

# UMESH RAJASHEKAR

## Curriculum Vitae

310 W., 113th St., Apt. 1B, New York, NY-10026, USA  
(646) 651-7580

[umesh@cns.nyu.edu](mailto:umesh@cns.nyu.edu)  
<http://www.cns.nyu.edu/~umesh>

### Education

- **Doctor of Philosophy in Electrical & Computer Engineering** Dec 2005  
The University of Texas at Austin, Austin, TX  
– Dissertation title: *Statistical Analysis and Selection of Visual Fixations.*
- **Master of Science in Electrical & Computer Engineering** Aug 2000  
The University of Texas at Austin, Austin, TX  
– Thesis title: *An AVS/Express Implementation of Depth Profiling of Subsurface Chromophores by Pulsed Photothermal Radiometry.*
- **Bachelor of Engineering in Electronics and Communication Engineering** Aug 1998  
The Karnataka Regional Engineering College, Karnataka, India

### Work Experience

- **Postdoctoral Fellow** Aug 2006 - present  
Howard Hughes Medical Institute & Lab. for Computational Vision, New York University  
– Supervisor: Prof. Eero Simoncelli  
– Developing algorithms for perceptual quality assessment of color images.
- **Postdoctoral Fellow** Jan 2006 - Jul 2006  
Autim, Inc. & Center for Perceptual Systems, The University of Texas at Austin  
– Supervisors: John E. Hooning & Prof. Alan Bovik  
– Contract project for the United States Postal Service  
– Developed quality assessment algorithms for line scan cameras
- **Assistant Director** Oct 2001 - Dec 2005  
Lab. for Image and Video Engineering, The University of Texas at Austin  
– Administered Windows NT/2000/XP systems  
– Created and maintained the lab's website and publication database  
– Managed purchases and inventory
- **Graduate Research Assistant** Jan 2000 - Jan 2006  
Dept. of Electrical & Computer Engineering; Center for Vision & Image Science; Center for Perceptual Systems, The University of Texas at Austin  
– Supervisors: Profs. Alan Bovik and Lawrence K. Cormack  
– Conducted doctoral research on the statistical analysis and selection of visual fixations
- **Graduate Research Assistant** Jan 1999 - Jan 2000  
Dept. of Biomedical Engineering, The University of Texas at Austin  
– Supervisor: Prof. Thomas E. Milner  
– Developed a 1D thermographic image reconstruction algorithm using AVS/Express

- **Trainee** Jul 1997 - Sep 1997  
Electronics and Radar Development Establishment, India
  - Simulated a polyphase pulse compression algorithm
  - Designed and implemented an ADSP-2101 based digital matched filter

## Teaching Experience

- **Guest Lecturer** Jan 2002 - Aug 2006  
Dept. of Electrical & Computer Engineering, The University of Texas at Austin
  - EE371R: Digital Image and Video Processing
  - EE381K-8: Digital Signal Processing
  - EE380L-7: Introduction to Pattern Recognition and Computer Vision
  - EE380L-8: Advanced Computer Vision
  - EE313: Linear Systems and Signals
- **Voluntary Teaching Assistant** Aug 1999 - Aug 2006  
Dept. of Electrical & Computer Engineering, The University of Texas at Austin
  - EE371R: Digital Image and Video Processing
  - EE381K-8: Digital Signal Processing
  - Created and maintained course homepage using WebCT & Blackboard
  - Designed homeworks, directed student projects, and conducted discussion sessions
- **Instructor** 24 Sep 2005  
Xilinx Inc., San Jose, CA
  - Taught day-long course on Digital Image & Video Processing to semiconductor engineers
- **Teaching Assistant** Jun 1999 - Aug 1999  
Dept. of Electrical & Computer Engineering, The University of Texas at Austin
  - EE381K-8: Digital Signal Processing
  - Developed MATLAB-based visualization tools for graduate DSP course
- **Teaching Assistant** Sep 1998 - Jan 1999  
Dept. of Electrical & Computer Engineering, The University of Texas at Austin
  - EE301: Introduction to Electrical and Computer engineering
  - Conducted lab sessions in digital circuits, PSpice and HTML
  - Supervised group projects on developing web pages

## Skills

- **Operating Systems:** Experienced in Windows NT/2000/XP system administration. Familiar with Linux.
- **Eye Tracking Systems:** Proficient in operating ASL's desktop and virtual reality-based eye tracking systems, and SRI's Dual Purkinje eye trackers.
- **Computer Languages:**
  - Proficient in MATLAB, C, C++, HTML, PHP, SQL
  - Experienced in FORTRAN, BASIC, Intel 8085 and 8086, Motorola 68000, ADSP-2101 and TMS-320C30 programming languages
  - Familiar with LabVIEW, PSpice, DirectX and AVS/Express.

