoral Dissertation

Students are required to complete a doctoral dissertation in accordance with Academic Senate regulations. In addition, they must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. The dissertation must be approved unanimously by the committee.

2.7 Final Examination

The dissertation defense committee is formed in accordance to UCI Senate regulations. This committee must approve the following for the student to pass the final examination:

Dissertation topic: The student must present a substantial written document representing the student's dissertation plan. This document must include the proposed dissertation abstract, a dissertation outline, a comprehensive survey of related work, and a detailed plan for completing the work. The student must present this dissertation plan to the dissertation committee, who must unanimously approve the student's proposal.

Dissertation document: The student must prepare the written dissertation in accordance with Academic Senate regulations and present this document to the committee with enough advance notice for appropriate review and critique prior to an oral defense. Following an oral defense of this document, any changes required must be approved by the entire committee.

Oral defense: The student must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. To ensure the public has an opportunity to participate in this examination, the student must announce the defense title, date, and time at least two weeks prior to the event to all faculty and doctoral students in the department.

2.8 Explanation of special requirements over and above graduate division minimum requirements

There are no additional requirements.

2.9 RELATIONSHIP TO MASTERS

There is not a M.S. in Informatics being proposed.

2.10 Special Preparation for Careers in Teaching

2.10.1 Teaching Requirement

Students are required to serve as Instructor or Teaching Assistant for at least two quarters.

2.10.2 Educational Training

Service as a teaching assistant is accompanied by specific teacher training opportunities. In particular, the following are offered:

ICS 398A Teaching Assistant Training Seminar (4) Theories, methods, and resources for informatics at the university level, particularly for teaching assistants. Classroom presentations, working with individuals, grading, motivating students, are topics taught. Participants will give and critique presentations and may be videotaped while teaching. Graded S/U only.

ICS 398B Advanced Teaching Assistant Seminar (4) Teaching informatics at the university level, emphasizing issues in teaching an entire course. Course organization, designing examinations and projects, grading, motivating students are topics taught. Participants will begin to assemble teaching portfolios. Graded S/U only. Prerequisite: ICS 398A or permission of instructor.

2.11 Sample Program

Within program constraints, students will design their own schedule and detailed curriculum with advice from their advisor, and to be approved by the program director.

Note that the first year of the program is designed, first, to provide a cohort experience and, second, to focus on introductory graduate classes and research methods. We adopt a model of “research from day one,” so that students have completed one substantive research project by the beginning of their second year. The later years allow for more advanced training and research specialization, while also gradually shifting the balance of student activities from coursework to research.

The goal of one substantive research project in the first year is supported by holding an annual “Research Jamboree” in the Fall of each year at which the returning second year students present their work to the department.

Sample Program of Study:

	Year 1	Year 2	Year 3
--	--------	--------	--------

Fall	INF 201 (Res Meth) INF 261 (Social Anal. of Comp) INF 209S (Seminar)	Elective 2 INF 299 Ind. Study <i>Research Jamboree</i>	Elective 5
Winter	INF 203 (Qual Methods) INF 232 (Res in HCI) INF 299 Ind. Study INF 209S (Seminar)	Elective 3 Elective 4	Elective 6 INF 207S Writing
Spring	Elective 1 INF 299 Ind. Study INF 205 (Quant Methods)	INF 299 Ind. Study INF 207S Writing <i>Survey Paper Assessment</i>	<i>Advancement (research portfolio assessment)</i>

2.12 Normative Time from Matriculation to Degree

Students making normal progress are expected to complete their coursework and produce 2-3 research papers of publishable quality in three years. The dissertation proposal is expected midway through the fourth year, with completion in the fifth.

3 Projected Need

3.1 Student Demand for the Program

Students are responding to the trends outlined above, and the National Science Foundation data reports that enrollment trends are matching these job growth prospects as shown in Figure 3.

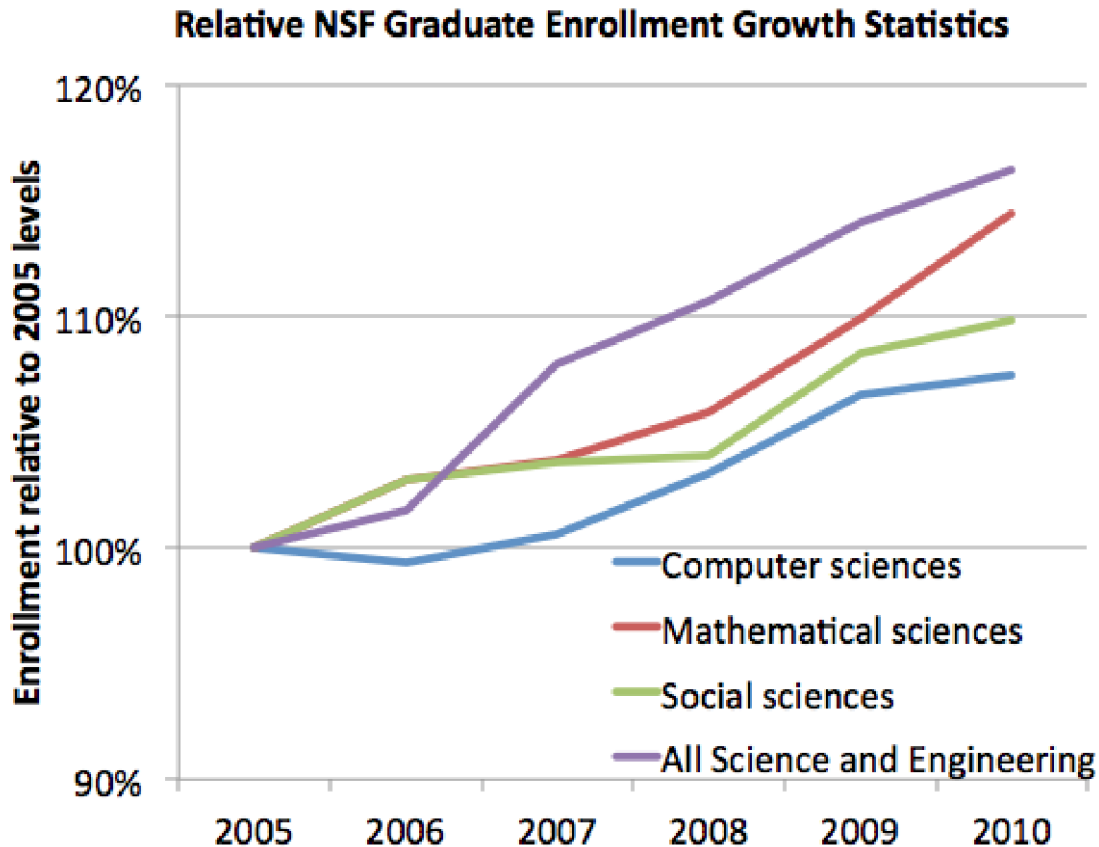


Figure 3

Source: <http://www.nsf.gov/statistics/infbrief/nsf12317/>

This degree will replace three tracks (General, Ubiquitous Computing, and Interactive and Collaborative Technologies) within the ICS Ph.D. specialization in Informatics. These programs currently enroll around 10 students per year from an applicant pool of approximately 150. (The primary constraint on enrollments is financial support.) We expect this overall number of applicants to remain the same or increase, particularly as we compete more directly with peer programs by making the program more visible.

3.2 Opportunities for graduates

The need for an Informatics Ph.D. can be seen in state and national trends emerging from statistics that have been collected by the National Science Foundation and the Bureau of Labor Statistics. While drawing on many interdisciplinary methods, the Informatics Ph.D. is fundamentally a computing degree and falls within the STEM category (Science, Technology, Engineering and Mathematics). Degrees in this category are fundamental to technology innovation, the development of new products and the creation of new understandings of the interplay between people and technology. STEM degrees broadly account for 8 million U.S. jobs. Of the occupations that STEM degrees prepare students for, 7 of the top 10 are jobs

specifically using computers (see Figure 1). These are well-paying jobs averaging \$100,00 - \$120,000 per year.

These trends are largely national, of which California makes up a large portion, but they are California specific as well: 15% of the total jobs in San Jose-Sunnyvale, Santa Clara, CA were STEM jobs and are 3 times that of the U.S. as a whole.

