

**Shrikanth S. Narayanan**

University of Southern California

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Email: [shri@sipi.usc.edu](mailto:shri@sipi.usc.edu)URL: <http://sail.usc.edu>**Professional Interests: HUMAN-CENTERED SENSING, COMPUTING AND INFORMATION PROCESSING**

- Speech and Language Processing, Automatic Speech/Speaker Recognition, Speech Translation
- Human Behavioral Signal Processing, Emotions, Behavioral Informatics
- Human-Machine and Mediated Interactions; Spoken dialog and Multimodal Systems; Virtual Humans
- Speech production modeling, Articulatory-Acoustics, Speech/Audio Synthesis; Audio/Music
- Biomedical Signal Processing and Modeling: Imaging & Instrumentation

**Education:**

- June 1995 **Ph.D.** in *Electrical Engineering*, University of California, Los Angeles (UCLA).  
**Fields of Specialty:** Signal Processing, Controls and Communication, Operations Research.  
**Thesis:** “*Fricative consonants: An articulatory, acoustic, and systems study*”  
**Committee:** A. Alwan (Chair), A. V. Balakrishnan, P. Ladefoged, M. M. Sondhi, A. Wilson
- June 1992 **Engineer degree** in *Electrical Engineering*, UCLA.
- December 1990 **Master of Science** in *Electrical Engineering*, UCLA.  
**Thesis:** “*Nonlinear filtering and smoothing for noisy alternating renewal process signals*”  
**Committee:** A. V. Balakrishnan, Richard Mortensen, Paul Wang
- June 1988 **Bachelor of Engineering** in *Electrical Engineering*  
 College of Engineering–Guindy, Anna University, Madras, India.

**Professional Experience:**

- 10-present Director, Ming Hsieh Institute, Electrical Engineering, USC
- 07-present **University of Southern California**, Andrew J. Viterbi Professor of Engineering,
- 05-present Professor, Department of Electrical Engineering, Department of Computer Science (*Joint*),  
 Department of Linguistics & Program in Computational Linguistics (*Joint*)  
 Department of Psychology (*Joint*)  
 Member, Signal and Image Processing Institute  
 Director, Signal Analysis and Interpretation Laboratory (SAIL)
- 02-08 Research Area Director & Investigator, Integrated Media Systems Center (NSF-ERC)
- 03-05 Associate Professor, Department of Electrical Engineering (Computer Science, Linguistics: *Joint*)
- 00-03 Assistant Professor, Department of Electrical Engineering-Systems
- 95-00 **AT&T Labs-Research, Florham Park, NJ (formerly, AT&T Bell Labs, Murray Hill)**
- 99-00 Principal Technical Staff Member
- 95-99 Senior Technical Staff Member  
*Speech and Image processing Research Laboratory.*  
 Speech processing, Automatic speech recognition, Spoken dialog systems  
 Multimodal interfaces, Communication and information service applications  
 Experiments and modeling in speech acoustics.
- 9/92 - 5/95 **Research Assistant, Department of Electrical Engineering, UCLA.**  
*Speech Processing and Auditory Perception Laboratory.*  
 Speech analysis, modeling, synthesis; Biomedical imaging and instrumentation.
- 6/93-10/93 **Member of Technical Staff, AT&T Bell Laboratories, Murray Hill, NJ. (intern)**  
 Speech analysis and articulatory synthesis research.
- 6/92-10/92 **Member of Technical Staff, AT&T Bell Laboratories, Murray Hill, NJ.(intern)**  
 Video coding; Motion compensation techniques.
- 9/89 - 10/91 **Research Assistant, Department of Electrical Engineering, UCLA.**  
 Filtering and control algorithms for energy systems modeling.

## Awards and Honors:

2011	UCLA School of Engineering, Alumni Professional Achievement Award
2011	Interspeech'11 Speaker State Challenge Award (with D. Bone, M. Black, M. Li, A. Metallinou, S. Lee)
2010	Best Papers at InterSpeech 2010, International Speech Communication Association (for Black et al, "Automatic Classification of Married Couples' Behavior using Audio Features")
2010	IBM Faculty Award
2010	Distinguished Faculty Service Award, USC
2010	IEEE Signal Processing Society Best Paper Award (for Lee & Narayanan, "Toward detecting emotions in spoken dialogs" published in IEEE Trans. Speech and Audio Processing)
2010	Fellow of AAAS for "outstanding contributions to human communication science and technologies and their applications to engineering systems development."
2010	Distinguished Lecturer of the IEEE Signal Processing Society (2010-2011)
2009	Fellow of IEEE for "contributions to human-centered multimodal signal processing and applications"
2009	InterSpeech 2009 Emotion Challenge Award (with C-C. Lee, E. Mower, C. Busso, S. Lee)
2009	Best Paper Award, IEEE International Conference on Distributed Computing in Sensor Systems
2009	Body Computing Conference, BodySlam Award
2008	IBM Faculty Research Award
2008	Okawa Foundation Research Award
2007	Co-author, best student paper (J. Shin), IEEE Multimedia Signal Processing Workshop 2007.
2006	President, Phi Kappa Phi Academic Honor Society, USC Chapter
2006	IEEE Signal Processing Society Best Paper Award (for Narayanan & Potamianos, "Creating Conversational Interfaces for Children" published in IEEE Trans. Speech and Audio Processing)
2006	Co-author, best student paper (S. Sundaram), IEEE Multimedia Signal Processing Workshop 2006.
2006	Mellon Award for Excellence in Mentoring, USC
2005	Fellow of Acoustical Society of America (for "contributions to speech production and imaging")
2005	Acoustical Society of America, "Hot topics" invited speaker (speech production)
2005	The Northrop Grumman High Visibility Research Award, USC Electrical Engineering
2005	Co-author, best student paper (S. Ananthkrishnan), IEEE ICASSP 2005.
2003	Faculty fellow, Phi Kappa Phi
2003	USC Engineering Junior Faculty Research Award
2003	Faculty Fellow, USC Provost Center for Interdisciplinary Research
2003	NSF CAREER award
2002	ISCA Best Student Paper, Second Place ICSLP 2002 (graduate student J. Shin & undergraduate student, A. Kazemzadeh).
2002	Senior Member, IEEE
2000,1997	AT&T Performance Award
1999,1996	AT&T True Achievement Award
1994	Vinnell Foundation Fellowship
1993	Anthony Fellowship;
1990-1991	DEED Scholarship, American Public Power Association

## Professional Memberships:

- Fellow, Acoustical Society of America (ASA)
- Fellow, Institute of Electrical and Electronic Engineers (IEEE) – Signal Processing Society
- Fellow, American Association for the Advancement of Science (AAAS)
- Member, International Speech Communication Association (ISCA)
- Member, Linguistic Society of America
- Member, American Association of Advancement of Sciences
- Member, Tau Beta Pi, National Engineering Honor Society; Member, Eta Kappa Nu, National Electrical Engineering Honor Society; Phi Kappa Phi Academic Honor Society