## Honors and Awards

- **Lloyd A. Jeffress Graduate Fellowship** Jun 2004  
The University of Texas at Austin
- **ICIP 2003 Student Author Travel Grant** Jul 2003  
IBM Research & Int. Conf. on Image Processing
- **CPS Student Author Travel Grant** Jul 2003  
Center for Perceptual Systems, The University of Texas at Austin
- **GEC Student Author Travel Grant** Apr 2002  
Graduate Engineering Council, The University of Texas at Austin
- **Appointed as Assistant Director for The Lab. for Image and Video Engineering** Oct 2001  
The University of Texas at Austin
- **Texas Telecommunications Engineering Consortium graduate fellowship** Dec 2000  
College of Engineering, The University of Texas at Austin
- **Ram's Horn Award for the best project (EE371R: Digital Image Processing)** Dec 1998  
Instructor: Prof. Alan Bovik, The University of Texas at Austin
- **Ranked 3rd overall in the Bachelor of Engineering Program** Aug 1998  
Mangalore University, India
- **President Scout award (equivalent of the Eagle Scout)** 1993  
Bharat Scouts & Guides, India

## Professional Activities

- **Reviewer for following journals:**
  - EURASIP Journal on Image and Video Processing
  - IEEE Signal Processing Letters
  - IEEE Signal Processing Magazine
  - IEEE Transactions on Circuits and Systems for Video Technology
  - IEEE Transactions on Image Processing
  - Image and Vision Computing
  - Iranian Journal of Electrical and Computer Engineering
  - Journal of Computing and Information Technology
  - Journal of Electronic Imaging
  - Journal of Real-Time Imaging
  - Journal of Visual Communication and Image Representation
  - Pattern Recognition
  - Perception
  - Signal Image and Video Processing
  - Vision Research
- **Reviewer for following conferences:**
  - Asian Conference on Computer Vision (ACCV) 2010,2009
  - European Signal Processing Conference (EUSIPCO) 2008, 2007

- IADIS International Conference WWW/Internet 2007, 2006
- IEEE International Symposium of Circuits and Systems (ISCAS) 2009
- IEEE Vehicular Technology Conference (VTC) 2010
- Neural Information Processing Systems Conference (NIPS) 2009, 2008
- Workshop on Applications of Computer Vision (WACV) 2007

- **Conference Committees:**

- Member of the program committee, Asian Conference on Computer Vision (ACCV) 2010
- Co-chair for session on Wireless Applications, UT Austin Wireless Networking Symposium 2004

- **Funding and Grant Committees:**

- Reviewer for the Foundation for Polish Science, 2010

- **Memberships in Professional Societies:**

- Member of IEEE 2007-present
- Member of IEEE Signal Processing Society, 2007-present
- Student member of IEEE, 1996-2006
- Student member of IEEE Signal Processing Society, 1996-2006
- Student member of IEEE Communications Society, 2000-2001
- Member of Vision Sciences Society, 2003,2006
- Member of New York Academy of Sciences, 2009-2011

## Publications

### Journal Articles

- [1] U. Rajashekar, Tony Tuan Vu, John E. Hooning, and Alan Conrad Bovik. Performance evaluation of mail-scanning cameras. *Journal of Electronic Imaging*, 19(2):023008, 2010.
- [2] Ian van der Linde, U. Rajashekar, Alan C Bovik, and Lawrence K Cormack. Visual memory for fixated regions of natural images dissociates attraction and recognition.. *Perception*, 38(8):1152–1171, 2009.
- [3] Ian Van Der Linde, U. Rajashekar, Alan C Bovik, and Lawrence K Cormack. DOVES: a database of visual eye movements.. *Spat Vis*, 22(2):161–177, 2009.
- [4] U. Rajashekar, I. van der Linde, A. C. Bovik, and L. K. Cormack. GAFFE: A gaze-attentive fixation finding engine. *Image Processing, IEEE Transactions on*, 17(4):564–573, April 2008.
- [5] U. Rajashekar, Ian van der Linde, Alan C Bovik, and Lawrence K Cormack. Foveated analysis of image features at fixations.. *Vision Res*, 47(25):3160–3172, Nov 2007.
- [6] U. Rajashekar, A. C. Bovik, and L. K. Cormack. Visual search in noise: Revealing the influence of structural cues by gaze-contingent classification image analysis. *J. Vis.*, 6(4):379–386, March 2006.
- [7] U. Rajashekar, G. C. Panayi, F. P. Baumgartner, and A. C. Bovik. The SIVA demonstration gallery for signal, image, and video processing education. *Education, IEEE Transactions on*, 45(4):323–335, 2002.

