

CURRICULUM VITA

Richard M. Stern, Jr.

Department of Electrical and Computer Engineering
Carnegie Mellon University
Pittsburgh, PA 15213
Phone: (412) 268-2535

513 Emerson Street
Pittsburgh, PA 15206
Cell phone: (412) 916-7386

Email: rms@cmu.edu
Citizenship: U.S.A.

www.ece.cmu.edu/~rms

PROFESSIONAL INTERESTS

Automatic speech recognition, auditory perception, acoustics, signal processing, biomedical instrumentation

EDUCATION

- Ph.D. (1977) Electrical Engineering and Computer Science
Massachusetts Institute of Technology, Cambridge, MA
- M.S. (1972) Electrical Engineering and Computer Sciences University of
California, Berkeley, CA
- S.B. (1970) Electrical Engineering
Massachusetts Institute of Technology, Cambridge, MA

EXPERIENCE

- 1995 - present Professor of Electrical and Computer Engineering Carnegie Mellon University.
- 1988 - present Associate Professor and Professor by Courtesy, Language Technologies Institute, Computer Science Department, Biomedical Engineering Department
- 2009 - present Artist Lecturer, School of Music
Carnegie Mellon University
- 1995 - 2003 Associate Director of the Information Networking Institute
Carnegie Mellon University
- 1982 - 1995 Associate Professor of Electrical and Biomedical Engineering
Carnegie Mellon University
- 1985 Visiting Professor in Speech and Communication Sciences,
Nippon Telegraph and Telephone Electrical Communications Laboratory,
Tokyo, Japan
- 1977 - 1982 Assistant Professor of Electrical and Biomedical Engineering
Carnegie Mellon University

LGE EXHIBIT NO. 1012

1979 - 1981 Adjunct Assistant Professor of Otolaryngology
University of Pittsburgh School of Medicine

1973 - 1976 Teaching and Research Assistant, Department of Electrical Engineering,
Massachusetts Institute of Technology

PROFESSIONAL ACTIVITIES (partial listing)

Distinguished Lecturer, International Speech Communication Association, 2008-2009.

General Chair, INTERSPEECH International Conference on Spoken Language Processing, September, 2006.

Technical Program Co-Chair, IEEE Workshop on Automatic Speech Recognition and Understanding, December 2005.

Technical Program Chair, 141st meeting of the Acoustical Society of America, June 2002.

General Chair, DARPA Spoken Language Technologies Workshop, March, 1994.

Publications Chair, ARPA Spoken Language Technology and Applications Day, April, 1993.

Publications Chair, IEEE Workshop on Applications of Signal Processing to Audio and Acoustics, October, 1993.

Chair, standing DARPA Speech and Natural Language Workshop Organizing Committee, 1991 1992.

Secretary, ARPA Spoken Language Coordinating Committee, 1990 - 1995.

General Chair, DARPA Speech and Natural Language Workshop, June, 1990.

International Advisory Board, International Speech Communication Association, 2006 - present.

International Advisory Board, Center for Speech and Language Technologies, Tsinghua University, Beijing, China, 2007 - 2010.

Chair, Selection Committee for IEEE James L. Flanagan Speech & Audio Processing Award, 2006 - 2008.

IEEE Signal Processing Society Technical Committee on Audio and Electroacoustics, 1991 1995.

IEEE Signal Processing Society Technical Committee on Speech, 1993 - 1997.

Editorial board, *Journal of Computer Speech and Language*, 1994 - 2010.

Ongoing collaborative research in binaural hearing with the Department of Otolaryngology at the University of Connecticut Medical School, Farmington, CT.

Member of Institute of Electrical and Electronics Engineers, Acoustical Society of America, International Speech Communication Association, Association for Research in Otolaryngology, Audio Engineering Society

Reviewer for National Science Foundation, International Speech Communication Association, IEEE, *J. Acoust. Soc. Amer.*, *Hearing Research*, *IEEE Transactions on Signal Processing*, *IEEE Transactions on Speech and Language*, *IEEE Transactions on Systems, Man, and Cybernetics*, and *Communications of the Association of Computing Machinery*.

HONORS AND AWARDS

Fellow, Institute of Electrical and Electronics Engineers (IEEE)

Fellow, International Speech Communication Association (ISCA)

Fellow, Acoustical Society of America (ASA)

Distinguished Lecturer of the International Speech Communication Association, 2008 to 2009

Allen Newell Award for Research Excellence, Carnegie Mellon University Department of Computer Science, 1992

IEEE Student Branch Award for Teacher of the Year, Carnegie Mellon University Department of Electrical Engineering, 1979

Joel and Ruth Spira Excellence in Teaching Award (with three colleagues), Carnegie Mellon University Department of Electrical and Computer Engineering, 2018

PUBLICATIONS AND PAPERS

Papers in Archival Journals

STERN, R. M., COLBURN, H. S., BERNSTEIN, L. R., AND TRAHOTIS, C. (2019). "The fMRI data of Thompson *et al.* (2006) do not constrain how the human midbrain represents interaural time delay," *Journal of the Association for Research in Otolaryngology* **20**:305-311.