**Key Editorial Services:**

2011	Guest Editor, EURASIP Journal on Advances in Signal Processing
2011	Guest Editor, ACM Transactions on Audio, Speech and Language Processing.
2007-present	Editor, Computer, Speech and Language Journal, Elsevier.
2009-present	Associate Editor, The Journal of the Acoustical Society of America
2008-present	Associate Editor, IEEE Transactions on Multimedia
2010-present	Associate Editor, IEEE Transactions on Affective Computing.
2006-2008	Associate Editor, IEEE Signal Processing Magazine
2006	Area Editor, Speech Synthesis, Handbook on Speech Processing, Springer
2002	Editorial Board, IEEE Trans. on Speech and Audio Processing, Spontaneous Speech Special Issue
2000-2004	Associate Editor, IEEE Transactions on Speech and Audio Processing

**Professional Society Services:**

2012	General Co-Chair APSIPA Annual Summit and Conference
2012	Technical Special Session Chair, Interspeech 2012
2010	Technical Program Co-Chair APSIPA Annual Summit and Conference
2009	Technical Program Co-Chair HLT-NAACL Conference
2009	Technical Program Co-Chair IEEE ASRU
2009	General Co-Chair, Second International Workshop on Children, Computer and Interaction
2007	General Co-Chair, IEEE Multimedia Signal Processing Workshop
2004-2007	Speech Processing Technical committee – IEEE Signal Processing Society (Policy subcommittee)
2005-2008	Multimedia Signal Processing Technical committee – IEEE Signal Processing Society
2001-present	Technical committee - Speech Communication, Acoustical Society of America
2002-present	ASA Committee on Standards Ex-officio member
2008	Co-chair, Registration, ICASSP 2008
2004	Publicity Chair, NAACL/Human Language Technology Conference (HLT)
2004	Sensory Information Processing Area Co-Chair, Intl Conf. Multimodal Interfaces (ICMI)
2003	Technical Program Chair, IEEE Automatic Speech Recognition and Understanding, Virgin Islands
2003	Workshop Technical Program Committees: SigDIAL; Multimodal User Authentication
2003	Education and Member subcommittee, IEEE Signal Processing Society Speech committee
2002	Technical Program Co-Chair, IEEE Speech Synthesis Workshop
2002	Tutorials Chair, International Conf. Spoken Language Processing
2002	Area Chair, Multilingual Processing, International Conf. Spoken Language Processing
2002	Special Session Chair, “Features and Models for Speech”, Acoust Soc. of Am. Meeting
2002	Co-Chair, Human-Machine Interface Track, International Conf. on Multimedia

**Review Services:**

- National Science Foundation,
- National Institutes of Health (NIDCD Study Section member 2008-11, Language Communication);
- Israel Science Foundation; Irish Research Council for Science, Engineering and Technology, Indo-US Foundation
- Several IEEE Transactions: Audio, Speech and Language Processing; Automatic Control; Signal Processing Letters; Multimedia; Medical Imaging; Signal Processing; Education
- Journal of the Acoustical Society of America; Speech Communication Journal
- Journal of the International Phonetic Association ; Journal of Speech and Hearing Research
- Several conferences including ICASSP, ICSLP, IJCAI, ACC, ICME, HLT, Interspeech and ASRU.

**Funded Research Projects at USC (09/2000-present):**

<b>SPONSOR</b>	<b>ROLE</b>	<b>TITLE</b>	<b>DATES</b>
ARL	CoPI (USC PI); collaborative research: Cogent	Improving Accuracy, Speed and Usability of Multi-Modal Biometric Handheld Devices	2009-2011
NSF	Co PI	Be A Scientist	2010-2015
NIH/NIAAA	CoPI (USC PI); collaborative research: Washington, UCI	Automating Behavioral Coding via Text-mining and Speech Signal Processing	2010-2015
DARPA	PI	Healing Heroes: Behavioral Signal Processing for PTSD	2011-2012
NSF (Expeditions in Computing)	PI (USC); collaborative research: GeorgiaTech, UIUC, MIT, BU, CMU	Behavioral Computing	2010-2015
NIH R01/NIDCD	PI	Dynamics of vocal tract shaping	2010-2015
ONR/BAE Systems	PI	Speaker Segmentation and Emotion Detection from Speech	2010-2011
NSF	PI	An Integrated Approach to Creating Context Enriched Speech Translation Systems	2009-2013
ONR	Co PI	Intelligent Coordination and Adaptive Classification for Naval Autonomous Systems	2009-2014
DARPA (sub to BAE)	PI	DeepGreen Phase II	2009-2010
Los Angeles Basin Clinical Translational Sciences Institute	Co PI	Translating automated bidirectional translation technologies to clinical settings	2009-2010
Army Research Labs	Co PI	Multimodal Biometrics	2009-2012
NIH/NIMH (ARRA)	Co Investigator	Disseminating Scientific Information about Autism to the Latino Community	2009-2011
Army	Co PI	Virtual Humans Research	2009-2011
DARPA	PI	SpeechLinks: Speech Translation for Tactical Communication	2006-2010
Fund for Innovative Undergraduate Teaching	PI	Engineers as Teachers	2009-2010
Army Research Office	Co PI	Virtual Sick Call	2009-2010
ONR	Co PI	INOTS: Interactive Naval Officer Training System	2009-2010
NSF	USC PI; Georgia Tech PI: Magerko	Collaborative Research: Modeling Creative and Emotive Improvisation In Theater Performance	2008-2011
Army Research Office	Co PI	Joint Fires and Effects Trainer System	2008-2009
Autism Speaks	PI	Speech Processing Technology for the Facilitation of Social Communication Training in Children with Autism	2008-2010
NSF	PI Narayanan	Exploring Emotional Vocal Productions through the use of Real-time Magnetic Resonance Imaging	2008-2010
NIH	Co PI	Mobile Device Biomonitoring to Prevent and Treat Obesity in Underserved Minority Youth	2008-2010
NSF	PIs: Mataric, Narayanan	Personalized Socially-Assistive Human-Robot Interaction: Applications to Autism Spectrum Disorder	2008-2011
Qualcomm	PI	Mobile Metabolic Health Monitoring	2008-2009
NSF (sub to ICT)	Investigator	Responsive Virtual Human Museum Guides	2008-2011
Army Research Office	Co-PI	Gunslinger: Virtual Humans in a Kinetic Environment	2007-2008
DHS	Co-PI, Hovy, PI	Center for Knowledge and Information Discovery	2007-2012
Army	PI	Virtual Humans-Natural Language	2007-2009
Army	PI	Tactical Questioning	2006-2008
NSF CRI	Investigator; PI Mataric	Human-Robot Interaction and Socially Assistive Robotics	2007-2008
NSF MRI	Investigator; PI Schaal	Humanoid Robots	2006-2008
Annenberg Center	PI	Emotions in Speaking and Singing	2006-2007
Provost Undergraduate Fund	Co-PIs: Byrd, Narayanan	Speech Production Modeling	2006
Zumberge Interdisciplinary Award	Co-PI; PI Zimmermann	Tele-rehabilitation	2006-2007
NIH R01/NIDCD	Co-PI; Byrd, PI	Prosody and Articulatory Dynamics in Spoken Language	2006-2011

