VIKAS CHANDRAKANT RAYKAR

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EXPERTISE Machine learning, Signal processing, Computer audition and vision.

RESEARCH INTERESTS

- Computational Statistics and Fast N-body problems in machine learning.
- Distributed Sensors for auditory and visual perception.
- Perceptually inspired structural models for spatial audio perception.

EDUCATION

Doctor of Philosophy Advisor: Dr. Ramani Duraiswami
Thesis: *Computational tractability of machine learning algorithms for tall fat data*
Department of Computer Science (January 2004 to current)
University of Maryland, College Park, MD *Current GPA*: 4.0/4.0

Master of Science Advisors: Dr. Ramani Duraiswami and Dr. Rama Chellappa
Thesis: *Position calibration of acoustic sensors and actuators on distributed general purpose computing platforms*
Department of Electrical Engineering (December 2003)
University of Maryland, College Park, MD
Major: Signal Processing *Minor*: Computer Engineering *GPA*: 3.828/4.0

Bachelor of Engineering
Electronics and Communication Engineering (May 2001)
National Institute of Technology,Trichy, India
Department Rank:1/51 *Aggregate*: 87.97% *Equivalent GPA*: 4.0/4.0

RESEARCH / WORK EXPERIENCE

Graduate Research Assistant 08/2001 to 02/2003 and 09/2003 to current
Perceptual Interfaces and Realities Lab., University of Maryland, CollegePark
Research Advisors: Dr. Ramani Duraiswami and Dr. B. Yegnanarayana

- Currently working on fast methods for machine learning.
- Developed algorithms and error bounds for automatic microphone array position calibration.
- Developed novel methods for time delay estimation using excitation source information in speech.
- Developed a method to estimate the frequency of the spectral notches in the measured Head Related Impulse responses.
- Implemented a real time video conferencing setup using a microphone array and a pan-tilt camera which includes auditory source localization, automatic camera pointing, face detection and multi channel speech enhancement.

Graduate Technical Intern 02/2003 to 08/2003
Future Platforms Lab, Intel Research Labs, Intel Corporation, Santa Clara, CA
Mentors: Dr. Igor Kozintsev and Dr. Rainer Lienhart

- Designed and implemented novel algorithms for 3D position calibration of a network of microphones/cameras and speakers/displays on distributed computing platforms. The work resulted in 3 publications and filing of 2 patents.

Undergraduate Research Fellow 11/1999 to12/1999 and 04/2000 to 05/2000
Speech and Audio laboratory, Indian Institute of Science, Bangalore, India
Advisor: Dr.T. V. Sreenivas

- Implemented a real-time 3D spatial audio system using Head Related Transfer Functions (HRTFs). Also worked on modelling and interpolation of HRTFs.

Undergraduate Summer Intern 05/20/1999 to 06/25/1999
Centre for Artificial Intelligence and Robotics, Bangalore, India
Advisor: Dr. Ambalal V. Patel

- Implemented PI and PD controller using Fuzzy Logic.

CURRENT MANUSCRIPTS

1. **SDM 2006** *Fast optimal bandwidth selection for kernel density estimation* Vikas C. Raykar and R. Duraiswami, Accepted for 2006 SIAM conference on Data Mining. (detailed version available as CS-TR-4774)
2. **NIPS 2005** *The improved fast Gauss Transform with applications to machine learning* Vikas C. Raykar and Ramani Duraiswami, Presented at the NIPS 2005 workshop on Large scale kernel machines.
3. **CS-TR-4767** *Fast computation of sums of Gaussians in high dimensions*, Vikas. C. Raykar, C. Yang, R. Duraiswami, and N. Gumerov. Under review for Journal of Machine Learning Research.
4. **CS-TR-4727** *Improved Fast Gauss Transform with variable source scales* Vikas C. Raykar, R. Duraiswami, and C. Yang, University of Maryland CollegePark, Department of Computer Science Technical Report, CS-TR-4727. (also published as UMIACS-TR-2005-34).
5. **SUBMITTED** *Variable scale improved fast Gauss transform for adaptive kernel density estimation* Vikas C. Raykar and R. Duraiswami.
6. **SUBMITTED** *Fast large scale Gaussian process regression using the improved fast Gauss transform* Vikas C. Raykar and R. Duraiswami.