DIETZ, M., LESTANG, J.-H., MAJDAK, P., STERN, R. M., MARQUARDT, T., EWERT, S. D., HARTMANN, W. M., and GOODMAN, D. F. M. (2017). "A Framework for Testing and Comparing Binaural Models," *Hearing Research* **360**:92-106.

DE LA CALLE SILOS, F., and STERN, R. M. (2017). "Synchrony-based feature extraction for robust automatic speech recognition," *IEEE Signal Processing Letters* **24**:1158-1162.

FREDES, J., NOVOA, J., KING, S., STERN, R. M., and BECERRA YOMA, N. (2017). "Locally-normalized filter banks applied to deep neural network-based robust speech recognition," *IEEE Signal Processing Letters* **24**:377-381.

KIM, C., and STERN, R. M. (2016). "Power-normalized cepstral coefficients (PNCC) for robust speech recognition," *IEEE Trans. on Audio, Speech, and Language Processing* **24**:1315-1329. **[Received IEEE Signal Processing Society Best Paper Award, 2019]**

CHO, B. J., KWON, H. Cho, J.-W., KIM, C., STERN, R. M. and PARK, H.-M. (2016). "A subband-based stationary-component suppression method using harmonics and power ratio for reverberant speech recognition," *IEEE Signal Processing Letters*, **23**:780-784.

ROMIGH, G. D., BRUNGART, D. S., STERN, R. M., and SIMPSON, B. D. (2015). "Efficient real spherical harmonic representation of head-related transfer functions," *IEEE Journal of Selected Topics in Signal Processing*, **9**: 921-930, August 2015.

POBLETE, V., ESPIC, F., KING, S., STERN, R. M., HUENEPAN, F., and BECERRA YOMA, N. (2015). "A perceptually-motivated low-complexity channel normalization technique applied to speaker verification." *Computer Speech and Language*, **31**:1-27, 2015.

POBLETE, V., BECERRA YOMA, N., and STERN, R. M. (2014). "Optimizing the parameters characterizing sigmoidal rate-level functions based on acoustic features," *Speech Communication*, **56**:19-34, January 2014.

HERMAN, H., COHEN, J. R., and STERN, R. M. (2013). "Perceptual properties of current speech recognition technology," *Proc. IEEE* **101**:1968-1985, September 2013.

STERN, R. M., and MORGAN, N. (2012). "Hearing is believing: biologically-inspired methods for robust speech recognition," *IEEE Signal Processing Magazine* **29**:34-43, November, 2012.

CHIU, Y.-H. B., RAJ, B., and STERN, R. M. (2012). "Learning-based auditory encoding for robust speech recognition," *IEEE Trans. on Audio, Speech, and Language Processing* **20**:900914, March 2012.

KIM, W., and STERN, R. M. (2011). "Mask classification for missing-feature reconstruction for robust speech recognition," *Speech Communication*, **53**:1-11, January 2011.

PARK, H.-M., and STERN, R. M. (2009). "Spatial Separation of Speech Signals using Continuously-Variable Weighting Factors Estimated from Comparisons of Zero Crossings," *Speech Communication Journal*, **51**(1):15-25, January 2009.

SELTZER, M. L., and STERN, R. M. (2006). "Subband Likelihood-Maximizing Beamforming for Speech Recognition in Reverberant Environments," *IEEE Transactions of Speech, Language, and Audio Processing* **14**(6): 2109-2121, November 2006.

RAJ, B., and STERN, R. M. (2005). "Missing-Feature Methods for Robust Automatic Speech Recognition," *IEEE Signal Processing Magazine*, September 2005.

KIM, N. S., LIM, W., and STERN, R. M. (2005). "Feature compensation based on switching linear dynamic model," *IEEE Signal Processing Letters*, **12**(6): 473-476.

SELTZER, M. L., RAJ, B., and STERN, R. M. (2004). "Likelihood-Maximizing Beamforming for Robust Hands-Free Speech Recognition," *IEEE Transactions of Speech and Audio Processing*, **12**(5): 489-498, September 2004. **[Received IEEE Signal Processing Society Best Student Paper Award, 2007]**

OBUCHI, Y., HATAOKA, N., and STERN, R. M. (2004), "Normalization of Time-Derivative Parameters for Robust Speech Recognition in Small Devices," *IEICE Trans. on Information and Systems*, **87-D**(4): 1004:1011, April 2004.