SPONSOR	ROLE	TITLE	DATES
ONR	Co-PI; PI B. Mel	Bioinspired audiovisual processing	2006-2009
MURI – ONR U Wash, Stanford, USC	USC PI ;co PI, Byrd	Human-like speech processing	2005-2010
NIH R01	PI	Dynamics of vocal tract shaping	2005-2009
AT&T	PI	Multilingual processing	2005-07
Dept. of Interior/DARPA	PI	User interface for speech translation	2005-07
School of Social Work	Co-PI; PI Trickett	Planning grant for infrastructure creation for child social service research	2005-06
NSF ITR Collaborative Research (UCLA-UCB-USC)	USC PI; project director A. Alwan, UCLA	“Automating Early Assessment of Academic Standards for Very Young Native and Non-Native Speakers of American English”	2003-2007
ARDA VACE	Co-Investigator; PI Nevatia	“Multimodal Speaker Identification”	2004-05
Sandia Labs	PI	“Multimodal systems”	2004-2005
LASER ACTD	PI	Training for Speech Translation	2004-2005
Army Science Conference	Investigator	Interactive Virtual Soldier System	2004
Freedom Forum	Investigator; ICTsubcontract	“Newseum: Be a Reporter”	2003-2004
Provost Undergraduate Research Fund	with E. Andersen	“Cross-Cultural Issues in Child-Machine Interactions	2003-2004
Provost Undergraduate Research Fund	with D. Byrd	“Toward Illuminating Fine Details in Human Speech Production: Investigations of Vocal Tract Movements”	2003-2004
Center for Interdisciplinary Research	Fellow	“Multimodal-Multilingual Communication Technologies”	2003-2004
Pratt & Whitney Institute for Collaborative Engineering	PI; co-PIs Helmy, Lee, Ortega, Zimmerman	“Wireless Mobile and Distributed Networking System for Efficient Aircraft Engine Inspection and Maintenance”	2003-2006
ONR/DARPA	co-PI; Lewis Johnson, PI	“Training Superiority: Rapid Development of Mission-Oriented Communication Skills”	2003-2005
NSF CAREER award	PI	“Modeling and Optimizing User-Centric Mixed-Initiative Spoken Dialogue Systems”	2003-2009
Provost Undergraduate Research Fund	co-PIs D. Byrd, E. Andersen	“Monolingual and Bilingual Spoken Language Interactions of Preschoolers”	2002-2003
NIH R01	co-PI; Byrd, PI	“Prosody and Articulatory Dynamics in Spoken Language”	2002-2007
NSF ITR	PI, co-PIs E. Chew, C. Kuo	“Content Based Query and Retrieval of Music Using Signal Processing and Knowledge-Based Methods”	2002-2005
DARPA Babylon/CAST Project	PI	“Multilingual Speech to Speech Translation Systems”	2002-2005
US Army/STRICOM	PI	“Robust Speech Recognition for Immersive Training”	2001-2004
US Army	joint PI with L. Johnson	“Expressive Speech Synthesis for Animated Characters in Training Applications”	2002-2004
Acorn Technologies	PI	“Robust Speech Processing”	2002
ALI Microelectronic Corp	PI	“Processing and Retrieval of Music”	2002
Lockheed Martin	PI	“Multimodal Speech Interfaces”	2001-2002
Lucent Technologies	PI	“Speech Interfaces for Mobile Devices”	2001
Zumberge Interdisciplinary Grant	co-PIs: Andersen, McLaughlin	“Investigations Into Preschool Children Interacting with Machines”	2002-2003
USC Arts Initiative	PI: M. Lazzari; co-PIs: Breisch, McLaughlin, Narayanan	Tactile experiences for Arts	2002-2003
Provost Undergraduate Research Fund	co-PIs: Andersen, Byrd	“Analysis of Child-Machine Spoken Dialogues”	2002
NSF-ERC Integrated Media Systems Center	Co-PI with several USC investigators	Integrated Media Systems Center	2000-2008
Powell Foundation	PI	“Speech Analysis and Interpretation Lab Set-Up”	2000-2002

