Silicon Valley Program Proposal for Computational Media

Overview

The Computational Media department proposes to build on its success with the Games and Playable Media (GPM) masters program to create a cluster of related professional degrees in Silicon Valley, all in areas of human-centered computational media. Specifically, we propose an expansion to GPM as well as three new interdisciplinary professional masters programs: Serious Games (SG), Human-Computer Interaction (HCI), and Human Language Media and Models (HLMM). The Serious Games program focuses on the development and use of games in applications such as education, training, public policy, and crowdsourcing. The Human-Computer Interaction program focuses on the design and evaluation of interfaces and interface technologies for interactive systems. Finally, the Human Language Media and Models program focuses on formal modeling and applications of human language media and user interaction in such media, including automated analysis of computer-mediated communication such as found in social media.

These programs provide students with opportunities to obtain a professional specialization in exciting, high-demand areas in computational media. Each of these four tightly interrelated programs provides courses that students in the other programs can take as electives, as well as opportunities for project-based courses in which interdisciplinary project teams from across the degree programs work together. For example, students in the SG program can take courses on game design, level design, and game audio from the GPM program, and courses on user experience design from the HCI program. Students in the GPM program can take courses on games user research from the HCI program and serious game design from the SG program. Students in HLMM can work with SG students in the analysis of forums on learning community websites, while HCI and HLMM students can study and work together on the use of language in pervasive and ubiquitous computing. Taken together, these four degree programs create a coherent intellectual program whose sum far exceeds its parts, bringing our distinctive computational media "brand" into Silicon Valley.

Computational Media requires a fundamentally interdisciplinary approach to understanding computation as a communicative, expressive form. Our department has already demonstrated a commitment to interdisciplinarity at the campus level through our tight connections with the Arts Division around shared game curricula, and the strong participation of CM faculty in the DANM program. With our SV proposal, we continue this campus-level interdisciplinary effort. The HCI program is being organized in coordination with the Psychology Department within the Social Sciences Division, and will build on the strengths of both the approved cluster hire in HCI within Psychology and CM faculty, including our future hire of a faculty member in Interaction Design and Technology. The HLMM program is being organized in collaboration with the Linguistics Department within the Humanities Division, and will build on the strengths of current research collaborations across CM, Linguistics, and Psychology, as described and motivated in the proposed FIGH in Natural Language Processing in Social Media.

Each of these programs makes use of the same model: a ladder-rank faculty member to anchor the program, and staff funded by PDST who provide additional instruction and program support.[1] An anchor faculty member is crucial to maintain the intellectual quality of the program, to support a tight connection between the intellectual interests and strengths of the program and the home campus, and to provide a peer-level contact in the Valley for local collaborators. We have learned the importance of hiring an anchor faculty member through our experience with the GPM program. We did not have a faculty requisition to hire a ladder-rank faculty member, but to ensure the success of our program we sought someone with this level of quality and international reputation to serve as the Program Director. We were successful in hiring Brenda Romero to fill this role. Her directorship has been critical to the success of the program. But now, because she does have the international reputation and quality of a tenured faculty member, we find ourselves in an unstable retention situation, where other universities are expressing interest in hiring her as a faculty member, and she isn't in a commensurate position here.

In the rest of this overview we address the review criteria outlined in the call for SV programs.

Why Silicon Valley?

All four of these programs have close ties to industries and workforces in Silicon Valley. GPM has strong ties with the commercial games industry. SG connects to the growing interest in games applied to areas such as training, healthcare, and corporate workflows. High tech companies that are not in the games business are turning towards these applications of games in growing numbers, ranging from Accenture's gamification group, to Google's growing interest in data games, to the Institute for the Future's focus on games as a way to envision the future effects of policies and technologies. HCI is of rapidly increasing importance in the Valley, as many of the primary growth areas in the Valley — ranging from social media to mobile and wearable technologies, to new forms of context-aware search — all fundamentally involve the design and evaluation of new forms of computer interaction. Finally, HLMM is a fast-growing area. For companies such Apple and Google, focused on mobile and wearable technologies, language interaction is becoming a necessary (and perhaps soon to be dominant) form of interaction. Social media companies such as Facebook and Twitter are performing ever more sophisticated automated analyses of language-based human-to-human communication, and modifying the behavior of the underlying system to optimize the user experience.

