Curriculum Vitae

MICHAEL L. SELTZER

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Department of ECE
Carnegie Mellon University
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EDUCATION

Doctor of Philosophy, Electrical & Computer Engineering expected May 2003
Carnegie Mellon University, Pittsburgh, PA

- Dissertation: "Microphone Array Processing for Robust Speech Recognition"
- Advisor: Professor Richard M. Stern

Master of Science, Electrical & Computer Engineering May 2000
Carnegie Mellon University, Pittsburgh, PA

- GPA: 3.92/4.00
- Master's Thesis: "Automatic Detection of Corrupt Spectrographic Features for Robust Speech Recognition"
- Advisor: Professor Richard M. Stern
- Coursework in digital signal processing, stochastic processes, multimedia coding, pattern recognition, linear systems

Bachelor of Science with Honors, Electrical Engineering May 1996
Brown University, Providence, RI

- GPA: 3.53/4.00
- Honors Thesis: "Printed Circuit Board Designs for the Huge Microphone Array"
- Advisor: Professor Harvey F. Silverman
- Coursework in digital systems design, analog circuit analysis & design, design of computing systems, VLSI design

HONORS

- Microsoft Research Graduate Fellowship 2002-2003
- Graduated with Honors, Brown University, 1996

INTERESTS

- Robust speech recognition in non-stationary environments
- Microphone array processing
- Statistical pattern recognition
- Machine learning for speech and audio applications

RESEARCH EXPERIENCE

Research Assistant
Carnegie Mellon University, Pittsburgh, PA May 1999-Present

- Advisor: Richard M. Stern
- Conducting research in speech recognition with emphasis on robustness to noise and channel effects
- Currently investigating speech recognition in hands-free environments using microphone arrays. Investigating methods of incorporating knowledge from speech recognition system into array processing scheme.
- Developed classification scheme to blindly identify noise-corrupted spectrographic regions for use in missing-feature compensation methods.

- Contributed to CMU effort in the Speech In Noisy Environments (SPINE1) evaluation – CMU had best performing system of nine participating university and industrial sites.
- Designed and implemented custom speech/audio capture hardware for multi-channel recording in extremely noisy military environments.
- Wrote feature-extraction front-end software for open-source releases of Sphinx II and Sphinx III

Research Intern
Microsoft Research, Redmond, WA June 2002-Aug 2002
- Supervisors: Jasha Droppo, Alex Acero
- Investigated the use of pitch and the harmonic structure of speech as the basis of a noise-compensation strategy to improve speech recognition performance in adverse environmental conditions.
- Developed algorithms based on harmonic modeling which improved recognition accuracy up to 30% on the Aurora 2 task

Research Intern
Cambridge Research Lab, Compaq Computer Corporation, Cambridge, MA Oct 2000-Feb 2001
- Supervisor: Bhiksha Raj
- Developed microphone array calibration schemes for speech recognition
- Investigated the application of these techniques to information kiosk applications

Research Assistant
Brown University, Providence, RI Sept 1995-May 1996
- Advisor: Harvey F. Silverman
- Designed circuit boards for two hardware elements of the Huge Microphone Array
- Created documentation for complex circuit board design software

TEACHING EXPERIENCE

Teaching Assistant
Signals and Systems - Instructor: B.V.K. Vijaya Kumar
Carnegie Mellon University, Pittsburgh, PA Aug 1998-Dec 1999
- Head teaching assistant
- Led recitations, lab, and review sessions
- Graded student exams

Teaching Assistant
Digital Communications and Signal Processing Systems Design - Instructor: David Casasent
Carnegie Mellon University, Pittsburgh, PA Jan 1999-May 1999
- Created, improved and graded homework assignments for DSP project class
- Advised student teams in design and implementation of speech/audio related projects
- Evaluated student teams' projects, presentations, and reports

PROFESSIONAL EXPERIENCE

Mixed-Signal Applications Engineer
Teradyne, Inc., Boston, MA Aug 1996-July 1998
- Developed custom test hardware/software solutions for power mixed-signal and telecommunications devices
- Developed DSP software routine for improved AC instrumentation performance
- Designed voltage regulation module and applications note for testing high-power digital devices
- Led effort to determine telecommunications test requirements for next-generation test system
- Had extensive interaction with customers and field engineers both in the field and in the factory

PUBLICATIONS

Journal articles

M. L. Seltzer, B. Raj, and R. M. Stern, "A Bayesian framework for spectrographic mask estimation for missing feature speech recognition," accepted for publication in *Speech Communication*.

B. Raj, M. L. Seltzer, and R. M. Stern, "Reconstruction of missing features for robust speech recognition," accepted for publication in *Speech Communication*.

M. L. Seltzer and B. Raj, "Speech recognizer-based filter optimization for microphone array processing," *IEEE Signal Processing Letters*, vol. 10, no. 3, March 2003.