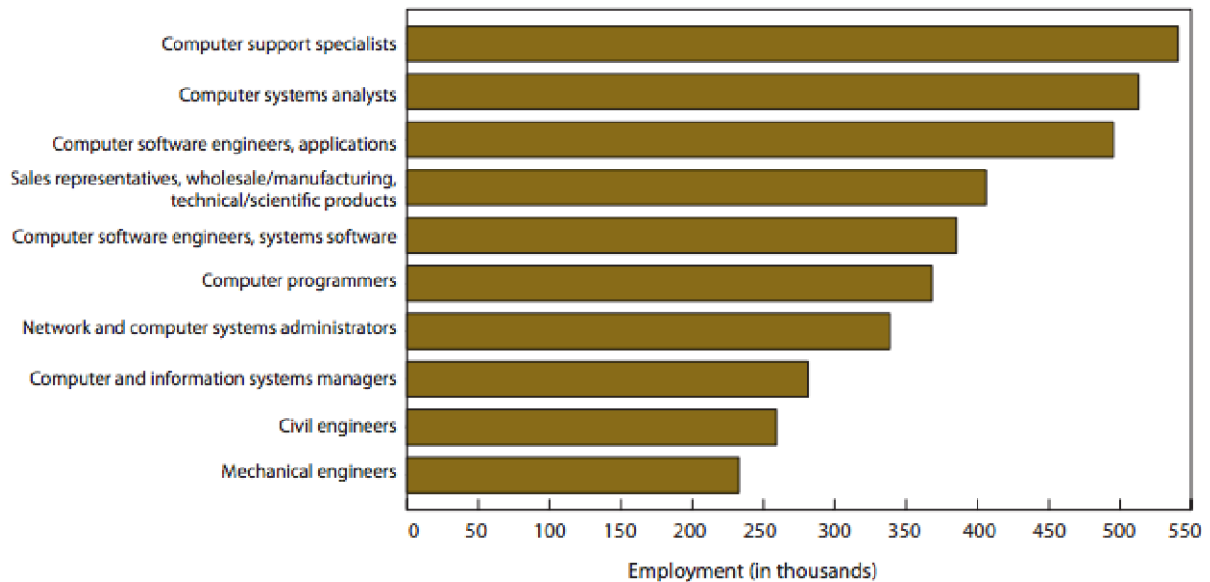


Figure 1: Employment by occupation for the largest STEM occupations [1]

The Informatics Ph.D. has broad applicability to future careers, but best matches the Bureau of Labor Statistics job category of “Computer and Information Research Scientists”

The BLS correctly describes the position as someone who invents and designs new technology and finds new uses for existing technology. “They study and solve complex problems in computing for business, science, medicine, and other uses. Most computer and information research scientists work for computer systems design and related services firms, scientific research and development companies, or the federal government. Most work full time, and those who do independent research may have flexibility in their work schedules. A Ph.D. in computer science or a related subject is required for most computer and information research scientist jobs. “

Critically the job outlook for Informatics Ph.D. degree recipients is expected to grow by 19% by 2020 (see Figure 2). Computer and information research scientists are likely to enjoy excellent job prospects, as many companies anecdotally report difficulties finding a sufficient number of people to fill these positions.

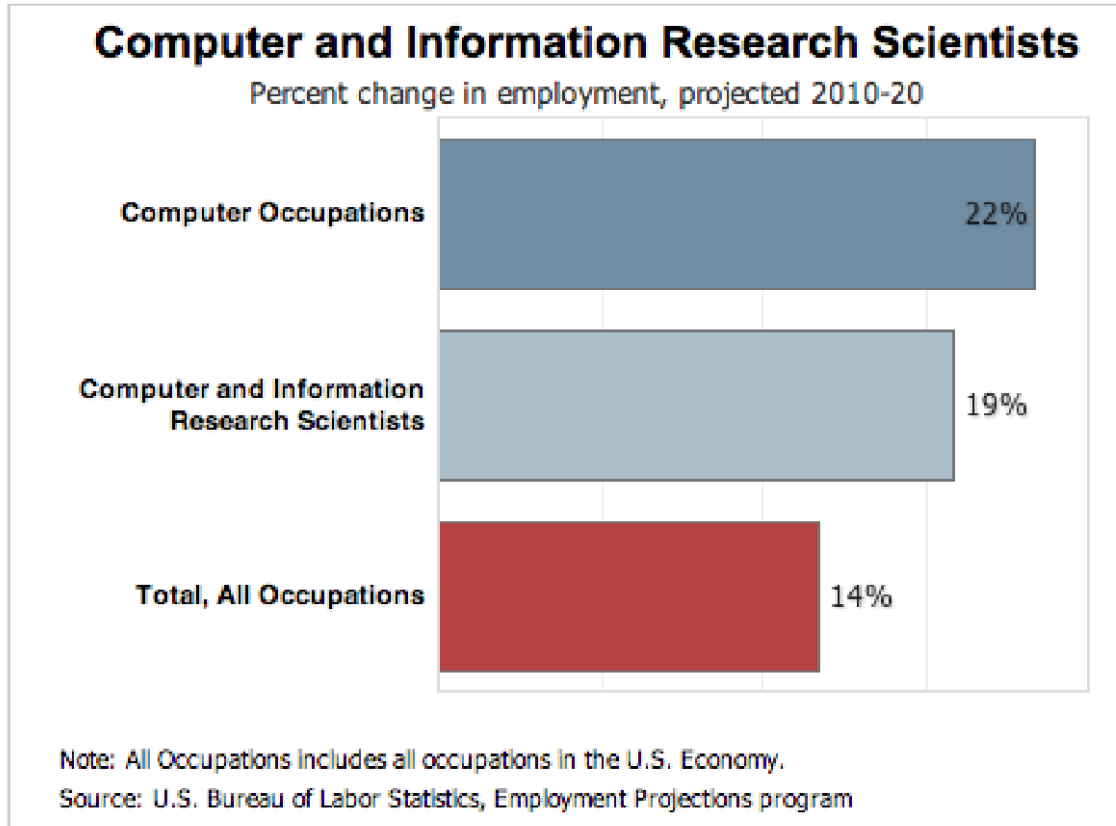


Figure 2

Source: <http://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm#tab-6>

The Informatics program represents an evolution of a program of teaching and research that stretches back to the foundation of the Department (now School) of Information and Computer Sciences. Ph.D. students from this program in its various forms have been well placed in the past, including academic placements at universities such as Georgia Tech and the University of Washington, and top industrial research institutions, such as Google, IBM, Xerox PARC, and Microsoft Research. The growth of the “I-school movement,” the broadening of Communication departments to include Informatics topics, and related trends augur well for our graduates continuing to be placed well. An informal poll of I-school hiring statistics (<http://bierdoctor.com/2012/05/22/hiring-and-placement-in-the-ischools/>) reveals that we rank third in overall placement of students at I-schools, and first when adjusted for quality of institution (that is, our students place in the top schools).

3.3 Importance to the Discipline

Informatics builds on the idea that expertise in information and communications technologies as well as in information management is fundamental to the advancement of science, commercial enterprises, and educational and societal missions. Despite a growing set of schools and programs in “information” and

informatics, there is still a great need for research and training in the discipline. The proposed degree program will produce substantial research results and excellent new scholars who will contribute to this growing discipline.

3.4 Ways in which the Program will meet the Needs of Society

As a discipline, Informatics is built on the idea of designing technologies to fit human needs and capabilities. People have suffered when technologies are incomplete in what they offer and are hard to learn and use. Applications that do not meet the needs of the people who will be using them fail, often at high cost. Much of the research related to human needs is conducted in the field, where we learn what people require in a deep way, and design and test our ideas with real people. Our projects are in diverse fields including medicine, science, entertainment, software development, education, environmental sustainability, and crisis management. We partner with companies and other organizations to both influence the design of technologies and assess their use in the field. Useful, usable applications are imperative for economic growth. Our society is thoroughly digitized and yet we can make better use of rapidly changing technologies through more thoughtful design and long term planning and evaluation. California's economy in particular depends on digital technology across a spectrum of industries from hardware and software design to specialized applications such as genomics to video gaming to the vibrant start up companies that bring innovations in digital technologies that empower users throughout the entire world. Our students have both broad and deep expertise in digital technologies, with a focus on human needs, and they are taking their places in industry and academia as leaders who understand how to design and how to assess socioeconomic impacts of technology.

Informatics departments and Schools of Information (I-Schools) are growing in response to the growing needs of society to have trained professionals addressing these issues. Thus, our graduates will directly impact and meet the needs of society by becoming these professionals, as consultants, industrial researchers and product designers, and so on. Additionally, graduates from this program will go on to academic positions, training the next generation of professionals and expanding the long-term impacts of the education and training they receive here.

3.5 Relationship of the Program to Research in Informatics and Information

The field of Informatics and Information is extremely broad, running the gamut from pricing and policies for information (*e.g.*, copyright, intellectual property, privacy considerations), to the design of new ways to communicate with technology (*e.g.*, Kinect, Microsoft's new controller that senses body movement), to understanding the ways in which society is changing with the introduction of well and ill-designed technologies (*e.g.*, e-democracy).