### Hardware/Software Donations Received (09/2000-present):

- Intel, Sun Microsystems, IBM, AT&T, Speechworks, Nokia

**Invited Talks:**

Sep 2011 Booz Allen Hamilton Distinguished Colloquium, University of Maryland, College Park, MD  
Jul 2011 Plenary Talk, International Conference on Multimedia and Expo (ICME), Barcelona, Spain  
Jul 2011 Invited Talk, Telefonica Research Multimedia Workshop, Barcelona, Spain  
Jun 2011 IEEE Distinguished Lecture, Princeton, NJ  
Apr 2011 Distinguished Lecture in Computing, Imperial College, London  
Apr 2011 Invited Lecture, Cambridge University, UK  
Apr 2011 Invited Lecture, Philips Research, Eindhoven, Netherlands  
Oct 2010 Invited Lectures: Chinese University of Hong Kong; Hong Kong University of Science & Technology  
Oct 2010 IEEE SPS Distinguished Lecture, Hong Kong  
Oct 2010 Invited Lectures: Tsinghua University, Beijing; Microsoft Research, Asia  
Oct 2010 Keynote, International Conference on Signal Processing Beijing  
July 2010 Invited lecture, 8th International Conference on Signal Processing and Communication, Bangalore  
July 2010 IEEE SPS Distinguished Lecture, Hyderabad, India  
July 2010 Invited Lectures, IIT Madras  
May 2010 Keynote Lecture, Speech Prosody Conference, Chicago  
Apr 2010 Keynote Lecture, Undergraduate Linguistics Conference, UCLA, Los Angeles  
Apr 2010 IEEE SPS Distinguished Lecture, University of Texas, Dallas  
Apr 2010 CML Distinguished Speaker Series, University of California, Irvine  
Nov 2009 University of California, Merced  
May 2007 Tsinghua-USC Workshop on Emerging Technologies, Beijing  
Feb 2007 Microsoft Research Seminar, Redmond, Washington  
Dec 2006 Indian Institute of Science/IEEE Signal processing Society, Bangalore, India  
Dec 2006 National University of Singapore-School of Computing, Singapore  
Mar 2006 Indian National Academy of Sciences Seminar, IIT-Madras, India  
Nov 2005 Samsung Electronics, Korea  
Aug 2005 AT&T Shannon Labs, University Collaboration Seminar, Florham Park, NJ  
July 2005 Cognitive Systems Workshop, Human Cognitive Models in System Design, Santa Fe, New Mexico  
May 2005 Hot Topics in Speech Communication, Acoustical Society of America, Vancouver, BC  
Mar 2005 Yonsei University EE Department Seminar, Seoul, Korea  
Oct 2004 International Conference on Spoken Language Processing  
Oct 2004 InHa University, Incheon, Korea  
Apr 2004 DARPA Workshop on Speech to Speech Translation, San Diego, CA  
Sept 2003 Technical University of Athens, Technical University of Crete, Greece  
May 2003 Massachusetts Institute of Technology & Harvard, Cambridge, MA  
Dec 2002 Cross EU-NSF ISLE Workshop, University of Edinburgh, Scotland  
Mar 2002 UCLA-EE Department Communications-Signal Proc. Seminar, LA, CA  
Oct 2001 California Institute of Technology-EE Department, Pasadena, CA  
Sept 2001 UC-Santa Barbara, ECE Department, Santa Barbara, CA  
Jun 2001 Panasonic Speech Technology Labs, Santa Barbara, CA  
Nov 2000 Rockwell Science Center, Thousand Oaks, CA  
Oct 2000 HRL Laboratories, Malibu, CA  
Mar 2000 University of Southern California, CA  
Nov 1999 Boston University, Boston, MA  
Nov 1998 University of California, Los Angeles, CA  
May 1997 Haskins Labs/Yale University, New Haven, CT  
Oct 1996 Intl. Conf. Spoken Language Processing, Philadelphia, PA  
Feb 1996 SPIE Conf. Medical Imaging, Newport Beach, CA  
Oct 1995 Intl. Conf. on Signals, Systems and Electronics, Monterey, CA  
Jun 1995 Haskins Labs, New Haven, CT

**Key University Services/USC:**

- Co-chair, USC Strategic Planning Subcommittee, Graduate Programs, 2010-11
- USC Academy of Polymathic Studies, Steering Committee, 2010-11
- Chair, USC University Research Committee, 2006-2009 (Co-Chaired, 2007-08); Member URC, 2010-11
- Faculty Advisory Council, USC Shoah Foundation Institute, 2008-present
- Member, USC University Research Committee, 2005-06; 2009-present
- Academic Promotions & Tenure Committee, USC Viterbi School of Engineering, 2004-2006
- Research Area Director (Applications Research), Integrated Media Systems Center (NSF-ERC), 2001-2008
- Research Vision Leader – Communications Systems, Integrated Media Systems Center, 2002-2008
- Research Leader, Pratt & Whitney Institute for Collaborative Engineering, USC, 2003-2008
- Faculty Coordinator, Electrical Engineering Systems Teaching Assistants, 2001-2004
- Graduate Student Recruitment, Fellowship Committees, 2001-2006
- Mentor: Undergraduate Research Program, Dean's Merit Research Program for freshmen engineers
- Freshmen interviews (Presidential Scholars/Trustee Scholars)
- Interdisciplinary program in Computational Linguistics

**Pre-USC Services:**

- AT&T Bell Labs Intern Mentor: Several graduate, undergraduate and high school students mentored in speech and language projects (1995-2000)
- AT&T Labs PhD Recruiter (1997-99)
- AT&T United Way volunteer
- UCLA Graduate Students Association: EE Departmental representative
- UCLA Minority Engineering Program Facilitator

**Industry Collaborations and Partnerships (2000-present):**

- Lockheed International
- HRL Labs
- Speech works International
- AT&T Research
- Bell Labs-Lucent
- IBM
- Qualcomm
- BBN Technologies
- BAE Systems
- Cogent Systems

## Teaching and Mentoring:

Fall'00-02,04-05,06-07	<b>EE519: Digital Speech Processing</b> ( <i>Course Developed</i> )
Spr 10, Fall 10	Graduate level introduction to speech signal processing. Applications to coding, recognition and synthesis
Spr'01	<b>EE599: Graduate Seminar on advanced topics in speech processing</b>
Spr'02,04,05,06,07,09	<b>EE619: Speech recognition and Spoken Language Engineering</b> ( <i>Course Developed</i> ) Emphasis on statistical approaches
9/90 - 6/94	<b>Teaching Associate/Fellow</b> , UCLA. Undergraduate engineering courses in Electrical and Electronic circuits, Signals and Systems, Feedback Control.

## POSTDOCTORAL ASSOCIATES/RESEARCH FACULTY:

- Dongrui Wu, Postdoctoral Associate, Physiological Signal Processing, (2009-present)
- Michael Proctor, Postdoctoral Associate, Speech Production, (2009-present)
- Athanasios Katsamanis, Postdoctoral Associate, Multimodal Signal Processing, (2009-present)
- Carlos Busso, Postdoctoral Associate, Multimodal Processing, (2008-2009)
- Matteo Gerosa, Postdoctoral Associate, Speech Recognition, (2006-2007)
- Panayiotis Georgiou, Research Assistant Professor, *Speech/Audio processing* (2002-present)
- Sungbok Lee, Research Assistant Professor, *Speech Production* (2001-present)
- Jon Nielsen, Postdoctoral Associate, *Imaging* (K. Nayak primary supervisor) (2005-2007)
- Scott Millward, Postdoctoral Associate, *User interfaces* (2004-05)

