

# Aswin C Sankaranarayanan

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## Affiliation

*Assistant Professor*  
ECE Department,  
Carnegie Mellon University, Pittsburgh, PA

## Research Interests

My research interests are broadly in *computer vision* and *signal processing*. My research focuses on developing computational tools and imaging architectures for high-dimensional visual signals --- this encompasses ideas across multiple disciplines: *compressive sensing, sparse approximations, multi-view geometry, computational imaging, non-linear signal models and reflectance properties of materials*.

## Education

2009 PhD, ECE Department, University of Maryland, College Park  
2007 MS, ECE Department, University of Maryland, College Park  
2003 B.Tech, EE Department, Indian Institute of Technology, Madras

## Work Experience

2013 – Assistant Professor, ECE Dept., Carnegie Mellon University  
2012 Research Scientist, DSP Group, Rice University  
2009 – 2011 Post-doctoral Research Associate, DSP Group, Rice University  
2003 – 2009 Graduate Research Assistant, ECE Dept., University of Maryland

## Teaching

Spring 2014 18-799N Computational Sensors  
Fall 2013 18-290 Signals and Systems  
Spring 2013 18-799J Compressive Sensing and Sparse Optimization

## Publications

*Journal papers (under review)*

1. A. Ito, A. C. Sankaranarayanan, A. Veeraraghavan, and R. G. Baraniuk, "BlurBurst: Removing blur due to camera shake using multiple images," under preparation

2. C. Hegde, A. C. Sankaranarayanan, W. Yin, and R. G. Baraniuk, "A convex approach for learning near-isometric linear embeddings," under review at IEEE Trans. Signal Processing (Submitted August 2014)
3. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Learning manifolds in the wild," under review at Applied and Computational Harmonic Analysis (Submitted August 2014)
4. J. Shi, W. Yin, A. C. Sankaranarayanan, and R. G. Baraniuk, "Video compressive sensing for dynamic MRI," under review at IEEE Trans. Image Processing. (Submitted Jan 2014)
5. Y. Li, C. Hegde, A. C. Sankaranarayanan, R. G. Baraniuk, and K. Kelly, "Compressive image classification via secant projections," under preparation
6. A. C. Sankaranarayanan, L. Xu, C. Studer, Y. Li, K. Kelly, and R. G. Baraniuk, "Video compressive sensing for spatial multiplexing cameras using motion-flow models," under review at SIAM J. Imaging Sciences (Submitted October 2014)

*Journal papers (in print)*

1. Y. Li, A. C. Sankaranarayanan, L. Xu, R. G. Baraniuk, and K. Kelly, "Realization of Hybrid Compressive Imaging Strategies," J. Optical Society of America A, vol. 31(8), pp. 1716-1720, 2014
2. A. Ito, S. Tambe, K. Mitra, A. Sankaranarayanan, and A. Veeraraghavan, "Compressive epsilon photography for post-capture control in digital imaging," ACM Trans. Graphics (TOG) / SIGGRAPH, vol. 33(4), July 2104
3. K. Mitra, A. Veeraraghavan, A. C. Sankaranarayanan, and R. G. Baraniuk, "Towards compressive camera networks," IEEE Computer, vol. 47(5), May 2014
4. M. Du, A. C. Sankaranarayanan, and R. Chellappa, "Robust face recognition from multi-view videos", IEEE Trans. Image Processing, vol. 23(3), pp. 1105-1117, 2014
5. E. Dyer, A. C. Sankaranarayanan, and R. G. Baraniuk, "Greedy feature selection for subspace clustering," J. Machine Learning Research, 14(Sep):2487–2517, 2013.
6. A. C. Sankaranarayanan, P. Turaga, R. Chellappa, and R. G. Baraniuk, "Compressive Acquisition of Linear Dynamical Systems," SIAM J. Imaging Sciences. 6(4), 2109–2133, 2013
7. S. Nagaraj, C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Optical flow-based transport on image manifolds," Applied and Computational Harmonic Analysis, 36(2), 280-301, March 2014
8. S. Taheri, A. C. Sankaranarayanan, and R. Chellappa, "Joint albedo estimation and pose tracking from video," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 35(7), pp. 1674 – 1689, July 2013
9. R. Chellappa, A. C. Sankaranarayanan, A. Veeraraghavan, and P. Turaga, "Statistical methods, and models for video based tracking, modeling, and recognition," Foundations and Trends in Signal Processing, vol. 1-2, 2010
10. H. Wu, A. C. Sankaranarayanan, and R. Chellappa, "Online empirical evaluation of tracking algorithms," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 32(8), pp. 1443-1458, August 2010
11. A. C. Sankaranarayanan, R. Patro, P. Turaga, A. Varshney, and R. Chellappa, "Modeling, and visualization of human activities for multi-camera networks," EURASIP J. Image and Video Computing, article id. 259860, 2009

