

# MING HSIEH INSTITUTE

MING HSIEH DEPARTMENT OF ELECTRICAL ENGINEERING



## 2010 - 2011 ANNUAL REPORT

---

## TABLE OF CONTENTS

LETTER FROM THE MING HSIEH INSTITUTE DIRECTOR.....	3
MING HSIEH LEADERSHIP TEAM.....	4
FACULTY ADVISORY COUNCIL.....	5
EXECUTIVE SUMMARY.....	6
CROSS-CUTTING ACTIVITIES .....	8
BEYOND 2020 – DEVELOPING A USC VISION SEMINAR SERIES .....	9
ELECTRICAL ENGINEERING COMMUNICATION, NETWORKS & SYSTEMS RESEARCH SEMINAR .....	10
INTEGRATED SYSTEMS SEMINAR SERIES .....	12
PHOTONIC DEVICES AND SYSTEMS SEMINAR.....	13
THIRD ANNUAL SCHOOL OF INFORMATION THEORY.....	14
SECOND INTERNATIONAL CONFERENCE ON QUANTUM ERROR CORRECTION.....	15
EE-S & EE-P HOLIDAY PARTY.....	16
SIPI 40TH ANNIVERSARY SYMPOSIUM.....	17
VISITOR PROGRAM.....	18
EXPERIMENTAL MINI-CLUSTER TO SUPPORT VLSI AND ARCHITECTURE CLASSES.....	19
THE SMARTPHONE IN YOUR POCKET.....	20
THEMATIC RESEARCH ACTIVITIES.....	21
MHI ORGANIZED ACTIVITIES & SCHOLARS.....	22
RETREAT.....	23
RESEARCH FESTIVAL.....	25
FACULTY TIMELINE & ALUMNI DATABASE.....	30

## MESSAGE FROM THE MING HSIEH INSTITUTE DIRECTOR

On behalf of the Ming Hsieh Institute (MHI), my co-directors, Hossein Hashemi, Bhaskar Krishnamachari and I are pleased to welcome you to review our Annual Report for the fiscal year July 1, 2010 - June 30, 2011. It highlights the Institute's activities and accomplishments during its first year with a vision toward continued success and growth in the future.

The Ming Hsieh Institute in the Ming Hsieh Department of Electrical Engineering was launched in July 2010, after a generous endowment gift of \$35 million dollars from Mr. Ming Hsieh, an alumnus of the department. One of the main goals of the institute is to position the Electrical Engineering Department at the forefront in thought leadership in the world in the area of electrical engineering, and specifically in the development of intelligent technologies to empower mankind.

In addition, the Ming Hsieh Institute is dedicated to defining the future of Electrical Engineering in general through positive impact, creativity and invention. MHI is focusing on creating a vibrant intellectual environment at USC while bringing student and faculty researchers together to engage in the development of new ideas. In its first year, MHI brought students and faculty together through two major events, which we plan to host annually, a Department Retreat and a EE Research Festival. Along with these events MHI also sponsors other activities including cross-cutting and thematic ground breaking research activities and a MHI Scholars Program targeting the most outstanding doctoral students.

Specific MHI sponsored activities included seminar series, conferences, a visitor program and mini-grants, all which were requested for funding through proposals submitted by Electrical Engineering faculty members. These activities are aligned with the institute's goal to position Electrical Engineering in the forefront in thought leadership and offer additional opportunities to showcase Electrical Engineering at USC to the outside world. Further details of the institute's activities are provided in the next several pages.

To learn more about the Ming Hsieh Institute and its future events, please visit us at <http://mhi.usc.edu>.

We thank you for reviewing our first annual report and hope for your continued engagement and participation in the institute's activities. Your support is the cornerstone for the continuing success of the Ming Hsieh Institute.

Sincerely,



Shrikanth S. (Shri) Narayanan  
Andrew Viterbi Professor of Engineering;  
Professor of Electrical Engineering,  
Computer Science, Linguistics and Psychology



Mr. Ming Hsieh (BSEE '83, MSEE '84) whose vision and support made the Ming Hsieh Institute possible.

## Ming Hsieh Institute Leadership Team

### Director:



**Shrikanth S. (Shri) Narayanan**

Andrew Viterbi Professor of Engineering; Professor of Electrical Engineering, Computer Science, Linguistics and Psychology; Ph.D., UCLA, 1995. Signals and systems modeling with an interdisciplinary emphasis on speech, audio, language, multimodal and biomedical signal and information processing and applications. EEB 430, (213) 740-6432  
shri@sipi.usc.edu <http://sail.usc.edu/shri.php>

### Co-Directors:



**Hossein Hashemi**

Associate Professor; Ming Hsieh Faculty Fellow in Electrical Engineering; Ph.D., Caltech, 2003. High-speed and RF integrated circuits. PHE 616, (213) 740-3596 hosseinh@usc.edu  
<http://www-rcf.usc.edu/~hosseinh/>



**Bhaskar Krishnamachari**

Associate Professor, Ming Hsieh Faculty Fellow in Electrical Engineering; Ph.D., Cornell University, 2002. Design and analysis of next-generation wireless networks.  
RTH 410, (213) 821-2528 bkrishna@usc.edu  
<http://ceng.usc.edu/~bkrishna/>

### Business Officer:



**Danielle Hamra**

Ming Hsieh Institute Business Officer  
PHE 606  
(213) 740-2694  
hamra@usc.edu

**Faculty Advisory Council:**



**Murali Annavaram**

Assistant Professor Ph.D., University of Michigan, 2001. Computer architecture, 3D stacking, ubiquitous computing. EEB 232, (213) 740-3299 annavara@usc.edu



**P. Daniel (Dan) Dapkus**

W. M. Keck Professor of Engineering; Ph.D., U. of Illinois, Urbana-Champaign, 1970. Photonics, MOCVD & III-V materials vertical cavity surface emitting lasers, novel photonic devices. VHE 314, (213) 740-4414 dapkus@usc.edu



**Martin A. Gundersen**

Professor of Electrical Engineering, Physics and Astronomy; Ph.D., USC, 1972. Quantum electronics; pulsed power; applied plasma science. SSC 421, (213) 740-4396 mag@usc.edu



**Richard M. Leahy**

Professor; Ph.D., University of Newcastle, 1984. Biomedical signal and image processing methods for anatomical and functional imaging with applications in neuroimaging, oncology, and gene expression. EEB 400C, (213) 740-4659 leahy@siipi.usc.edu



**Urbashi Mitra**

Professor; Ph.D., Princeton University, 1994. Multi-user spread-spectrum systems, space-time coding, communication theory, wireless resource allocation, ultra wideband communications, sensor networks. EEB 540, (213) 740-4667 ubli@usc.edu



**Michelle Povinelli**

Assistant Professor, WiSE Jr. Gabilan Chair; Ph.D., Massachusetts Institute of Technology, 2004. Nanophotonics, photonic crystals, metamaterials, nano-optomechanics. PHE 614, (213) 740-8682 povinell@usc.edu <http://www.usc.edu/nanophotonics>



**Viktor K. Prasanna**

Charles Lee Powell Chair in Engineering, Professor; Ph.D., Penn State, 1983. Parallel and distributed systems, embedded systems, configurable architectures, high performance computing. EEB 200, (213) 740-4483 prasanna@usc.edu <http://pgroup.usc.edu>

## EXECUTIVE SUMMARY

The Ming Hsieh Institute's (MHI) first Annual Report provides information on the Institute's events, sponsored activities and accomplishments during the past fiscal year July 1, 2010 - June 30, 2011. One of the key goals of the Ming Hsieh Institute in its first year was to bring together the entire, large and richly diverse, Electrical Engineering (EE) department family. MHI achieved this by developing and hosting events that had significant student, faculty and alumni participation by sponsoring a variety of programs that align with the Institute's goal to position Electrical Engineering in the forefront in thought leadership.

Key activities sponsored by the Ming Hsieh Institute include ground-breaking, cross-cutting and thematic proposals that were submitted by faculty members to launch research and other academic endeavors that enhance the department in significant ways. Thematic proposals targeted providing venture funding to facilitate activities under well-defined themes to initiate research and academic programs that are strikingly innovative and forward-looking. Cross-cutting proposals aimed to support programmatic activities that broadly benefit EE faculty and students and build an energetic academic environment to increase the department's impact and visibility. The proposals were evaluated by the Faculty Advisory Council and/or the MHI leadership. The Ming Hsieh Institute provided sponsorship for 12 of the 15 submitted cross-cutting proposals that included several innovative seminar series, support of major conferences organized by EE faculty, a visitor program and several mini-grants. A total of five thematic proposals were submitted by faculty and the Ming Hsieh Institute provided sponsorship for one of these proposals titled "Large-Scale Software-Radio Testbed." Detailed information about each funded proposal is in the following pages.

Another flagship program that MHI was proud to initiate and sponsor is the MHI Ph.D. Scholar Program for recognizing and nurturing promising future academic and research leaders. Faculty advisors were asked to nominate outstanding Ph.D. students and a total of 13 nominees were submitted. Out of the 13 excellent nominees, 5 Ph.D. students from the EE department were named "2010-2011 Ming Hsieh Institute Ph.D. Scholars." This set of students was chosen carefully by a faculty committee on the basis of their research accomplishments, promise and desire for an academic career beyond the Ph.D. and to facilitate their career development and mentorship from department faculty. Our 2010-2011 Ph.D. Scholars served as leaders in Electrical Engineering and traveled to other universities and top laboratories to give talks and represent the department. We are very happy to showcase the talents of these outstanding students and are excited to continue this program in 2012 and in the long-term.

In addition to sponsored activities, MHI developed and sponsored the First Electrical Engineering Department Retreat and the EE Research Festival, which are planned to be hosted annually. The First EE Department Retreat was held on Saturday, March 26 – Sunday, March 27 at the Lake Arrowhead Resort and Spa with a total of 158 guests in attendance including 60 Ph.D. students and 36 faculty members (many with their families), 8 of which have been with USC for over 35 years. The objective of the retreat was to bring faculty and Ph.D. students together in a social environment both to receive updates regarding the department's research accomplishments across the board and to discuss and collaborate on defining the future of Electrical Engineering, at USC and beyond. We received positive feedback from students and faculty that signifies the success of the retreat and we plan to continue hosting it in future years and implement suggestions to improve the program and participation.

Another successful event was the First EE Research Festival, held on campus with 175 in attendance. The Research Festival was a day-long event that showcased Ph.D. student research through posters and oral presentations. 25 graduating Ph.D. students gave 10 minute long oral presentations and 85 Ph.D.

students gave poster presentations. Faculty judges deliberated and selected two presentation winners and four best posters that were announced at an awards ceremony where students were acknowledged and some awarded for their outstanding work. Attendees included members of the USC Viterbi Community including Dean Yannis Yortsos, local alumni and industry representatives. A reception was held prior to the awards ceremony, which gave students, faculty, alumni, and industry representatives an opportunity to network in a social setting. The Research Festival was concluded with a panel session titled the *Birth of Aerospace in Southern California: a conversation about Engineering, History & Art*. The main focus of the Research Festival was to showcase the outstanding research conducted by our Ph.D. students, which possibly will lead to future opportunities and relationships with fellow Electrical Engineering members. MHI plans to continue hosting a Research Festival annually in the spring semester, and our goal for next year is to increase alumni and industry participation to give students more future opportunities.

Additionally, the Ming Hsieh Institute has been gathering historical department content and using the data for numerous projects. Some of these projects include the construction of faculty history timeline and an alumni database with profile details. With the help of Electrical Engineering faculty members, MHI compiled information on all past and present EE faculty members and their Ph.D. student's academic career information. Using faculty data, MHI created an EE Faculty History Timeline that included tenured and tenure-track faculty with "primary" EE appointment who have been with the department for over three years. This design includes faculty photos with a data graph showing the timeframe they were appointed in EE, years faculty members served as department chairs, and facts about the department. The Faculty Timeline was showcased at the Retreat and Research Festival, which helped influence faculty members to respond and provide valuable historical information which was also documented. Using alumni information provided by faculty, MHI created an alumni database and used this information to document details of tenured and tenure-track Faculty who currently hold a faculty position at a university. Both projects not only offered an opportunity to engage the EE department but also to help showcase their outstanding and enduring accomplishments.

These efforts demonstrate how the Ming Hsieh Institute has begun to realize its commitment by advancing its goals and plans in supporting and enhancing the Viterbi School of Engineering's Ming Hsieh Department of Electrical Engineering. Activities for the 2011-2012 fiscal year are underway. We hope this annual report encourages faculty members to initiate innovative and important projects and events, and all our key stakeholders to continue their strong engagement with, and support of, the USC Ming Hsieh Department of Electrical Engineering. We request you to continue to visit our website [mhi.usc.edu](http://mhi.usc.edu) for upcoming events and sponsored activities.