This doctoral program fits (indeed, is specifically designed around) the research program of the faculty in Informatics. The faculty in Informatics have an international reputation in this area, with three in the CHI (Computer Human Interaction) Academy, two faculty having achieved the "CHI Lifetime Achievement

Award,” three Fellows of the Association for Computing Machinery, and one ACM-W Athena Award winner (Woman of the Year in Computer Science).

Broadly speaking, the Informatics Ph.D. program and the faculty areas of research are (in alphabetical order):

- Computer Supported Cooperative Work (CSCW)
- Educational Technology (ET)
- Games and Virtual Worlds (Ga)
- Green IT (GIT)
- Human-Computer Interaction (HCI)
- Information and Communication Technologies for Development (ICT4D)
- Medical Informatics (MI)
- Organizational Studies (Org)
- Science and Technology Studies (STS)
- Ubiquitous Computing (UC)

Contributions of Faculty to research and teaching in Informatics topics:

Faculty Member	CSCW	ET	Ga	GIT	HCI	ICT4D	MI	Org	STS	UC
Geof Bowker	X				X				X	
Yunan Chen	X				X		X			
Paul Dourish	X		X		X	X			X	X
Judith Gregory		X				X	X		X	
Gillian Hayes	X	X			X		X			X
Mimi Ito	X	X							X	
James Jones					X					
Cory Knobel	X				X				X	
Alfred Kobsa					X		X			
Gloria Mark	X				X	X		X		
Melissa Mazmanian	X				X			X	X	X
Bonnie Nardi	X		X		X	X				
Judith Olson	X				X			X		
Gary Olson	X				X			X		
Don Patterson				X	X	X				X
David Redmiles	X				X					
Bill Tomlinson		X	X	X	X	X				X
Andre van der Hoek	X	X			X					

3.6 Program Differentiation

Competitors in this area include Georgia Tech, Carnegie Mellon, the University of Washington, Stanford, Penn State and Michigan. Our forte is the study of teams being supported by various technologies, both tools for getting their work products done and for communicating when team members are not collocated. In addition, the strong link to the Software Engineering program at UCI, and the fact of being housed within the same school as CS and Statistics, allows a focus on both technical expression and research methods – a combination that is unavailable elsewhere. We have growing strengths in Science and Technology Studies and in Organizational Studies, which differentiate us from several of these programs. Overall, our program is known as a top program in Informatics, and establishing this PhD program will further solidify us as such.

4 Faculty

The Ph.D. in Informatics is designed to incorporate the full complement of research and teaching expertise of the faculty of the Department of Informatics. The faculty below have expressed a specific interest in being listed as core faculty of the program.

- Geof Bowker, Professor
- Yunan Chen, Assistant Professor
- Paul Dourish, Professor
- Judith Gregory, Adjunct Associate Professor
- Gillian Hayes, Assistant Professor
- Mimi Ito, MacArthur Foundation Professor in Residence
- James Jones, Assistant Professor
- Cory Knobel, Adjunct Assistant Professor
- Alfred Kobsa, Professor
- Gloria Mark, Professor
- Melissa Mazmanian, Assistant Professor
- Bonnie Nardi, Professor
- Judith Olson, Donald Bren Professor
- Gary Olson, Donald Bren Professor
- Don Patterson, Associate Professor
- David Redmiles, Professor
- Bill Tomlinson, Associate Professor
- Andre van der Hoek, Professor and Chair

5 Courses

See Appendix 1.

6 Resource Requirements

This program replaces existing teaching in three tracks within the Ph.D. in Information and Computer Sciences. No additional resources are required.

- A. FTE faculty: No additional faculty need be hired for this degree program.
- B. Library acquisition: The titles already purchased by the library should be sufficient for the program.
- C. Computing costs: The School of ICS computing support coupled with UCI resources already in existence will be sufficient for the program.
- D. Equipment: No additional equipment is required for the program.
- E. Space and other capital facilities: The program will make use of existing facilities in the School of ICS for both teaching and research.
- F. Other operating costs: No additional operating costs will be required. A teaching release may be offered to the Program Director, at the discretion of the chair and in accordance with enrollment growth.

7 Graduate Student Support

As in our current offerings, Ph.D. students in this program will be supported by a combination of fellowship, research assistantship and teaching assistantship. Students are the backbone of research in the Department of Informatics and will be involved in a variety of funded research projects as part of the PhD program in Informatics. Faculty in this area have been successful in being awarded grants, which in turn support the students often in research assistantships. Increasingly, there is a need for students trained according to the PhD program described in this proposal to engage in the research funded by faculty grants. The sampling of funded research projects noted in the table below, although not a comprehensive listing of all current funding in the department, demonstrates this connection for a subset of research projects funded in the last five years.

Project Title	PI & Co-PI	Funding Source	Year Funded	Amount
Tangible Icons for Multi-tasking Awareness	Mark	Fuxi Xerox	2007	\$40,000
Developing 21st Century Skills for the Web: Managing Multi-tasking and Interruptions	Mark	Google	2007	\$50,000
Designing and Evaluating Ambient-Tangible Displays for Collaboration	Dourish	NSF	2007	\$449,481
HCC: Computing Place Context	Patterson	NSF	2007	\$449,765
NSF: Collaboration Resilience: Restoring Human Infrastructure with Technology	Mark	NSF	2007	\$450,000
An Agent-Based Approach to Human-Computer Interaction for Systems of Collocated Devices	Tomlinson	NSF	2007	\$500,000
Technology Support for Interactive and Collaborative Visual Schedules	Hayes	Autism Speaks	2008	\$83,563
VOSS: Leveraging Development Expertise across Cyberinfrastructures	Dourish	NSF	2008	\$125,749

Project Title	PI & Co-PI	Funding Source	Year Funded	Amount
Computational Metaphor Identification for Supporting Creativity in Science Education	Tonlinson	NSF	2008	\$200,000
VOSS: The Social Life of Spacecraft: The Organization of Interplanetary Sociotechnical Systems	Dourish	NSF	2008	\$218,091
Early Career Award: Mobile and Ubiquitous Computing Technologies for Young Children with Chronic Health Conditions	Hayes	NSF	2008	\$499,038
American Indian Summer Institute in Computer Science: Linking Native Culture to Computer Game Culture	Tomlinson, Frost, Regan	NSF	2008	\$599,723
Decentralized Virtual Activities and Technologies:	Scacchi, Koba, Lopes, Mark, Taylor, Redmiles	NSF	2008	\$2,997,936
HCC Decentralized Virtual Activities and Technologies: A Socio-Technical Approach	Scacchi	NSF	2008	\$3,000,000
Challenge of Supporting Information Management, Sharing, and Storage with Next Generation Computing Systems	Mark	Computing Research Association	2009	\$280,000
Narrative-Centered Computing for Childhood Environmental Awareness	Tomlinson	NSF	2009	\$280,371
Usable Location Privacy in Geo-Social Networks	Goodrich, Tsduki, Kobsa	NSF	2009	\$300,000
HCC: Widescale Computer-Mediated Communication in Crisis Response: Roles, Trust & Accuracy in the Social Distribution of Information	Mark	NSF	2009	\$479,000
Use of Observations of Daily Living among Low Birth Weight Infants and their Caregivers to Improve Care and Reduce Incidence of Chronic Conditions over the Lifespan	Hayes	Robert Wood Johnson Found.	2009	\$479,533
HCC: Small: From Local Ties to Transnational Connections: The Role of Computer-mediated Communication in Relational Maintenance	Dourish	NSF	2009	\$499,999
Scaling Social Networks to Social Movements	Dourish, Mazmanian	NSF	2010	\$201,870
EAGER: HCC: Death and the Social Network: The Persistence of Digital Identity	Dourish, Hayes	NSF	2010	\$247,089
Research on Location Sharing	Kobsa	Disney	2010	\$350,000
VOSS: Innovating Across Cultures in Virtual Organizations	Dourish, Mazmanian	NSF	2010	\$400,000
SoCS: Socio-Computational Approaches to Planetary Exploration	Dourish, Mazmanian	NSF	2010	\$749,257
Working Together Apart: Challenges of CrossCultural Collaboration	Olson & Olson	Google	2010	750,000
Next Steps in Articulating Success Factors for Distributed Collaborations	G. Olson	NSF	2010	\$399,336
Causality Project	Tomlinson & Black	Constellation Energy	2011	\$50,000