12. A. C. Sankaranarayanan, A. Veeraraghavan, and R. Chellappa, "Distributed detection, tracking, and recognition using a network of video cameras," *Proc. of the IEEE*, vol. 96(10), pp. 1606-1624, October 2008
13. A. C. Sankaranarayanan, A. Srivastava, and R. Chellappa, "Algorithmic, and architectural optimizations for computationally efficient particle filtering," *IEEE Trans. Image Processing*, vol. 17(5), pp. 737-748, May 2008
14. V. Cevher, A. C. Sankaranarayanan, J. H. McClellan,, and R. Chellappa, "Target tracking using a joint acoustic video system," *IEEE Trans. Multimedia*, vol. 9, pp. 715-727, June 2009

*Conference papers (select)*

1. H. Gonsalves, M. Correia, X. Li, A. C. Sankaranarayanan, and V. Tavares, "DALM-SVD: Accelerated sparse coding through singular value decomposition of the dictionary," *ICIP 2014*
2. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Lie operators for compressive sensing," *ICASSP 2014*
3. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Learning measurement matrices for redundant dictionaries," *SPARS, 2013*
4. L. Xu, A. C. Sankaranarayanan, C. Studer, Y. Li, R. G. Baraniuk, K. F. Kelly, "Multi-scale compressive video acquisition," *COSI, 2013*
5. D. K. Grady, M. Moll, C. Hegde, A. C. Sankaranarayanan, R. G. Baraniuk, and L. E. Kavraki, "Multi-robot target verification with reachability constraints," *IEEE Intl. Symp. Safety, Security, and Rescue Robotics (SSRR), 2012*
6. D. K. Grady, M. Moll, C. Hegde, A. C. Sankaranarayanan, R. G. Baraniuk, and L. E. Kavraki, "Multi-objective sensor replanning for a car-like robot," *SSRR, 2012*
7. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Near isometric linear embeddings of manifolds," *Statistical Signal Processing (SSP) Workshop, 2012*
8. A. C. Sankaranarayanan, C. Studer, and R. G. Baraniuk, "CS-MUVI: Video compressive sensing using spatially multiplexing cameras," *ICCP, 2012*
9. J. Holloway, A. C. Sankaranarayanan, A. Veeraraghavan, and S. Tambe, "Flutter shutter video camera for compressive sensing of high-speed videos," *ICCP, 2012*
10. A. E. Waters, A. C. Sankaranarayanan, and R. G. Baraniuk "SpaRCS: Compressive sensing of sparse and low rank matrices," *NIPS, 2012*
11. A. C. Sankaranarayanan, C. Hegde, S. Nagraj, and R. G. Baraniuk, "Go with the Flow: Optical flow-based transport operators for image manifolds," *Allerton, 2011*
12. A. C. Sankaranarayanan, P. Turaga, R. G. Baraniuk and R. Chellappa, "Compressive acquisition of dynamic scenes," *ECCV, 2010*
13. A. C. Sankaranarayanan, A. Veeraraghavan, O. Tuzel, and A. Agrawal, "Image invariants for smooth reflective surfaces," *ECCV, 2010*
14. A. C. Sankaranarayanan, A. Veeraraghavan, O. Tuzel and A. Agrawal, "Specular surface reconstruction from sparse reflection correspondences," *CVPR, 2010*
15. Q. Cai, A. C. Sankaranarayanan, Q. Zhang, Z. Liu, and Z. Zhang, "Real time head pose tracking from multiple cameras with a generic model," *AMFG Workshop, 2010*
16. V. Cevher, A. C. Sankaranarayanan, M. Duarte, D. Reddy, R. G. Baraniuk ,and R. Chellappa, "Compressive sensing for background subtraction," *ECCV, 2008*

17. A. C. Sankaranarayanan and R. Chellappa, "Stochastic fusion of multi-view gradients," ICIP, 2008
18. D. Reddy, A. C. Sankaranarayanan, V. Cevher, and R. Chellappa, "Compressed sensing for multi-view tracking and 3-D voxel reconstruction," ICIP, 2008
19. V. Cevher, A. C. Sankaranarayanan, and R. Chellappa, "Factorized variational approximations for acoustic multi source localization," ICASSP, 2008
20. A. C. Sankaranarayanan and R. Chellappa, "Optimal multi-view fusion of object locations," Workshop on Motion and Video Computing, 2008.
21. H. Wu, R. Chellappa, A. C. Sankaranarayanan, and S. K. Zhou, "Robust visual tracking using the time-reversibility constraint," ICCV, 2007
22. H. Wu, A. C. Sankaranarayanan, and R. Chellappa, "Insitu evaluation of tracking algorithms using time reversed chains," CVPR, 2007
23. A. C. Sankaranarayanan, R. Chellappa, and A. Srivastava, "Algorithmic and architectural design methodologies for particle filters in hardware," ICCD, 2005
24. A. C. Sankaranarayanan, R. Chellappa, and Q. Zheng, "Tracking objects in video using motion and appearance models," ICIP, 2005