#### FINANCIAL SUMMARY (2010-11)

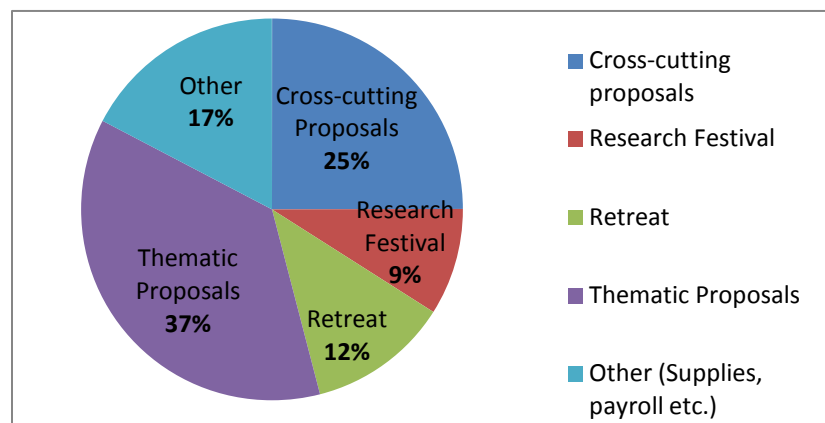
Thematic Proposals: 37%

Cross-cutting Proposals: 25%

Supplies, payroll etc: 17%

Retreat: 12%

Research Festival: 9%

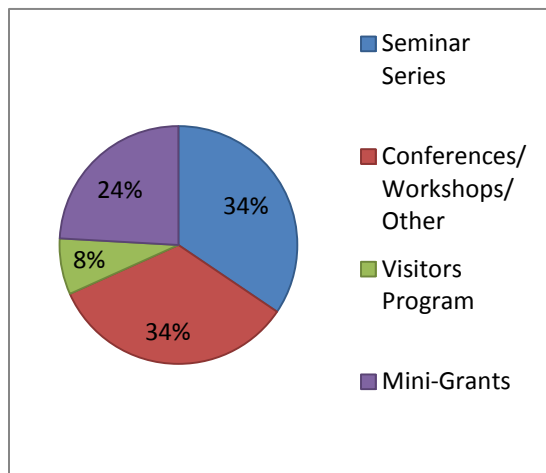




## 1. CROSS-CUTTING ACTIVITIES

In September 2010, the Ming Hsieh Institute requested cross-cutting proposals to be submitted from faculty within the USC Ming Hsieh Department of Electrical Engineering for a number of activities and programs that seek to enhance the intellectual and social life of the department. All tenured and tenure-track faculty with primary appointment in the Ming Hsieh Department of Electrical Engineering at USC were eligible to submit applications for the below activities. Each faculty member was eligible to participate in multiple proposals. There was no limit on the number of Principal Investigators (PI) per proposal. USC faculty members outside of the EE Department were able to serve as Co-PIs, but not submit the proposal. A total of 15 cross-cutting proposals were submitted by faculty in 2010-2011. The Ming Hsieh Institute provided sponsorship for 12, not including the MHI Scholars Program. These activities (*listed below*) were sponsored to benefit faculty and students in the Ming Hsieh Department of Electrical Engineering, with the objective to attract and retain the best talents, build an energetic academic environment, and increase visibility. Below are the approved sponsored cross-cutting activities and further details of each activity is provided on the pages to follow.

**Workshop and Event Organization** –MHI provided support for events such as workshops, seminars, meetings, and panel sessions. Sponsored activities include:



### Seminar Series:

1. Beyond 2020 – Developing a USC Vision
2. Electrical Engineering Communication, Networks and Systems Research Seminar
3. Integrated Systems Seminar Series
4. Photonic Devices and Systems Seminar

### Conferences/Workshops/Other:

5. Third Annual School of Information Theory
6. Second International Conference on Quantum Error Correction
7. EE-S Holiday & End of the Year Reception
8. EE-EP Holiday Party
9. SIPI 40th Anniversary Symposium

**Visitors Program** - The Ming Hsieh Institute provided funds for faculty to host top researchers and practitioners from both academia and industry to visit USC for a few days or weeks. Travel funding was also available under this program for USC researchers to visit other academic and industry institutions but none were granted this year. Sponsored activities include:

10. Dr. Zhijian Tang of Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (TNO), Rijswijk, Netherlands hosted by Professor Urbashi Mitra

**Mini-Grants** - Support for miscellaneous events, projects, causes that will aid our faculty and students in ways that cannot be ordinarily supported through other sources. Sponsored activities include:

11. Experimental mini-cluster to support VLSI and architecture classes
12. The Smartphone In Your Pocket Refreshing the Hardware of EE579



### 1.1 BEYOND 2020 – DEVELOPING A USC VISION SEMINAR SERIES

**Organizer:** Sandeep Gupta

**Proposal received:** 11/15/2010

**Proposal approved:** 1/3/2011

**Duration of funding:** 1/1/2011-12/31/2011 (1 year)

#### **Summary:**

During summer, Dean Yortsos initiated a discussion to take stock of on-going research activities in EE Department relevant to the era beyond the “End of Moore’s Law”. This started several conversations and meetings, including one called by the Dean. Discussions before, during, and after that meeting have given rise to the following three-step plan to develop a complete inventory of on-going research in this area, and to develop and disseminate a clear and impactful USC vision for future research. As mentioned below, the process is structured in a manner that will improve interactions between faculty members across multiple departments as well as with doctoral students. The three-step process will also help formation of USClead teams to pursue large research initiatives and will strategically inform hiring decisions in many areas of EE. Finally, this process will initiate a substantial overhaul of a large part of our curriculum.

#### **A Faculty Seminar Series**

Gupta plans to invite members of Viterbi and College faculty who are interested in materials, devices, circuits, systems, and applications to a seminar series to share their vision of the landscape of their field beyond 2020. Each week, one or two faculty members will share their vision (each talking for 15-20 minutes). This will be followed by a discussion (approximately 30-40 minutes) that will end with an update of a working draft of key aspects of the collective USC vision for beyond 2020.

With the goal of developing a holistic vision, the seminar series will span materials and devices, circuits and design, system architectures, and applications. Research ideas that fall into any one of the above areas or cut across multiple areas will be covered. Other areas will be included as they emerge during the discussions. The seminar series will also include discussions of curriculum overhaul required to train students for careers in the era beyond 2020. Each speaker will describe specific challenges and opportunities expected to emerge in the next decade, such as those posed by slowdown of CMOS physical scaling, that motivate his/her research, share key thoughts and ideas, and outline anticipated impact by identifying the domain of impact and estimates of the level of impact. To expose doctoral students to the academic culture, we will invite them to these seminars and encourage them to participate in the discussions. To facilitate distillation and to enable updates at the end of each week’s discussion, the working draft of collective USC vision for beyond 2020 will be maintained in the form of bullet points. At the end of the first phase of this seminar series, these bullets will be expanded into a full-length report. MHI funding was requested to provide lunch for the Faculty Seminar Series attendees.

## **1.2 ELECTRICAL ENGINEERING COMMUNICATION, NETWORKS AND SYSTEMS RESEARCH SEMINAR**

**Organizer(s):** Alex Dimakis and Rahul Jain

**Proposal received:** 12/4/10

**Proposal approved:** 1/4/11

**Duration of funding:** 1/11 – 5/11 2011 Spring Semester

**Summary:** The Communications, Networks and Systems seminar has been running since Spring 2010. It has been sponsored by the Ming Hsieh Institute since Spring 2011. It is a weekly seminar that takes place every Wednesday, 2-3pm in EEB-248, and brings together faculty and students in communications, networks and controls (and sometimes signal processing and electro-physics as well) with common interests.

One of the goals has been to expose students in various areas to work in other areas, e.g., communications Ph.D. students know very little about research in controls, and vice-versa. Many faculty found this a very worthy goal, and encouraged us to make this into a research seminar course, in which Ph.D. students (particularly when in their first year) and some MS students, can enroll. The registered students are asked to submit seminar summaries. The seminars, though are open to all. They have usually been very well-attended over the course of the last one year. This seminar series ensure that first year Ph.D. students and the enrolled MS students get a good exposure to research, including research in other areas as well.

The funding from the Ming Hsieh Institute has enabled CommNetS to sustain this as a weekly seminar course with a fixed schedule. Earlier, it had been relying on visitors who happen to be in the LA area, or who can take care of their travel expenses themselves, to come give talks, in addition to local and internal speakers. However, the funds have now given flexibility of inviting and hosting high quality speakers from outside the LA are as well.

CommNetS seminars are very well attended and have targeted some very high quality speakers, that ordinarily would not be able to have in the seminar series since there are only four annual department colloquium talks, in addition to the Viterbi and Munushian keynote lectures.

To reiterate, the goal for this seminar series has been (i) to bring together faculty, postdocs and students in different areas/divisions but with common interests together, (ii) expose students to research in diverse areas, as well as to accomplished speakers, and (iii) to establish the CommNetS seminar series to be well known outside as well, like long running Net-DSP-Comm seminars at Berkeley, LIDS seminars at MIT, CSL seminars at Illinois and CSPL seminars at Michigan. We intend to continue running this seminar series, and hope to make it a permanent seminar series in the department.

**Website:** <http://csi.usc.edu/~dimakis/CommNetS/>

**Schedule:**

Date	Title	Speaker	Host
Jan. 12, 2:00pm. EEB 248	Utility Optimal Scheduling in Networks- Small Delay and No Underflow	Longbo Huang (USC)	Rahul Jain
Jan. 19, 2:00pm. EEB 248	Role of Feedback in Interference Networks	Changho Suh (UC Berkeley)	Alex Dimakis
Jan. 26, 2:00pm. EEB 248	Bringing network coding closer to practice	Christina Fragouli (EPFL)	Alex Dimakis
Jan. 27, 4:30pm. SAL 101	Sparse Approximations- Algorithms and Analysis	Anna Gilbert (Michigan)	Alex Dimakis
Feb. 2, 2:00pm. EEB 248	Recent results on discrete memoryless broadcast channels	Chandra Nair (CUHK)	Giuseppe Caire
Feb. 9, 2:00pm. EEB 248	Title	ITA	N/A
Feb. 16, 2:00pm. EEB 248	Delay and power-optimal control in multi-class queueing systems	Chih-ping Li (USC)	Rahul Jain
Feb. 23, 2:00pm. EEB 248	Channel coding, non asymptotic fundamental limits with and without feedback	Yury Polyanskiy (Princeton/MIT)	Urbashi Mitra
Mar. 2, 2:00pm. EEB 248	A Clean Slate Design of Wireless Ad Hoc Networks Using On Off Division Duplex	Dongning Guo (Northwestern)	Alex Dimakis
Mar. 9, 2:00pm. EEB 248	Robustness in High Dimensions -- Principal Component Analysis	Constantine Caramanis (UT Austin)	Alex Dimakis
Mar. 23, 2:00pm. EEB 248	Cooperative Information Exchange over Networks	Tom Courtade (UCLA)	Rahul Jain
Mar. 30, 2:00pm. EEB 248	Wavelets on Graphs - Theory and Applications	Antonio Ortega (USC)	Rahul Jain
Apr. 6, 2:00pm. EEB 248	A New Approach to Robustness and Flexibility in High-dimensions	Sujay Sanghavi (UT Austin)	Rahul Jain
Apr. 13, 2:00pm. EEB 248	Wireless Open-Access Research Program	Ashutosh Sabharwal (Rice)	Rahul Jain
Apr. 20, 2:00pm. EEB 248	Rethinking wireless networks with network coding - Overhead and stability challenges	Yalin Sagduyu (Intelligent Automation, Inc.)	Alex Dimakis
Apr. 27, 2:00pm. EEB 248	Content-Aware Caching and Traffic Management in Content Distribution Networks	Srinivas Shakkottai (Texas A&M)	Rahul Jain
Apr. 11, 2:00pm. EEB 248	Network Modulation-- Simultaneous Optimality in Multi-User Communication	Yuval Kochman (UC San Diego)	Giuseppe Caire
Apr. 25, 2:00pm. EEB 248	MDS Array Codes with Optimal Rebuilding	Zhiying Wang	Alex Dimakis
Apr. 26, 2:00pm. TBD	Efficient Code Constructions for Reliable Distributed Storage	P Vijay Kumar (IISc Bangalore)	Alex Dimakis
Apr. 8, 2:00pm. EEB 248	Multi-Channel Multi-Stage Spectrum Sensing- Link Layer Performance and Energy Consumption	Przemysław Pawełczak (UCLA)	Bhaskar Krishnamachari

### 1.3 INTEGRATED SYSTEMS SEMINAR SERIES

**Organizer:** Hossein Hashemi

**Proposal received:** 12/15/2010

**Proposal approved:** 1/3/11

**Duration of funding:** 1/11 – 5/11 2011 Spring Semester

**Summary:** Integrated Systems Seminar Series covers integrated systems, circuits, and devices with wide range of applications including communication, computation, networking, sensing, and imaging. Invited speakers, all prominent researchers in academia or industry, meet with faculty, Ph.D. students, post-doctoral scholars, and research associates within the Ming Hsieh Department of Electrical Engineering during their visit at USC. For spring 2011, Firooz Aflatouni, a 5th year Ph.D. student and one of the Ming Hsieh Scholars, served as the organizer and host of the integrated systems seminar series.