## Book Chapters

- [1] U. Rajashekar, A. C. Bovik, and D. Nair. The SIVA image processing demos. In Alan C. Bovik, editor, *The Essential Guide To Image Processing*, chapter 2, pages 23–41. Academic Press, 2nd edition, 2009.
- [2] U. Rajashekar and E. P. Simoncelli. Multiscale denoising of photographic images. In Alan C. Bovik, editor, *The Essential Guide To Image Processing*, chapter 11, pages 241–261. Academic Press, 2nd edition, 2009.
- [3] U. Rajashekar, A. C. Bovik, D. Sage, M. Unser, L. J. Karam, and R. L. Lagendijk. Image processing education. In AI Bovik, editor, *Handbook of Image & Video Processing*, chapter 2.4, pages 73–95. Elsevier, 2 edition, 2005.
- [4] D. Wei, U. Rajashekar, and A. C. Bovik. Wavelet denoising for image enhancement. In AI Bovik, editor, *Handbook of Image & Video Processing*, chapter 3.4, pages 157–165. Elsevier, 2 edition, 2005.

## Conference Papers and Abstracts

- [1] D. Ganguli, J. Freeman, U. Rajashekar, and E. P. Simoncelli. Orientation statistics at fixation. In *Vision Sciences Society 10th Annual Meeting*, Naples, FL. November 7–12 2010.
- [2] U. Rajashekar, Z. Wang, and E. P. Simoncelli. Perceptual quality assessment of color images using adaptive signal representation. In *Proc. SPIE*, volume 7527, pages 75271L–9, San Jose, California, USA. SPIE. January 18–21 2010.
- [3] U. Rajashekar, Z. Wang, and E. P. Simoncelli. Quantifying color image distortions based on adaptive spatio-chromatic signal decompositions. In *Image Processing (ICIP), 2009 16th IEEE International Conference on*, pages 2213 –2216, Cairo, Egypt. November 7–10 2009.
- [4] R. M. Figueras i Ventura, U. Rajashekar, Z. Wang, and E. P. Simoncelli. Contextually adaptive signal representation using conditional principal component analysis. In *Acoustics, Speech, and Signal Processing, 2008. ICASSP 2008. Proceedings. 2008 International Conference on*, pages 877–880, Las Vegas, NV. March 30– April 4 2008.
- [5] U. Rajashekar, I. van der Linde, A. C. Bovik, and L. K. Cormack. Foveated analysis and selection of visual fixations in natural scenes. In *Image Processing, 2006 IEEE International Conference on*, pages 453–456, Atlanta, GA, USA. October 8–11 2006.
- [6] U. Rajashekar, I. van der Linde, A. C. Bovik, and L. K. Cormack. Statistical analysis and selection of visual fixations. In *Proceedings Vision Sciences Society, Sixth Annual Meeting*, Sarasota, Florida. May 05 – 10 2006.
- [7] I. van der Linde, U. Rajashekar, L. K. Cormack, and A. C. Bovik. A study of human recognition rates for foveola-sized image patches selected from initial and final fixations on calibrated natural images. In *Human Vision and Electronic Imaging X, Proc. of SPIE*, volume 5666, March 2005.
- [8] I. van der Linde, U. Rajashekar, L. K. Cormack, and A. C. Bovik. The role of natural image statistics on visual memory and recognition. In *Proceedings of British Machine Vision Association and Society for Pattern Recognition: Symposium on Image Features & Statistics.*, London, UK. October 27 2004.
- [9] U. Rajashekar, L. K. Cormack, and A. C. Bovik. Point-of-gaze analysis reveals visual search strategies. In *Human Vision and Electronic Imaging IX*, volume 5292, pages 296–306, San Jose, CA. SPIE-Int. Soc. Opt. Eng. January 19-21 2004.