Project Title	PI & Co-PI	Funding Source	Year Funded	Amount
A Comparative Evaluation of Multiple Chat Stream Interfaces for Information-intensive Environments	Mark	Northrup Grummon	2011	\$50,000
NSF RAPID: Citizen Use of Social Media in the Egyptian Uprising	Mark	NSF	2011	\$50,000
Activity-Awareness Everywhere: A Smartphone Infrastructure for Studying and Supporting Ubiquitous Multitasking in Information Work	Mark	Google	2011	\$60,000
Supporting Healthy Outcomes for High-Risk Infants Using Mobile Computing and Personal Health Records	Hayes	Google	2011	\$74,000
Quantifying Electronic Medical Records Usability to Improve Clinical Workflow – QUICK	Chen	AHRQ	2011	\$79,037
Naturalistic Studies of User Errors in Security-Related Behaviors	Tsudik, Kobsa	NSF	2012	\$49,999
Providing Privacy-Sensitive Social Support for Families of High-Risk Infants Using Mobile Computing	Hayes	Google	2012	\$60,000
ISE Pathways: Repurposing Obsolescence: Teaching DIY Science, Technology and Engineering Practices to Adolescents in Underserved Communities	Hertz, Hayes, Black	NSF	2012	\$250,000
HCC Small: Patient-Provider Handoff: Collaboration Challenges and Technology Design	Chen	NSF	2012	\$499,786
HCC Multitasking as a Collaborative System: Examining the Millennial Generation	Mark	NSF	2012	\$500,000
Intel Science and Technology Center for Social Computing	Dourish, Maurer, Mainwaring	Intel	2012	\$12,500,000
Designing for scale: understanding the value of information and communication technologies for individuals, communities and movements	Dourish	Australian Research Council	2013	\$339,900

8 Governance

The Department of Informatics already offers graduate degrees and will follow the policies already in place for this new program.

9 Changes in Senate Regulations

No changes required.

Appendices:

A. Program Summary

B. Catalogue Copy

C. Website Copy

D. Faculty Vote

E. Revised/New Course Action Forms (if applicable)

F. Letter of support from Dean of each participating school.

Appendix 1: List of Courses

201 Research Methodology for Informatics (4). Introduction to strategies and idioms of research in informatics. Includes examination of issues in scientific inquiry, qualitative and quantitative methods, and research design. Both classic texts and contemporary research literature are read and analyzed.

203 Qualitative Research Methods in Information Systems (4). Introduction to qualitative research methods used to study computerization and information systems, such as open-ended interviewing, participant observation, and ethnography. Studies of the methods in practice through examination of research literature. Prerequisite: Informatics 251 or 261. Formerly ICS 235A.

205 Quantitative Research Methods in Information Systems (4). Quantitative research methods used to study computerization and information systems. Design of instruments, sampling, sample sizes, and data analysis. Validity and reliability. Longitudinal versus cross-sectional designs. Analysis of secondary data. Studies of the methods through examination of research literature. Prerequisites: basic knowledge of elementary statistics; Informatics 251 or 261. Formerly ICS 235B.

207S Doctoral Seminar on Research and Writing (2). Doctoral seminar centered on original research and writing. Provides a chance for doctoral students at all levels to present original work, brainstorm ongoing issues, and learn to provide and receive critical feedback from peers. Prerequisite: consent of instructor. Satisfactory/Unsatisfactory only. May be repeated for credit as topics vary.

209S Seminar in Informatics (2). Current research and research trends in Informatics. Forum for presentation and criticism by students of research work in progress. May be repeated for credit. Formerly ICS 229.

231 Human-Computer Interaction (4). The design and evaluation of interfaces to computer systems and applications with special attention to their fit to human cognitive capabilities and organizational practices. Includes coverage of hypermedia, groupware, and other rapidly emerging developments. Formerly ICS 205.

232 Research in Human-Computer Interaction (4). Introduction to contemporary topics in human-computer interaction, including methods, technologies, design, and evaluation. Emerging application domains and their challenges to traditional research methods. Advanced architectures and technologies. Critical issues. Some familiarity with HCI principles expected.

233 Knowledge-Based User Interfaces (4). Concepts related to the development of interactive software systems with a focus on knowledge-based tools and human-centered design. Topics span the fields of human-computer interaction, software engineering, and knowledge representation. Prerequisite: CS 171 or equivalent. Formerly ICS 206.

235 Advanced User Interface Architecture (4). Architectural concerns in advanced interactive systems. The design of current and emerging platforms for novel interactive systems. Paradigms such as constraint-based programming, multimodal interaction, and perceptual user interfaces for individual, distributed, and ubiquitous applications. Formerly ICS 227.

241 Introduction to Ubiquitous Computing (4). The "disappearing computer" paradigm. Differences to the desktop computing model: applications, interaction in augmented environments, security, alternate media, small operating systems, sensors, and embedded systems design. Evaluation by project work and class participation. Same as CS 248A. Formerly ICS 203A.

242 Ubiquitous Computing and Interaction (4). Principles and design techniques for ubiquitous computing applications. Conceptual basis for tangible and embodied interaction. Interaction in virtual and augmented environments. Design methods and techniques. Design case studies. Examination by project work. Prerequisites: Informatics 231 and 241. Same as CS 248B. Formerly ICS 203B.

244 Introduction to Embedded and Ubiquitous Systems (4). Embedded and ubiquitous system technologies including processors, DSP, memory, and software. System interfacing basics; communication strategies; sensors and actuators, mobile and wireless technology. Using pre-designed hardware and software components. Design case studies in wireless, multimedia, and/or networking domains. Prerequisites: B.S. degree in computer science; or ICS 51, CS 152; Mathematics 3A or 6G or ICS 6D/Mathematics 6D; CS 161. Same as CS 244.

251 Computer-Supported Cooperative Work (4). The role of information systems in supporting work in groups and organizations. Examines various technologies designed to support communication, information sharing, and coordination. Focuses on behavioral and social aspects of designing and using group support technologies. Formerly ICS 233.

261 Social Analysis of Computing (4). The social and economic impacts of computing and information technologies on groups, organizations, and society. Topics include computerization and changes in the character of work, social control and privacy, electronic communities, and risks of safety-critical systems to people. Formerly ICS 230.

263 Computerization, Work, and Organizations (4). Selected topics in the influence of computerization and information systems in transforming work and organizations. Theories of organization and organizational change. Processes by which diverse information technologies influence changes in work and organizations over short and long time periods. Prerequisite: Informatics 251 or 261. Formerly ICS 234A.

265 Theories of Computerization and Information Systems (4). Social and economic conceptions of information technology. Macrosocial and economic conditions that foster changes in information technologies. Social construction of information and computer technology in professional worlds. Theories of

information technology and large-scale social change. Prerequisite: Informatics 251 or 261. Formerly ICS 234B.

267 Digital Media and Society (4). Selected topics in the technological and social aspects of online interaction, governance, and policy including online games, social media, electronic activism, e-commerce, and digital libraries. Media-theoretic approaches to digital technology. Architectures, infrastructure considerations, and their consequences. Prerequisite: Informatics 251 or 261.

269 Computer Law (4). The American legal system and its provisions affecting computer systems, computer networks, and information processing. Intellectual property, contracts, privacy, liability for malfunction, computer crime, constitutional issues, transborder data flow, computer-based evidence, and litigation. Prerequisite: graduate standing or consent of instructor. Formerly Informatics 264.

Faculty vote:

Are you in favor of the proposal for a PhD in Informatics that was included in the email from Gillian Hayes on 11/20/12.*

Eligible to Vote:

Professors/ Lecturers SOE 16

Associates 2

Assistants 4

Total 22

Yes:

Professors/ Lecturers SOE 12

Associate Professor 2

Assistant Professor 4

Total 18



HAL STERN

Ted and Janice Smith Family Foundation Dean and Professor of Statistics
Donald Bren School of Information and Computer Sciences

6210 Donald Bren Hall
Irvine, CA 92697-3425
Tel (949) 824-7427
Fax (949) 824-3976
<http://www.ics.uci.edu>

December 3, 2012

To whom it may concern:

Re: Proposed Informatics Ph.D. program

It is with great pleasure that I provide this letter of support for the proposal for a Ph.D. program in Informatics. Informatics is a broad academic field encompassing human-computer interaction, information science, information policy, and social aspects of computing. The Bren School takes great pride in being the only computing-focused school in the University of California. This position has allowed us to providing extremely broad coverage of the field of computing in both our research and training programs. The proposed Ph.D. program in Informatics is a natural next step for us and would be another UC "first".

