Amit Ashok

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Research Interests

Computational optical imaging, physical optics, inverse problems, machine learning, statistical inference, and information theory.

Education

- **Ph.D. in Electrical and Computer Engineering** 2008
  University of Arizona, Tucson, AZ **Minor: Optical Sciences**
  Advisor: *Kenneth VonBehren Chaired* Professor Mark A. Neifeld
  Dissertation Title: A task-specific approach to computational imaging system design.
- **M.S. in Electrical Engineering** 2001
  University of Cape Town, South Africa
  Thesis Title: Implementation and analysis of a Bayesian approach to multiple-antenna SAR interferometry.
- **B.Sc. in Electronics and Telecommunication Engineering** 1998
  University of Swaziland, Swaziland

Research Funding

- **DARPA Research Grant: Award amount $3.6 million** *2010-2013*
  Department of Electrical and Computer Engineering University of Arizona
  Knowledge Enhanced Compressive Measurement (KECoM) PI: *Prof. Nathan Goodman*
  Co-PIs: **Dr. Amit Ashok**, Prof. Ali Bilgin, Prof. Michael Gehm,
  Prof. Bane Vasic, Prof. William Ryan, Prof. Michael Marcellin

Research Experience

- **Senior Research Scientist** July 2009 - present
  Department of Electrical and Computer Engineering University of Arizona
  Optical Computing and Processing Lab (OCPL)

  - Conducting research in areas of computational optical imaging, compressed sensing, statistical inference, and information theory.

  - Actively involved with three DARPA research programs, one of them, MOSAIC, is tasked with building the world's first 50 Gigapixel imager.

  - Responsible for developing the mathematical framework based on the Task-specific information metric for the DARPA KECoM grant.

  - Co-supervising five graduate students towards their thesis and dissertation research in these areas.

- **Senior Scientist** Dec 2007 - July 2009
  Research and Development and New Applications Groups OmniVision CDM Optics

  - Developed multi-aperture computational imaging system designs for improved low-light performance, passive ranging, computational zoom, and high dynamic range imaging. Built lab prototypes to verify the performance of candidate multi-aperture computational imaging system.

- Developed the theoretical framework for joint opto-electronic optimization of computational imaging system design.

- Conducted feasibility study on the applicability of various state of the art micro-mechanical actuation technologies to miniaturized wafer-level imaging systems.

- Carried out research and development effort in Wavefront-coding and wafer-level optical imagers with applications in security, medical, and automotive sectors.

- Developed concept imager designs for optical character recognition and day/night IR imaging.

- **Graduate Research Assistant** June 2002 - Nov 2007
  Department of Electrical and Computer Engineering University of Arizona
  Optical Computing and Processing Lab (OCPL)

  - Developed an ultra-thin imager design using point spread function engineering for DARPA's MONTAGE project.

  - Co-developed a task-specific information(TSI) framework for imaging system design/analysis and optimized a compressive imager design for target detection task using the TSI metric.

  - Designed and deployed a high-performance computing cluster (128-node) for computational imaging research.

- **Graduate Research Assistant** May 2000 - Nov 2001
  Department of Electrical Engineering University of Cape Town

  - Conducted radar system design simulation studies, including multiple-antenna interferometric SAR systems and also developed a real-time optical tracking system simulator using Matlab's Simulink.

Teaching Experience

- **Substitute Lecturer** 2004 - present
  Department of Electrical and Computer Engineering University of Arizona

  - Taught lectures for out-of-town faculty, in courses such as: Neural Networks, Image Science and Engineering, Digital Signal Processing

  - Delivered invited guest lecture in a Computational Photography course

  - Taught several lectures in a linear system theory course in Fall 2010.

- **Graduate Teaching Assistant** Jan 2002 - May 2002
  Department of Electrical and Computer Engineering University of Arizona

  - Electrical Engineering Lab course

- **Graduate Teaching Assistant** May 2000 - Nov 2001
  Department of Electrical Engineering University of Cape Town

  - Electromagnetics, Electrical Circuits, Power Engineering

  - Designed and implemented a lab course in Digital Signal Processing.

Patents

- **Amit Ashok** and Joseph Dagher, "Object-based pre-processing for OCR," Patent Pending, PCT/US2010/026535, filed August, 2010.
- Joseph Dagher, **Amit Ashok**, David Tremblay, Kenny Kubala, "Image Data Fusion Systems and Methods," Patent Pending, PCT/US2009/032683, filed January, 2009.

Journal Publications

- Jun Ke, **Amit Ashok**, Mark A. Neifeld, "Block-wise Motion Detection Using Compressive Imaging System," in press, Optics Communications, 2010.
- Vicha Treeaporn, **Amit Ashok**, Mark A. Neifeld, "Increased field of view through optical multiplexing," Optics Express, 18, pp. 22432-22445, 2010.
- Jun Ke, **Amit Ashok**, Mark A. Neifeld, "Object reconstruction from adaptive compressive measurements in feature-specific imaging," Applied Optics, 49(34), pp. H27-H39, 2010.
- **Amit Ashok** and Mark A. Neifeld, "Point Spread Function Engineering for Iris Recognition Imaging System Design," Applied Optics, 49(10), pp. B26-B39, 2010.
  Also appears in Virtual Journal of Biomedical Optics, Vol. 5, Issue 8, 2010.
- **Amit Ashok**, Pawan Baheti and Mark A. Neifeld, "Compressive imaging system design using task-specific information," Applied Optics, 47(25), pp. 4457-447, 2008.
- Mark A. Neifeld, **Amit Ashok**, and Pawan Baheti, "Task Specific Information for Imaging System Analysis," JOSA A, 24(12), pp. B25-B41, 2007.
- **Amit Ashok** and Mark A. Neifeld, "Pseudo-random phase masks for super-resolution imaging from sub-pixel shifting," Applied Optics, 46(12), pp. 2256-2268, 2007.
- **Amit Ashok** and Mark A. Neifeld, "Information-based analysis of simple incoherent imaging systems," Optics Express, 11, pp. 2153-2162, 2003.
- Amit Ashok and Mark A. Neifeld, "Hybrid Measurement Basis Design for Compressive Imaging," *to be submitted*.
- Amit Ashok and Mark A. Neifeld, "Compressive Light Field Imaging," *in preparation*.