#### Schedule:

Date	Title	Speaker	Host
Jan. 28, 2:00pm. EEB 248	Ultra-Wideband Radio Frequency Signal Analysis using Spatial-Spectral Holography	Dr. Kris Merkel, S2 Corporation	Hossein Hashemi
Feb. 4, 2:00pm. EEB 248	CMOS ICs in Biotechnology	Prof. Arjang Hassibi, University of Texas – Austin	Hossein Hashemi
Feb. 11, 2:00pm. EEB 248	CMOS: Challenges and Opportunities	Dr. Alireza Shirvani, MediaTek	Hossein Hashemi
Mar. 25, 2:00pm. EEB 248	ADC-based Multi-GHz Wireline Transceivers	Dr. Afshin Momtaz, Broadcom Corporation	Hossein Hashemi
Apr. 1, 2:00pm. EEB 248	Digital Radio Concepts for SoC	Dr. Yorgos Palaskas, Intel	Hossein Hashemi
Apr. 8, 2:00pm. EEB 248	Analog Front End ICs for Electrochemical and Biomedical Sensors	Prof. Bertan Bakkaloglu, Arizona State University	Hossein Hashemi
Apr. 15, 2:00pm. EEB 248	Exploring the Limits of Power and Miniaturization in Chip Design for Wireless Sensors	Prof. Brian Otis, University of Washington	Hossein Hashemi
Apr. 22, 2:00pm. EEB 248	The Next Wave of Mixed-Signal Interface Electronics	Prof. Boris Murmann, Stanford University	Hossein Hashemi

#### 1.4 PHOTONIC DEVICES AND SYSTEMS SEMINAR

**Organizer:** Michelle Povinelli

**Proposal received:** 12/8/2010

**Proposal approved:** 1/3/2011

**Duration of funding:** 1/1/2011-12/31/2011 (1 year)

##### Summary:

The purposes of the seminar are to 1) expose our Ph.D. students to cutting-edge research from outside USC, 2) encourage interaction between USC faculty, staff, and students working in photonics, and 3) boost the visibility of the USC photonics effort on the national level, as visiting speakers have the chance to meet our faculty and tour our labs. In accordance with the goals of the Ming Hsieh Institute, the speakers are selected to encourage dialogue between researchers interested in devices and systems issues in photonics research. A fourth goal is to expose Ph.D. students to photonics-related career options in academia and industry.

For spring 2011, two local, university-based speakers were hosted. The target is to host approximately four university and two industry speakers per year. Due to the large number of faculty candidate talks in the spring semester, the majority of the seminars will be scheduled for the fall semester. This fall's speakers will be chosen according to their ability to place their research within a broader perspective and discuss future directions in the field. Ming Hsieh funding will be used to bring in high-profile speakers from outside the local area.

##### Schedule:

Date	Title	Speaker	Host
Feb. 10, 1:00pm. EEB 248	Photothermal Excitation for Ultrafast Micro and Nanofluid Systems and Biomedical Applications	Prof. Eric P. Y. Chiou, UCLA	Michelle Povinelli
Feb. 24, 1:00pm. SSL 150	Integrated optical sensors for portable biomedical sensing and imaging	Prof. Ofer Levi, University of Toronto	Michelle Povinelli

### 1.5 THIRD ANNUAL SCHOOL OF INFORMATION THEORY

**Organizer(s):** Aylin Yener and Gerhard Kramer

**Proposal received:** 7/2010

**Proposal approved:** 8/2/2010

**Duration of funding:** 8/5/2010 – 8/8/2010

#### Summary:

The 2010 North American School of Information Theory was held Thursday, August 5, to Sunday, August 8, 2010, at USC in Los Angeles. The school offered graduate students and postdoctoral researchers the opportunity to learn from leading experts in information theory through short courses and talks as well as the chance to present their own work. Lecturers included Emmanuel Candès, Andrea Goldsmith, Alon Orlitsky, Rüdiger Urbanke, Sergio Verdú, and Jack Wolf. Jack Wolf was the second Padovani Lecturer of the IEEE Information Theory Society and gave his lecture at the School. The Padovani Lecture is sponsored by a generous gift of Roberto Padovani. Thanks to the generous support from our sponsors including the USC Ming Hsieh Institute, we were able to accommodate a record number of 178 students.

**Website:** <http://www.itsoc.org/school2010>

8:30am	Breakfast & Registration	Breakfast	Breakfast	Breakfast
9:00am	<b>Padovani Lecture</b> <b>Jack Wolf</b> Can an Information Theorist Be Happy in a Center for Information Storage?	<b>Emmanuel Candès</b> Information Theory of Data Matrices: Recovery from Incomplete and Corrupted Entries	<b>Sergio Verdú</b> Reading Shannon	<b>Rüdiger Urbanke</b> Approaching Shannon
10:45am	<b>Padovani Lecture</b> <b>Jack Wolf</b> Can an Information Theorist Be Happy in a Center for Information Storage?	<b>Emmanuel Candès</b> Information Theory of Data Matrices: Recovery from Incomplete and Corrupted Entries	<b>Sergio Verdú</b> Reading Shannon	<b>Rüdiger Urbanke</b> Approaching Shannon
11:45am	Lunch	Lunch	Lunch	Lunch
1:00pm	<b>Andrea Goldsmith</b> Seeking Shannon Capacity of Wireless Channels and Networks	<b>Alon Orlitsky</b> Probability Estimation over Large Alphabets	Student Poster Presentations 3 (1:30-3:30)	Student Poster Presentations 5 (until 3:00)
2:30pm	<b>Andrea Goldsmith</b> Seeking Shannon Capacity of Wireless Channels and Networks	<b>Alon Orlitsky</b> Probability Estimation over Large Alphabets		
4:00pm	Student Poster Presentations 1	Student Poster Presentations 2	Student Poster 4	
6:45pm	Picnic	Dinner, Speaker & Organizer Dinner	Dinner	

## 1.6 SECOND INTERNATIONAL CONFERENCE ON QUANTUM ERROR CORRECTION

**Organizer (s):** Daniel Lidar and Todd Brun

**Proposal received:** 11/9/2010

**Proposal approved:** 12/2/2010

**Duration of funding:** 12/5/11 - 12/9/11

### Summary:

Quantum error correction of decoherence and faulty control operations forms the backbone of all of quantum information processing. In spite of remarkable progress on this front ever since the discovery of quantum error correcting codes more than a decade ago, there remain important open problems in both theory and applications to real physical systems. In short, a theory of quantum error correction that is at the same time comprehensive and realistically applicable has not yet been discovered. Therefore the subject remains a very active area of research with a continuing stream of progress and breakthroughs.

The Second International Conference on Quantum Error Correction, hosted by the USC Center for Quantum Information Science & Technology (CQIST), will bring together a wide group of experts to discuss all aspects of decoherence control and fault tolerance. The subject is at this point in time of a mostly theoretical nature, but the conference will include talks surveying the latest experimental progress, and will seek to promote an interaction between theoreticians and experimentalists.

Topics of interest include, in random order: fault tolerance and thresholds, pulse control methods (dynamical decoupling), hybrid methods, applications to cryptography, decoherence-free subspaces and noiseless subsystems, operator quantum error correction, advanced codes (convolutional codes, catalytic, entanglement assisted, ...), topological codes, fault tolerance in the cluster model, fault tolerance in linear optics QC, fault tolerance in condensed matter systems, unification of error correction paradigms, self-correcting systems, error correction/avoidance via energy gaps, error correction in adiabatic QC, composite pulses, continuous-time QEC, error correction for specific errors (e.g., spontaneous emission), etc.

MHI support will be used to subsidize the participation of students and to cover the expenses of invited speakers.

**Website:** <http://qserver.usc.edu/qec11/>



### **1.7 EE SYSTEMS HOLIDAY AND END OF THE YEAR RECEPTION**

**Organizer:** Alexander Sawchuk

**Proposal received:** 11/2010

**Proposal approved:** 12/1/2010

**Duration of funding:** 1 day event

**Summary:**

The EE Systems reception helped foster interaction among the faculty and staff of EE Systems and personnel from other administrative units within VSoE in an informal setting. The event was a large success with over 75 attendees. We thank the Ming Hsieh Institute for funding the refreshments and beverages.

On 12/14/2010, thanks to the MHI support, EE Systems held its first holiday celebration event in EEB 248 at 3pm.

### **1.8 EE ELECTROPHYSICS HOLIDAY PARTY**

**Organizer:** Hossein Hashemi

**Proposal received:** 11/2010

**Proposal approved:** 12/1/2010

**Duration of funding:** 1 day event

**Summary:**

The Ming Hsieh Department of Electrical Engineering Electro-Physics (EEEP) consists of 15 tenured or tenure-track (TTT) faculty members, about 10 staff members, several research and teaching faculty members, and a large number of Ph.D. students, research associates, and post-doctoral fellows. The EEEP faculty spans vastly different research topics including electronics, optics, nano-science and nano-technology, micro-electromechanical systems, electromagnetic, plasma, energy sciences, quantum engineering, power engineering, and bio-inspired and biomedical systems. EEEP faculty, graduate students, research associates, and various laboratories are spread over several buildings including PHE, SSC, VHE, RTH, BHE, and KAP. As such, regular interaction between EEEP family is limited.

On 12/15/2010, thanks to the MHI support, the EEEP family held its first holiday celebration event at the University Club. The event was attended by the majority of faculty, staff, and graduate students. Several mini-games helped the EEEP family to interact and get to know each other on a personal level. The feedback after the event was overwhelmingly positive, encouraging the department to continue holding this event on a regular basis.

### 1.9 SIPI 40TH ANNIVERSARY SYMPOSIUM

**Organizer:** C.-C. Jay Kuo

**Proposal received:** 5/10/2011

**Proposal approved:** 5/16/11

**Duration of funding:** 12/3/2012-12/6/2012

#### **Summary:**

The Signal and Image Processing Institute (SIPI) will celebrate its 40th anniversary in 2012. We plan to organize a one-day symposium on Dec. 2 (Sunday) as the main highlight of a sequence of celebration events. The guests of the symposium will include SIPI Founding Directors, Dr. William K. Pratt and Dr. Harry C. Andrews, former and current faculty, alumni and current Ph.D. students and friends to participate in this event. We expect the number of participants to be around 200.

There are three main objectives of this symposium.

- 1) **Visibility:** we would like to promote SIPI's outstanding research accomplishments over the last 40 years to the outside world and enhance SIPI's visibility.
- 2) **Networking:** we would like to build a network among past and current SIPI members, including faculty, alumni and current Ph.D. students.
- 3) **Planning:** we would like to use this opportunity as a technology forum for strategic planning and obtain inputs for the future growth of SIPI.

The symposium will consist of three parts:

- historical review
- current status
- future outlook

The symposium will be videotaped and some short clips will be uploaded to Youtube for sharing.

Description of how MHI support will be used in the symposium: The event will take place in the JW Marriot hotel in downtown LA. We need some deposit for room/facility reservation. The MHI support will be used for this purpose. Furthermore, the MHI support will be used to cover the travel and lodging expenses of a few key guests. The symposium will charge participating members a registration fee to cover the cost of the lunch and/or the dinner banquet.

### 1.10 VISITOR PROGRAM

**Organizer:** Urbashi Mitra

**Proposal received:** 1/5/11

**Proposal approved:** 1/28/11

**Duration of funding:** 10/1/2011-11/30/2011

#### **Summary:**

Dr. Zijian Tang, Research scientist of TNO Defence, Security and Safety , Rijswijk, the Netherlands has been approved to come to USC as a visiting professor for two months beginning on October 1, 2011.

The goals of the visit are the design of sea trial signals, to be followed by algorithm design, as part of a European project in which the University of Technology, Delft and the Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (Netherlands Organisation for Applied Scientific Research) aka TNO are involved. In summer 2011, we designed preliminary signals based on multi-scale Gabor transforms for transmission in a successful sea trial. We are waiting for the declassification of the mobile data and have begun preliminary analysis on the stationary data (stationary transmitter and receivers). The major challenge at the moment is designing high performance channel estimation which will enable us to test the efficacy of some of our newly proposed multi-scale, multi-lag channel equalizers. Dr. Tang and I are working with a visiting graduate student from the University of Padova (Nicolo Michelusi) on adapting his newly developed channel estimation methods for hybrid channels (with a diffuse and sparse component) to the underwater channels. Mr. Michelusi's Ph.D. advisor is Michele Zorzi and he is also part of the aforementioned European project. Based on a recent collaboration visit, Dr. Tang, Prof. Geert Leus of TUD and I have determined that carrier frequency offset (CFO) estimation will be critical for this project. This is a new and exciting research avenue that will likely draw upon CFO work that has previously been undertaken for MIMO systems, but for completely different channel models. We anticipate that both joint research proposals, conference papers and seminars will result from the visit.

**1.11 EXPERIMENTAL MINI-CLUSTER TO SUPPORT VLSI AND ARCHITECTURE CLASSES****Organizer:** Sandeep Gupta, Collaborators: Woojoo Lee, Doochul Shin**Proposal received:** 11/15/2010**Proposal approved:** 12/1/2010**Duration of funding:** 1 time funding for year-long experiment**Summary:**

Background: We had proposed to acquire, configure, and manage a mini-cluster, on an experimental basis. The objectives of our proposed experiments were: (i) to demonstrate that it is beneficial – in terms of providing students with upgraded tool versions, libraries, and technologies, and (ii) to study the feasibility of installation, troubleshooting, and upkeep of our own cluster using a combination of available resources, namely an external vendor for installation and occasional major repairs, a fraction of a departmental IT staff member's effort, and a designated TA for tools used in our classes.

Developments to date: Using approximately \$7,500 of the MHI funds, we have acquired an eight-node cluster. This cluster was successfully installed by an outside vendor under the guidance of Murali Annavaram and with significant help from two of his senior doctoral students. The cluster became available somewhere in the middle of Spring 2011. (Our new machine has been named Dhaulgiri.) Within a couple of weeks our Tools TA, Woojoo Lee, who is funded by the department, was able to successfully install all Cadence tools that we use in our VLSI Design classes, especially EE 577a. He was also able to install the associated utilities, libraries, and technology files. Since it was late in the semester, we did not make this cluster and tools available to the students enrolled in EE 577a. Instead, since ITS's Student Computing Facility (SCF) cluster (which now has only two main machines, aludra and nunki) had become extremely slow to the point where we were forced to assign to students in our 577a class a design assignment that was *eight times smaller than what we had assigned in Spring 2009*, we carried out extensive benchmarking on SCF and our new CEng mini-cluster. The benchmarking clearly demonstrated that the SCF machines are inadequate since our tasks take nine-times longer to complete on SCF compared to our \$7,500 CEng mini-cluster. We presented this data at Viterbi IT Advisory Council and shared the information with ITS staff and administrators who are in-charge of SCF. (The slides presented at the Viterbi IT Advisory Council are enclosed. Recall that the CEng mini-cluster is referred to as Dhaulgiri.) After over a year of discussions with ITS, which had produced no concrete results, the results of above mentioned benchmarking effort finally convinced ITS that they need to make serious changes to SCF. The series of meetings that will plan these changes should occur over the next few weeks. We are hopeful that the new and improved SCF will be in place by the end of September, by the time the new students in VLSI classes will get their first design assignments.