JOURNAL PUBLICATIONS

1. *Position Calibration of Microphones and Loudspeakers in Distributed Computing Platforms* Vikas C. Raykar, Igor Kozintsev, and Rainer Lienhart, IEEE Transactions on Speech and Audio Processing, Volume 13, Issue 1, pp. 70-83, Jan. 2005.
2. *Speaker Localization using Excitation source information in speech* Vikas C. Raykar, B.Yegnanarayana, S. R. Mahadeva Prasanna, and Ramani Duraiswami, IEEE Transactions on Speech and Audio Processing, Volume 13, Issue 5, Part 2, pp. 751-761, Sep. 2005.
3. *Extracting the frequencies of the pinna spectral notches in measured head related impulse responses* Vikas C. Raykar, Ramani Duraiswami, and B. Yegnanarayana, The Journal of the Acoustical Society of America, Volume 118, Issue 1, pp. 364-374, July 2005. (detailed version available as CS-TR-4727.)

PATENTS

1. *Method for three-dimensional position calibration of audio sensors and actuators on a distributed computing platform*, V. C. Raykar, R. W. Lienhart, and I. V. Kozintsev, US Patent number 6,941,246 B2, 2005.
2. *Three-Dimensional Position Calibration of Audio Sensors and Actuators on a Distributed Computing Platform.* (filed on 05/09/2003 along with Igor Kozintsev and Rainer Lienhart)

BOOK CHAPTERS

1. *Providing Common Time and Space in Distributed AV-Sensor Networks by Self-Calibration* R. Lienhart, I. Kozintsev, D. Budnikov, I. Chikalov, and V. C. Raykar in Intelligent Multimedia Processing with Soft Computing Series: Studies in Fuzziness and Soft Computing, Vol. 168 Tan, Yap-Peng; Yap, Kim H.; Wang, Lipo (Eds.) 2005.

CONFERENCE PUBLICATIONS

1. **ICASSP 2005** *The manifolds of spatial hearing* Ramani Duraiswami and Vikas C. Raykar, In Proceedings of International Conference on Acoustics, Speech, and Signal Processing, Philadelphia, March 2005, vol. III, pp. 285-288.
2. **ICASSP 2005** *Approximate expressions for the mean and the covariance of the maximum likelihood estimator for acoustic source localization* Vikas C. Raykar and Ramani Duraiswami, In Proceedings of International Conference on Acoustics, Speech, and Signal Processing, Philadelphia, March 2005, vol. III, pp. 73-76.
3. **ICASSP 2004** *Automatic position calibration of multiple microphones* Vikas C. Raykar and Ramani Duraiswami, In Proceedings of International Conference on Acoustics, Speech, and Signal Processing, Montreal, Quebec, Canada, May 2004, vol. IV, pp. 69 - 72.
4. **ACM MM 2003** *Position calibration of audio sensors and actuators in a distributed computing platform* Vikas C. Raykar, Igor Kozintsev and Rainer Lienhart, In Proceedings of the Eleventh ACM International Conference on Multimedia, Berkeley, CA, USA, November 2003, pp. 572 - 581.
5. **ICCV 2003** *Self localization of acoustic sensors and actuators on distributed platforms* Vikas C. Raykar, Igor Kozintsev and Rainer Lienhart, ICCV 2003 International Workshop on Multimedia Technologies in E-Learning and Collaboration, Nice, France, October 2003.
6. **Eurospeech 2003** *Tracking a moving speaker using excitation source information* Vikas C. Raykar, B. Yegnanarayana, S. R. Mahadeva Prasanna and Ramani Duraiswami, Eurospeech 2003, Geneva, September 2003, pp. 69-72..
7. **ICAD 2003** *Extracting significant features from the HRTF* Vikas C. Raykar, B. Yegnanarayana, Ramani Duraiswami and Larry Davis, In Proceddings of the 9^{th} International Conference on Auditory Display (ICAD 2003), Boston, July 2003, pp. 115 - 118.
8. **ICPR 2002** *Virtual audio system customization using visual matching of ear parameters* D.Zotkin, R.Duraiswami, L.Davis, A, Mohan and V.C.Raykar, ICPR 2002, Quebec City, Canada. August 2002.
9. **DSPS Fest 2000** *Head Related Impulse Response Interpolation for Dynamic Spatialization* T. V. Shreenivas, V.C.Raykar and R.Raman, Texas Instruments DSPS Fest-2k, Bangalore, India, November 2000.