- [10] U. Rajashekar, L. K. Cormack, and A. C. Bovik. Image features that draw fixations. In *Image Processing, 2003. ICIP 2003. Proceedings. 2003 International Conference on*, volume 3, pages III-313-16 vol.2, Barcelona, Spain. September 14-17 2003.
- [11] C. R. Palmer, T. C. Lien, U. Rajashekar, and L. K. Cormack. Abrupt visual onsets elicit involuntary reflexive eye movements. In *Proceedings of Vision Sciences Society, Third Annual Meeting*, Sarasota, Florida, USA. May 09 - 14 2003.
- [12] U. Rajashekar, L. K. Cormack, A. C. Bovik, and W. S. Geisler. Image properties that draw fixation. In *Proceedings Vision Sciences Society, Second Annual Meeting*, Sarasota, FL, USA. May 10 - 15 2002.
- [13] U. Rajashekar, L. K. Cormack, and A. C. Bovik. Visual search: structure from noise. In *Proceedings ETRA 2002 Eye Tracking Research and Applications Symposium*, pages 119-123, New Orleans, LA. ACM. March 25 - 27 2002.
- [14] G. C. Panayi, U. Rajashekar, and A. C. Bovik. Image processing for everyone. In *First IEEE Workshop on Signal Processing Education*, Hunt, TX, USA. October 15 - 18 2000.
- [15] U. Rajashekar and A. C. Bovik. Interactive DSP education using MATLAB demos. In *First IEEE Workshop on Signal Processing Education*, Hunt, TX, USA. October 15 - 18 2000.

### **Thesis**

- [1] U. Rajashekar. *Statistical Analysis and Selection of Visual Fixations*. Talk, The University of Texas at Austin, Dept. of Electrical and Computer Engineering, The University of Texas at Austin., November 18 2005.
- [2] U. Rajashekar. An AVS/Express implementation of depth profiling of subsurface chromophores by pulsed photothermal radiometry. Master's thesis, The University of Texas at Austin, 2000.

### **Other Publications**

- [1] U. Rajashekar. Help manual for the SIVA image processing demos. In accompanying CD to *The Essential Guide To Image Processing*, Academic Press, Editor: Al Bovik, 2009.
- [2] U. Rajashekar, T. Arnow, A. C. Bovik, and L. K. Cormack. Gaze-centric image analysis for visual search. SPIE Newsroom, June 2006.
- [3] U. Rajashekar, A. C. Bovik, and L. K. Cormack. Image properties that draw attention. *The Networker*, Newsletter of the Wireless, Networking, and Communications Group (WNCG), The University of Texas at Austin, 2003.
- [4] U. Rajashekar, G. C. Panayi, F. P. Baumgartner, and A. C. Bovik. SIVA- Signal, Image and Video Audio Visualizations.. Copyrighted Software. The University of Texas at Austin., 1999.

### **Poster Presentations**

- [1] Perceptual quality assessment of color images using adaptive signal representation. In *Proc. SPIE*, volume 7527, pages 75271L-9, San Jose, California, USA. SPIE. January 18-21 2010.
- [2] Foveated analysis and selection of visual fixations in natural scenes. In *Image Processing, 2006 IEEE International Conference on*, pages 453-456, Atlanta, GA, USA. October 8-11 2006.

- [3] Statistical analysis and selection of visual fixations. In *Proceedings Vision Sciences Society, Sixth Annual Meeting*, Sarasota, Florida. May 05 – 10 2006.
- [4] Image features that draw fixations. In *Image Processing, 2003. ICIP 2003. Proceedings. 2003 International Conference on*, volume 3, pages III–313–16 vol.2, Barcelona, Spain. September 14–17 2003.
- [5] Eye tracking and gaze contingent displays. Texas Alliance for Technology Commercialization, February 5th Forum February 5 2003.
- [6] Predicting point of gaze. Texas Telecommunications Engineering Consortium (TxTEC) January 2001.
- [7] Image processing for everyone. In *First IEEE Workshop on Signal Processing Education*, Hunt, TX, USA. October 15 – 18 2000.
- [8] Interactive DSP education using MATLAB demos. In *First IEEE Workshop on Signal Processing Education*, Hunt, TX, USA. October 15 – 18 2000.

