

Sandeep Bhat

Curriculum Vitae

ECE Dept., Univ. of California, Santa Barbara
Santa Barbara, CA 93106, USA
☎ +1 (805) 893 2585
✉ sandeepkhat AT ece DOT ucsb DOT edu
🌐 www.ece.ucsb.edu/~sandeepkhat

Last Updated: Jan 24, 2013

Education

- 2009–2013 **Ph.D. in Electrical & Computer Engineering**, University of California, Santa Barbara, Santa Barbara, California, GPA – 3.77/4.00 Expected: March 2013.
Thesis: Separation, Denoising, and Reconstruction of 4D Embryonic Cardiac Microscopy Datasets for Improved Visualization and Flow Analysis
Advisor: Prof. Michael Liebling
- 2007–2008 **M.S. in Electrical & Computer Engineering**, University of California, Santa Barbara, Santa Barbara, California, GPA – 3.77/4.00.
Major in Signal Processing, Minor in Communications
- 1999–2003 **B.E. in Electronics & Communications**, from Visveswaraiah Technological University, R.V. College of Engineering, Bangalore, India, Aggregate Percentage 87.68 %.
SECOND rank for the University out of about 2000 students,
FIRST rank for the College out of about 120 students

Ph.D. Thesis

- Title *Separation, Denoising, and Reconstruction of 4D Embryonic Cardiac Microscopy Datasets for Improved Visualization and Flow Analysis*
- Committee Prof. Michael Liebling (Chair), Prof. B.S. Manjunath, Prof. Kenneth Rose, and Prof. Matthew Turk
- Description The thesis addresses key challenges in high-speed, high-resolution embryonic cardiac imaging. First we develop a motion based cardiac structure separation technique for brightfield microscopy that enables 3000 fps, 3-color, 3D+time reconstructions of embryonic hearts. Second we adapt this technique for denoising of cardiac optical coherence tomography (OCT) images. Finally we develop a multi-viewpoint reconstruction technique that mitigates reconstruction errors common in conventional 3D+time reconstruction methods. The methods have been adopted for quantitative study of cardiac development and dynamics.
- Award UCSB ECE *Spring Dissertation Fellowship* 2012

Computer skills

- Languages MATLAB, C, C++, Processing (Java)
- Software Development Microsoft Visual Studio, Eclipse IDE, TI Code Composer Studio
- Other Software ImageJ, Imaris, Adobe Illustrator, Photoshop, After Effects, GIMP, Quicktime Pro, Office, CVS, SVN, L^AT_EX

Experience

Professional

- 2008–Present **Graduate Student Researcher**, *UC Santa Barbara*, Santa Barbara, California.
Developed image processing techniques for reconstruction and analysis of high-speed, high-resolution 3D+time cardiac datasets from brightfield (BF) microscopy and optical coherence tomography (OCT).
- Extended a wavelet + dynamic programming based non-rigid temporal registration technique for synchronization of cardiac BF sequences over multiple cardiac cycles and used it to separate static, periodic and transient cardiac structures based on their motion. They were then recombined into a 3-color, 3000 fps, 3D+time visualization of the embryonic heart that enables improved quantification of cardiac dynamics by computation of optical flow.
 - Adapted this technique for denoising of cardiac OCT data. The method preserves spatial and temporal resolution while greatly reducing transient noise that prevents quantitative analysis of the images.
 - Developed a mixed integer linear programming (MILP) based 3D+time reconstruction technique that aligned parallel high-speed 2D+time sequences acquired at orthogonal viewpoints. The method mitigated accumulation of registration errors that effect conventional 3D+time reconstruction techniques.
 - Published 2 IEEE journal papers, 1 OSA journal paper, 3 IEEE conference papers, and 1 conference poster.
- 2003–2007 **Senior Engineer**, *Media Processing Group, Ittiam Systems Pvt. Ltd.*, Bangalore, India.
- Design and implementation of a Media Engine and Media System Framework similar to Linux gStreamer, for development of Multimedia Player and Recorder on TI DaVinci, DM320, DM270 platforms. The work involved the development of algorithms for distributed processing on dual core processors, audio-video syncing algorithms, FF/REW mechanism, power management algorithms, data buffering schemes for slower media and networks. This product has hence been deployed in several handheld video player-recorders for customers like Creative, Microsoft, and Thomson (RCA). Design and development of Hard Disk and Compact Flash Drivers on TIs DM320 and DM270 platforms.
 - Responsible for making software releases to several customers (Korean, Taiwanese, and American). Sent onsite once (Thomson, Indianapolis, USA) to assist the customer with product development.
 - Developed On Screen Display (OSD), Hard Disk and Compact Flash Drivers for TIs DM270 and DM320 platforms.
 - Development of EXIF and JFIF image parsers for PC, DM270 and DM320 platforms.
- Mar-Jun 2003 **Project Trainee**, *Control Systems Group, Indian Space Research Organization (ISRO)*, Bangalore, India.
Three month internship experience includes hardware design for satellite VMS (vibration measurement system). The project involved the development of hardware logic using Actel FPGA to interface the components on the processor card used in Vibration Analysis and Satellite control. The logics were realized in VHDL.