Conference articles

M. L. Seltzer, J. Droppo, and A. Acero, "A harmonic-model-based front end for robust speech recognition," submitted to *EUROSPEECH 2003*, Geneva, Switzerland.

M. L. Seltzer and R. M. Stern, "Subband parameter optimization of microphone arrays for speech recognition in reverberant environments," *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing 2003*, Hong Kong.

M. L. Seltzer, B. Raj, and R. M. Stern, "Speech recognizer-based microphone array processing for robust hands-free speech recognition," *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing 2002*, Orlando, FL.

M. L. Seltzer and B. Raj, "Calibration of microphone arrays for improved speech recognition," *Proceedings of EUROSPEECH 2001*, Aalborg, Denmark.

B. Raj, M. L. Seltzer, and R. M. Stern, "Robust speech recognition using missing features," *Proceeding of the Workshop on Consistent and Reliable Cues (CRAC) for Sound Analysis 2001*, Aalborg, Denmark.

R. Singh, M. L. Seltzer, B. Raj, and R. M. Stern, "Speech in noisy environments: robust automatic segmentation, feature extraction, and hypothesis combination," *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing 2001*, Salt Lake City, UT.

M. L. Seltzer, B. Raj, and R. M. Stern, "Classifier-based mask estimation for missing feature methods of robust speech recognition," *Proceedings of the International Conference on Spoken Language Processing 2000*, Beijing, China.

B. Raj, M. L. Seltzer, and R. M. Stern, "Reconstruction of damaged spectrographic features for robust speech recognition," *Proceedings of the International Conference on Spoken Language Processing 2000*, Beijing, China.

M. L. Seltzer, "Calibration routine for improved distortion performance in the VHF digitizer," *Proceedings of the Teradyne Users Group Conference*, Austin, TX, April 1998.

M. L. Seltzer, "A circuit for supply pin voltage regulation ," Test Technique Note, Teradyne, Inc., 1997.

Ph.D. Proposal

M. L. Seltzer, "Microphone array processing for robust speech recognition," Ph.D. Thesis Prospectus, June, 2001.

Master's Thesis

M. L. Seltzer, Automatic Detection of Corrupted Speech Features for Robust Speech Recognition, Master's Thesis, Department of Electrical and Computer Engineering, Carnegie Mellon University, May, 2000.

SELECTED PRESENTATIONS

"Towards a pitch-aware front end for robust ASR," Microsoft Research, Redmond, WA, August 19, 2002.

"Application of missing feature compensation methods to GSM-coded Spanish telephone speech," presented to Telefónica Investigación y Desarrollo at Carnegie Mellon University, Pittsburgh, PA, October 15, 2001.

"Calibration of microphone arrays for improved speech recognition," Eurospeech 2001, Aalborg, Denmark, September 4, 2001.

"Speech recognizer-based filtering: a new approach to microphone array speech recognition," Cambridge Research Lab, Compaq Computer Corporation, Cambridge, MA. February 17, 2001.

"Classifier-based mask estimation for missing feature methods of robust speech recognition," International Conference on Spoken Language Processing 2000, Beijing, China, October 19, 2000.

"Estimation of spectrographic masks for missing feature methods of robust speech recognition," BBN Technologies, Cambridge, MA. March, 2000.

"Co-channel speech separation," Sphinx Speech Recognition Group, Carnegie Mellon University, Pittsburgh, PA. January 13, 2000.

"Hidden Markov Models for Speech Recognition," Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA, November 15, 1999.

SUPERVISION

Andy K. S. Eow, B.S. candidate, Fall, 2002

- Supervised efforts to create a baseline speech recognition system for automatic transcription of meeting data.

PROFESSIONAL ACTIVITIES & AFFILIATIONS

Reviewer for *IEEE Transactions on Speech and Audio Processing*
Member of *Sigma Xi,* the scientific research honor society, elected 1996
Member of *IEEE Signal Processing Society,* since 1995
Member of *IEEE*, since 1994

SKILLS

- Extensive experience using SPHINX II/ SPHINX III speech recognition systems including feature extraction, acoustic modeling, training and testing
- Experience using HTK speech recognition system speech recognition systems including feature extraction, acoustic modeling, training and testing
- C, Matlab, C++, shell scripts, Perl, Unix, Windows, xwaves, Framemaker, HTML, MS Office
- Knowledge of hardware for audio, music and telephony applications.
- Native in English, proficient in French, basic knowledge of Spanish

ACTIVITIES

- ECE Representative to the CMU Graduate Student Assembly, May 1999-August 2001
- Brown Outdoor Leadership Training (BOLT), 1995-1996 - led ten sophomores on a 5 day backpacking trip in the White Mountains, teaching leadership skills, group dynamics, and team building; trained next class of BOLT leaders
- Brown Breaks Projects, January 1996 - led students on a weeklong Habitat for Humanity project to Patterson, NJ