### **Talks**

- [1] Quantifying color image distortions based on adaptive spatio-chromatic signal decompositions. In *Image Processing (ICIP), 2009 16th IEEE International Conference on*, pages 2213 –2216, Cairo, Egypt. November 7–10 2009.
- [2] Quantifying color image distortions based on adaptive spatio-chromatic signal decompositions. Laboratory for Computational Vision, New York University, NY, NY, USA. November 3 2009.
- [3] Adaptive signal decompositions for quantifying color image distortions. Laboratory for Computational Vision, New York University, NY, NY, USA. June 11 2009.
- [4] Modeling invariance in images using lie groups. Laboratory for Computational Vision, New York University, NY, NY, USA. April 9 2009.
- [5] Segmentation and fuzzy-logic classification of m-fish chromosome images. Presented on behalf of H. Choi, K. R. Castleman, and A.C. Bovik, IEEE International Conference on Image Processing, Atlanta, Georgia. October 8–11 2006.
- [6] Measuring intra- and inter-observer agreement in identifying and localizing structures in medical images. Presented on behalf of M. P. Sampat, Z. Wang, G. J. Whitman, T. Stephens, M. K. Markey and A. C. Bovik, IEEE International Conference on Image Processing, Atlanta, Georgia. October 08-11 2006.
- [7] Point-of-gaze analysis for the selection of visual fixations. Laboratory for Computational Vision, New York University, NY, NY, USA. August 22 2006.
- [8] Statistical analysis and selection of visual fixations in natural scenes. Cognition and Perception Area Seminar. The University of Texas at Austin. February 17 2006.
- [9] Independent component analysis. Guest lectures in EE380L-7: Introduction to Pattern Recognition and Computer Vision, Instructor: Dr. Jake Aggarwal. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. February 14 2006.
- [10] Maximum likelihood and bayesian estimation. Guest lectures in EE380L-7: Introduction to Pattern Recognition and Computer Vision, Instructor: Dr. Jake Aggarwal. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. January 30 2006.

- [11] Statistical Analysis and Selection of Visual Fixations. Dept. of Electrical and Computer Engineering, The University of Texas at Austin.. November 18 2005.
- [12] Digital image and video processing (for everyone). Taught a tutorial-style day-long course on Digital Image and Video Processing at Xilinx, San Jose, CA September 24 2005.
- [13] Hough transforms. Guest lectures in EE371R: Digital Image and Video Engineering, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. May 4 2005.
- [14] Image pyramids. Guest lectures in EE371R: Digital Image and Video Engineering, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. November 17 2004.
- [15] Digital filter design. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. October 4 2004.
- [16] Z-transforms. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. September 15 2004.
- [17] Nonmetric methods (in pattern recognition). Guest lectures in EE380L-8: Advanced Computer Vision, Instructor: Dr. Jake Aggarwal. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. April 13 2004.
- [18] Point-of-gaze analysis reveals visual search strategies. In *Human Vision and Electronic Imaging IX*, volume 5292, pages 296–306, San Jose, CA. SPIE-Int. Soc. Opt. Eng. January 19-21 2004.
- [19] Multirate signal processing. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. November 12 2003.
- [20] Independent component analysis. Guest lectures in EE380L-7: Introduction to Pattern Recognition and Computer Vision, Instructor: Dr. Jake Aggarwal. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. October 29 2003.
- [21] Stereo vision. Guest lectures in EE371R: Digital Image and Video Engineering, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. July 24 2003.
- [22] Fourier integrals and generalized functions. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. January 15 2003.
- [23] Introduction to digital signal processing. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Alan C. Bovik. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. January 13 2003.
- [24] Image properties that draw fixation. In *Proceedings Vision Sciences Society, Second Annual Meeting*, Sarasota, FL, USA. May 10 – 15 2002.



- [25] Demystifying the Fourier series. Guest lectures in EE313: Linear Systems and Signals, Instructor: Dr. Clint Slatton. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. April 8 2002.
- [26] Review session. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Michael A. Smith. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. April 15 2002.
- [27] Visual search: Structure from noise. Cognition and Perception Area Seminar. The University of Texas at Austin. March 4 2002.
- [28] Pattern analysis for predicting eye fixations. Guest lectures in EE380L-8: Advanced Computer Vision, Instructor: Dr. Jake Aggarwal. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. March 28 2002.
- [29] Visual search: structure from noise. In *Proceedings ETRA 2002 Eye Tracking Research and Applications Symposium*, pages 119–123, New Orleans, LA. ACM. March 25 – 27 2002.
- [30] Review session. Guest lectures in EE381K-8: Digital Signal Processing, Instructor: Dr. Michael A. Smith. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. February 25 2002.
- [31] Principal component analysis. Guest lectures in EE380L-8: Advanced Computer Vision, Instructor: Dr. Jake Aggarwal. Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. February 21 2002.
- [32] Point of gaze analysis for fixation point prediction. Ph.D. Qualifying Exam, Dept. of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA December 3 2001.
- [33] Hey!! whatcha lookin' at??. Presentation at Texas Instruments, Dallas, TX, USA July 18 2001.