How is this proposal complementary and synergistic with the main campus?

In the years since an undergraduate game degree started on this campus, we have grown into international leaders in game education and research, culminating in the creation of the Computational Media department. With this proposal, we both bolster our existing games professional masters program and expand our efforts to build visibility in computational media broadly. Both the SG and HLMM programs build on and consolidate our currently distributed efforts in these areas, while the HCI program builds on the existing strengths of faculty in Psychology and CM and the approved HCI cluster hire.

How does this proposal reflect our research and graduate mission and core values of the campus?

[1] We assume a PDST model throughout this proposal, because this is the model for the current GPM M.S. However, we also expect to investigate other potential models, such as that of self-supporting degree programs.

We have already provided an overview of how our proposal builds on our research and graduate mission. Our proposal reflects the core values of interdisciplinarity, diversity, positive societal impact and increased engagement with international students:

- Interdisciplinarity. Since its founding, UC Santa Cruz has been a radical innovator, forging fundamental new connections between disciplines. Our CM SV proposal continues in this tradition, forging deep intellectual connections between computing, the humanities and social sciences.
- Diversity. Women and ethnic minorities are grossly under-represented in traditional engineering disciplines. Curricular experience across multiple institutions has found that computing programs that deeply connect with other disciplines and put computing in the context of solving real-world problems attract significantly higher percentages of under-represented populations. Although the reasons are unclear, both HCI and HLMM attract significantly more female scientists than other sub-areas of computing. Our CM SV programs can serve as gateways to have more diverse populations participating in the construction of digital culture in SV.
- Positive societal impact. Pursued unreflectively and unwisely, games, interface design and human language technologies can be used to recapitulate negative cultural values, reinforce a culture of technological consumption, and enable large-scale automated surveillance. Our approach to these technologies includes an understanding of the ethical dimensions of technologies, and a focus on developing these technologies to increase human potential and enable positive societal transformation.
- International students. In an era of globalization, it is important for UC Santa Cruz to engage with more international students, in the context of our core values and interdisciplinary research approaches. Our CM SV programs will attract international students (we have demonstrated this with the GPM program), as our programs provide a gateway into exciting employment opportunities in SV.

What is the funding model and student target goal for these programs?

As stated above, all our programs use the model of an anchor faculty member, with instruction and program support likely funded by PDST. Our enrollment targets are as follows:

- GPM: 25-30 students a year, for 50-60 total in a two year program.
- SG: 20-25 students a year in the two year track, plus 10-15 in the accelerated one year track, for 50-65 total over the two tracks.
- HCI: 15-20 students a year in the two year track, plus 15-20 in the accelerated one year track, for 45-60 total over the two tracks.
- HLMM: 15-20 students a year in the two year track, plus 15-20 in the accelerated one year track, for 45-60 total over the two tracks.

What is the competitive edge for these programs?

All of our programs offer a unique competitive edge within SV. GPM is the only professional games masters in Northern California, and has already established itself as a top 10 in the country (we consider our peer institutions to be the masters programs at USC, NYU and CMU). There is currently only one SG masters program in the country, at Michigan State University. We have significantly greater visibility in games than MSU, and would be the only such program in California. Stanford hosts the only HCI masters program in the Bay Area, which is based in the Design School. We would offer the only technically-

focused HCI masters program in the Bay Area, and the only one that can take advantage of being part of a greater CM ecosystem of classes. Finally, our HLMM program would be a distinctive interdisciplinary program because of our strength in theoretical linguistics, and its focus on Human Language in interactive and social media, which is an area of large growth. It will be the only M.S. program with a one year track option focusing on natural language interaction in California.