## PH.D STUDENTS GRADUATED

1. Prasanta Kumar Ghosh, "Novel Signal Representations for Speech", IBM Research
2. Erik Bresch, "Dynamic models in speech production", Philips Research
3. Selina Chu, "Unstructured Audio Processing" (jointly with C. C. Jay Kuo), Oregon State University
4. Samuel Kim, "Audio Modeling and Indexing", IDIAP/EPFL
5. Emil Ettelaie, "Speech Translation through Classification"
6. Viktor Rozgic, "Multimodal detection and tracking"
7. Emily Mower, "Affective interactions: analysis and recognition" (jointly with M. Mataric), U Michigan, Ann Arbor
8. Kyu Jeong Han, "Speaker modeling methods", (Fall 2009), IBM TJ Watson Research
9. Ozlem Kalinli, "Attention-based methods in speech and audio processing", (Fall 2009), Sony
10. Joseph Tepperman, "Pronunciation modeling and assessment", (Spring 2009), Rosetta Stone
11. Jorge Silva, "Information theoretic representations and models for classification", (Fall 2008), University of Chile [USC Viterbi Best Thesis Award]
12. Erdem Unal, "Music Information Retrieval under uncertainty: Polyphonic Music" (Spring 2008), Scientific and Technological Research Council of Turkey (TUBITAK)
13. Vivek Kumar Rangarajan Sridhar, "Prosody enriched speech translation", (Spring 2008), AT&T Research
14. Carlos Busso, "Multimodal processing of Emotions" (Spring 2008), University of Texas-Dallas
15. Shiva Sundaram, "Data-driven methods in speech and audio processing" (Spring 2008), Deutsche Telecom
16. Chu Ping Liu, "Cochlear Implant Speech Processing" (jointly with Qian-Jie Fu) (Spring 2008), Logitech
17. Sankaranarayanan Ananthakrishnan, "Prosody models for speech applications" (Spring 2008), BBN
18. Jongho Shin, "User modeling in human-machine conversations" (Fall 2007), LG Electronics/Emory Univ.
19. Murtaza Bulut, "Data-driven approaches to expressive speech synthesis" (Fall 2007), Philips Research
20. Abhinav Sethy, "Unsupervised methods for Speech and language modeling" (Spring 2007), IBM Watson
21. Chartchai Meesookho, "Collaborative Classification and Tracking of multiple targets" (with U. Mitra)
22. Dagen Wang, "Embedded Speech Systems with applications to speech translation" (Spring 2006), IBM
23. Serdar Yildirim, "Multimodal processing for child-machine interactions" (Spring 2006), Assistant Professor, Mustafa Kemal University, Turkey

24. Soonil Kwon, "Unsupervised speaker indexing" (Spring 2005), Sejong University, Seoul, Korea
25. Chul Min Lee, "Automatic Emotion Recognition from Speech and Language Information" (Fall 2004), LG Electronics
26. Naveen Srinivasamurthy, "Joint compression and classification with applications to distributed speech recognition" (jointly with A. Ortega) (2003 Fall), Texas Instruments
27. Hsuan-Huei Maverick Shih, "Statistical Recognition and Theme finder for Query by Humming Systems" (jointly with C.-C. Kuo) (2003 Spring), Vice President, Egis Technology, Taiwan

Served in over sixty PhD qualifying/dissertation committees in addition to the following students in my group:

#### **CURRENT PH.D STUDENTS (research topic)**

- Matt Black, "Automating behavioral assessments"
- Abe (Ebrahim) Kazemzadeh, "Affective computing with language"
- Andreas Tsiartas, "Statistical Learning for Speech Translation"
- Angeliki Metallianou, "Joint processing of facial expressions and speech"
- Jeremy Lee, "Modeling Multimodal Human Interactions"
- Ming Li, "Body sensing and multimodal processing"
- Kartik Audhkasi, "Production-Perception based speech processing"
- Adam Lammert, "Speech Production Dynamics"
- Vikram Ramanarayanan, "Speech production modeling"
- Daniel Bone, "Multimodal Signal Processing"
- Komath Naveen Kumar, "Robust Pattern Learning"
- Qun Feng Tan, "Sparse Representations for Classification"
- Bo Xiao, "Multimodal Signal Processing"
- Jannngwon Kim, "Emotional Speech Production"
- James Gibson, "Multimodal Signal Processing"
- Dogan Can, "Spoken Language Processing"
- Rahul Gupta, "Human Interaction Modeling"
- Theodora Chaspari, "Behavioral Signal Processing"
- Adam Abegg
- Zhaojun Yang
- Colin Vaz
- Andreas Zavou

#### **M.S. STUDENTS (research topic)**

- Dhaval Shah, "Audiovisual Biometrics", (2009)
- Stephen Tobin, "Speech Production Analysis using realtime MRI" (2007)
- Farhad Farahani, "Multiresolution analysis of pitch for speaker recognition" (2005)
- Donal McErlean, "Graphical Models for Collaborative Processing in Sensor Networks" (2003)
- Alvertos Diamantopolous, "Multimodal speech interfaces" (2002)
- Jeff Haynes, "Optimization in sensor networks using genetic algorithms" (2002)

#### **UNDERGRADUATE RESEARCH STUDENTS (research topic)**

The students were funded through the undergraduate research program (NSF funded or funded by the USC Provost Research Fund), or the Dean's Merit Research Program. Some of their work has contributed to conference publications.

- Naa Adei Mante, "Speech Imaging Research", 2011-present
- Ellen Feldman, "Emotions Research", 2011-present
- Juanchen Li, "Affective Computing", 2011-present
- James Li, "Multimodal Biometrics", 2010-present
- Stephanie Aceves, "Emotion Modeling", 2010-present
- Michelle Dee, "Human Interaction Analysis", 2008-present
- Ilene Rafii, "Motion capture based behavior analysis", 2008-present
- Jonathan Chang, "Child Machine Interaction", 2008-2010

- Johnson Wang, “Emotions research”, 2009-2010
- David Grayson Smith, “Emotions research from multimodal perspective”, 2009-2010
- Karie Lau, “Nonverbal signals of emotion”, 2007-08
- Nathan Dahlin, “Vocal Beatbox Production Models”, 2007-08
- Jesse Hans, “Articulatory signatures of spontaneous speech phenomena”, 2007-08
- Matthew Tan, “Expressive Inging Voices”, 2007 Summer (from U California, Berkeley)
- Jeannette Chang, “Detecting Certainty in Problem Solving: Multimodal Processing”, 2006-present
- Jeremy Chi-chun Lee, “Gesture information processing from motion capture”, 2006-2007
- Joshua Izumigawa, “Toward modeling multiperson interactions”, 2006-2007
- Celeste De Frietas, “Speech production modeling from real time MRI data”, 2006-2007
- Sharad Rao, “Audio modeling: Creating ontologies”, Summer 2005 (from U Illinois, Urbana-Champaign)
- David Hunt and Nathan Go, “Creating a novel speech production database”, 2005
- Nirali Shah, “Analysis of MRI Speech production data”, (2003-04)
- Jason Adams and Daylen Riggs, “Speech production”, (2004-05)
- Sonia Khurana, Marni Landes, Lewis Lawyer, “Children’s Interactive Multimedia Project”, (2003-04).
- Sonia Khurana and Talip Ucar, “Acoustic Analysis of Children’s speech”, (2002-03).
- Joe Tepperman, “Spoken Name Recognition”, (2002-03).
- Marni Landes, “Human factors for child machine interactions”, (2002-03).
- Abe Kazemzadeh, “Analysis of user behavior in spoken dialogs”, (2000-02). *Honor’s Thesis: Towards biological models for Linguistics: Human-computer dialog analysis and protein folding*
- Sudha Arunachalam (Neuroscience) and Dylan Gould (Linguistics), “Politeness and frustration language in child-machine interactions (2000-01)
- Joshua Katz (Annenberg) and Sonia Khurana (EE), “Experimental design and tools for investigating preschoolers talking to machines” (2001-02)
- Dylan Gould (Linguistics) and Ryan Cunningham (EE), “Design and collection of data for expressive speech synthesis” (2001-02)
- Ahmet Certen (EE) and Unal Erdem (EE), “Signal Analysis and User modeling for Query by Humming Systems”, (2001-02)