**Our ongoing plans for this cluster:** First, we will continue to use the CEng mini-cluster for VLSI classes to keep ITS on its toes with respect to SCF upgrades. In Fall 2011, we will provide a randomly selected subset of students in participating classes access to this cluster and tools. (They will retain their access to SCF machine like their other classmates but encouraged to use this cluster.) We will then continually survey all students enrolled in participating classes to assess the relative benefits of the mini cluster. We will also evaluate our ability to maintain this cluster. Second, we will use this cluster to install and try new versions of software and design libraries to ensure that they work and are stable before requesting ITS to install the new versions on SCF. This will minimize unpleasant surprises while allowing us to provide the latest versions of the tools to our students. Third, in August 2011, we will encourage all CEng faculty to use this mini-cluster for their classes for which it might be useful. This will also help us continue to evaluate our ability to maintain this cluster.

---

### **1.12 THE SMARTPHONE IN YOUR POCKET – REFRESHING THE HARDWARE OF EE579**

**Organizer:** Murali Annavaram

**Proposal received:** 11/24/2010

**Proposal approved:** 12/1/2010

**Duration of funding:** 1 time funding

**Summary:**

The goal of this MHI grant was to provide greater platform selection to the students of EE 579 (Wireless and Mobile Networks Design and Laboratory). Prior to receiving the grant, the students had access to ten Nokia N95 smart phones. By including iPhone and Android alternatives students would be able to select a platform that best met their application goal or matched their target user demographic. The MHI grant supported the purchase of seven Android Nexus One phones and eight iPhone 3GS phones. Students embraced these purchases enthusiastically; seven groups used Andorid Nexus One phones for applications varying from weLobby (a social networking application for lobbying congress) to a dating service. Five groups selected the iPhone alternative for their final project, creating applications such as Hungry Pig (a 2-d tile based game in which a pig tries to eat falling food, pig movement being controlled by tilting the phone) to an augmented reality application that used the camera to overlay directions to a destination.

## 2. THEMATIC RESEARCH ACTIVITIES

In September 2011, The Ming Hsieh Institute also requested thematic proposals to be submitted from EE faculty. Thematic proposals should facilitate research and scholarly activities under well-defined, finite-duration themes that are strikingly innovative and forward-looking within the general theme of empowering humankind with intelligent technologies. These will initiate research and scholarly directions that are strikingly innovative and forward-looking within the theme of empowering humankind with intelligent technologies. The Institute's activities will be coordinated with academic and research activities of the Ming Hsieh Department engaging as many of its faculty as possible. A total of five thematic proposals were submitted by faculty in 2010-2011. The Ming Hsieh Institute provided sponsorship for one of these proposals titled "Large-Scale Software-Radio Testbed".

### 2.1 LARGE-SCALE SOFTWARE-RADIO TESTBED

**Organizer(s):** K. Psounis, G. Caire, A. Molisch, M. Chen Collaborators: A. Dimakis, R. Govindan, H. Hashemi, R. Jain, B. Krishnamachari, J.Kuo, T. Levi, U. Mitra, A. Ortega

**Proposal received:** 4/24/2011

**Proposal approved:** 5/11/2011

**Duration of funding:** 5/15/2011 – 5/15/2012 (*after report of year 1 is submitted MHI will consider funding year 2*)

#### Summary:

Large-Scale Software-Radio Testbed aims to build the best software radio testbed in the world at USC. Two natural questions arise. First, why should one build the best software radio testbed today? The answer is that there is a tremendous demand in the world to increase wireless throughput, and the best way to achieve this is by bringing together people with diverse expertise, such as networking, communications, information theory and hardware design, into a software radio testbed where people can design, implement, and test fundamentally new wireless communication systems. Second, why should one build this at USC? The answer is that the Electrical Engineering department at USC has a particularly strong presence in all related research areas, but somehow it lacks a world-class facility where faculty can experiment, implement and showcase the innovative results of their research. Given that a large number of faculty have shown strong willingness to collaborate around this testbed, this is a great opportunity for the department as a whole. The testbed will be located at the Ultra Lab space at USC, and will consist of ten top of the line, fully programmable WARP software radios, coupled with another ten USRP software radios. Faculty from the EE department have already come up with four multidisciplinary projects that they plan to begin as soon as the testbed is funded and have committed to use Ph.D. students funded from other sources to perform the work. Two of those projects, namely, creating a distributed multiuser MIMO system from distinct base stations and demonstrating a massive multi-user MIMO system, are expected to yield important results within a year and the PIs plan to hold a live demonstration of those results on next year's MHI research festival. There are detailed timelines for all projects, specific milestones for the two projects that are expected to yield immediate results, information about the faculty and students that will be involved in each project, as well as specific plans to make the testbed self sustainable by seeking funding from external sources. While trained Ph.D. students are expected to manage the lab initially, the PIs will seek a very experienced post-doc to act as a lab manager. Finally, the PIs would like to stress that many more projects, not described in this document, are expected to start within a year or two after the testbed is operational, involving all PIs and all collaborators.

### 3. MHI ORGANIZED ACTIVITIES & PROJECTS

**3.1 MHI Scholars Program** – 5 top Ph.D. students from the EE department were named "2010-2011 Ming Hsieh Institute Scholars." This set of students were chosen carefully by a faculty committee on the basis of their research accomplishments, promise and desire for an academic career beyond the Ph.D. and to help them in their career development and mentorship from department faculty. They were awarded an annual stipend of \$2000, as well as funds for travel to other institutions to help expand their horizons and enable them to gain visibility and receive feedback on their work. MHI scholars showcased leadership in Electrical Engineering by traveling to other Universities to give talks and represent the department. Some of the MHI Ph.D. Scholars were offered faculty positions at other universities after visiting to give talks and networking with faculty members. They have also gained valuable experience by organizing and taking on leadership roles at Ming Hsieh Institute sponsored events such as the EE Research Festival and the Department Retreat.

For 2010-2011, nominations for the MHI Scholars Program were due on November 15 and were required to be submitted by the student's thesis advisor with a cover letter, CV of student, and two letters of reference. Of the 13 nominees received by the deadline, 5 top Ph.D. students from the EE department were named "2010-2011 Ming Hsieh Institute Scholars." We are very happy to showcase the talents of these outstanding students and are excited to continue this program in the future.

#### 2010-2011 Ming Hsieh Institute Ph.D. Scholars:



**Firooz Aflatouni**

Research Interest: RF inspired photonics and low power integrated RF and millimeter-wave systems in silicon-based processes. PHE 416, (213) 740-3058 aflatoun@usc.edu



**Prasanta Kumar Ghosh**

Research Interest: Understanding human speech communication with application to machine recognition of speech especially inspired by the speech production and perception link. EEB405, (213) 821-2433 prasantg@usc.edu



**Samir Sharma**

Research Interests: signal processing with a focus in inverse ill-posed imaging problem; currently exploring the application of compressed sensing and parallel imaging for accelerated water-fat MRI.

EEB 414, (213) 740-4650 sdsharma@usc.edu



**Chuan Wang**

Research Interests: Carbon nanotube nanoelectronics and macroelectronics. RTH B118, (213) 821-4208 chuanwan@usc.edu



**Omer Faruk Yilmaz**

Research interests: Advanced optical signal processing for reconfigurable fiber optical networks with emphasis on coherent detection.

EEB 533, (213) 740-0024 oyilmaz@usc.edu



### 3.2 DEPARTMENT RETREAT



On Saturday, March 26 – Sunday, March 27 MHI hosted the First Electrical Engineering Retreat at the Lake Arrowhead Resort and Spa. All faculty, Ph.D. students, post-doctoral scholars, and research associates in the Ming Hsieh Department of Electrical Engineering were invited with their families to attend the two day retreat. MHI heavily subsidized the cost for the participation of all department members but charged a small fee for attendees and their families.

- Faculty at USC for 35+ years – complimentary
- Faculty - \$50
- Ph.D. students - \$20
- Family (includes above fee)- \$200

There were a total of 158 guests in attendance including 60 Ph.D. students and 36 faculty members, 8 of which have been with USC for over 35 years. Event organizer and MHI co-director Hossein Hashemi lead all the panel sessions and was the moderator for the weekend. The retreat pamphlet is provided on the next page which includes the following event itinerary:

- Structured Brainstorming Session on “Current and Future Roles of Electrical Engineering in Human Health and Wellbeing” moderated by Prof. Leahy. Organizing Faculty: Profs. Molisch, Narayanan, Povinelli
- Structured Brainstorming Session on “Computing Beyond Moore’s Law” moderated by Prof. Gupta. Organizing Faculty: Profs. Annavaram, Hashemi, Levi, Pinkston, Zhou
- Structured Brainstorming Session on “Creating an Intelligent Networked World” moderated by Prof. Caire. Organizing Faculty: Profs. Brun, Dimakis, Jain, Krishnamachari, Mitra, Psounis, Scholtz, Willner
- Social networking & family time
- Banquet Dinner featuring the Keynote Talk by Dr. Robert Lucky  
*The Joys and Disappointments of Engineering*



- Musical ensemble by USC faculty and Ph.D. students
- Status report by the EE department chairs - Eun Sok Kim and Alexander A. Sawchuk
- Illustrious Past 5 Decades Roundtable discussion on "Past 4 Decades of Electrical Engineering at USC" by Profs. Breuer, Cheng, Golomb, Hellwarth, Lindsey, Mendel, Sawchuk, Scholtz, Steier
- Roundtable discussion on "Crystal Ball: USC Electrical Engineering Beyond 2020" by Profs. Brun, Krishnamachari, Narayanan, Ortega, Psounis, Zhou

**GUEST SERVICES**  
High-speed wireless internet access throughout the entire Resort including all guest rooms and outdoor pool area.  
When smoking throughout the Resort including guest room balconies, outdoor pool area, Lawn and Lakeside Terrace. Smoking is permitted outdoors in the parking lot and on the pathways along Lake Arrowhead.

**SMS OF THE PINES**  
Phone (909)744-3000 to schedule any services.  
\*Sms of the Pines, a full-service luxury spa with nine treatment rooms, plus VIP Couples Journey Suite, retail boutique, fitness studio complete with the latest cardiovascular equipment, exercise studio for yoga, aerobics, and Pilates, beauty salon for hair and nails, three private lounges with an outdoor patio overlooking Lake Arrowhead, and two complete locker rooms each with steam room and experience shower.

\*Daily use of fitness facility is complimentary to all guests (18 and older) and includes aerobic and yoga classes (daily schedule available at front desk), private locker room, Jacuzzi and steam room.



Resort locations reserved for EE Retreat - Acorn, Ballroom, Foyer, Lakeside Terrace and Stars (luggage room). Hotel staff has a copy of the Retreat agenda and can assist with directions at anytime.

**Lake Arrowhead Resort & Spa**  
Address: 27984 Hwy 189  
Lake Arrowhead, CA 92352  
Phone: 909-336-1511 | Fax: 909-744-3088

Ming Hsieh Institute  
Department of Electrical Engineering  
Viterbi School of Engineering  
PHE 606  
3737 Watt Way  
Los Angeles, CA 90089-0271  
213-740-2694  
mhi.usc.edu

Ming Hsieh Institute Leadership Team  
Shri Narayanan, Director  
Hossein Hashemi, Co-Director  
Bhaskar Krishnamachari, Co-Director  
Danielle Hamra, Business Officer

2011 Ph.D. Scholars  
Firooz Aflatouni  
Prasanta Kumar Ghosh  
Samir Sharma  
Chuan Wang  
Omer Faruk Yilmaz

**The Ming Hsieh Institute Vision**  
To shape the future of the field of Electrical Engineering, enhancing its positive impact on all spheres of human endeavor, with emphasis on empowerment through intelligent technologies.

To foster creativity and invention within all facets of USC's Ming Hsieh Department of Electrical Engineering including research and education.

To create a vibrant intellectual environment at USC where world-class researchers in Electrical Engineering and related fields engage in the development of new ideas, thus positioning the Ming Hsieh Department at the forefront in thought leadership in the world.