As the UC that is closest to SV, our programs will attract students who can intern with SV high tech companies during their degrees. Students can gain experience through corporate internships and they can be confident that their degree can lead to opportunities in industry or academia. We have a strong track record of placing graduate students for summer internships in high tech labs at Google, CISCO, IBM, Microsoft and PARC, among others.

Games and Playable Media

We propose to redesign the existing Games and Playable Media MS to provide a deeper education for students, improve competitiveness for the program, and better accommodate the student body which is full time and majority international. The Games and Playable Media MS is focused on providing advanced capabilities to create entertainment games. The current degree program has an accelerated curriculum format that graduates students in one calendar year. It was designed to be attractive to working professionals in Silicon Valley who would leave their existing position, dramatically enhance their skills, and then return to the workforce, with only one year of lost income. To date, the program has not attracted any such students. Instead, the program has been attracting students who are appx 60% international. For both domestic and foreign students, they typically have not yet started working in the games industry. As a result, a core design assumption for the program is not correct.

Our GPM program has been successful. In fact, it is the first program to demonstrate the viability of Santa Cruz offering such programs in the Valley. From two years of running the program, however, we have learned the following drawbacks for a one year program in GPM:

- It is hard on students, creating significant burnout by the end of Spring quarter, and yet the curriculum requires them to keep working at full speed through Summer.
- The one year format is seen as a negative for prospective students, since it is perceived as not being as rigorous. One such student writes, “There are also a few rumors that a 1 Year Course is not viewed very favorably by the industry in the US or other countries — more so for international candidates like me.”
- The one year format limits the amount of game design instruction students can receive before they must begin their capstone game project, and hence these projects are not as strong as hoped.
- Internships are an important route into the games industry for students, and a one year program prevents students from having an internship experience before graduation.
- The accelerated format makes it nearly impossible for students to take regular classes at the main UCSC campus, and contributes to the lack of integration of these students in the overall UCSC game program.
- Finally, the one year format creates financial risk for the program, since one bad student recruiting year can have a significant adverse effect on program finances.

The redesigned curriculum will be a two academic year program, with no courses offered in the summer. The program will be designed for 25-30 students per year, for a steady state student body of 50-60 students. The curriculum will have a two-year Project Track as its core pillar. This involves background classes on game prototyping, game system architecture, and procedural world generation in the first year, with a three-quarter game project sequence in the second year. Students then choose one of three specialization tracks to add on to the Project core. These tracks are Game Design, Game Technology, and Level Design, each involving classes focused on these disciplines, with some classes shared among tracks. Several of these classes can also be taken by students in the Serious Games degree program, such as introductory classes on game design, level design, game audio, and game criticism. Thus, the expansion of GPM MS course offerings creates synergies and cost advantages among MS degree programs.

We anticipate continuing to use the PDST fee model, with reduced PDST fees per student as compared to the current GPM MS program. This is due to the high cost of the program as compared to peer programs--at one calendar year, the present program is approximately the same cost as comparison programs on a total program cost. For a two year program, continuation of the current fees would make the UCSC program significantly more expensive than peer programs, a problem exacerbated by non-resident tuition.[2]

From a staffing perspective, this proposal requires one ladder rank faculty FTE to act as the anchor faculty member for the program. As described in the Overview, we hired someone of ladder rank quality into a non-ladder rank position in order to ensure intellectual rigor and a real connection with our interests on the main campus. While this has contributed significantly to the success of our program, it has also lead to an unstable retention situation. The faculty FTE will also provide some teaching resource that doesn't have to be provided by PDST, providing required flexibility to reduce PDST fees. The program will also require a full time Lecturer, as well as 2-3 part-time Lecturers to teach specialized courses, such as Game Audio. The Lecturers will be funded from PDST fees.