ABSTRACTS / TALKS

1. **ASA 2004** *Extracting the frequencies of the pinna spectral notches in measured head related impulse responses* Vikas C. Raykar, Ramani Duraiswami, and B. Yegnanarayana, Presented at the 148th meeting of Acoustical Society of America, San Diego, California, November 2004.
2. **ASA 2004** *A study of pinna anthropometry and the spectral notch frequencies* Vikas C. Raykar, Ramani Duraiswami, and B. Yegnanarayana, Presented at the 148th meeting of Acoustical Society of America, San Diego, California, November 2004.

SKILLS

1. Expertise in C, C++ and MATLAB.
2. Experience in building real-time video conferencing systems with Matrox EVI-D30 pan-tilt camera and PowerDAQ data acquisition board.
3. Built a real time face detection system using Firewire camera and openCV.
4. Coding experience with MIL Image processing library, Intel Integrated Performance Primitives (IPP) Library, openCV and portaudio.
5. Working knowledge of FORTRAN, DirectX and Verilog.
6. Working knowledge of MPI and openMP.

7. DSP Processors including Texas Instruments TMS320C30 and TMS320C54.
8. Assembly languages such as 8085, 8086 & 8051/52 microcontrollers.
9. Also familiar with packages like MS-Office, LaTeX and HTML programming.

HONORS

1. Best Outgoing student in the Electronics and communication Engineering Department at Regional Engineering College, Trichy, India for the year 2000-2001.
2. Recipient of the prestigious National Science Fellowship Award (Engineering Stream) for the year 1999 under the KVPY scheme funded by the Department of Science and Technology (DST),Government of India.
3. Recipient of the National Talent Search Examination (NTSE) scholarship in the year 1995.
4. Was 18th rank in State level Entrance Examination into engineering Colleges.
5. Was 13th rank in State level public examination.
6. Was 2nd rank in Karnataka State in X standard public examination.

PROFESSIONAL ACTIVITIES

1. Attended the 2005 Machine Learning summer school in Chicago.
2. Student member of IEEE Signal processing society.
3. Reviewer for IEEE transactions on speech and audio processing.

VISA STATUS F-1 Student Visa

REFERENCES

1. Dr.Ramani Duraiswami (Assistant Professor, Department of Computer Science and Director, Perceptual Interfaces and Reality Laboratory, University of Maryland, CollegePark)
2. Dr. B. Yegnanarayana (Visiting Professor, University of Maryland, CollegePark and Professor, Dept. of Computer Science and Engineering Indian Institute of Technology Madras)
3. Dr.Rama Chellappa (Professor, Department of Electrical Engineering and Director of the Center for Automation Research, at the University of Maryland in College Park)
4. Dr.Igor Kozintsev (Researcher, Architecture Research Lab, Intel Research Labs, Santa Clara, CA)
5. Dr.Rainer Lienhart (Professor, Computer Science department, University of Augsburg, Germany)