Conference Publications

- Vicha Treeaporn, **Amit Ashok**, and Mark A. Neifeld, "Space-time Compressive Imaging," accepted, SPIE Visual Information Processing XX, 2011.
- Jun Ke, **Amit Ashok**, and Mark A. Neifeld, "Adaptive compressive imaging for object reconstruction," Proceedings of SPIE 7818A, Adaptive Coded Aperture Imaging and Non-Imaging Sensors IV, 2010.
- **Amit Ashok** and Mark A. Neifeld, "Compressive Imaging: Hybrid Projection Design," **Invited Paper**, OSA Topical Meeting: Imaging Systems, Tucson, Arizona, 2010.
- **Amit Ashok** and Mark A. Neifeld , "Compressive Light Field Imaging," **Invited Paper**, **Best Paper Award**, Proceedings of SPIE 7690A, Three-Dimensional Imaging, Visualization, and Display, 2010.
- Vicha Treeaporn, **Amit Ashok**, and Mark A. Neifeld, "Increased Field Of View Through Optical Multiplexing," OSA Topical Meeting: Imaging Systems, Tucson, Arizona, 2010.
- **Amit Ashok**, Pawan Baheti and Mark A. Neifeld, "Task Specific Information," **Invited Paper**, OSA Topical Meeting: Computational Optical Sensing and Imaging (COSI), paper CTuA1, Vancouver, Canada, 2007.
- **Amit Ashok**, Pawan Baheti and Mark A. Neifeld, "Task-specific information: an imaging system analysis tool," Proceedings of SPIE 6575, Visual Information Processing XVI, 2007.
- **Amit Ashok** and Mark A. Neifeld, "Recent progress on multi-domain optimization for ultra-thin cameras," **Invited Paper**, Proceedings of SPIE 6232, Intelligent Integrated Microsystems, 62320N, 2006.
- Mark A. Neifeld and **Amit Ashok**, "Imaging using Alternate Point Spread functions: Lenslets with Pseudo-Random Phase Diversity, " **Invited Paper**, OSA Topical Meeting: Computational Optical Sensing and Imaging (COSI), paper CMB1, North Carolina, 2005.

- Mark A. Neifeld and **Amit Ashok**, "An Information-Based Analysis of Two Single-Detector Imaging System," Proceedings of the 7th Joint Conference on Information Sciences(JCIS),Cary, North Carolina, pp.1404-1407, 2003.
- **Amit Ashok** and Andrew J. Wilkinson,"Topographic mapping with multiple antenna SAR interferometry:a Bayesian model-based approach," IEEE Geoscience and Remote Sensing Symposium (IGARSS), vol. 5, pp. 2058-2060, Sydney, 2001.

Conference Talks

- **Amit Ashok**, Pawan Baheti, and Mark A. Neifeld, "Projective Imager Design with Task Specific Information," Frontiers in Optics, OSA Technical Digest, paper FThQ4, 2007.
- **Amit Ashok**, Pawan Baheti, and Mark A. Neifeld, "Task-Specific Information," Frontiers in Optics, OSA Technical Digest, paper FWH4, 2006.
- Michael Stenner, **Amit Ashok**, and Mark A. Neifeld, "Multi-Domain Optimization for Ultra-Thin Cameras," Frontiers in Optics, OSA Technical Digest, paper FWH5, 2006.
- **Amit Ashok** and M. A. Neifeld, "Engineering the Point-Spread-Function for Super-Resolution from Multiple Low-Resolution Sub-Pixel Shifted Frames," Frontiers in Optics, OSA Technical Digest Series, paper FThU4, 2005.
- **Amit Ashok** and Mark A. Neifeld, "Information-theoretic capacity of simple imaging systems," Frontiers in Optics, OSA Technical Digest, paper ThII2, 2003.
- **Amit Ashok**, "Computational Imaging: A joint system design perspective," **Invited Talk**, Raytheon's MEOSTN Computational EO/IR Workshop, September, 2011.

General Audience Publication

- **Amit Ashok** and Mark A. Neifeld, "Compressive Light Field Imaging," SPIE Newsroom Article, August, 2010. `http://spie.org/x41521.xml`

Awards and Honors

- *Best Paper Award*, SPIE Three-Dimensional Imaging, Visualization, and Display II, 2010.
- International Student Scholarship, University of Cape Town, 1999 and 2000.
- Dean's award for best academic performance, University of Swaziland, 1998.
- Vice-Chancellor award for best academic performance, University of Swaziland, 1998.
- Sino-Swazi award for best academic performance, University of Swaziland, 1995.

Professional and Service Activity

- Served on committee for comprehensive exams and oral defense of graduate students.
- Program Committee and *Session Chair*, SPIE Visual Information and Processing, 2011.
- Program Committee, SPIE Three-Dimensional Imaging, Visualization, and Display, 2011.
- Member of OSA, SPIE, and IEEE.
- Journal Reviewer:
  - OSA Journals: JOSA A, Applied Optics, Optics Letters, Optics Express
  - IEEE Journals: Transactions on Image Processing, Signal Processing Letters.