Serious Games

The SG MS program focuses on providing advanced training in the design and construction of non-entertainment-focused games. Serious games is the term for a broad category of games and game-like experiences that encompass training games, educational games, citizen science games, persuasive games (games providing advocacy for a given issue), health games, game-based workplace systems, and game-based crowdsourcing. This program will have two tracks (a regular two academic year degree, and an accelerated one year degree for highly-qualified students) and be aimed at full time students, both local and international. For the regular program, the target students are 0-4 years from undergraduate degree, while the accelerated program seeks students with more experience (who may be taking time off from industry to complete the degree). We project 20-25 students a year in the two year track, plus 10-15 in the accelerated one year track, for 50-65 total over the two tracks.

There is a clear market demand for a graduate degree in SG. In the 2015 admission cycle for academic graduate programs at UCSC BSOE (not counting the GPM M.S. professional degree) 94 students (23

[2] However, as noted above, we also intend to explore having a fully fee supported program, as this offers some degrees of flexibility as compared to a PDST program.

Ph.D. and 71 MS) indicated Computer Games as their research interest (two thirds are international students). A growing number of non-game high-tech companies such as Intel, Google, and Accenture are creating groups devoted to SG. Further, educational institutions, K-college, are making increasing use of educational games as part of their curriculum. Healthcare providers are becoming increasingly interested in health games as a way to help people maintain healthy lifestyles and manage long-term health issues. Finally, the public and non-profit sectors are increasingly turning to games for communication, advocacy and policy envisionment exercises.[3]

The regular track curriculum will be coursework-focused in the first year, and project-focused in the second year. First year courses will include instruction on serious games analysis and criticism, educational theories and games, and the design of non-digital serious games. Shared courses with the GPM program will include game design, game criticism, and game prototyping. The second year sequence involves the creation of a substantial game project, as well as courses on portfolio development, games user research (from the HCI program), and electives that can be drawn from the other master's programs and selected main campus courses. The accelerated track is based primarily on the second year curriculum, because students will only be admitted to the accelerated track if they already have knowledge of most of the material in the first year curriculum.

As mentioned in the Overview, this program will be the first such program in California, and the second in the country. Given our international reputation in games research and education, this program will quickly become *the* program in which to study SG.

The economic model of this program will mirror that of the GPM MS, and our current assumption is that it will use PDST fees. PDST fees will primarily pay for instructional staff, student travel to the yearly Game Developer's Conference, and for special programs (speakers, workshops, min-conferences) offered to students.

From a staffing perspective, this program will require one ladder-rank FTE who is a noted expert in the area of Serious Games, someone with a profile like Kurt Squire or Constance Steinkuehler at University of Wisconsin, Madison. They founded the Games, Learning and Society initiative, are leaders in the area of education games, and Steinkuehler was the first White House "game czar" (title: Senior Policy Analyst for the White House Office of Science and Technology). The anchor faculty member is expected to provide academic leadership, teach in the program, and administer full and part-time lecturers (supported on PDST).

Human-Computer Interaction (HCI)

The HCI MS program focuses on providing advanced training in theories and practices for approaching a design problem of interactive media holistically, beyond usability and accessibility. This program will have two tracks (a regular two academic year degree, and an accelerated one year degree for highly-qualified students) and be aimed at full time students, both local and international. For the regular program, the target students are 0-4 years from undergraduate degree, while the accelerated program seeks students with more experience. They may include engineers, artists, humanists and social scientists

[3] Computational Media faculty frequently receive emails from partners interested in developing serious games, and seeking students with such backgrounds, needs we unfortunately don't currently have the resources to fulfill.

who already work in SV and would like to enhance their portfolio in HCI, interaction design, user experience, and related areas. We project 15-20 students a year in the two year track, plus 15-20 in the accelerated one year track, for 45-60 total over the two tracks.