## HIGH SCHOOL STUDENTS

- 2007 Summer: Nicolas Castro, Brentwood School; Sophie Leahy: El Segundo High
- 2007-08: Yeon Grace Lu: Los Alamitos High

## VISITING RESEARCH STUDENTS

- Sergi Hernanz, Technical University of Catalunya, Barcelona, 2004, “Robust Speaker Recognition” (Diploma Thesis)
- Matteo Gerosa, IRST/University of Padova, 2005, “Modeling and recognizing children’s speech (Ph.D)
- David Suunderman, Siemens, Germany, 2005, “Signal transformation for synthesis” (Ph.D.)
- Michael Grimm, Karlsruhe University, 2005, “Emotions in speech” (Ph.D.)
- Andreu Fernandez, Technical University of Catalunya, Barcelona, 2006, “Error propagation and models for speech recognition” (Diploma Thesis)
- Arthur Pouzet, “Speech Imaging and Acoustic Modeling”, 2006
- Tsuneo Kato, “Articulatory information driven Speech recognition”, KDDI/Japan, 2007-08
- Jorge Gilabert, “Spanish English Speech to Speech Translation”, University of Catalunya, Barcelona 2007-2008
- Carlos Molina, “Novel methods for speech assessment”, University of Chile, 2008 (Ph.D.)
- Chi-Sang Jung, “Speech Biometrics”, Yonsei University, 2009-10 (Ph.D.)
- Ozan Cakmak, “Affective computing form text”, Mustafa Kemal Univeristy, Turkey, 2011

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**Peer-reviewed Publications and Patents:****Shrikanth S. Narayanan****Journals**

1. Jorge Silva and Shrikanth Narayanan. Nearly Optimal Estimation of Mutual Information based on a Complexity Regularized Tree-Structured Partition. *IEEE Transactions on Information Theory*. 2011.
2. Prasanta Kumar Ghosh, Louis Goldstein, Shrikanth Narayanan, “Auditory-like filterbank: An optimal speech processor for efficient human speech communication”, *Springer Proceedings of Indian Academy of Sciences (Sadhana)*, Special Issue on Speech Processing, 2011.
3. Chi-Chun Lee, Emily Mower, Carlos Busso, Sungbok Lee, Shrikanth Narayanan. Emotion recognition using a hierarchical binary decision tree approach. *Speech Communication*. Sensing Emotion and Affect - Facing Realism in Speech Processing. 53(9-10): 1162-1171, November-December 2011.
4. Prasanta Ghosh and Shrikanth Narayanan. Automatic Speech recognition using articulatory features from subject-independent acoustic-to-articulatory inversion. *J. Acoust. Soc. Am. Express Letters*. 130 (4): EL251-EL257, 2011.
5. Qun Feng Tan, Panayiotis Georgiou and Shrikanth Narayanan. Enhanced Sparse Imputation Techniques for a Robust Speech Recognition Front-End. *IEEE Transactions on Audio, Speech and Language Processing*. 2011.
6. Adar Emken, Ming Li, Gautam Thatte, Sangwon Lee, Murali Annavaram, Urbashi Mitra, Shrikanth Narayanan, and Donna Spruijt-Metz. Recognition of Physical Activities in Overweight Hispanic Youth Using KNOWME Networks. *Journal of Physical Activity & Health*. 2011.
7. Yoon-Chul Kim, Cecil E. Hayes, Shrikanth S. Narayanan, Krishna S. Nayak. A Novel 16-Channel Receive Coil Array for Accelerated Upper Airway MRI at 3 Tesla. *Magnetic Resonance in Medicine*. 65(5): 1365-1371, 2011.
8. Matthew Black, Abe Kazemzadeh, Joseph Tepperman and Shrikanth Narayanan. Automatically Assessing the ABCs: Verification of Children's Spoken Letter-Names and Letter-Sounds. *ACM Transactions on Audio, Speech and Language Processing*. 2011.
9. Gautam Thatte, Ming Li, Sangwon Lee, Adar Emken, Shrikanth Narayanan, Urbashi Mitra, Donna Spruijt-Metz and Murali Annavaram. KNOWME: An Energy-Efficient, Multimodal Body Area Network for Physical Activity Monitoring. *ACM Transactions on Embedded Computing Systems*. 2011.
10. Prasanta Ghosh, Louis Goldstein and Shrikanth Narayanan. Processing speech signal using auditory-like filterbank provides least uncertainty about articulatory gestures. *J. Acoust. Soc. Am.* 129(6): 4014-4022, June 2011.
11. Gautam Thatte, Ming Li, Sangwon Lee, Adar Emken, Murali Annavaram, Shrikanth Narayanan, Donna Spruijt-Metz, and Urbashi Mitra. Optimal Time-Resource Allocation for Energy-Efficient Physical Activity Detection. *IEEE Transactions on Signal Processing*. 59(4): 1843-1857, 2011.
12. Emily Mower, Maja Mataric and Shrikanth Narayanan. A Framework for Automatic Human Emotion Classification Using Emotional Profiles. *IEEE Transactions on Audio, Speech and Language Processing*. 19(5): 1057-1070, 2011.

