Aswin C Sankaranarayanan

URL: http://www.ece.cmu.edu/~saswin
Email: mailto:saswin@andrew.cmu.edu
Phone: (412) 268-1087

Porter Hall, B17
5000 Forbes Ave
Pittsburgh, PA 15213

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

Awards / Honors

2017	NSF CAREER award
2017	Eta Kappa Nu (Sigma chapter) Excellence in Teaching Award
2016	Herschel M. Rich Invention Award (Rice University)
2015	Best paper award, CVPR 2015 Workshop on Computational Cameras and Displays (CCD)
2015	Keynote talk at CVPR Workshop on Computational Cameras and Displays
2015	Best poster runner-up at ICCP 2015
2010	Best paper award, CVPR 2010 Workshop on Analysis and Modeling of Faces and Gestures
2009	Distinguished Dissertation Fellowship, ECE Department, Univ. Maryland
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

Publications

Journal papers (in print)

1. L. Cheng, Y. Wu, A. C. Sankaranarayanan, S-M. Chang, B. Guo, N. Sasaki, H. Kobayashi, C-W. Sun, Y. Ozeki, and K. Goda, "GHz optical time-stretch microscopy by compressive sensing," IEEE Photonics Journal, In Press, 2017
2. Z. Hui and A. C. Sankaranarayanan, "Shape and Spatially-Varying Reflectance Estimation from Virtual Exemplars," in IEEE Trans. Pattern Analysis and Machine Intelligence (PAMI), In Press, 2017
3. M. S. Asif, A. Ayremlou, A. C. Sankaranarayanan, A. Veeraraghavan, and R. G. Baraniuk, "Lens-Free Imaging: Thin, Bare-Sensor Cameras using Masks and Computation," in IEEE Trans. Computational Imaging, In Press, 2017
4. R. G. Baraniuk, T. Goldstein, A. C. Sankaranarayanan, C. Studer, A. Veeraraghavan, and M. Wakin, "Compressive Video Sensing: Algorithms, Architectures, and Applications," IEEE Signal Processing Magazine, 34(1): 52-66, 2017.
5. J-H. R. Chang, B. V. K. Bhagavatula, and A. C. Sankaranarayanan, "2^{16} Shades of Gray: High bit-depth projection using light intensity control," Opt. Express, 24, 27937-27950. 2016.
6. A. C. Sankaranarayanan, M. A. Herman, P. Turaga, and K. F. Kelly, "Enhanced Compressive Imaging Using Model-Based Acquisition: Smarter sampling by incorporating domain knowledge," IEEE Signal Processing Magazine, 33(5): 81--94. 2016.
7. V. Boominathan, J. K. Adams, M. S. Asif, B. W. Avants, J. T. Robinson, R. Baraniuk, A. C. Sankaranarayanan, and A. Veeraraghavan, "Lensless Imaging: A computational renaissance," IEEE Signal Processing Magazine, 33(5): 23--35. 2016.
8. J. Mota, N. Deligiannis, A. C. Sankaranarayanan, V. Cevher, and M. Rodrigues, "Adaptive-rate sparse signal reconstruction with application in compressive background subtraction," 64(1): 3651—3666, 2016.
9. C. Hegde, A. C. Sankaranarayanan, W. Yin, and R. G. Baraniuk, "A convex approach for learning near-isometric linear embeddings," in IEEE Trans. Signal Processing, 63(22), pp. 6109-6121, 2015
10. 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,'' in SIAM J. Imaging Sciences, 8(3), pp. 1489-1518, 2015
11. Y. Li, C. Hegde, A. C. Sankaranarayanan, R. Baraniuk, and K. Kelly, "Compressive image acquisition and classification via secant projections," Journal of Optics, 17(6), pp. 065701, 2015
12. A. Ito, S. Tambe, K. Mitra, A. C. Sankaranarayanan, and A. Veeraraghavan, "Compressive epsilon photography for post-capture control in digital imaging," ACM SIGGRAPH/ACM Trans. Graphics, 33(4), pp. 88:1-12, 2014
13. Y. Li, A. C. Sankaranarayanan, R. G. Baraniuk, and K. Kelly, "Realization of Hybrid Compressive Imaging Strategies," J. Optical Society of America (A), 31(8), pp. 1716-1720, 2014
14. K. Mitra, A. Veeraraghavan, A. C. Sankaranarayanan, and R. G. Baraniuk, "Towards compressive camera networks," IEEE Computer, 47(5), pp. 52-59, 2014
15. M. Du, A. C. Sankaranarayanan, and R. Chellappa, "Robust face recognition from multi-view videos", IEEE Trans. Image Processing, 23(3), pp. 1105-1117, 2014
16. E. Dyer, A. C. Sankaranarayanan, and R. G. Baraniuk, "Greedy feature selection for subspace clustering," J. Machine Learning Research, 14(Sep), pp. 2487−2517, 2013

