EECS Strategic Plan with FTE priorities for 2009-10

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Introduction

Electrical Engineering & Computer Science at UC Merced currently includes Assistant Professors Stefano Carpin, Miguel Carreira-Perpinan, Alberto Cerpa, Marcelo Kallmann, Shawn Newsam, David Noelle, Songhwai Oh and Ming-Hsuan Yang. Additionally, Professor Steve Kang, currently serving as University Chancellor, is affiliated with the EECS group. The group currently has a total of 18 graduate students enrolled in the PhD program.

Since the campus opened in fall 2005, one student has graduated with an MS degree and two PhD students have advanced to candidacy. We expect several more students to advance to candidacy during the 2008-9 academic year and also expect to admit a number of graduate students to begin in fall 2009, mostly at the PhD level.

This document describes the strategic plan of the graduate program with emphasis in EECS. It lists the faculty hiring priorities in the context of the guidelines below.

Guidelines

All major universities in the world offer strong graduate programs in Electrical Engineering, Computer Science and related disciples. EECS graduate programs are particularly robust in the campuses of the UC system. Table 1 indicates the enrollment percentages that EECS graduate programs constitute as part of the Schools/Colleges of Engineering [2] and as part of the campuses overall [1]. In this table, EECS is taken to include graduate programs in Electrical Engineering, Electrical and Computer Engineering, Computer Engineering, Computer Science and Engineering, and Computer Science. EECS graduate enrollments range from 29.2% to 80.8% of engineering graduate enrollments and from 12.0% to 30.7% of campus-wide graduate enrollments in the UC system. The EECS emphasis area at UCM currently constitutes 10% of the campus-wide graduate enrollment, well below the UC average of 20%, and thus has significant potential for growth.

The goal of the EECS faculty is to achieve a first class graduate and research program through the following specific objectives:

1. **Strategic Domains:** The group has decided to pursue concentrations of researchers in specific emerging domains, rather than trying to cover all areas in EECS.

Table 1: Row 1: EECS graduate enrollment at UC campuses [2]; row 2: engineering graduate enrollment [2]; row 3: EECS graduate enrollment as a percentage of engineering graduate enrollment; row 4: campus graduate enrollment [1]; row 5: EECS graduate enrollment as a percentage of campus graduate enrollment.

	UCSB	**UCB**	**UCR**	**UCSC**	**UCD**	**UCSD**	**UCLA**
EECS enrollment	409	520	206	252	392	593	708
Engineering enrollment	674	1,780	308	312	1,124	1,213	1,388
EECS percentage	60.7%	29.2%	66.9%	80.8%	34.9%	48.9%	51.0%
Campus enrollment	2,981	10,317	2,214	1,444	7,017	3,952	11,548
EECS percentage	22.6%	17.3%	13.9%	21.6%	16.0%	30.7%	12.0%

2. **Innovative Curriculum:** The group plans to offer a novel and attractive graduate program by focusing on modern areas and leveraging unique opportunities for establishing strong interdisciplinary tracks in conjunction with Cognitive Science, Applied Math, Environmental Engineering and Mechanical Engineering.

3. **Covering Immediate FTE Needs:** In order to cover the minimum required undergraduate and graduate CSE/EECS course offerings for the 2010-11 academic year, the group would need to increase from the 10.5 currently hired and allocated faculty positions to approximately 14.5 faculty positions.

These guidelines are elaborated on in the following sections.

Strategic Domains

The group seeks to develop depth before breadth and is therefore pursuing concentrations of researchers in specific EECS domains, rather than trying to initially cover all sub-disciplines. The research interests of the current faculty include: image processing, computer vision, computer graphics, computational geometry, computer animation, robotics, artificial intelligence, computational cognitive neuroscience, machine learning, sensor networks, wireless communication and distributed systems.

These domains can be grouped roughly into three main focus areas: **Learning**, **Autonomy**, and **Systems**. These three areas are all interrelated to generic Intelligent Systems, and directly promote the association with other graduate groups, in particular Cognitive Science and Applied Math. Exciting research areas in Learning, Autonomy, and Systems include:

- Virtual Reality and Human Computer Interaction
- Autonomous Robotics
- Computer Games and Artificial Intelligence
- Tracking and Computer Vision

- Image Processing and Analysis
- Sensor and Actuator Networks
- Wireless Communication Networks
- Machine Learning

The group aims to recruit faculty with related and complementary research interests in these areas, in order to build a strong and focused program that can attract top graduate students, offer modern and compelling programs for both undergraduate and graduate students, successfully compete for funding, and achieve national and international recognition and visibility in research.