### *Book chapters*

1. R. Chellappa and A. C. Sankaranarayanan, "Surveillance," Encyclopedia of Biometrics, Stan Li (Ed.), Springer, 2009
2. R. Chellappa, A. Veeraraghavan, and A. C. Sankaranarayanan, "Knowledge extraction from surveillance sensors," Wiley Handbook on Science and Technology for Homeland Security, John G. Woeller (Ed.), Wiley, 2010
3. A. C. Sankaranarayanan, R. Chellappa, and R. G. Baraniuk, "Distributed sensing and processing for multi-camera networks," Distributed Video Sensor Networks, Bir Bhanu et al. (Ed.), Springer 2011
4. M. Du, A. C. Sankaranarayanan, and R. Chellappa, "Face tracking and recognition in a camera network," Multibiometrics for Human Identification, Bir Bhanu and Venu Govindaraju (Ed.), Cambridge, 2011
5. A. C. Sankaranarayanan and R. G. Baraniuk, "Compressive Sensing," Encyclopedia of Computer Vision, Ikeuchi (Ed.), (to appear)
6. A. Veeraraghavan, A. C. Sankaranarayanan, and R. G. Baraniuk, "Compressive Sensing for Video Applications," to appear in E-Reference Signal Processing

### **Selected Talks**

- |         |   |
|---------|---|
| 04/2014 | "Computational imaging --- A vision for complex materials," Arizona State University                                |
| 04/2014 | "Learning near-isometric linear embeddings," SenSIP Distinguished Lecturer Seminar Series, Arizona State University |
| 07/2013 | "Learning near-isometric linear embeddings," IBM Watson Research Center   |
| 04/2013 | "Sensing videos compressively," Ohio State University   |
| 04/2013 | "Breaking the resolution limits of sensors," VASC Seminar, Carnegie Mellon University                               |
| 03/2013 | "Breaking the resolution limits of sensors," BME Seminar, Carnegie Mellon University                                |

- 03/2013 "A convex approach for learning near-isometric embeddings", Academia Sinica, Taiwan
- 03/2013 "Breaking the resolution limits of sensors", ECE Dept., National Taiwan University
- 02/2013 "A Sensible View in the Post-Nyquist Age", ECE Dept., Carnegie Mellon University
- 11/2012 "Compressive sensing of high-dimensional visual signals," Univ. of California, Riverside
- 06/2012 Tutorial on video compressive sensing, CVPR 2012 Short Course, Providence, RI
- 05/2012 "Recovering low rank and sparse matrices from compressive measurements", SIAM Imaging Conference, Philadelphia
- 05/2012 "Sensing videos with spatial multiplexing cameras", SIAM Imaging Conference, Philadelphia
- 04/2012 "CS-MUVI: Video compressive sensing of spatially multiplexing cameras", ICCP, Seattle, WA
- 03/2012 "Low-dimensional sensing of high-dimensional visual signals", ECE Dept., CMU
- 01/2012 "Learning Manifolds in the Wild", University of Delaware
- 01/2012 "Learning Manifolds in the Wild", Colorado School of Mines
- 10/2011 "Video compressive sensing", CAAM Seminar, Rice University
- 06/2011 "Go with the flow: Optical flow-based transport operators for image manifolds", University of Colorado, Boulder
- 06/2011 "Compressive video sensing," Keynote talk, CVPR OTBVS workshop, Colorado Springs, CO
- 04/2011 "Computational methods and models for multi-camera systems," MERL, Cambridge, MA
- 10/2010 "Image invariants for Smooth Mirrors", University of Maryland, College Park
- 08/2010 "Video compressive sensing", MIT Media Labs, Cambridge, MA
- 12/2009 "Online evaluation of tracking algorithms," PETS Winter workshop, UT
- 2009 "Statistical inference in multi-view problems," ECEGSA Student Seminar (*Best speaker award*).
- 2008 "Remote biometrics for the maritime domain," ROBUST Biometrics conference, Honolulu, HI
- 2008 "Compressive acquisition of reflectance fields," ECEGSA Student Seminar, College Park, MD
- 2008 Mixed state space models for automatic target recognition and behavior analysis in video sequences," SPIE Defense and Security Symp., Orlando, FL
- 2007 "Statistical estimation under projective transformation: theory and applications in computer vision," IBM Watson Research Center

## Awards

- 2008 – 2009 Distinguished Dissertation Fellowship, ECE Department, Univ. Maryland
- 2010 Best paper award, Analysis and Modeling of Faces and Gestures (AMFG), 2010
- 2009 Best Speaker award, ECEGSA Student Seminar Series
- 2007 – 2009 Future Faculty Fellowship, A. James Clark School of Eng., Univ. Maryland
- 2007 Workshop for Emerging Leaders in Multi-Media, IBM Watson Research Center

## Professional Service

**Local arrangements chair**, ICCP 2014

**Reviewer (Conference):** ECCV 2012,2014; CVPR 2008 – 2015; ICCV 2007, 2011, 2013; ICME 2007, 2008; ICCP 2015

**Reviewer (Journal):** IEEE Pattern Analysis and Machine Intelligence, IEEE Trans. Image Processing, IEEE Trans. Signal Processing, IEEE Trans. Multimedia, IEEE Signal Processing Letters, IEEE Trans. Circuits and Systems for Video Technology, EURASIP Journal on Advances in Signal Processing, Machine Vision and Applications, Journal of Signal Processing Systems