**Ming Hsieh Department of Electrical Engineering Retreat**  
sponsored by the Ming Hsieh Institute  
March 26 - 27, 2011  
Lake Arrowhead Resort & Spa

SATURDAY, 3/26/2011 Suggested Activities for families (if you choose NOT to attend sessions)	SATURDAY, 3/26/2011 AGENDA	SUNDAY, 3/27/2011 AGENDA
1:00pm Meet at MHI information desk (an MHI representative will be at this desk at all times to answer any questions). A guide will walk guests to the Lake Arrowhead Village (2 blocks)	11:30am Buffet lunch - Ballroom Foyer (seating provided in Acorn Room)	8:00am Buffet breakfast - Lakeside Terrace Room (will be served until 10am)
1:30pm Arrowhead Queen Boat Tour - \$16 per person, \$10 per person if a group of 15 or more attend (children under 3 are free). Experience the beauty and excitement of a narrated tour of Lake Arrowhead aboard the elegant Arrowhead Queen. The splendor and serenity of Lake Arrowhead's lush forest, sparkling water and blue skies glide by as you sit back and enjoy close-up views of exquisite lakefront homes and learn about the fascinating history of the lake on a 50 minute boat tour of the lake. P: 909-336-6992	1:00pm Welcome by the MHI leadership, status report of MHI sponsored activities, and introduction to the program	9:00am Social networking & family time
3:00pm Lake Arrowhead Village (boutiques, outlets, children playgrounds, art galleries) The village is very close to the resort so guests can spend time there at their leisure and walk back to the hotel at their preference, the hotel offers many amenities as well (details on back).	1:30pm Structured Brainstorming Session on "Current and Future Roles of Electrical Engineering in Human Health and Wellbeing" moderated by Prof. Leahy, Organizing Faculty: Profs. Molisch, Narayanan, Povinelli	Ballroom Group activities will be organized but are not mandatory
	2:30pm Coffee break - back of the Ballroom	11:30am LAKESIDE WALKING TOUR Meet in lobby at 9:45am, a hotel guide provides guests a 1 1/2 hour walk along the shores of Lake Arrowhead using the private Lake Arrowhead Association's walking path. Weather permitting, in case of bad weather activities will be indoors - Ballroom
	3:00pm Structured Brainstorming Session on "Computing Beyond Moore's Law" moderated by Prof. Gupta, Organizing Faculty: Profs. Annamalai, Hashemi, Levi, Pinkston, Zhou	11:30pm Hotel check-out Bring luggage to Stars Room (room will be secured)
	4:00pm Coffee break & hotel check-in for remaining guests and Ph.D. students (hotel lobby)	12:30pm Buffet lunch - Lakeside Terrace Room
	4:30pm Structured Brainstorming Session on "Creating an Intelligent Networked World" moderated by Prof. Caire, Organizing Faculty: Profs. Brun, Dimakis, Jain, Krishnamachari, Mitra, Psounis, Scholtz, Willner	1:30pm Welcome by the EE department chairs, department status report
	5:30pm Social networking & family time	2:00pm <b>Illustrious Past 5 Decades</b>
	7:30pm Banquet Dinner featuring the Keynote Talk by Dr. Robert Lucky, <i>The Joys and Disappointments of Engineering</i>	2:30pm Roundtable discussion on "Past 4 Decades of Electrical Engineering at USC" by Profs. Breuer, Cheng, Golomb, Hellwarth, Lindsey, Mendel, Sawchuk, Scholtz, Steier
	9:30pm Musical ensemble by USC faculty and Ph.D. students	3:30pm Coffee break
	10:00pm Social networking & family time	4:00pm Roundtable discussion on "Crystal Ball: USC Electrical Engineering Beyond 2020" by Profs. Brun, Krishnamachari, Narayanan, Ortega, Psounis, Zhou
		5:30pm Buses depart resort and return to USC

The objective of the retreat was to bring faculty and Ph.D. students together to receive an annual update regarding research accomplishments across the board. The retreat was planned in a social environment so attendees were able to interact and build relationships that resulted in bringing the department as a whole closer, interlinking students and faculty. As well as discussing technical research topics, some attendees showcased their impressive talents during a musical ensemble at the banquet dinner. Photographs and a video were constructed at the retreat, which can be viewed by visiting this link: [http://www.youtube.com/watch?v=aQNIS9Gw\\_uA](http://www.youtube.com/watch?v=aQNIS9Gw_uA)

The Institute conducted a confidential survey after the retreat and received positive feedback from attendees with some suggestions on how to improve it in future years, which we plan to incorporate.





### 3.3 RESEARCH FESTIVAL

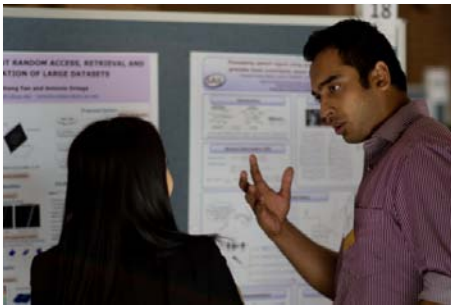


As one of the MHI goals to enhance the research visibility of the Electrical Engineering department, the Ming Hsieh Institute hosted The First Annual Ming Hsieh Department of Electrical Engineering Research Festival on Friday, April 29 at USC Park Campus. MHI plans to host this event annually and continue to increase participation and expand the Electrical Engineering Department externally. The Research Festival was a day-long event that showcased Ph.D. student research through posters and oral presentations. The entire USC Viterbi Community was invited to the event as

well as local EE alumni, and select academic representatives in Electrical Engineering. Industry representatives were also invited so they could see the outstanding research conducted by our Ph.D. students and provide possible future opportunities.

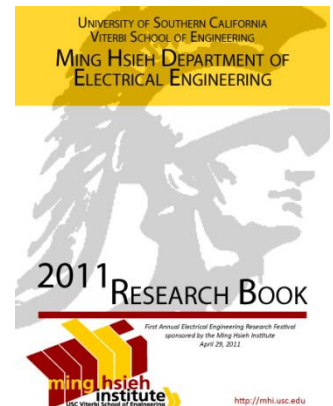
The event began with a keynote talk by John Brooks Slaughter titled *Celebrating Research*, followed by a welcome by MHI director Shri Narayanan and an overview of the day by event organizer and MHI co-director, Bhaskar Krishnamachari.

Poster Sessions and Graduating Ph.D. Presentations were going on simultaneously, one session scheduled in the morning and one in the afternoon by research category. 25 graduating Ph.D. students gave 10 minute long oral presentations and 85 Ph.D. students gave poster presentations. Faculty judges deliberated and selected two presentation winners and four best posters that were announced at the Awards Ceremony, which followed the Reception.



MHI compiled a Research Book including Ph.D. student and Post Doctoral Scholar research summaries and distributed it to all event attendees. Extra Research Books were given to the department chairs and our External Relations Department to give to external Electrical Engineering contacts to enhance the visibility of our Ph.D. student research and the EE faculty and department.

The Research Festival concluded with a panel session on the *Birth of Aerospace in Southern California: a conversation about Engineering, History & Art* organized by: Bill Deverell, Huntington-USC Institute on California and the West and Urbashi Mitra, Ming Hsieh Department of Electrical Engineering. This panel session was a perfect ending to the Research Festival because some alumni that were confirmed to attend the panel also got a chance to see some student work, and students in turn stayed for the panel session and learned valuable information.



## Event Program

**MING HSIEH DEPARTMENT OF  
ELECTRICAL ENGINEERING**

**RESEARCH FESTIVAL**

FRIDAY, APRIL 29, 2011

9:15AM - 10:00AM  
WELCOME CEREMONY & KEYNOTE TALK BY:  
JOHN BROOKS SLAUGHTER - "CELEBRATING RESEARCH"

10:00AM - 12:00PM  
POSTER SESSION #1 & GRADUATING PH.D. PRESENTATIONS

12:00PM - 1:00PM  
LUNCH

1:00PM - 3:00PM  
POSTER SESSION #2 & GRADUATING PH.D. PRESENTATIONS

3:00PM - 4:00PM  
RECEPTION

4:00PM - 4:30PM  
AWARDS CEREMONY

4:30PM - 5:30PM  
PANEL SESSION: THE BIRTH OF AEROSPACE IN SOUTHERN  
CALIFORNIA: A CONVERSATION ABOUT ENGINEERING, HISTORY & ART



hosted by the Ming Hsieh Institute

### Poster Session #1

10:00am - 12:00pm - Gerontology Patio

#### Applied Electromagnetics

1.	Esin Sozer	Magnesium based photocathodes for pulsed power switching applications
----	------------	---

#### Bio-Electronics and Bio-Optics

2.	Ben McIntosh	A Visual Simulator and Intraocular Camera for Retinal Prostheses
----	--------------	--

#### Computer Architecture

3.	Lizhong Chen	Critical Bubble Scheme: An Efficient Implementation of Globally-aware Network Flow Control
4.	Woojin Choi	Unified Signatures for Improving Performance in Transactional Memory
5.	Waleed Dweik	Reliability Aware Exceptions for Software Directed Fault Handling
6.	Yuhao Jin	Communication-Aware Globally-Coordinated On-Chip Networks
7.	Mehrtash Manoochehri	CPPC: Correctable Parity Protected Cache
8.	Ruisheng Wang	Thread Criticality Support in On-Chip Networks
9.	Bardia Zandian	WearMon: Reliability Monitoring Using Adaptive Critical Path Testing

#### Controls

10.	Afshin Abadi	Intelligent Assist Driving in a Megacity
-----	--------------	--

#### Integrated Circuits and Systems

11.	Firooz Afiatouni	RF Assisted Phase Control of Semiconductor Lasers
12.	SangHyun Chang	Human Feature Detection Radar Authors: Ta-Shun Chu, Jonathan Roderick, SangHyun Chang, Chenliang Du, Timothy Mercer
13.	Behnam Analui	0.6GHz Software-Defined Receiver

#### Nano-Science, Nano-Technology & MEMS

14.	Mehmet Aykol	Electromechanical Resonance Behavior of Suspended Carbon Nanotubes under High Bias Voltages
15.	Chun-Yung Chi	Large area GaAs NW on Si
16.	Chih-Chieh Hsu	A Biomimetic Fabricated Carbon Nanotube Synapse for Prosthetic Applications
17.	Anderson Lin	Real-Time Label-Free Detection of DNA Synthesis by FBAR-Based Mass Sensing
18.	Yen Ting Lin	InGaN Light Emitting Diodes Grown on GaN Nanostructures
19.	Chuan Wang	Macroelectronic Integrated Circuits Using High-Performance Separated Carbon Nanotube Thin-Film Transistors
20.	Jialu Zhang	Air-Stable n-Type Separated Carbon Nanotube Thin-Film Transistors and Its Application in CMOS Logic Circuits

2011 USC EE RESEARCH FESTIVAL

2 | Page

Welcome Ceremony & Keynote Talk by John Brooks Slaughter - *Celebrating Research*  
9:15am - 10:00am - Gerontology Auditorium



JOHN BROOKS SLAUGHTER, Ph.D., P.E.  
Professor of Education and Engineering  
University of Southern California

A former director of the National Science Foundation, chancellor of the University of Maryland, College Park, and president of Occidental College, Dr. Slaughter has served for many years as a leader in the education, engineering and scientific communities. He is well known for his commitment to increasing diversity in higher education with a special focus on the STEM disciplines.

Graduating Ph.D. Presentations  
10:00am - 12:00pm - Gerontology Auditorium

#### Signal Processing

10:00am	Matthew P. Black	You made me do it: Classification of Blame in Married Couples' Interactions - A Case Study in Behavioral Signal Processing
10:10am	SangHyun Chang	Human and Environment Sensing via UWB Radar
10:20am	Yu-Teng Chang	Modular Graph Partitioning: Statistical Null Models and Applications
10:30am	Seongho Steve Cho	Block-Based Image Steganalysis: Algorithm and Performance Evaluation
10:40am	Zihong Fan	Interactive Navigation of Large Datasets, Random Retrieval, Tiling and Compression
10:50am	Prasanta Ghosh	A computational framework for exploring the role of speech production in speech recognition
11:00am	Athanasios A. Katsamanis	Multiple Instance Learning for Behavioral Signal Processing
11:10am	Woo-Shik Kim	3-D Video Coding System with Enhanced Rendered View Quality
11:20am	Sunil Kumar	Transform based Graph Signal Processing (GSP) Methods
11:30am	Cheng-Hao Kuo	Multi-Person Tracking by On-Line Learned Discriminative Appearance Models
11:40am	Emily Kaplan Mower	Emotions in Engineering: Methods for the Interpretation of Ambiguous Emotional Content
11:50am	Michael Ian Proctor	An MRI Study of Human Beatboxing

#### Networks

21.	Majed A. Alresani	Backpressure With Adaptive Redundancy (BWAR)
22.	Dilip Bethanabhotla	Optimizing video streaming experience for a user in a cellular network
23.	Hao Feng	Diversity Backpressure Algorithm with Mutual Information Accumulation
24.	Yi Gai	Online Learning Algorithms for Network Optimization with Unknown Variables
25.	Harsha Honnappa	The T/G/1 Queue
26.	Dileep M. Kaiathil	Incentive Mechanisms for Spectrum Sharing - Contracts for Cooperation
27.	Hoang Le	A Memory-Efficient and Modular Approach for Dictionary-Based String Matching on FPGAs
28.	Shuping Peter Liu	Machine Learning Based Automatic Patient Monitoring and Prioritizing by Body Sensor Network Systems
29.	Maheswaran Sathiamoorthy	Distributed Storage Codes Reduce Latency in Vehicular Networks
30.	Kyuhon Son	Towards Green Cellular Networks
31.	Wenyuan Tang	Network Game Theory
32.	Yi Wang	Markov-optimal sensing policy for user state estimation in mobile devices
33.	Yi-Hua Edward Yang	High Performance IP Lookup on FPGA with Combined Length-Infix Pipelined Search