RAJ, B., SELTZER, M. L., and STERN, R. M. (2004), "Reconstruction of Missing Features for Robust Speech Recognition," *Speech Communication Journal*, **43**(4): 275-296, September 2004.

SELTZER, M. L., RAJ, B., and STERN, R. M. (2004). "A Bayesian Framework for Spectrographic Mask Estimation for Missing Feature Speech Recognition," *Speech Communication Journal*, **43**(4): 379-393, September 2004.

- SINGH, R., RAJ, B., and STERN, R. M. (2001), "Automatic Generation of Sub-Word Units for Speech Recognition Systems," *IEEE Trans. on Speech and Audio Proc.* **10**(2):89-99.
- HUERTA, J. M., and STERN, R. M. (2001). "Distortion-Class Modeling for Robust Speech Recognition under GSM RPE-LTP Coding," *Speech Communication Journal*, **34**:213-225 (invited paper).
- MORENO, P. J., RAJ, B., and STERN, R. M. (1998). "Data-Driven Environmental Compensation for Speech Recognition: A Unified Approach," *Speech Communication Journal*, **24**: 267-85.
- STERN, R. M., and SHEAR, G. D. (1996a) "Lateralization and Detection of Low- Frequency Binaural Stimuli: Effects of Distribution of Internal Delay," *J. Acoust. Soc. Amer.* **100**: 2278-2288.
- STERN, R. M., and SHEAR, G. D. (1996b) "Lateralization and Detection of Low- Frequency Binaural Stimuli: Specification of the Extended Position-Variable Model," *Physics Auxiliary Publication Service*, AIP document E-JASMA-100-2278- 0.175MB via <http://www.aip.org/epaps/epaps.html>.
- TRAHIOTIS, C., and STERN, R. M. (1994) "Across-Frequency Interaction in Lateralization of Complex Binaural Stimuli," *J. Acoust. Soc. Amer.* **96**: 3804- 3806 (L).
- STERN, R. M., ZEPPEFELD, T., and SHEAR, G. D. (1991). "Lateralization of Rectangularly Modulated Noise: An Explanation for Counterintuitive Reversals," *J. Acoust. Soc. Amer.* **90**: 1901-1907.
- COAST, D. A., STERN, R. M., CANO, G. G., and BRILLER, S. A. (1990). "An Approach to Cardiac Arrhythmia Analysis Using Hidden Markov Models," *IEEE Trans. Biomed. Eng.* **37**: 826836.
- TRAHIOTIS, C., and STERN, R. M. (1989). "Lateralization of Bands of Noise: Effects of Bandwidth and Differences of Interaural Time and Phase," *J. Acoust. Soc. Amer.* **86**: 1285-1293.
- RUDNICKY, A. I., and STERN, R.M. (1989). "Spoken Language Research at Carnegie Mellon," *Speech Technology Magazine* **4**: 38-43.
- STERN, R. M., ZEIBERG, A. S., and TRAHIOTIS, C. (1988). "Lateralization of Complex Binaural Stimuli: A Weighted Image Model," *J. Acoust. Soc. Amer.* **84**, 156-165.
- STERN, R. M., and LASRY, M. J. (1987). "Dynamic Speaker Adaptation for Feature-Based Isolated Letter Recognition," *IEEE Trans. on Acoustics, Speech, and Signal Processing* **35**: 751763.
- STERN, R. M., and COLBURN, H. S. (1985). "Lateral-Position Models of Interaural Discrimination," *J. Acoust. Soc. Amer.* **77**: 753-755.
- STERN, R. M., and COLBURN, H. S. (1985). "Subjective Lateral Position and Interaural Discrimination," *Physics Auxiliary Publication Service*, AIP document no. PAPS JASMA-77-753-29.
- LASRY, M. J., and STERN, R. M. (1984). "A Posteriori Estimation of Correlated Jointly Gaussian Mean Vectors," *IEEE Trans. on Pattern Anal. and Mach. Intel.* **6**: 530-535.
- CROWLEY, J. L., and STERN, R. M., Jr. (1984). "Fast Computation of the Difference of Low Pass (DOLP) Transform," *IEEE Transactions on Pattern Analysis and Machine Intelligence* **6**: 212-222.
- STERN, R. M., Jr., SLOCUM, J. E., and PHILLIPS, M. S. (1983). "Interaural Time and Amplitude Discrimination in Noise", *J. Acoust. Soc. Amer.* **73**:1714-1722.

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.