Innovative Curriculum

The group plans to offer novel and attractive undergraduate and graduate educational programs. Two main complementary actions are being taken in order to accomplish this.

First, the group would like to focus courses and research on modern applications (as listed in the previous section) that nurture creativity and the discovery of new applications of technology. This is a response to the observed lack of interest in Computer Science which has become incorrectly viewed as mere training in computer programming instead of a scientific discipline [3]. Second, the group is exploring the option of having interdisciplinary tracks in order to identify novel and attractive areas of emphasis. For instance, Professor Noelle is currently a member of and Professors Carpin, Carreira-Perpinan, Kallmann, and Newsam are currently affiliated members of the Cognitive Science graduate group; Professors Kallmann, Newsam and Cerpa are affiliated members of Applied Math graduate group; and Professors Carpin and Kallman are affiliated members of the Mechanical Engineering and Applied Mechanics group. It is expected that these cross-discipline efforts will naturally lead to emphasis areas within the EECS graduate program that could be complemented with courses or research from other graduate groups.

Covering Immediate FTE Needs

In order to cover the minimum required undergraduate and graduate course offerings for the 2010-11 academic year, the group will be required to grow from the 10.5 currently hired and allocated faculty positions to approximately 14.5 faculty positions. This request is based on the following:

- The current UCM enrollment is 2,700 students.
- The campus-wide student body growth is approximately 800 students net per year.
- The SoE comprises 20% of the student body (undergraduate and graduate).

- 33% of SoE students are enrolled in CSE (undergraduate) and EECS (graduate). EECS undergraduate and graduate programs constitute the following percentages of School/Colleges of Engineering at other UC campsus [2]: Berkeley–29.1%, San Diego–33.7%, Davis–34.3%, Los Angeles–43.6%, Riverside–50.4%, Santa Barbara–56.3%, and Santa Cruz–69.6%.

- The student-to-faculty ratio is 19.8.

Request for faculty positions

The faculty hiring priorities for the graduate group are currently driven by the goal to establish concentrations of researchers in select EECS domains. This goal correlates with the hiring strategy for the CSE undergraduate program as described in the School of Engineering strategic plan. In particular, the following four positions are requested by the EECS group with the first two positions CSE-11 and CSE-12 given high priority in order to fill important CSE areas needed to complement current teaching and research programs.

CSE-11: Security Senior Position. This position will target the following areas: security, ubiquitous computing, distributed sensing and monitoring, and similar areas. Considering the composition of the current EECS faculty, the requested rank is at the associate or full level. The space needs for the CSE-11 position is expected to be similar to that of the current EECS faculty: a modest level of dry lab space for several computer and/or experimental research workstations. The exact space needs will depend on the research area of the selected candidate.

CSE-12: Algorithms & Theory Senior or Junior Position. This position will target algorithms & theory. The EECS group currently lacks expertise in this area which is critical for the future of the program. While preference is for a senior candidate considering the composition of the current EECS faculty, we would be willing to hire an outstanding junior candidate. The space needs for CSE-12 are expected to be low due to the nature of the research; deskspace for graduate students is often sufficient for researchers in this area. This makes this an attractive area to target given the current space constraints on campus.

CSE-13: Embedded Systems Senior Position. This position will be instrumental to bridge possible research and teaching gaps between Electrical Engineering and Computer Science. Possible research topics include, but are not limited to, embedded systems, robotics hardware, sensor networks and the like. The space needs for the CSE-13 position are expected to be similar to that of the current EECS faculty working in systems related areas: a dry lab space for several computer and/or experimental research workstations, and workspace for assembling and testing devices. The exact space needs will depend on the research area of the selected candidate.

EE-2: Smart Devices Senior position. This position is needed to build the Electrical Engineering undergraduate major under planning. This new position will therefore

be instrumental not only to jump-start the undergraduate program in Electrical Engineering but also to strengthen the EECS graduate program under development. Considering the current situation in Electrical Engineering, i.e. one open search with broad scope, we feel the new search should be broad as well. If possible, the following research areas will be targeted: smart energy infrastructure; and novel computational paradigms and devices. The space needs for the EE-2 position are expected to be similar to that of the current EE-1 position; a dry lab space for several computer and/or experimental research workstations, and possibly workspace for assembling and testing devices. The exact space needs will depend on the research area of the selected candidate.

References

[1] UC Campus Websites.

[2] American Society for Engineering Education. http://www.asee.org/.

[3] Peter J. Denning and Andrew McGettrick. Recentering computer science. *Communications of the ACM*, 48(11):15–19, 2005.