#### Photonics

34.	Thanh Le	Integration of High Sensitivity Whispering Gallery Mode Resonators Sensing System: a Practical Device
35.	Yoo Seung Lee	Hybrid Si-LiNbO <sub>3</sub> Micro-Ring Electro-Optically Tunable Resonators for Active Photonic Devices
36.	Yun Chu Li	Novel Coupling Modulation Design Using Ring-Resonator-Based Light Drop Structure
37.	Chenxi Lin	Optical Modelling of Silicon Nanowire Arrays for Photovoltaic Applications
38.	Jing Ma	Applications of Optical Forces in Tunable Microphotonic Devices
39.	Hari Mahalingam	Solgel based titania films for high index optical waveguides
40.	Yan Yan	On-Chip Mirrorless-Oscillation in Nonlinear Silicon Waveguides Using Non-degenerate Four-Wave Mixing
41.	Omer Faruk Yilmaz	Tunable Optical Tapped Delay Lines using Wavelength Conversion and Chromatic Dispersion based Delays

#### VLSI/CAD

42.	Prasaneet Das	Generating vectors for post silicon delay characterization
43.	Jonathan R. Joshi	Modeling Biological Neural Compartment using Custom Silicon Circuits
44.	Mohammad Mirza-Aghatabar	Redundancy and Partitioning for Yield/Area Maximization of SoC in Nano-Technologies with High Defect Densities

2011 USC EE RESEARCH FESTIVAL

3 | Page

**Graduating Ph.D. Presentations**

**1:00pm - 3:00pm - Gerontology Auditorium**

**Communications**

1:00pm	Marjan Baghaie	Cooperative Communication in Wireless Networks
1:10pm	Ozgun Bursalioglu	Joint Source-Channel Coding for Deep Space Image Transmission Using Rateless Codes
1:20pm	Hoon Huh	Large System Analysis of Multi-cell MIMO Downlink: Fairness Scheduling and Inter-cell Cooperation

**Networks**

1:30pm	Joon Ahn	Optimizing Data Dissemination in Wireless Networks
1:40pm	Chih-ping Li	Delay and Power-Optimal Control in Multi-Class Queueing Systems
1:50pm	Yi Wang	Energy Efficient Mobile Sensing: Principles and Architectures

**Controls**

2:00pm	Yun Wang	Dynamic Variable Speed Limit Control: Design, Analysis and Benefit
--------	----------	--

**Integrated Circuits and Systems**

2:10pm	Firooz Aflatooni	RF Assisted Phase Control of Semiconductor Lasers
--------	------------------	---

**Photonics**

2:20pm	Yoo Seung Lee	Active Integrated Photonic Devices in Single Crystal LiNbO <sub>3</sub> Micro-Platelets and Hybrid Si-LiNbO <sub>3</sub> Platform (Presentation)
2:30pm	Lawrence Simpson Stewart	In-Plane Thermally Tuned Silicon-on-Insulator Wavelength Selective Reflector

**VLSI/CAD**

2:40pm	Doochul Shin	Circuit Designing and Synthesis Techniques for Error Tolerance Applications
--------	--------------	---

**Computer Architecture**

2:50pm	Young Hoon Kang	Fault-Tolerant Flow Control in On-Chip Networks
--------	-----------------	---

2011 USC EE RESEARCH FESTIVAL

4 | Page

23.	Sung Won Lee	Joint Optimization of Transport Cost and Reconstruction for Spatially-Localized Compressed Sensing in Multi-Hop Sensor Networks
24.	Ming Li	The KNOWME network: body sensing, processing and modeling methods in metabolic health monitoring
25.	Yanguang Lin	Kinetic Parameters Estimation for Heterogeneous Tumor Model
26.	Yenting Greg Lin	Transmission Traveltime Tomography For High Contrast Velocity Line Structures
27.	Tsung-Jung Liu	A Multi-metric Fusion Approach to Visual Quality Assessment
28.	Sean Raymond McPherson	Detecting Low-Rate Periodic Events in Internet Traffic Using Renewal Theory
29.	Angeliki Metallinou	Tracking Changes in Continuous Emotion States using Body Language and Prosodic Cues
30.	Nicolo Michelusi	Hybrid Sparse/Diffuse UWB Channel Estimation
31.	Mohammad Reza Rajati	Solving Zadeh's Challenge Problems in Computing with Words
32.	Vikram N. Ramanarayanan	Prosodic Variation within Speech Planning and Execution - Insights from Real-Time MRI
33.	Benjamin Louis Raskob	Stereo Vision Using Disparity Phase Interference
34.	Samir D. Sharma	Accelerated Water-Fat MRI
35.	Travis B. Smith	Piecewise Linear Deblurring Improves Resolution in Spiral Magnetic Resonance Imaging
36.	Qun Feng Tan	Enhanced Sparse Imputation Techniques for a Robust Speech Recognition Front-End
37.	David S. Wheland	Structural Analysis of the Cerebral Cortex Using Blind Source Separation
38.	Bo Xiao	Multimodal Turn Taking Analysis on Human Dyadic Conversation
39.	Ali Yousefi	Supervised Learning in a Single Layer Dynamic Synapses Neural Network
40.	Wentao Zhu	Longitudinal Registration of Liver PET Scans Using Four Phase CT
41.	Yinghua Zhu	Dynamic 3D Visualization of Vocal Tract Shaping During Speech

**Undergraduate Research Presentations**

1.	Michael Caselden	Gracie Gets Rovy: An interactive demonstration of hardware hacking Presenting 10am-12pm
2.	Soyoung Kang & Rittik Shah	Mouse Blink Stimulator Presenting 10am-12pm & 1pm-3pm

2011 USC EE RESEARCH FESTIVAL

6 | Page

**Poster Session #2**

**1:00pm - 3:00pm - Gerontology Patio**

**Communications**

1.	Sunav Choudhary	A Sparse Approximation for the Under Water Acoustic Channel
2.	Chiranjib Choudhuri	Information vs. Estimation
3.	Hassan Ghozan	Interference Focusing for Mitigating Cross-Phase Modulation in a Simplified Optical Fiber Model
4.	Ming Yue Ji	Interference Alignment, Algorithms and Application to Wireless Cellular Networks
5.	Ching-Yi Lai	Entanglement-assisted Quantum Error-correcting Codes
6.	Dimitris S. Papailopoulos	Interference Alignment as a Rank Constrained Rank Minimization
7.	Kristen Leigh Pudenz	Software Verification via Quantum Learning and Testing
8.	Karthikeyan Shanmugam	Caching in Video aware wireless networks
9.	Jun Yang Shen	Passive Target Positioning Using TOA Measurements
10.	Asher Voskoboinik	Frequency Domain Multiple Tone Interrogation for Fast Brillouin Distributed Optical Fiber Sensors
11.	Srinivas Yerramalli	Partial FFT Demodulation: A Detection Method for Doppler Distorted OFDM Systems
12.	Yicong Zheng	Geometric Manipulation of Ensembles of Atoms on Atom Chip for Quantum Computation
13.	Daphney-Stavroula Zois	Optimal Sensor Selection for Multihypothesis Physical Activity Detection in Wireless Body Area Networks

**Signal Processing**

14.	Sergul Aydore	Partial Phase Locking Value for Multidimensional Circular Gaussian Model
15.	Chitresh Bhushan	Surface Constrained Volumetric Registration of Diffusion Tensor Images
16.	Daniel Bone	Intoxicated Speech Detection Using Hierarchical Features and Iterative Speaker Normalization
17.	Zihong Fan	Interactive fast random access, retrieval and navigation of large datasets
18.	Prasanta Ghosh	Processing speech signal using auditory-like filterbank provides least uncertainty about articulatory gestures
19.	James Gibson	Classification of Couples' Behavioral Interaction using Diverse Density Support Vector Machines
20.	Dian Gong	Tensor Voting for Robust Manifold Learning with both Inlier and Outlier Noise
21.	Jangwon Kim	An Exploratory Study of Manifolds of Emotional Speech
22.	Mohammad Korjani	Perceptual Computing: Aiding People in Making Subjective Judgments

2011 USC EE RESEARCH FESTIVAL

5 | Page

**Best Paper Nominees**

Hamed Abrishami	Harsha Honnappa	Dimitri Papailopoulos
Marjan Baghaie	Dileep Kalathil	Jinko Suh
Matt Black	Young Hoon Kang	QunFeng Tan
Yoon-Sik Cho	Cheng-Hao Kuo	Rahul Ugaonkar
Chiranjib Choudhuri	Hoang Le	Yi Wang
Joyita Dutta	Yoo Seung Lee	Chaun Wang
Zihong Fan	Ming Li	Ozgun Yilmaz
Yi Gai	Anderson Lin	Bardi Zanadian
Prasanta Ghosh	Chenxi Lin	Jialu Zhang
Dian Gong	Mehrtash Mannochehri	
	Osunde Osoba	

**Panel Session**

**4:30pm - 5:30pm - Gerontology Auditorium**

**The Birth of Aerospace in Southern California: a conversation about Engineering, History and Art**

For the last century Southern California has provided the primary home for the U.S. aerospace industry. This panel considers some of the consequences for USC, the engineering profession, and for Southern California itself, as aerospace influence ranged from art and architecture to pop culture.

**Panelists:**

Ron Blackwelder, Aerospace & Mechanical Engineering, USC  
Robert McEliece, Allen E. Puckett Professor, Electrical Engineering, CalTech  
Ken Richardson, former President & COO, Hughes Aircraft Company  
Laif Swanson, Jet Propulsion Laboratory  
Jason Weems, History of Art, UC Riverside  
Peter Westwick, History, USC

**Organized by:**

Bill Deverell, Huntington-USC Institute on California and the West  
Urbashi Mitra, Ming Hsieh Department of Electrical Engineering  
sponsored by the USC Center for Excellence in Research, the Ming Hsieh Institute and the Viterbi School of Engineering

2011 USC EE RESEARCH FESTIVAL

6 | Page

2011 USC EE RESEARCH FESTIVAL

7 | Page



Panel Session Flyer

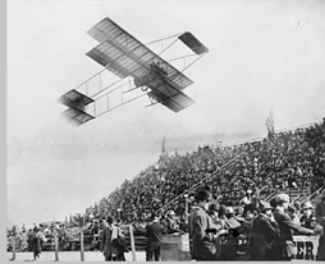
University of Southern California



Ming Hsieh Institute

Department of Electrical Engineering

USC Viterbi  
School of Engineering



For the last century, Southern California has provided the primary home for the U.S. aerospace industry. This panel considers some of the consequences for USC, the engineering profession, and for Southern California itself, as aerospace influence ranged from art and architecture to pop culture.

All are welcome to attend and participate.

## THE BIRTH OF AEROSPACE IN SOUTHERN CALIFORNIA: A CONVERSATION ABOUT ENGINEERING, HISTORY & ART

GERONTOLOGY AUDITORIUM - 3715 MCCLINTOCK AVENUE  
FRIDAY, APRIL 29 4:30PM

**PANELISTS:**

Ron Blackwelder, Aerospace & Mechanical Engineering, USC  
Robert McEliece, Allen E. Puckett Professor, Electrical Engineering, Caltech  
Ken Richardson, former President & COO, Hughes Aircraft Company  
Laif Swanson, Jet Propulsion Laboratory  
Jason Weems, History of Art, UC Riverside  
Peter Westwick, History, USC

**Organized by:**

Bill Deverell, Huntington-USC Institute on California and the West and  
Urbashi Mitra, Ming Hsieh Department of Electrical Engineering. *For questions please contact Professor Mitra at [ubli@usc.edu](mailto:ubli@usc.edu)*



**PARKING INFORMATION**  
Please enter through Gate 6 located at  
W 36th Place & Vermont Avenue off the  
Santa Monica Freeway.

Parking - \$8  
For complete driving directions visit:  
<http://ee.usc.edu/about/maps.htm>



sponsored by the USC Center for Excellence in Research,  
the Ming Hsieh Institute and the Viterbi School of Engineering

HUNTINGTON-USC  
INSTITUTE ON  
CALIFORNIA  
& THE WEST

## Research Festival Award Winners

### Honorable Mention Paper Award Winners

- Prasanta Ghosh Processing speech signal using auditory-like filterbank provides least uncertainty about articulatory gestures
- Rahul Uргаonka Optimal Power Cost Management Using Stored Energy in Data Centers

### Best Paper Award Winners

- Matthew Black - Automatic Prediction of Children's Reading Ability for High-level Literacy Assessment
- Chuan Wang - Wafer-Scale Fabrication of Separated Carbon Nanotube Thin-Film Transistors for Display Applications

### Best Poster Award Winners - Session One

- Behnam Analui - 0-6GHz Software-Defined Receiver
- Jialu Zhang - Air-Stable n-Type Separated Carbon Nanotube Thin-Film Transistors and Its Application in CMOS Logic Circuits

### Best Poster Award Winners - Session Two

- Yicong Zheng - Geometric Manipulation of Ensembles of Atoms on Atom Chip for Quantum Computation
- Samir Sharma - Accelerated Water-Fat MRI

### Honorable Mention Best TA

Satsuki Takahashi  
Kartik Audhkhasi  
Waleed Dweik  
Chih-Chieh Hsu  
Aaron Friesz  
Brandon Franzke  
Jesse Theiss  
Jonathan Joshi  
Benjamin Raskob