The creation of a Ph.D. in Informatics will complete the School's long-planned transition from a single doctoral program in Information and Computer Science (ICS) with concentrations in a variety of subdisciplines to separate doctoral programs in Computer Science, Statistics, Software Engineering and Informatics. As the core of the degree program already exists within the ICS doctoral program, we are not requesting any additional resources at this time.

Our Department of Informatics faculty is extremely highly regarded in the areas to be covered by the proposed degree program. The faculty group working in human-computer interaction is highly influential; according to Microsoft Academic Search they rank 4th in the United States in terms of citations of their work. Moreover, our research expertise in social computing (and our connections to the School of Social Sciences) attracted the attention of Intel and they have recently provided a \$12.5 million five-year award to establish the Intel Science and Technology Center for Social Computing at UC Irvine. Finally, I'd note that a recent study by researchers at Michigan State University reported that UC Irvine ranks first in terms of number of doctoral students placed in top information school faculty positions.

I strongly support the proposal for a Ph.D. program in Informatics as it represents an important step in the continued development of the Bren School.

Please don't hesitate to contact me if you require any additional information.

Sincerely,

A handwritten signature in black ink that reads "Hal Stern".

Hal S. Stern
Ted and Janice Smith Family Foundation Dean
and Professor of Statistics

UNIVERSITY OF CALIFORNIA

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

The Donald Bren School of
Information and Computer Sciences

Department of Computer Science
Irvine, CA 92697-3435
Tel: (949) 824-0016
Fax: (949) 824-4056
www.ics.uci.edu

November 30, 2012

To Whom in May Concern,

I am pleased to endorse the proposed Ph.D. program in Informatics that is being forwarded to the campus by the Department of Informatics. The proposal, in extracting and enhancing what now is a concentration in the Ph.D. program in Information and Computer Science, represents an important step forward in our School's portfolio of offerings. Moreover, it fits in well with the existing Ph.D. program in Computer Science.

Sincerely,

A handwritten signature in blue ink that reads "Michael T. Goodrich".

Michael T. Goodrich
Chair
Department of Computer Science

December 1, 2012

Re: Proposed Ph.D. degree in Informatics

To Whom It May Concern:

I am delighted to write this letter in support of the proposal for a Ph.D. degree in Informatics. This proposal has been several years in the making, and completes the transition of Ph.D. degrees in our department from being housed as concentrations inside the school-wide Information and Computer Science Ph.D. program into two separate Ph.D. degrees: Software Engineering (proposed in 2009 and admitting Ph.D. students now) and Informatics (the current proposal).

Our department is recognized as a worldwide leader in Informatics. We rank first, for instance, in placing our graduate students in top Information Schools (<http://bierdoctor.com/2012/05/22/hiring-and-placement-in-the-ischools/>). Recently, too, we hired renowned Professor Bowker and two of his colleagues, and Intel funded a \$12.5 Science and Technology Center for Social Computing that is jointly managed by our Department and Anthropology. The proposed Ph.D. degree in Informatics befits our role as a leading and innovative department, sets an example for others to follow, and explicitly recognizes the strength of our graduate training with a separate, highly visible program.

I strongly endorse this proposal and encourage its approval. The proposal is unique within the UC system; it would be its first in Informatics. Mindful of the current budgetary climate, it also does not require any additional resources, yet will benefit many future students and the work that they pursue.

If you have any questions please feel free to contact me.

Sincerely,



André van der Hoek
Professor and Chair

Graduate Program in Informatics

The PhD in Informatics prepares students to apply a variety of technical and social approaches to understand fundamental human and digital experiences and to design transformative solutions to a variety of human, organizational, and social challenges. A fundamental focus of our research is a dual view of information technology -- as a technical object and as a cultural object. From a technical perspective, we are concerned with the design and analysis of advanced information technologies and digital media. But we understand these too as objects that embody social values, shape human experiences, and carry cultural meaning. Our interests lie in the relationship between these two aspects of interactive technology.

The PhD in Informatics incorporates four connected emphases: an empirical focus that emphasizes understanding of technology design and use in practice; a theoretical focus aimed at understanding contexts of information system use; a technological focus aimed at new capabilities and infrastructures; and a design focus that includes integrative and holistic consideration of technical and human considerations. Students in the PhD program engage with multiple stakeholders, including faculty and researchers in other disciplines, major corporations and entrepreneurial enterprises, governmental and non-governmental agencies, and volunteer organizations such as open source communities. Through our involvement with these organizations, our research connects to the world beyond the university.

Admission to Graduate Programs in Informatics

Students applying to the program may have degrees in any field, though preference will generally be given to those with a technical or social science background.

Doctor of Philosophy in Informatics

All PhD students are expected to maintain a minimum GPA of 3.5 throughout the program. In addition, no grade lower than B is counted towards satisfying any course requirements.

Pre-Candidacy Course Requirements

Required Core Courses

INF 261: Social Analysis of Computing

INF 232: Research in Human Computer Interaction

INF 209S: Seminar in Informatics (twice, usually in first year)

Research Methods Core

INF 201: Research Methods

INF 203: Qualitative Methods

INF 205: Quantitative Methods

INF 207S: Doctoral Seminar on Research and Writing (twice, usually after first year)

Research Experience

INF 299 (Independent Study): Four quarters required pre-advancement, recommended at least two quarters per year in each of the first two years.

Electives in Informatics (6 Ph.D. level classes)

A set of six elective courses. The selection of courses should form a coherent educational plan to be approved by the student's faculty advisor and by the Informatics PhD program director. A written record of this plan and its approval must be filed with the PhD program director prior to advancement. Although the courses may be chosen from any PhD level courses on campus, it is recommended that at least three be chosen from within the school of ICS.

Qualifying Examinations

Teaching Requirements

To enhance their education and experience in teaching, all students will be required to work as readers or TAs for at least two quarters. Additionally, before or during the first quarter in which they are working in this capacity, all students will enroll in ICS 398A, a two-unit seminar. Those students wishing to gain more instruction around their teaching may also enroll in ICS 398B, the advanced teaching seminar, which is also a two-unit seminar.

Field Examinations

There will be no formal field evaluations. However, each year, students will be evaluated individually and given written feedback about their progress (for first year students, this evaluation will take place before the end of Spring quarter; for continuing students, it will take place before the end of Fall quarter.) In preparation, students will write a statement about their progress and meet with their advisors who give some feedback and complete a form reporting their assessment of the student's progress. The program faculty as a whole will then meet to discuss all the students, with a letter written to the student summarizing the assessment and, if necessary, deadlines for specific activities to be finished or goals to be achieved. This evaluation letter will state either that the student is making good progress or has been given cautionary status. The students who have certain activities to finish will be reviewed again 6 months after this evaluation. A second cautionary review constitutes formal failure to make adequate progress within the program.

Qualifying Exams

At the end of the student's second year: The student develops an appropriate reading list to fit his/her areas of interest within Informatics, co-developed with the advisor. The student then writes a paper synthesizing this literature and noting the areas that are currently interesting and under-researched. The paper serves as the basis for an oral examination, generally in the Spring quarter of the second year.

At the end of the third year: The student will be evaluated by an assessment of a research portfolio. A portfolio should comprise three papers of publishable quality, as judged by the faculty. These papers might well be expansions or developments from term papers developed in class; the goal is to determine the student's capacity to produce research writing of publishable quality. Student may work on papers collaboratively, but the portfolio as a whole must demonstrate writing ability through single-authored or lead-authored work. (Collaboratively written papers will be accompanied by a statement of contributions signed by all authors.)

The students are encouraged to report on projects conducted with at least two different faculty members. Advancement to candidacy is on the basis of an oral defense of the research portfolio, normally in the Spring of the third year. The advancement committee is formed in accordance with UCI campus regulations.

Doctoral Dissertation

Students are required to complete a doctoral dissertation in accordance with Academic Senate regulations. In addition, they must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. The dissertation must be approved unanimously by the committee.

Final Examination

The dissertation defense committee is formed in accordance to UCI Senate regulations. This committee must approve the following for the student to pass the final examination:

Dissertation topic: The student must present a substantial written document representing the student's dissertation plan. This document must include the proposed dissertation abstract, a dissertation outline, a comprehensive survey of related work, and a detailed plan for completing the work. The student must present this dissertation plan to the dissertation committee, who must unanimously approve the student's proposal.

Dissertation document: The student must prepare the written dissertation in accordance with Academic Senate regulations and present this document to the committee with enough advance notice for appropriate review and critique prior to an oral defense. Following an oral defense of this document, any changes required must be approved by the entire committee.

Oral defense: The student must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. To ensure the public has an opportunity to participate in this examination, the student must announce the defense title, date, and time at least two weeks prior to the event to all faculty and doctoral students in the department.