Teaching

- 2009–2011 **Research Mentor**, *UCSB Summer Research Mentorship Program*.
Mentored and supervised advanced high school students in lab projects involving construction of a morphological heart atlas from multiple zebrafish embryo datasets.
- 2008–2009 **Teaching Assistant**, *Fundamentals of Multimedia*, for Prof. Michael Melliar-Smith.
Assisted in grading and mentoring of class projects.
Received ECE *Outstanding TA* award in 2009
- 2008 **Teaching Assistant**, *Digital Design Principles*, for Prof. Volkan Rudoplu.
Assisted in grading, setting exam problems, handling and teaching lab experiments.

Publications

- Journals
- **Sandeep Bhat**, Irina V. Larina, Kirill V. Larin, Mary E. Dickinson, Michael Liebling, "4D Reconstruction of the Beating Embryonic Heart From Two Orthogonal Sets of Parallel Optical Coherence Tomography Slice-Sequences," IEEE Transactions on Medical Imaging, Nov 2012 (In Press).
 - **Sandeep Bhat**, Jungho Ohn, Michael Liebling, "Motion-based structure separation for label-free, high-speed, 3D cardiac microscopy," IEEE Transactions on Image Processing, Vol. 21, Issue 8, Aug 2012.
 - **Sandeep Bhat**, Irina V. Larina, Kirill V. Larin, Mary E. Dickinson, Michael Liebling, "Multiple-cardiac-cycle noise reduction in dynamic optical coherence tomography of the embryonic heart and vasculature," Optics Letters, Vol. 34, Issue 23, pp. 3704-3706, Dec 2009.
- Conferences
- **Sandeep Bhat**, Michael Liebling, "Separation and Pseudo-Coloring of High-Speed Bright-Field Microscopy Images of the Beating Embryonic Heart," 44th Annual Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov 2010.
 - Michael Liebling, **Sandeep Bhat**, Jungho Ohn, "Multiscale, multimodal, and multidimensional microscopy of cardiac development," 2010 IEEE Workshop on Signal Processing Systems, San Francisco Bay Area, California, USA, Oct 2010.
 - **Sandeep Bhat**, Michael Liebling, "Cardiac Tissue and Erythrocyte Separation in Bright-Field Microscopy Images of the Embryonic Zebrafish Heart for Motion Estimation," IEEE Proc. of International Symposium on Biomedical Imaging 09, pp. 746-749, Jul 2009
- Posters/Talks
- **Sandeep Bhat**, Michael Liebling, "Heart Wall And Erythrocyte Motion Estimation In The Embryonic Zebrafish Via Blind Source Separation Of Brightfield Microscopy," BiImage Informatics Conference 2009, HHMI Janelia Farms, Ashburn, VA.
 - **Sandeep Bhat**, Michael Liebling, "Improving Specificity in Bright-Field Microscopy Images of the Beating Embryonic Heart via Motion-Based Separation", 12th Annual UC Systemwide Bioengineering Symposium. One of the nine finalists chosen for "Grand Challenges in Bioengineering" competition.

Achievements and Awards

- 2012 ECE Spring Dissertation Fellowship
ECE Summer Fellowship
- 2011 One of the nine finalists out of 160 talks/posters, "Grand Challenges in Bioengineering" competition, UC System Wide Bioengineering Symposium, Santa Barbara, California.
- 2009 ECE Outstanding Teaching Assistant
- 2008 "Image Registration and Mosaicking", a project done as part of Advanced Topics in Computer Vision course (Prof. Matthew Turk) won the BEST PROJECT award for the class.
- 2003-04 Certificate of Merit from R.S.S.T (R.V. College of Engineering) for securing the FIRST place in the College for 5th, 6th, 7th, and 8th semesters.
- 2003 SECOND Rank for Electronics & Communications branch, Vishveshwaraiah Technological University, India among nearly 2000 students.
FIRST Rank for Electronics & Communications branch, R.V. College of Engineering, Bangalore, India among nearly 120 students.
- 2002 "Excellence In Education" award and ₹ 5000 cash reward from RVCE81EL group.

Communication Skills

- 2011 Gave two talks for “*Grand Challenges in Bioengineering*” competition, UC Systemwide Biosymposium, Santa Barbara, California.
- 2010 Talk at 44th Annual IEEE Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, California.
- 2009 Talk at IEEE International Symposium on Biomedical Imaging (ISBI’09), Boston, Massachusetts.
- 2009 Poster at BiImage Informatics Conference, HHMI Janelia Farm, Virginia.
- 2006 Handled Ittiam Systems booth at TI Developer Conference (TIDC), Bangalore, India.

Professional Memberships

- 2007-2013 Member of the Institute of Electrical and Electronics Engineers (IEEE)
- 2008-2013 Member of the Society for Industrial and Applied Mathematics (SIAM)

Interests

- Photography I love to take photos and have gotten pretty good at it over time. I have exhibited my work a couple of times at UCSB. To view my latest work visit www.flickr.com/photos/sandeepkhat
- Sports I play badminton, table-tennis and cricket. But my favorite sport is SQUASH, which I love to play and watch on PSASquash TV.
- Music I love Indian music and was a Radio Jockey (RJ) for the INDIA SHOW on KCSB 91.9 fm, Santa Barbara from Jan 2009 – Dec 2012.