### Best TA

Sean McPherson  
Arash Saifhashemi

### 2nd Place Best Presentation

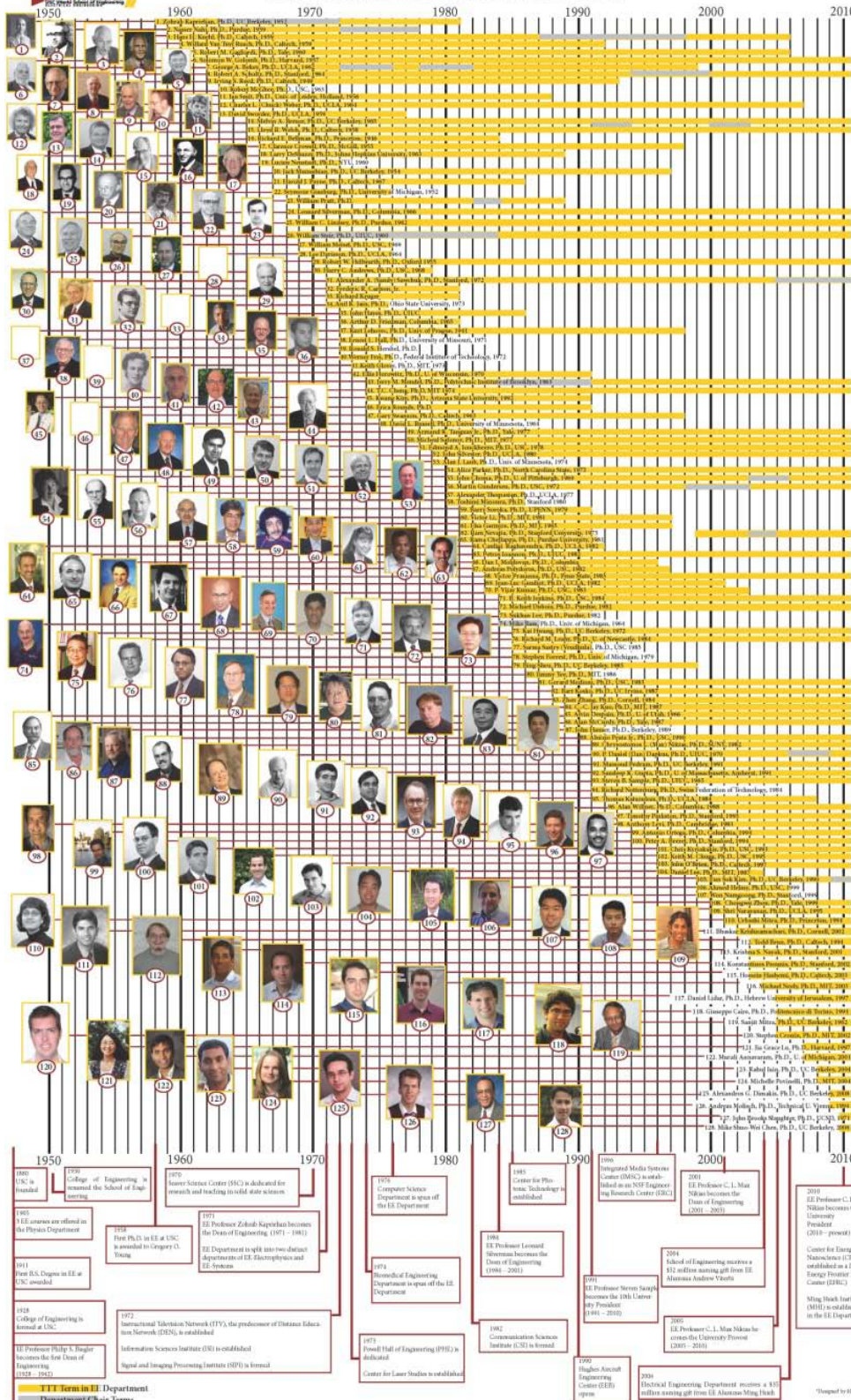
Emily Mower - Emotions in Engineering: Methods for the Interpretation of Ambiguous Emotional Content

### Grand Prize-Best Presentation

Firooz Aflatouni - FR Assisted Phase Control of Semiconductor Lasers



University of Southern California  
Viterbi School of Engineering  
Ming Hsieh Department of Electrical Engineering Timeline



### 3.4 FACULTY TIMELINE

MHI compiled information on all past and present faculty members. This information includes year of appointment at USC and year of departure. Faculty and staff also provided further information on past faculty members, for instance where they are now, etc. – all this information is documented. Using this information, MHI created an EE Faculty History Timeline including the tenured and tenure-track faculty with “primary” appointment in EE-S or EE-EP who have been with the department for over three years. The design includes faculty photos with a data graph showing the timeframe they were appointed in EE, year’s faculty members served as department chairs, and facts about the department. MHI plans to update this data as accurate information is provided. The Faculty Timeline was showcased at the Retreat and Research Festival, which helped influence faculty members to respond and provide valuable historical information which was also documented. To view and print full size image please visit: <http://mhi.usc.edu/assets/001/75733.pdf>



### 3.5 EE ALUMNI DATABASE

With the help of EE Faculty members, MHI created a database with all successful USC EE alumni who have decided to pursue a career in academia. All information provided by the advisors of student alumni is documented in this database. MHI also created the below Alumni Profile Design including information from the database, which was showcased at the Research Festival. At this point, we are focusing on USC EE Ph.D. alumni (i.e., received their Ph.D. in USC EE) who have chosen the academic path and gone to become faculty members (including those who went somewhere else at first and then became faculty). To view and print full size image please visit:  
<http://mhi.usc.edu/assets/001/75186.pdf>

#### NORTH AMERICA

ARIZONA STATE UNIVERSITY	Hongyu Yu, Ph.D., USC 2005 - Advisor: E.S. Kim
KOTAS TASKALIS, Ph.D., USC 1988 - Advisor: P. Ioannou	
SARINA SASTRY (Vandana), Ph.D., USC 1985	
AUBURN UNIVERSITY	Prathima Agrawal, Ph.D., USC 1977 - Advisor: M. Breuer
BINGHAMTON UNIVERSITY	Qing Wu, Ph.D., USC 2001 - Advisor: M. Pedram
QINRU QIU, Ph.D., USC 2001 - Advisor: M. Pedram	
BU CHAN, Ph.D., USC 2006 - Advisor: K. Hwang	
BOISE STATE UNIVERSITY	Wan Kuang, Ph.D., USC 2005 - Advisor: I.O'Brien
BRIGHAM YOUNG UNIVERSITY	J. David Long, Ph.D., USC 1989 - Advisor: J. Mendel
BRIAN JEFFS, Ph.D., USC 1989 - Advisor: R. Leahy	
GREGORY P. NORDIA, Ph.D., USC 1992 - Advisor: A.B. Tanguay, Jr.	
CAL POLY POMONA	James S. Kang, Ph.D., USC 1983 - Advisor: R. Scholtz
SALAM SALLOUM, Ph.D., USC - Advisor: M. Breuer	
CAL STATE - DOMINGUEZ HILLS	Antonio Boudi, Ph.D., USC - Advisor: J. Silvester
CAL STATE - NORTHRIDGE	Nagwa E. Bekir, Ph.D., USC 1978 - Advisor: R. Scholtz
AMAD BEKIR, Ph.D., USC - Advisor: S. Golomb	
CALIFORNIA STATE UNIVERSITY - FULLERTON	Mostafa Shiva, Ph.D., USC 1982 - Advisor: J. Mendel
CAL STATE - LOS ANGELES	Kamran Karimloo, Ph.D., USC 1984 - Advisor: Michael G. Safanov
CARNEGIE MELLON UNIVERSITY	Diana Marculescu, Ph.D., USC 1998 - Advisor: M. Pedram
RADA MARCULESCU, Ph.D., USC 1998 - Advisor: M. Pedram	
JOHN P. SHEN, Ph.D., USC 1981 - Advisor: J. Hayes	
COLUMBIA UNIVERSITY	Harish Krishnaswamy, Ph.D., USC 2009 - Advisor: H. Hashemi
CORNELL UNIVERSITY	Stephen Wicker, Ph.D., USC 1987 - Advisor: L. Welch
DUKE UNIVERSITY	Martin Brooks, Ph.D., USC 1988 - Advisor: J. Choma
ALLEN DENEV, Ph.D., USC 1995 - Advisor: J. Choma	
EMORY UNIVERSITY	Betty Tang, Ph.D., USC 1983 - Advisor: S. Golomb
GEORGIA TECH	Hongwei Wu, Ph.D., USC 2004 - Advisor: J. Mendel
HO HONG, Ph.D., USC 2005 - Advisor: V. Prasanna	
INSTITUTO TECNOLÓGICO AUTÓNOMO DE MEXICO	Fernando Ramirez-Mendez, Ph.D., USC 1998 - Advisor: R. Scholtz
TOWNSHEND UNIVERSITY	Julie Dickerson, Ph.D., USC 1993 - Advisor: R. Kosko
JOHNS HOPKINS UNIVERSITY	Jonghye Woo, Ph.D., USC 2009 - Advisor: C.C. Kuo
JOHN JOHNS GONZALEZ, Ph.D., USC 1986 - Advisor: J. Mendel	
LOYOLA MARYMOUNT UNIVERSITY	Lei Huang, Ph.D., USC 2002 - Advisor: C.C. Kuo
MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Moe Z. Win, Ph.D., USC 1987 - Advisor: R. Scholtz
NAVAL POSTGRADUATE SCHOOL	Harold M. Fredrickson, Ph.D., USC 1968 - Advisor: S. Golomb
OHIO UNIVERSITY	Jeffrey Dill, Ph.D., USC - Advisor: J. Silvester
PASADENA CITY COLLEGE	Sabah A. Al-Quaddoomi, Ph.D., USC 1983 - Advisor: R. Scholtz
PENN STATE UNIVERSITY - HARRISBURG	Hossein Jula, Ph.D., USC 2002 - Advisor: P. Ioannou
STANFORD UNIVERSITY	Robert M. Gray, Ph.D., USC 1969 - Advisor: R. Scholtz
STATE UNIVERSITY OF NEW YORK	Gary S. Bloom, Ph.D., USC 1976 - Advisor: S. Golomb
STEVENS INSTITUTE OF TECHNOLOGY	Philipos Mordoch, Ph.D., USC 1983 - Advisor: G. Medioni
TEMPLE UNIVERSITY	Abraham Waxman, Ph.D., USC 1966 - Advisor: S. Golomb
SEUNG G. KONG, Ph.D., USC 1991 - Advisor: R. Kosko	
TEXAS A&M UNIVERSITY	Anirudha Datta, Ph.D., USC 1991 - Advisor: P. Ioannou
UNIVERSITY OF ALABAMA, HUNTSVILLE	Wendi (David) Pan, Ph.D., USC 2002 - Advisor: A. Ortega
UNIVERSITY OF ARIZONA	Salim Hariri, Ph.D., USC 1986 - Advisor: C. Raghavendra
UNIVERSITY OF CALIFORNIA - DAVIS	Junyi Qi, Ph.D., USC 1998 - Advisor: R. Leahy
UNIVERSITY OF CALIFORNIA - LOS ANGELES	Christopher W. Walker, Ph.D., USC 1993 - Advisor: S. Golomb
DAVID SHATRUCK, Ph.D., USC 2000 - Advisor: R. Leahy	



#### University of Southern California Viterbi School of Engineering Ming Hsieh Department of Electrical Engineering Alumni Profiles - Full-Time Tenured and Tenured Track Faculty

#### ASIA



UNIVERSITY OF CALIFORNIA - IRVINE  
Homayoun Yousefi Zadeh, Ph.D., USC - Advisor: J. Silvester  
Payam Heydari, Ph.D., USC 2001 - Advisor: M. Pedram  
Athanasios Sideris, Ph.D., USC 1985 - Advisor: M. Safanov  
Paul Kurzba, Ph.D., USC 1988 - Advisor: A. Parker



UNIVERSITY OF CALIFORNIA - RIVERSIDE  
Afsin Abdollahi, Ph.D., USC 2006 - Advisor: M. Pedram



UNIVERSITY OF CALIFORNIA - SAN DIEGO  
Bhadar Rao, Ph.D., USC - Advisor: J. Mendel



UNIVERSITY OF CALIFORNIA - SANTA BARBARA  
Steven P. DenBaars, Ph.D., USC 1988 - Advisor: D. Dapkus  
B.S. Maniath, Ph.D., USC 1991 - Advisor: R. Chellappa



UNIVERSITY OF CALIFORNIA - SANTA CRUZ  
Nobuhiko Kobayashi, Ph.D., USC 1998 - Advisor: D. Dapkus  
Amitan Varma, Ph.D., USC 1986 - Advisor: C. Raghavendra



UNIVERSITY OF CINCINNATI  
Harold Carter, Ph.D., USC 1980 - Advisor: M. Breuer



UNIVERSITY OF HOUSTON  
Deniz Gurkan, Ph.D., USC 2003 - Advisor: A. Willner  
Thomas Hebert, Ph.D., USC 1989 - Advisor: R. Leahy



UNIVERSITY OF KANSAS  
Richard D. Colgren, Ph.D., USC 1993



UNIVERSITY OF MICHIGAN  
Achilles Anastasopoulos, Ph.D., USC 1999 - Advisor: K. Chugg  
Jing San, Ph.D., USC 1989 - Advisor: P. Ioannou



UNIVERSITY OF MINNESOTA  
M. Inuran Hayee, Ph.D., USC 1998 - Advisor: A. Willner  
Georgios B. Giannakis, Ph.D., USC 1986 - Advisor: J. Mendel



UNIVERSITY OF MISSOURI  
Jae Wan Kwon, Ph.D., USC 2004 - Advisor: E.S. Kim



UNIVERSITY OF NEBRASKA  
Paul G. Smeyers, Ph.D., USC 1984 - Advisor: M. Gundersen



UNIVERSITY OF NEW MEXICO  
Mari Hossein-zadeh, Ph.D., USC 2004 - Advisor: A. Levi  
Zachary Baker, Ph.D., USC 2006 - Advisor: V. Prasanna



UNIVERSITY OF PUERTO RICO, RIO PIEDRAS  
Carlos J. Corrada-Braves, Ph.D., USC 2002 - Advisor: R. Scholtz