13. Matthew Black, Joseph Tepperman and Shrikanth Narayanan. Automatic Prediction of Children's Reading Ability for High-level Literacy Assessment. *IEEE Transactions on Audio, Speech and Language Processing*. 19(4): 1015 - 1028, 2011.
14. Joseph Tepperman, Sungbok Lee, Shrikanth Narayanan and Abeer Alwan. A Generative Student Model for Scoring Word Reading Skills. *IEEE Transactions on Audio, Speech and Language Processing*. 19(2): 348-360, 2011.
15. Serdar Yildirim, Shrikanth Narayanan and Alexandros Potamianos. Detecting Emotional State of a Child in a Conversational Computer Game. *Computer, Speech, and Language*. Special Issue on Affective Speech. 25(1): 29-44, 2011.
16. Prasanta Ghosh, and Shrikanth Narayanan. Joint source-filter optimization for robust glottal source estimation in the presence of shimmer and jitter. *Speech Communication*. 53(1): 98-109, 2011.
17. Prasanta Ghosh, Andreas Tsiartas and Shrikanth Narayanan. Robust voice activity detection using long-term signal variability. *IEEE Transactions on Audio, Speech and Language Processing*. 19(3): 600-613, 2011.
18. Yoon-Chul Kim, Shrikanth S. Narayanan, Krishna S. Nayak. Flexible retrospective selection of temporal resolution in real-time speech MRI using a golden-ratio spiral view order. *Magnetic Resonance in Medicine*. 65(5): 1365-1371, 2011.
19. Dongrui Wu, Christopher Courtney, Brent Lance, Shrikanth S. Narayanan, Michael Dawson, Kelvin Oie, and Thomas D. Parsons. Optimal Arousal Identification and Classification for Affective Computing Using Physiological Signals: Virtual Reality Stroop Task. *IEEE Transactions on Affective Computing*, 1(2): 109-118, 2010.
20. Erik Bresch and Shrikanth Narayanan. Real-time MRI investigation of resonance tuning in soprano singing. *J. Acoust. Soc. Am. Express Letters*, 128(5): EL335-341, 2010.
21. Prasanta Ghosh, and Shrikanth Narayanan. A generalized smoothness criterion for acoustic-to-articulatory inversion. *J. Acoust. Soc. Am.* 128(4):2162-2172, 2010.
22. Ming Li, Viktor Rozgic, Gautam Thatte, Sangwon Lee, Adar Emken, Murali Annaram, Urbashi Mitra, Donna Spruijt-Metz and Shrikanth Narayanan. Multimodal Physical Activity Recognition by Fusing Temporal and Cepstral Information. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. 18(4): 369-380, 2010.
23. Jorge Silva and Shrikanth Narayanan. Information Divergence Estimation based on Data-Dependent Partitions. *Journal of Statistical Planning and Inference*. 140(11)-3180-3198, 2010.
24. Dhaval Shah, Kyu J. Han, and Shrikanth S. Narayanan. Robust Multimodal Person Recognition Using Low-Complexity Audio-Visual Feature Fusion Approaches. *International Journal of Semantic Computing*. 4(2): 155-179, 2010
25. Prasanta Ghosh and Shrikanth Narayanan. Bark frequency transform using an arbitrary order allpass filter. *IEEE Signal Processing Letters*. 17(6):543-546, 2010.
26. Jorge Silva and Shrikanth Narayanan. Non-Product Data-Dependent Partitions for Mutual Information Estimation: Strong Consistency and Applications. *IEEE Transactions on Signal Processing*. 58(7): 3497-3511, July 2010.
27. Viktor Rozgic, Kyu Jeong Han, Panayiotis G. Georgiou and Shrikanth Narayanan. Multimodal speaker segmentation and identification in presence of overlapped speech segments. *Journal of Multimedia*, Special Issue on Data Semantics and Multimedia Information Management. 5(4): 322-331, 2010.

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29. Vivek Rangarajan, Srinivas Bangalore and Shrikanth Narayanan. Combining lexical, syntactic and prosodic cues for improved online dialog act tagging. *Computer, Speech, and Language*. 23(4): 407-422, October 2009.
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32. Prasanta Ghosh and Shrikanth Narayanan. Closure duration analysis of incomplete stop consonants due to stop-stop interaction. *J. Acoust. Soc. Am. Express Letters* **126** (1): EL1-7, July 2009.
33. Ozlem Kalinli and Shrikanth Narayanan. Prominence Detection Using Auditory Attention Cues and Task-Dependent High Level Information. *IEEE Transactions on Audio, Speech and Language Processing*. 17(5): 1009-1024, 2009.
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41. Jorge Silva and Shrikanth Narayanan. Discriminative Wavelet Packet Filter Bank Selection for Pattern Recognition. *IEEE Transactions on Signal Processing*. 57(5): 1796-1810, 2009.
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44. Serdar Yildirim and Shrikanth Narayanan. Automatic Detection of Disfluency Boundaries in Spontaneous Speech of Children Using Audio-Visual Information. *IEEE Transactions on Speech, Audio and Language Processing*. 17(1): 2 – 12, January 2009.
45. Sankaranarayanan Ananthakrishnan and Shrikanth Narayanan. Unsupervised Adaptation of Categorical Prosody Models for Prosody Labeling and Speech Recognition. *IEEE Transactions on Audio, Speech and Language Processing*. 17(1): 138 – 149, January 2009.
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48. Jorge Silva and Shrikanth Narayanan. Upper Bound Kullback-Leibler Divergence for Transient Hidden Markov Models. *IEEE Transactions on Signal Processing*. 56(9): 4176 - 4188, September 2008.
49. Murtaza Bulut and Shrikanth Narayanan. On the robustness of overall Fo-only modifications to the perception of emotions in speech. *J. Acoust. Soc. Am.* 123(6): 4547-4558, June 2008.
50. Chuping Liu, John Galvin, Qian-Jie Fu, and Shrikanth Narayanan. Effect of spectral normalization on different talker speech recognition by cochlear implant users. *J. Acoust. Soc. Am.* 123(5): 2836-2847, May 2008.
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52. Vivek Rangarajan, Srinivas Bangalore and Shrikanth Narayanan. Exploiting acoustic and syntactic features for automatic prosody labeling in a maximum entropy framework. *IEEE Transactions on Audio, Speech and Language Processing*. 16(4): 797-811, May, 2008.
53. Erdem Unal, Elaine Chew, Panayiotis Georgiou and Shrikanth Narayanan. Challenging Uncertainty in Query by Humming Systems: A fingerprinting approach. *IEEE Transactions on Audio, Speech and Language Processing*. 16(2): 359-371, February, 2008.
54. Joseph Tepperman and Shrikanth Narayanan. Using articulatory representations to detect segmental errors in nonnative pronunciation. *IEEE Transactions on Audio, Speech and Language Processing*. 16(1): 8-22, January 2008.
55. Sankaranarayanan Ananthakrishnan and Shrikanth Narayanan. Automatic Prosody Labeling using Acoustic, Lexical, and Syntactic Evidence. *IEEE Transactions on Audio, Speech and Language Processing*. 16(1): 216-228, January 2008.