There is a clear market demand for a graduate degree in HCI. In the 2015 admission cycle for graduate programs at UCSC BSOE, 134 students (29 PhD and 105 MS) indicated HCI as their research interest, and an additional 31 indicated Digital Media as their interest (two thirds are international students). HCI skills are in massive demand on the job market in high tech companies. In a 2014 TechRepublic's roundtable of IT executives and tech recruiters, HCI was mentioned as one of the top IT job skills[4].

In the accelerated program the curriculum will be coursework-focused in the first two quarters, and project-focused in the last quarter, possibly spilling into summer quarter. The instructional structure consists of 5 core courses, which include fundamentals of interaction design and human behaviors, user-centered research and evaluation, and ideation and prototyping studios. In the regular program students will have more time to engage with emphasis areas (described below), will have time for an internship, and will have a second project experience.

Two aspects differentiate the proposed HCI MS from the other HCI MS offered in SV (there is currently only Stanford University's HCI MS, managed by its Design school). One is the greater technical engagement of the UCSC degree. The other is two emphasis areas, which reflect UCSC core values and build on the research strengths of the faculty that spearhead this initiative: a Playful HCI track and an HCI for Wellbeing track. Both tracks aim for broader engagement with users and with issues of social good, and will be composed of electives from the GPM, HLMM and SG degrees as well as other courses at the UCSC main campuses that will be telecast over the network.

The economic model of this program will likely use PDST fees (though it too will explore the possibility of being completely fee funded). PDST fees will primarily pay for instructional staff, staff time to manage corporate internship placements, and student travel for those with accepted papers to premier conferences in HCI such as ACM CHI, UIST, CSCW, and for special programs (e.g., high profile speakers from industry, workshops, and mini-conferences) offered to students.

From a staffing perspective, this program will require one ladder rank faculty FTE to act as the anchor faculty member for the program, who is a high profile and well networked HCI expert, a person with a profile similar to Dr. Victoria Bellotti from PARC (a CHI Academy award recipient). This anchor faculty is expected to administer industry-sponsored projects, and manage industrial guest lecturers (expected to teach 1 course per year) and 2 full time lecturers (each expected to perform 4 courses worth of teaching each year and mentor students in industry-sponsored projects). These two lecturer positions will be funded by PDST fees.

Human Language Media and Models

The field of human language media and models (HLMM) develops theories and computational models of human language data in a range of media, i.e., language in social media such as online news groups, or

[4] http://www.techrepublic.com/article/top-it-job-skills-in-2014-big-data-mobile-cloud/

traditional media such as film. HLMM is by definition an interdisciplinary field, encompassing research on models of social and informal language in Linguistics or Anthropology, research on spontaneous human language production and comprehension in Psychology, and research on computational models of human-language media in Computational Media and other departments in BSOE. Both research on, and applications of, Human-Language Media have grown exponentially in the last twenty years, and include research and applications aimed at the huge amount of human-language media, e.g., online forum discussions, weblogs, tweets, and posts on Facebook.

Given the interdisciplinary nature of HLMM, training M.S. students must be addressed by a multidisciplinary collaborative approach that can attract graduate students with a broad spectrum of undergraduate education. The accelerated program will be a one academic year program aimed at full time students, both local and international, who have already finished a B.S. or a B.A. in a related disciplinary area. They may include engineers, linguists, or social scientists who already work in SV and would like to develop a concentration of skills in HLMM, language data analytics, conversational interfaces (e.g., SIRI), natural language processing, and related areas. Students in the regular track will have less complete preparation, and will use the first year of their program to develop a deeper background in preparation for the second year (when they will participate in the same curriculum as students on the accelerated track), and will have time for an internship experience. This program could easily attract 30 to 50 incoming students a year, between the two tracks. The most optimal configuration would be to have courses for this program available to the students on the main campus, similarly to the way that current courses in SV such as TM 245 are available now to M.S. and Ph.D. students on the main campus, and faculty associated with those programs move between SV and the main campus.