Normative Time from Matriculation to Degree

Students making normal progress are expected to complete their coursework and produce 2-3 research papers of publishable quality in three years. The dissertation proposal is expected midway through the fourth year, with completion in the fifth.

GRADUATE PROGRAMS IN INFORMATION AND COMPUTER SCIENCE

The Bren School of ICS offers M.S. and Ph.D. degrees in Computer Science, Networked Systems, Software Engineering, and Statistics; a MS degree in Information and Computer Science; and a PhD degree in Informatics.

Information and Computer Science M.S. students must complete one of the following concentrations: Embedded Systems or Informatics (INF).

See page 358 for additional information about the graduate program in Computer Science. See page xxx for additional information about the graduate programs in Informatics and Software Engineering. See page 371 for additional information about the graduate program in Statistics. The degree program in Networked Systems is supervised by an interdepartmental faculty group from the Department of Computer Science in the Bren School and the Department of Electrical Engineering and Computer Science in The Henry Samueli School of Engineering. Information is available on page 382 in the Interdisciplinary Studies section of the *Catalogue*.

ADMISSION

Applicants will be evaluated on the basis of their prior academic record. Applicants for the M.S. degree are expected to have a bachelor's degree in computer science or a related field. Those who do not have an undergraduate degree in computer science may take the Computer Science Subject GRE test to demonstrate sufficient background in the field. Scores are reviewed on a case-by-case basis.

Applicants are expected to have (1) skills in computer programming at least equivalent to those obtained in college-level courses in programming and language development; (2) skills in mathematics equivalent to those obtained in complete college-level courses in logic and set theory, analysis, linear algebra and modern algebra, or probability and statistics; (3) data structures, analysis of algorithms, automata theory, or formal languages; and (4) computer architectures.

All applicants are evaluated on the materials submitted: letters of recommendation, official GRE test scores, official college transcripts, and personal statement. For more information, contact the ICS graduate counselor at (949) 824-5156 or send e-mail to gcounsel@ics.uci.edu.

Course Substitutions

A student who has taken relevant graduate courses at UCI or another university may petition to have a specific course certified as equivalent to one which satisfies Bren School of ICS requirements. The petition should describe the course and should be approved by either the student's advisor or the instructor teaching the class, and by the Associate Dean for Student Affairs. Only two courses can be substituted.

Master of Science Program

The Bren School offers M.S. degrees in Computer Science, Information and Computer Science, Networked Systems, Software Engineering, and Statistics.

Students pursuing the M.S. in Information and Computer Science must complete a concentration in Embedded Systems or Informatics (INF).

See page 358 for additional information about the graduate program in Computer Science. See page xxx for additional information about the graduate program in Software Engineering. See page 371 for additional information about the graduate program in Statistics. See page 382 in the Interdisciplinary Studies section for additional information about the Networked Systems program.

M.S. students may select one of two options, the thesis plan or the comprehensive examination plan, as described below. The normative time for completion of the M.S. degree is two years. All study must be completed within four calendar years from the date of admission.

Plan I: Thesis Plan. The thesis option is available for graduate students who may wish to continue on to a Ph.D. program or those who wish to concentrate on a specific problem. To qualify for this option, students must be in good academic standing with their Department. The student must enroll in at least two quarters of Thesis Supervision (CS 298 or Informatics 298) that will substitute for two required courses as specified under the concentration area or specialization of choice. All required courses must be completed with a grade of B or better, and the student must write a research or thesis project. A committee of three faculty members (voting members of the Academic Senate) will guide the student and give final approval of the thesis. The committee will consist of an advisor (faculty member from the student's department) who is willing to supervise the thesis project, and two other faculty members (one of which must be from the student's department) who are willing to serve on the committee as readers of the thesis. An oral presentation of the thesis to the committee will be required. Seminar courses that have an "S" suffix (e.g., 209S) do not count toward degree requirements.

Plan II: Comprehensive Examination Plan. The student completes the required units as specified under the concentration area. Each course must be completed with a grade of B or better. Seminar courses that have an "S" suffix (e.g., 209S) do not count toward degree requirements. The student must take a comprehensive examination given by ICS faculty. The examination covers the core requirements.

ICS CONCENTRATION IN EMBEDDED SYSTEMS—M.S.

The goal of this program is to prepare students for challenges in developing future embedded systems. These future systems will further integrate communications, multimedia, and advanced processors with complex embedded and real-time software for automotive, medical, telecommunications, and many other application domains. Furthermore, embedded systems are becoming parallel, deploying multiprocessor systems-on-a-chip and parallel application software. An in-depth knowledge of the underlying scientific and engineering principles is required to understand these advances and to contribute productively to development of such systems. This program helps students master embedded system fundamentals, advanced computer architecture and compilers, networking, security, embedded, parallel and distributed software, and computer graphics in a sequence of courses and labs. Students also complete a large embedded systems project and may choose to write a Master's thesis.

Required Courses

The following courses must be completed with a grade of B or better: all students must complete six courses from the following List A: Introduction to Embedded and Ubiquitous Systems (CS 244), Design Automation and Prototyping of Embedded Systems (CS 247), Computer Systems Architecture (CS 250A), Internet (CS 232), Network and Distributed Systems Security (CS 203), Parallel Computing (CS 242), Modern Microprocessors (CS 250B), Distributed Computer Systems (CS 230), High-Performance Architectures and Their Compilers (CS 243).

Six additional courses chosen in one of the following two ways: (1) for students pursuing the M.S. thesis option, two four-unit courses in Thesis Supervision (CS 298) plus four graduate courses taken from List A or the following List B; or (2) for all other students, six graduate courses taken from List A or the following List B: Advanced Compiler Construction (CS 241), Software for Embedded Systems (CS 245), Validation and Testing of Embedded Systems (CS 246), Introduction to Computer Design (CS 252), Advanced System Software (Engineering EECS 211), Visual Computing (CS 211A), Introduction to Ubiquitous Computing (CS 248A/Informatics 241), Software Engineering (Informatics 211), Advanced User Interface Architecture (Informatics 235), Wireless and Mobile Networking (CS 236), Data Compression (CS 267), Graph Algorithms (CS 265), Real-Time Computer Systems (Engineering EECS 223). M.S. students who do not have an undergraduate degree in Computer Science or equivalent must also take CS 260.

Comprehensive Examination or Thesis

Each student must either (1) pass a comprehensive examination administered by the Embedded Systems faculty; or (2) submit a thesis for approval by a three-person committee consisting of an advisor (who is an ICS Embedded Systems full-time faculty member) and two other full-time faculty members (one of which must be from ICS).

ICS CONCENTRATION IN INFORMATICS (INF)—M.S.

Informatics is the interdisciplinary study of the design, application, use, and impact of information technology. It goes beyond technical design to focus on the relationship between information system design and use in real-world settings. These investigations lead to new forms of system architecture, new approaches to system design and development, new means of information system implementation and deployment, and new models of interaction between technology and social, cultural, and organizational settings.

In the Donald Bren School of Information and Computer Sciences, Informatics is concerned with software architecture, software development, design and analysis, programming languages, ubiquitous computing, information retrieval and management, human-computer interaction, computer-supported cooperative work, and other topics that lie at the relationship between information technology design and use in social and organizational settings. Effective design requires an ability to analyze things from many different perspectives, including computer science, information science, organizational science, social science, and cognitive science. Relevant courses in those disciplines are therefore an integral part of the program and give this concentration a unique interdisciplinary flavor—which is imperative as the computing and information technology fields play such a pervasive role in our daily lives.

Students must complete the Survey courses, Informatics Core courses, Informatics Breadth courses, and a focus track in General Informatics, Interactive and Collaborative Technology, or Ubiquitous Computing. All courses must be passed with a grade of B or better.

Survey of Research and Research Methods: Research Methods in Informatics (Informatics 201) and two quarters of Seminar in Informatics (Informatics 209S). Students in the M.S. program may substitute for Informatics 201 one additional four unit Informatics course numbered 200–299.

Informatics Core Courses: three courses chosen from Software Engineering (Informatics 211), Human-Computer Interaction (Informatics 231 or Informatics 232), Introduction to Ubiquitous Computing (Informatics 241), Social Analysis of Computing (Informatics 261).

Informatics Breadth: two four-unit graduate courses in ICS, CS, or Statistics, outside of Informatics.

Students must choose a track and complete the required courses:

General Informatics Track (GEN)

Electives: six four-unit graduate courses approved by the student's advisor and the Department Chair, excluding 290s, 298s, and 299s.