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57. Dagen Wang and Shrikanth Narayanan. Robust speech rate estimation for spontaneous speech. *IEEE Transactions on Audio, Speech and Language Processing*. 15(8): 2190 - 2201, November 2007.
58. Carlos Busso and Shrikanth Narayanan. Interrelation between Speech and Facial Gestures in Emotional Utterances: A single subject study. *IEEE Transactions on Audio, Speech and Language Processing*. 15(8): 2331 - 2347, November 2007.
59. Michael Grimm, Emily Mower, Kristian Kroschel, and Shrikanth Narayanan. Primitives based estimation and evaluation of emotions in speech. *Speech Communication*. 49: 787-800, November 2007.
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62. Soonil Kwon and Shrikanth Narayanan. Robust Speaker Identification based on Selective Use of Feature Vectors. *Pattern Recognition Letters* 28: 85-89, 2007.
63. Shiva Sundaram and Shrikanth Narayanan. Automatic Acoustic Synthesis of Human-Like Laughter. *J. Acoust. Soc. Am.*, J. Acoust. Soc. Am, 121(1):527-535, Jan 2007.
64. Erik Bresch, Jon Nielsen, Krishna Nayak, Shrikanth Narayanan. Synchronized and noise-robust audio recordings during realtime MRI scans. *J. Acoust. Soc. Am.* 120(4): 1791-1794, October 2006.
65. Abhinav Sethy, Shrikanth Narayanan, and S. Parthasarathy. A Split Lexicon Approach for Improved Recognition of Spoken Names. *Speech Communication*. 48(9): 1126-1136, Sept 2006.
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68. N. Srinivasamurthy, A. Ortega, S. Narayanan. Efficient scalable encoding for distributed speech recognition. *Speech Communication*, Vol. 48: 8, pp. 888-902, August, 2006.
69. Soonil Kwon and Shrikanth Narayanan. Unsupervised multiple speaker indexing using generic models. *IEEE Transactions on Speech and Audio Processing*, 13(5):1004-1013, 2005.
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71. Erdem Unal, Shrikanth Narayanan, Maverick Shih, Elaine Chew, C.-C. Jay Kuo. Creating Data Resources for Designing User-centric Front-ends for Query by Humming Sys-

- tems. *ACM Multimedia Systems Journal*, Special Issue on Music Information Retrieval (C. Djeraba and N. Sebe and M. S. Lew, Eds.), Spring 2005.
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### Book Chapters

1. Selina Chu, Shrikanth Narayanan and C.C-. Jay Kuo. Unstructured Environmental Audio: Representation, Classification and Modeling. In Wenwu Wang, Machine Audition: Principles, Algorithms and Systems, pages 1-21, Information Science Reference (IGI Global), Hershey, PA, 2010.
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3. M. Bulut, and S.S. Narayanan. Speech synthesis systems in ambient intelligence environments. In Hamid Aghajan, Ramón López-Cózar Delgado, Juan Carlos Augusto, Editors, Human-Centric Interfaces For Ambient Intelligence, Elsevier, Germany, 2009.
4. C. Busso, Z. Deng, U. Neumann and S.S. Narayanan. Learning expressive human-like head motion sequences from speech. In Z. Deng and U. Neumann, editors, Data-Driven 3D Facial Animations, pages 113-131. Springer-Verlag, 2007
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7. A. Alwan, S. Narayanan, B. Strope, and A. Shen. Speech production and perception models and their applications to synthesis, recognition, and coding. In Chollet, DiBenedetto, Esposito, and Marinaro, editors, Speech Processing, Recognition, and Artificial Neural Networks, pages 138-161. Springer-Verlag, 1999.

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S. Narayanan and A. Alwan, editors. Text to Speech Synthesis: New paradigms and advances. Prentice Hall, 2004

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- [1] Erdem Unal, Elaine Chew, Panayiotis Georgiou And Shrikanth Narayanan. A Perplexity Based Cover Song Matching System For Short Length Queries. Proceedings Of International Society For Music Information Retrieval Conference, Miami, FL, 2011.
- [2] Panayiotis G. Georgiou, Matthew P. Black, Adam C. Lammert, Brian R. Baucom And Shrikanth S. Narayanan. "That's Aggravating, Very Aggravating": Is It Possible To Classify Behaviors In Couple Interactions Using Automatically Derived Lexical Features? Proceedings Of Affective Computing And Intelligent Interaction (ACII), Lecture Notes In Computer Science, Memphis, TN, 2011.

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- [3] Athanasios Katsamanis, James Gibson, Matthew Black And Shrikanth Narayanan. Multiple Instance Learning For Classification Of Human Behavior Observations. Proceedings Of Affective Computing And Intelligent Interaction (ACII), Lecture Notes In Computer Science, Memphis, TN, 2011.
- [4] Chi-Chun Lee, Athanasios Katsamanis, Matthew P. Black, Brian R. Baucom, Panayiotis G. Georgiou And Shrikanth S. Narayanan. Affective State Recognition In Married Couples' Interactions Using PCA-based Vocal Entrainment Measures With Multiple Instance Learning. Proceedings Of Affective Computing And Intelligent Interaction (ACII), Lecture Notes In Computer Science, Memphis, TN, 2011.
- [5] Abe Kazemzadeh, Sungbok Lee, Panayiotis Georgiou And Shrikanth Narayanan. Emotion Twenty Questions: Toward A Crowd-Sourced Theory Of Emotions. Proceedings Of Affective Computing And Intelligent Interaction (ACII), Lecture Notes In Computer Science, Memphis, TN, 2011.
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## **SAIL research reported in the public media**

Some of the research by the speech lab members and their collaborators has drawn local/national/international media attention (print, online and broadcast radio/television).

<http://sail.usc.edu/news.php>

<http://viterbi.usc.edu/news/research/narayanan.htm>

### **Behavior Signal Processing and Behavioral Informatics (2009-present)**

BBC World Service, AOL News, BBC News (Technology), NBC Nightly News, KTLA, NBC Ch4

### **Speech Translation (2005-present)**

The work on speech to speech translation has been reported in *Business Week*, *KCET TV*, and a number of print/online outlets including *USNews.com*, *Ventura County Star*, *Persian Journal*, *Clinical Window Journal*, *Annenberg TV* and the *Daily Trojan*.

### **Emotion Recognition (2004-08)**

The work on automatic emotion detection has been highlighted in television (*MSNBC*, *CBS*, *CNN*, *KCAL-Los Angeles*), radio (*BBC*, *Australian Broadcast Corporation*, *National Public Radio*, *Irish National Radio* and other local stations in the USA such as in Los Angeles *KPCC*, and Boston/Rhode Island) and print media (*MIT Technology Review*, *Wired*, *Newsweek*, *Financial Times of London*, *Australian Financial Review*, *Inc. Magazine*, *German Focus*, *Italian Panorama*, *Miami Herald*, *New Yorker*).

### **Language Training (2004-05)**

The work on language training using speech recognition and virtual reality technologies has appeared on *ABC*, *NPR*, *NY Times*, *IEEE Intelligent Systems*.

### **Expressive Synthesis (2005)**

National Academy of Engineering Radio (WTOP Baltimore), BBC 4 and BBC World Service, Baltimore Sun

### **Speech Production (2004,2008)**

USC College Magazine, Medical Science News, ADVANCE for Speech-Language Pathologists & Audiologists.

### **Interdisciplinary Research (2004,2007,2008)**

USC Daily Trojan, USC Trojan Family Magazine, USC Chronicle, USC Engineer, USC College Magazine