There is a clear market demand for a graduate degree in HLMM. In the 2015 admission cycle for graduate programs at UCSC BSOE, 99 students (24 PhD and 75 MS) indicated human language processing as a main research interest. HLMM skills are in massive demand on the SV job market: a search for jobs in Natural Language Processing on Feb 20th 2015 within 100 miles of the 95064 zip code returned 330 jobs: 65 of these jobs have a “research” job function. The NLDS group in BSOE currently consists of 11 Ph.D. students and 7 M.S. students under the supervision of a single faculty member. Half of the graduate students in Linguistics have gone into industry in the last 5 years, all of them had the advantage of taking CMPS/Ling/Psych 245 “Computational Models of Discourse and Dialogue.” We hope to build on this initial strong show of interest by our current graduate population in both Linguistics and BSOE to create a much stronger and more varied curriculum.

The curriculum will require 37 units, 7 five unit classes and a 2 unit M.S. project. The project will take place in the last quarter, although it is expected that student class projects in both the Fall and Winter will lay the important ground work that makes it possible to complete the M.S. in one year. The instructional structure for the accelerated track consists of 5 core courses, and two electives, which include fundamentals of processing language from the level of phonemes to large scale discourse structures, corpus-based and theoretical linguistics classes, and basic classes in data mining and data analytic techniques. The regular track will precede this with preparatory coursework and allow time for an internship.

The proposed HLMM MS differs from other ways of acquiring expertise in human language media and models in two ways: (1) the HLMM M.S. will draw on UCSC's strengths in interdisciplinary and novel programs and include coursework in linguistic theory as well as basic analytical and corpus linguistics techniques; and (2) the HLMM M.S. will benefit from its co-location with the SG and HCI M.S. degrees in SV to allow students to take classes in language based interaction for serious games, and in basic issues of human interface design for conversational interfaces; (3) there is no other program with a 1 year M.S. option offering this concentration in California.

The economic model of this program will likely use PDST fees (though it too will explore the possibility of being completely fee funded). PDST fees will primarily pay for instructional staff, staff time to manage corporate internship placements, and student travel for those with accepted papers to premier conferences in HLMM such as SIGDIAL, EMNLP, ACL, NAACL, ICIDS, IVA, and for special programs (e.g., high profile speakers from the industry, workshops, mini-conferences) offered to students.

From a staffing perspective, this program will require one ladder rank faculty FTE to act as the anchor faculty member for the program, who can connect with the interdisciplinary nature of the HLMM program and interact with the other program anchor faculty in SG and HCI, and contribute courses that can be part of the curricula of multiple programs. We imagine a relatively junior person with a profile similar to Dr. Reid Swanson, a recent postdoc in CM, or Oliver North, a recent Linguistics PhD. working as an analytical linguist at Google. This anchor faculty member is expected to administer industry-sponsored projects, as well as manage industrial guest lecturers (expected to teach 1 course per year) and 2 full time lecturers (each expected to perform 4 courses worth of teaching each year and mentor students in industry-sponsored projects). These two lecturer positions will be funded by PDST fees.

Staging Plan

Rather than require all the faculty FTE, student space, and startup funds simultaneously, we propose to stage the development and launch of these programs over several years. At the same time, it is important that not too much time pass between the launch of one program and the next — otherwise the planned synergies between programs won't be possible. We present a potential staging plan below.

Academic Year	**Activities**
2015–16	Convert Brenda Romero, current GPM Program Director, to regular FTE Submit GPM program revision to two years Search for Serious Games anchor faculty member
2016–17	Launch revised GPM MS Submit Serious Games program proposal Search for HCI anchor faculty member
2017–18	Launch Serious Games MS Submit HCI program proposal Search for HLMM anchor faculty member
2018–19	Launch HCI MS

	Submit HLMM program proposal
2019–20	Launch HLMM MS