Interactive and Collaborative Technology Track (ICT)

ICT electives (group 1): two courses chosen from Computerization, Work, and Organizations (Informatics 263), Theories of Computerization and Information Systems (Informatics 265), Qualitative Research Methods in Information Systems (Informatics 203), Quantitative Research Methods in Information Systems (Informatics 205 or Social Science 201A and 201B).

ICT electives (group 2): two courses chosen from Knowledge-Based User Interfaces (Informatics 233), Advanced User Interface Architectures (Informatics 235), Computer-Supported Cooperative Work (Informatics 251).

ICT Breadth: two four-unit graduate courses approved by the student's advisor, excluding 290s, 298s, and 299s. Students are encouraged, but not required, to take them outside of Informatics.

Ubiquitous Computing Track (UBICOMP)

Additional required courses: Ubiquitous Computing and Interaction (Informatics 242) and Introduction to Embedded and Ubiquitous Systems (Informatics 244).

UBICOMP Breadth: four four-unit graduate courses approved by the student's advisor excluding 290s, 298s, and 299s. Students are encouraged, but not required, to take them outside of Informatics.

Informatics PhD – Website Copy

The PhD in Informatics prepares students to apply a variety of technical and social approaches to understand fundamental human and digital experiences and to design transformative solutions to a variety of human, organizational, and social challenges. A fundamental focus of our research is a dual view of information technology -- as a technical object and as a cultural object. From a technical perspective, we are concerned with the design and analysis of advanced information technologies and digital media. But we understand these too as objects that embody social values, shape human experiences, and carry cultural meaning. Our interests lie in the relationship between these two aspects of interactive technology.

The PhD in Informatics incorporates four connected emphases: an empirical focus that emphasizes understanding of technology design and use in practice; a theoretical focus aimed at understanding contexts of information system use; a technological focus aimed at new capabilities and infrastructures; and a design focus that includes integrative and holistic consideration of technical and human considerations. Students in the PhD program engage with multiple stakeholders, including faculty and researchers in other disciplines, major corporations and entrepreneurial enterprises, governmental and non-governmental agencies, and volunteer organizations such as open source communities. Through our involvement with these organizations, our research connects to the world beyond the university.

Fall 2014 to Current Course Requirements

All Ph.D. students are expected to maintain a minimum GPA of 3.5 throughout the program. In addition, no grade lower than B is counted towards satisfying any course requirements.

Pre-Candidacy Course Requirements

Required Core Courses

INF 261: Social Analysis of Computing

INF 232: Research in Human Computer Interaction

INF 209S: Seminar in Informatics (twice, usually in first year)

Research Methods Core

INF 201: Research Methods

INF 203: Qualitative Methods

INF 205: Quantitative Methods

INF 207S: Doctoral Seminar on Research and Writing (twice, usually after first year)

Research Experience

INF 299 (Independent Study): Four quarters required pre-advancement, recommended at least two quarters per year in each of the first two years.

Electives in Informatics (6 Ph.D. level classes)

A set of six elective courses. The selection of courses should form a coherent educational plan to be approved by the student's faculty advisor and by the Informatics PhD program director. A written record of this plan and its approval must be filed with the PhD program director prior to advancement.

Although the courses may be chosen from any PhD level courses on campus, it is recommended that at least three be chosen from within the school of ICS.

Teaching Requirements

To enhance their education and experience in teaching, all students will be required to work as readers or TAs for at least two quarters. Additionally, before or during the first quarter in which they are working in this capacity, all students will enroll in ICS 398A, a two-unit seminar. Those students wishing to gain more instruction around their teaching may also enroll in ICS 398B, the advanced teaching seminar, which is also a two-unit seminar.

Field Examinations

There will be no formal field evaluations. However, each year, students will be evaluated individually and given written feedback about their progress (for first year students, this evaluation will take place before the end of Spring quarter; for continuing students, it will take place before the end of Fall quarter.) In preparation, students will write a statement about their progress and meet with their advisors who give some feedback and complete a form reporting their assessment of the student's progress. The program faculty as a whole will then meet to discuss all the students, with a letter written to the student summarizing the assessment and, if necessary, deadlines for specific activities to be finished or goals to be achieved. This evaluation letter will state either that the student is making good progress or has been given cautionary status. The students who have certain activities to finish will be reviewed again 6 months after this evaluation. A second cautionary review constitutes formal failure to make adequate progress within the program.

Qualifying Exams

At the end of the student's second year: The student develops an appropriate reading list to fit his/her areas of interest within Informatics, co-developed with the advisor. The student then writes a paper synthesizing this literature and noting the areas that are currently interesting and under-researched. The paper serves as the basis for an oral examination, generally in the Spring quarter of the second year.

At the end of the third year: The student will be evaluated by an assessment of a research portfolio. A portfolio should comprise three papers of publishable quality, as judged by the faculty. These papers might well be expansions or developments from term papers developed in class; the goal is to determine the student's capacity to produce research writing of publishable quality. Student may work on papers collaboratively, but the portfolio as a whole must demonstrate writing ability through single-authored or lead-authored work. (Collaboratively written papers will be accompanied by a statement of contributions signed by all authors.)

The students are encouraged to report on projects conducted with at least two different faculty members. Advancement to candidacy is on the basis of an oral defense of the research portfolio, normally in the Spring of the third year. The advancement committee is formed in accordance with UCI campus regulations.

Doctoral Dissertation

Students are required to complete a doctoral dissertation in accordance with Academic Senate regulations. In addition, they must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. The dissertation must be approved unanimously by the committee.

Final Examination

The dissertation defense committee is formed in accordance to UCI Senate regulations. This committee must approve the following for the student to pass the final examination:

Dissertation topic: The student must present a substantial written document representing the student's dissertation plan. This document must include the proposed dissertation abstract, a dissertation outline, a comprehensive survey of related work, and a detailed plan for completing the work. The student must present this dissertation plan to the dissertation committee, who must unanimously approve the student's proposal.

Dissertation document: The student must prepare the written dissertation in accordance with Academic Senate regulations and present this document to the committee with enough advance notice for appropriate review and critique prior to an oral defense. Following an oral defense of this document, any changes required must be approved by the entire committee.

Oral defense: The student must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. To ensure the public has an opportunity to participate in this examination, the student must announce the defense title, date, and time at least two weeks prior to the event to all faculty and doctoral students in the department.

Normative Time from Matriculation to Degree

Students making normal progress are expected to complete their coursework and produce 2-3 research papers of publishable quality in three years. The dissertation proposal is expected midway through the fourth year, with completion in the fifth.

Graduate Degree Program Summary

Date: 12/7/12

Degree Program: Informatics

Degree Objective: PhD

Degree (Diploma) Title: Doctor of Philosophy, Informatics

Degree Concentration: N/A

Degree Program Code: INF

Specialization or Emphasis: N/A

Academic Unit: Donald Bren School of Information & Computer Sciences

Date Authorized:

Last Updated:

Last Program Review:

Normative Time: Five years

Application Deadlines: Fall, December 15; applications not accepted for Winter/Spring

Admission Requirements:

Students applying to the program may have degrees in any field, though preference will generally be given to those with a technical or social science background.

Advising:

Key activities of the Ph.D. in Informatics are the responsibility of the Informatics faculty group. Informatics faculty teach the specialized courses required for Informatics Ph.D. students, organize special research seminars, and review the papers and examinations required in the Ph.D. program. They also play a special role in advising Informatics Ph.D. students about their individual programs of study and research.

Each year students will be evaluated individually and given written feedback about their progress (for first year students, this evaluation will take place before the end of Spring quarter; for continuing students, it will take place before the end of Fall quarter.) In preparation, students will write a statement about their progress and meet with their advisors who give some feedback and complete a form reporting their assessment of the student's progress. The program faculty as a whole will then meet to discuss all the students, with a letter written to the student summarizing the assessment and, if necessary, deadlines for specific activities to be finished or goals to be achieved. This evaluation letter will state either that the student is making good progress or has been given cautionary status. The students who have certain activities to finish will be reviewed again 6 months after this evaluation. A second cautionary review constitutes formal failure to make adequate progress within the program.

Residence Requirement: Six quarters

Language/Alternate Skills Requirement: None

Teaching Requirement: Two quarters

Coursework and Examination Requirements:

Pre-Candidacy Course Requirements

Students must complete three Informatics core courses, four research methods core courses, six electives and four quarters individual study courses.

1. Required Core Courses

INF 232 Research in Human-Centered Computing

INF 261 Social Analysis of Computing

INF 209S: Seminar in Informatics (twice, usually in first year)

2. Research Methods Core

INF 201: Research Methods

INF 203: Qualitative Methods

INF 205: Quantitative Methods

INF 207S: Doctoral Seminar on Research and Writing (twice, usually after first year)

3. Research Experience

INF 299 (Independent Study): Four quarters required pre-advancement, recommended at least two quarters per year in each of the first two years.