UNIVERSITY OF TENNESSEE - KNOXVILLE  
Fel "Fred" Wang, Ph.D., USC 1990 - Advisor: M. Pedram



UNIVERSITY OF TEXAS - ARLINGTON  
Qilian Liang, Ph.D., USC 2000 - Advisor: J. Mendel



UNIVERSITY OF TEXAS SAN ANTONIO  
Raieda Boreana, Ph.D., USC 1991 - Advisor: C. Raghavendra



UNIVERSITY OF TEXAS, DALLAS  
Carlos Busso, Ph.D., USC 2008 - Advisor: S. Narayanan



UNIVERSITY OF TORONTO  
Elvino Sousa, Ph.D., USC - Advisor: J. Silvester



UNIVERSITY OF SOUTHERN CALIFORNIA  
Keith M. Chugg, Ph.D., USC 1995 - Advisor: A. Polydoros  
Martin Gundersen, Ph.D., USC, 1972 - Advisor: W. Faust  
B. Keith Jenkins, Ph.D., USC, 1984  
Chris Kyriakakis, Ph.D., USC, 1993  
Aluizio Prata Jr., Ph.D., USC, 1990  
Amitan Varma, Ph.D., USC 1986 - Advisor: C. Raghavendra  
Daniel Ertin, Ph.D., USC 1987 - Advisor: M. Gundersen



UNIVERSITY OF VIRGINIA - CHARLOTTESVILLE  
Gang Tao, Ph.D., USC 1989 - Advisor: P. Ioannou



UNIVERSITY OF WATERLOO  
Baris Fidan, Ph.D., USC 2002 - Advisor: P. Ioannou



UNIVERSITY OF THE WEST INDIES  
Brian Costello, Ph.D., USC 1980 - Advisor: M. Safanov



UNIVERSITY OF WYOMING  
Margaret Stefanopoli, Ph.D., USC 2005 - Advisor: M. Safanov



WAYNE STATE UNIVERSITY  
Qingchong (John) Liu, Ph.D., USC 1996 - Advisor: R. Scholtz



WORCESTER POLYTECHNIC INSTITUTE  
Michael Demetriou, Ph.D., USC 1993 - Advisor: P. Ioannou



AOU UNIVERSITY, SOUTH KOREA  
Jia Sung Lee, Ph.D., USC 2001 - Advisor: J. Mendel  
Jae-Joon Lee, Ph.D., USC 2007 - Advisor: C.C. Kuo



AMERICAN UNIVERSITY, DUBAI, UAE  
Reza Khosravi, Ph.D., USC 2000 - Advisor: A. Willner



CHIANG MAI UNIVERSITY, THAILAND  
Noparat Vanitchanan, Ph.D., USC - Advisor: J. Silvester



COLLEGE OF TECHNOLOGICAL STUDIES  
Mubarak Alharashami Alhariri, Ph.D., USC 1983 - Advisor: M. Safanov



DANKOOK UNIVERSITY, KOREA  
Kyu-Hyuk Chung, Ph.D., USC 2003 - Advisor: K. Chugg



DONGGUK UNIVERSITY, SOUTH KOREA  
Jong-Suk Ahn, Ph.D., USC - Advisor: J. Silvester  
Yun-Pin Hong, Ph.D., USC 1998 - Advisor: P. Bearel



FENG CHIA UNIVERSITY, TAIWAN  
Li Chien Lin, Ph.D., USC 1994 - Advisor: C.C. Kuo



HANYANG UNIVERSITY, SOUTH KOREA  
Yong Ho Song, Ph.D., USC 2002 - Advisor: T. Pinkston



HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY  
Chi Yung Tsai, Ph.D., USC 1994 - Advisor: M. Pedram



INDIA INSTITUTE OF SCIENCE, BANGALORE  
P. Vijay Kumar, Ph.D., USC 1983 - Advisor: R. Scholtz



INDIA INSTITUTE OF TECHNOLOGY, DELHI  
Ranjan Mallik, Ph.D., USC 1992 - Advisor: R. Scholtz



KASETSART UNIVERSITY, THAILAND  
Mongkol Raksapacharong, Ph.D., USC 1998 - Advisor: T. Pinkston



KING THRON BUDHONKUT UNIVERSITY OF TECHNOLOGY, THAILAND  
Wattapone Kunwilaak, Ph.D., USC 2003 - Advisor: C.C. Kuo



KONKUK UNIVERSITY, SOUTH KOREA  
Yungho Choi, Ph.D., USC 2001 - Advisor: T. Pinkston



KOREA UNIVERSITY  
Jun Heo, Ph.D., USC 2002 - Advisor: K. Chugg



KUWAIT UNIVERSITY  
Ebrahim Abdulrahman Ismail, Ph.D., USC - Advisor: J. Silvester  
Asad Abdulaziz Ismael, Ph.D., USC 1983 - Advisor: M. Breuer  
Sami Habib, Ph.D., USC 2001 - Advisor: A. Parker



MUSTAFA KEMAL UNIVERSITY, TURKEY  
Serdar Yildirim, Ph.D., USC 2006 - Advisor: S. Narayanan



NATIONAL CENTRAL UNIVERSITY, TAIWAN  
Po-Chyi Su, Ph.D., USC 2003 - Advisor: C.C. Kuo



NATIONAL CHENG-KUNG UNIVERSITY, TAIWAN  
Kuen-Jong Lee, Ph.D., USC 1991 - Advisor: M. Breuer  
Chih-Hung Kuo, Ph.D., USC 2003 - Advisor: C.C. Kuo  
Wen-Kuang Kuo, Ph.D., USC 2003 - Advisor: Chung-Chieh Jay Kuo



NATIONAL CHIAO-TUNG UNIVERSITY, TAIWAN  
Tienn-Huei Lee, Ph.D., USC 1987 - Advisor: R. Scholtz  
Po-Tung Lee, Ph.D., USC 2003 - Advisor: J. Brien  
Shang-Ho Tsai, Ph.D., USC 2005 - Advisor: C.C. Kuo  
Feng-Tuan Chen, Ph.D., USC 2004 - Advisor: C.C. Kuo  
Sau-Hsiuan Wu, Ph.D., USC 2003 - Advisor: C.C. Kuo



NATIONAL CHUNG CHEN UNIVERSITY, TAIWAN  
Tzung-Hsien Liu, Ph.D., USC 1998 - Advisor: J. Mendel  
Huan Chen, Ph.D., USC 2002 - Advisor: C.C. Kuo



NATIONAL CHUNG-HSING UNIVERSITY, TAIWAN  
Minkuan Chang, Ph.D., USC 2003 - Advisor: C.C. Kuo



NATIONAL HSING HUA UNIVERSITY  
Bor-Sen Chen, Ph.D., USC 1983 - Advisor: M. Safanov



NATIONAL KAORIUNG FIRST UNIVERSITY OF SCIENCE AND TECH., TAIWAN  
Jieh-Chian Wu, Ph.D., USC - Advisor: J. Silvester



NATIONAL SUN YAT-SEN UNIVERSITY, KAOHSIUNG, TAIWAN  
Wan-Jen Huang, Ph.D., USC 2008 - Advisor: C.C. Kuo



NATIONAL TAIPEI UNIVERSITY OF TECHNOLOGY, TAIWAN  
Tien-Yung Kuo, Ph.D., USC 1998 - Advisor: C.C. Kuo



NATIONAL TAIWAN UNIVERSITY  
Ming-Sui Lee, Ph.D., USC 2006 - Advisor: C.C. Kuo



NATIONAL TSING HUA UNIVERSITY, TAIWAN  
Kai-Ming Feng, Ph.D., USC 1999 - Advisor: A. Willner  
Ta-Shun Chu, Ph.D., USC 2010 - Advisor: H. Hashemi  
Chon-Yung Chu, Ph.D., USC 1982 - Advisor: J. Mendel  
Ching Han Lance Hsu, Ph.D., USC 1998 - Advisor: R. Leahy  
Hwa-Chun Lin, Ph.D., USC 1991 - Advisor: C. Raghavendra



NATIONAL UNIVERSITY OF SINGAPORE  
Changyuan Yu, Ph.D., USC 2005 - Advisor: A. Willner

	NATIONAL ILAN UNIVERSITY, YILAN, TAIWAN Cho-chin Lin, Ph.D., USC 1995 - Advisor: V. Prasanna
	POHANG INSTITUTE OF TECHNOLOGY, SOUTH KOREA Hwangjun Song, Ph.D., USC 1999 - Advisor: C.C. Kuo
	SEJONG UNIVERSITY, SOUTH KOREA Seonil Kwon, Ph.D., USC 2005 - Advisor: S. Narayanan
	SEOUL NATIONAL UNIVERSITY, SOUTH KOREA Kyoung-Mu Lee, Ph.D., USC 1993 - Advisor: C.C. Kuo
	SHANDONG UNIVERSITY, CHINA Jinliang Peng, Ph.D., USC 2006 - Advisor: C.C. Kuo
	SHARIF UNIVERSITY OF TECHNOLOGY, IRAN Javad Salehi, Ph.D., USC 1984
	Mojtaba Atarodi, Ph.D., USC - Advisor: J. Choma
	Ali Medi, Ph.D., USC 2007 - Advisor: W. Namgoong
	SUNGKYUNKWAN UNIVERSITY, SOUTH KOREA Dong-In Kim, Ph.D., USC 1990 - Advisor: R. Scholtz
	Woon Guk Jeong, Ph.D., USC 1990 - Advisor: D. Dapkus
	Jiaei Shin, Ph.D., USC 2001 - Advisor: C.C. Kuo
	TAIWAN INSTITUTE OF TECHNOLOGY, TAIWAN Ge-Ming Chin, Ph.D., USC 1991 - Advisor: C. Raghavendra
	THAMMASAT UNIVERSITY, THAILAND Junavit Chaldabhongse, Ph.D., USC 1996 - Advisor: C.C. Kuo
	Sanva Mitani, Ph.D., USC 1999 - Advisor: B. Kosko
	THE NATIONAL HEALTH RESEARCH INSTITUTE C.C. Chien, Ph.D., USC 1994 - Advisor: P. Ioannou
	UNIVERSITY OF HONG KONG Cho-Li Wang, Ph.D., USC 1995 - Advisor: V. Prasanna
	YONSEI UNIVERSITY, SOUTH KOREA Hong Yeop Son, Ph.D., USC 1991 - Advisor: S. Golomb
<h2>EUROPE</h2>	
	ATHENS INFORMATION TECHNOLOGY, GREECE Gregory Yovanis, Ph.D., USC 1988 - Advisor: S. Golomb
	CYPRUS UNIVERSITY OF TECHNOLOGY Fragiskos Papadopoulos, Ph.D., USC 2009 - Advisor: K. Psounis
	DUBLIN CITY UNIVERSITY Anthony Holoban, Ph.D., USC 1992 - Advisor: M. Safanov
	EURECOM, FRANCE Akis Spyropoulos, Ph.D., USC 2008 - Advisor: K. Psounis
	ETH, SWITZERLAND Thyrazoulos Spyropoulos, Ph.D., USC 2006 - Advisor: C. Raghavendra
	FREDERICK UNIVERSITY OF CYPRUS Marinos Lestas, Ph.D., USC 2005 - Advisor: P. Ioannou
	ISTANBUL TICARET UNIVERSITY, TURKEY Esen Kucukaltun, Ph.D., USC 2006 - Advisor: R. Leahy
	IZMIR INSTITUTE OF TECHNOLOGY, TURKEY Orhan Cokdemir, Ph.D., USC 2003 - Advisor: K. Chugg
	MUT INFORMATICS INSTITUTE, TURKEY Ertan Mumcuoglu, Ph.D., USC 1994 - Advisor: R. Leahy
	UNIVERSITY OF CYPRUS Marinos Polycarpou, Ph.D., USC 1992 - Advisor: P. Ioannou
	UNIVERSITY OF MACEDONIA, GREECE Anastasio Economides, Ph.D., USC 1990 - Advisor: P. Ioannou
	UNIVERSITY OF THESSALY, GREECE Ioannis Katsavounidis, Ph.D., USC 1998 - Advisor: C.C. Kuo
	UNIVERSITY OF VALENCIA, SPAIN Baltasar Belferril-Lozano, Ph.D., USC 2002 - Advisor: A. Ortega
<h2>SOUTH AMERICA</h2>	
	FATHOLIC UNIVERSITY OF RIO DE JANEIRO, BRAZIL Jose Roberto Boisson de Mares, Ph.D., USC 1977 - Advisor: R. Scholtz
	UNIVERSITY OF BRASILIA Joao Luiz Azevedo de Carvalho, Ph.D., USC 2006 - Advisor: R. Scholtz
	UNIVERSIDADE ESTADUAL DE CAMPINAS, BRAZIL Nelson Fonseca, Ph.D., USC - Advisor: J. Silvester
	Newton Frateschi, Ph.D., USC 1993 - Advisor: D. Dapkus
	UNIVERSITY OF CHILE, SANTIAGO Jorge Silva, Ph.D., USC 2008 - Advisor: S. Narayanan
	UNIVERSIDADE FEDERAL DE MINAS GERAIS - BRAZIL Dionysio da Silva, Ph.D., USC - Advisor: A. Parker
<h2>AFRICA</h2>	
	UNIVERSITY OF STELLENBOSCH, SOUTH AFRICA John P. Burger, Ph.D., USC 2001 - Advisor: W. Steier
<h2>AUSTRALIA</h2>	
	UNIVERSITY OF MELBOURNE William Shieh, Ph.D., USC 1996 - Advisor: A. Willner