4. Electives in Informatics (6 PhD level classes)

A set of six elective courses. The selection of courses should form a coherent educational plan to be approved by the student's faculty advisor and by the Informatics PhD program director. A written record of this plan and its approval must be filed with the PhD program director prior to advancement. Although the courses may be chosen from any PhD level courses on campus, it is recommended that at least three be chosen from within the school of ICS.

All Ph.D. students are expected to maintain a minimum GPA of 3.5 throughout the program. Failure to maintain this minimum will result in a recommendation that the student be disqualified. In addition, no grade lower than B is counted toward satisfying any course requirements.

Advancement to Candidacy

At the end of the student's second year: The student develops an appropriate reading list to fit his/her areas of interest within Informatics, co-developed with the advisor. The student then writes a paper synthesizing this literature and noting the areas that are currently interesting and under-researched. The paper serves as the basis for an oral examination, generally in the Spring quarter of the second year.

At the end of the third year: The student will be evaluated by an assessment of a research portfolio. A portfolio should comprise three papers of publishable quality, as judged by the faculty. These papers might well be expansions or developments from term papers developed in class; the goal is to determine the student's capacity to produce research writing of publishable quality. Student may

work on papers collaboratively, but the portfolio as a whole must demonstrate writing ability through single-authored or lead-authored work. (Collaboratively written papers will be accompanied by a statement of contributions signed by all authors.)

The papers are encouraged to report on projects conducted with at least two different faculty members.

Advancement to candidacy is on the basis of an oral defense of the research portfolio, normally in the Spring of the third year. The advancement committee is formed in accordance with UCI campus regulations.

Required Courses, Elective Courses: See above

Dissertation Topic Defense

The student must present a substantial written document representing the student's dissertation plan. This document must include the proposed dissertation abstract, a dissertation outline, a comprehensive survey of related work, and a detailed plan for completing the work. The student must present this dissertation plan to the dissertation committee, who must unanimously approve the student proposal. The dissertation committee is formed in accordance to UCI Senate regulations.

Doctoral Dissertation and Final Examination

Students are required to complete a doctoral dissertation in accordance with Academic Senate regulations. In addition, they must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. The dissertation must be approved unanimously by the committee.

UNIVERSITY OF CALIFORNIA, IRVINE
UC IRVINE LIBRARIES

January 16, 2013

TO: Professors Judy Olson & Gillian Hayes
Department of Informatics, Bren School of ICS

FROM: Lorelei Tanji
University Librarian & AUL for Collections

RE: Library response to proposal for Ph.D. in Informatics

The UCI Libraries is committed to the ongoing support of the graduate and doctoral programs offered by the Bren School of ICS. This draft proposal for a doctoral program in Informatics appears to be a reconfiguration and replacement of the doctoral degree currently awarded by the School with a greater emphasis in Informatics.

At this time, the Research Librarian assigned to the School is confident that current and existing resources will meet the proposed program's needs and that sufficient holdings exist and the critical current literature is being acquired. However, as new research and instruction emphases are defined and additional library collection materials are needed--especially in the area of journal subscriptions and conference proceedings--we will have to carefully assess how the library will be able to add them under the current fiscal conditions.

The perceived interdisciplinary nature of this degree program will draw on information needs in Business, Administration, the Social and Behavioral Sciences and probably other fields, in which there is significant subject strength at UCI and within the UC. In the meantime, sufficient access is readily available via Inter-Library Loan and Document Supply to allow for needed access. We ask that faculty and graduate students keep the Research Librarian informed of information needs as they arise.

Please let me know if there is any additional information that is required.

Appendix C: Information formerly required by CPEC

- 1) Name of Program: Informatics
- 2) Campus: Irvine
- 3) Degree/Certificate: Ph.D.
- 4) CIP Classification (to be completed by UCOP)
- 5) Date to be started: Fall 2014
- 6) Modification of existing program: The program represents an evolution of the current Informatics track in the Information and Computer Science Ph.D. program of the School. This used to be one overarching program, but individual Ph.D. programs have been ‘carved out’ for a number of years now (Computer Science, Software Engineering). The creation of a separate Ph.D. program in Informatics represents the last step in dividing the overarching Ph.D. program into separate Ph.D. programs.
- 7) Purpose (academic or professional training) and distinction from other programs offered in California)?

This program is academic in nature and trains students to be academic or industrial researchers. This program is most similar to the UC Berkeley program in Information. Our program, however, sits in a school that also houses Computer Science, whereas the Berkeley school does not. Their program has grown from a professional Library Science program, and thus has more of a professional focus. Ours is has a more technological orientation, particularly in areas such as ubiquitous computing and HCI.

- 8) Type(s) of students to be served: Students may enter the program directly from a Bachelor’s program in a variety of disciplines or from MS, MFA, or MA programs, again in a variety of disciplines.
- 9) If program is not in current academic plan, reason for program now: This proposal has been in the 5-year academic plan for several years now.
- 10) The program does not require approval of a licensure board.
- 11) Special features of the program: In addition to traditional classroom-based graduate courses, students will also be required to participate in a research seminar, a writing seminar, and at least four quarters of directed research study.
- 12) No new courses are required.
- 13) Other required courses:

<u>Department</u>	<u>Course #</u>	<u>Title</u>	<u>Hours/Week</u>	<u>Lecture/Lab</u>
Informatics	201	Social Analysis of Computing	3	Lecture
Informatics	232	Research in HCI	3	Lecture
Informatics	209S	Seminar in Informatics	2	Lecture
Informatics	201	Research Methods	3	Lecture
Informatics	203	Qualitative Methods	3	Lecture
Informatics	205	Quantitative Methods	3	Lecture
Informatics	207S	Seminar on Research and Writing	2	Lab

- 14) UC Campuses and other California institutions, public or private, which now offer or plan to offer this program or closely related programs.

This program is most similar to the UC Berkeley program in Information. See Item 7 for differentiation.

- 15) Related programs offered by the proposing institution:

Prior to the formation in 2002 of separate departments of Informatics and Computer Science, ICS offered a single PhD program in Information and Computer Science. Since the development of separate departments and more varied curriculum, a Ph.D. in Computer Science and a Ph.D. in Software Engineering have been established. The Department of Informatics voted in 2010 to create, alongside the PhD in Software Engineering, a PhD program that would more precisely match the needs of the remaining doctoral students currently being served by the PhD program. This would achieve two ends. First, it would allow us more easily to target the pedagogical style and academic content of the program towards those students; and second, it would unite the administrative and enrollment units for the program. This program replaces three tracks (General, Interactive and Collaborative Technologies, and Ubiquitous Computing) within the current ICS Ph.D. concentration in Informatics.

Comparison with the Software Engineering degree: The two programs draw upon a very different audience, and therefore are rooted in a quite different set of courses. While courses pertaining to one program may sometimes be used as electives in the other program, no significant overlap exists. A particularly distinguishing feature of the Informatics program is that its courses regularly draw enrollments with aligned programs elsewhere on campus, including Visual Studies, Anthropology, Women's Studies, Studio Art, Planning Policy and Design, and Business; we expect this to continue and, as the program develops, will seek appropriate alignments through graduate emphases and similar mechanisms.

- 16) Summarize employment prospects for graduates of the proposed program

The Informatics Ph.D. has broad applicability to future careers, but best matches the Bureau of Labor Statistics job category of "Computer and Information Research Scientists," which the BLS predicts to grow by 19% by 2020 to over 250,000 jobs (see full proposal for citation and details)

- 17) Estimated enrollment for first 5 years and basis for estimate:

We anticipate enrolling between 10 and 15 students each year during the first five years. These numbers are based on enrollment in the three tracks within the current ICS Ph.D. program that this program will replace.

- 18) Additional cost of the program for 5 years:

No additional FTE Faculty, Library Acquisitions, Computing, Other Facilities, or Equipment will be needed beyond that already in plan to support the current ICS Ph.D. program.

19) How and by what agencies will the program be evaluated:

The program will be evaluated as part of the School of ICS's external review that currently occurs every seven years.

Additional Note: The Faculty voted at the end of 2012 on the proposal for a PhD in Informatics. The wording and results of that vote follow:

Faculty vote:

Are you in favor of the proposal for a PhD in Informatics that was included in the email from Gillian Hayes on 11/20/12.*

Eligible to Vote:

Professors/ Lecturers SOE 16

Associates 2

Assistants 4

Total 22

Yes:

Professors/ Lecturers SOE 12

Associate Professor 2

Assistant Professor 4

Total 18