17. A. C. Sankaranarayanan, P. Turaga, R. Chellappa, and R. G. Baraniuk, “Compressive Acquisition of Linear Dynamical Systems,” SIAM J. Imaging Sciences. 6(4), pp. 2109–2133, 2013
18. 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), pp. 280-301, 2014
19. S. Taheri, A. C. Sankaranarayanan, and R. Chellappa, “Joint albedo estimation and pose tracking from video,” IEEE Trans. Pattern Analysis and Machine Intelligence, 35(7), pp. 1674 – 1689, 2013
20. 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
21. H. Wu, A. C. Sankaranarayanan, and R. Chellappa, “Online empirical evaluation of tracking algorithms,” IEEE Trans. Pattern Analysis and Machine Intelligence, 32(8), pp. 1443-1458, 2010
22. 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
23. A. C. Sankaranarayanan, A. Veeraraghavan, and R. Chellappa, “Distributed detection, tracking, and recognition using a network of video cameras,” Proc. of the IEEE, 96(10), pp. 1606-1624, 2008
24. A. C. Sankaranarayanan, A. Srivastava, and R. Chellappa, “Algorithmic, and architectural optimizations for computationally efficient particle filtering,” IEEE Trans. Image Processing, 17(5), pp. 737-748, 2008
25. V. Cevher, A. C. Sankaranarayanan, J. H. McClellan, and R. Chellappa, “Target tracking using a joint acoustic video system,” IEEE Trans. Multimedia, 9(4), pp. 715-727, 2007

Papers in Top Conferences (typically 20-30% acceptance rates, 8+ pages long paper)

1. J-H. Chang, C-L. Li, B. Poczos, B. V. K. Vijaya Kumar and A. C. Sankaranarayanan, “One network to solve them all — Solving Linear Inverse Problems using Deep Projection Models,” In IEEE Intl. Conf. Computer Vision (ICCV), 2017.
2. Z. Hui, K. Sunkavalli, J-Y. Lee, S. Hadap, J. Wang and A. C. Sankaranarayanan, “Reflectance capture using univariate sampling of BRDFs,” In IEEE Intl. Conf. Computer Vision (ICCV), 2017.
3. C-Y. Tsai, K. Kutulakos, S. Narasimhan, and A. C. Sankaranarayanan, “The geometry of first-returning photons in non-line-of-sight imaging,” in IEEE Intl. Conf. Computer Vision and Pattern Recognition (CVPR), 2017
4. V. Saragadam, J. Wang, X. Li, and A. C. Sankaranarayanan, “Compressive spectral anomaly detection,” in IEEE Intl. Conf. Computational Photography (ICCP), 2017
5. J. Wang, A. C. Sankaranarayanan, M. Gupta, and S. G. Narasimhan. "Dual Structured Light 3D using a 1D Sensor." In European Conference on Computer Vision (ECCV), 2016
6. J. R. Chang, A. C. Sankaranarayanan, and B. V. K. Vijaya Kumar. "Random Features for Sparse Signal Classification." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016
7. C-Y. Tsai, Chia-Yin, A. Veeraraghavan, and A. C. Sankaranarayanan. "Shape and Reflectance from Two-Bounce Light Transients," IEEE Intl. Conf. Computational Photography (ICCP), 2016
8. Z. Hui, A. C. Sankaranarayanan, K. Sunkavalli, and S. Hadap. "White balance under mixed illumination using flash photography." In ICCP, 2016

9. J. Wang, Y. Matsushita, B. Shi, and A. C. Sankaranarayanan, “Photometric stereo from small angular variations,” in IEEE Intl. Conf. Computer Vision (ICCV), 2015
10. H. Chen, M. S. Asif, A. C. Sankaranarayanan, and A. Veeraraghavan, “FPA-CS: Focal plane array-based compressive imaging in short-wave infrared,” in CVPR, 2015
11. J. Wang, M. Gupta, and A. C. Sankaranarayanan, “LiSens --- A scalable approach to video compressive sensing,” in ICCP, 2015
12. Z. Hui and A. C. Sankaranarayanan, “A dictionary-based approach for estimating shape and spatially-varying reflectance,” in ICCP, 2015
13. A. C. Sankaranarayanan, C. Studer, and R. G. Baraniuk, “CS-MUVI: Video compressive sensing using spatially multiplexing cameras,” ICCP, 2012
14. J. Holloway, A. C. Sankaranarayanan, A. Veeraraghavan, and S. Tambe, “Flutter shutter video camera for compressive sensing of high-speed videos,” ICCP, 2012
15. A. E. Waters, A. C. Sankaranarayanan, and R. G. Baraniuk "SpaRCS: Compressive sensing of sparse and low rank matrices,” NIPS, 2012
16. A. C. Sankaranarayanan, P. Turaga, R. G. Baraniuk and R. Chellappa, “Compressive acquisition of dynamic scenes,” ECCV, 2010
17. A. C. Sankaranarayanan, A. Veeraraghavan, O. Tuzel, and A. Agrawal, “Image invariants for smooth reflective surfaces,” ECCV, 2010
18. A. C. Sankaranarayanan, A. Veeraraghavan, O. Tuzel and A. Agrawal, “Specular surface reconstruction from sparse reflection correspondences,” CVPR, 2010
19. V. Cevher, A. C. Sankaranarayanan, M. Duarte, D. Reddy, R. G. Baraniuk ,and R. Chellappa, “Compressive sensing for background subtraction,” ECCV, 2008
20. H. Wu, R. Chellappa, A. C. Sankaranarayanan, and S. K. Zhou, “Robust visual tracking using the time-reversibility constraint,” ICCV, 2007
21. H. Wu, A. C. Sankaranarayanan, and R. Chellappa, “Insitu evaluation of tracking algorithms using time reversed chains,” CVPR, 2007
22. A. C. Sankaranarayanan, R. Chellappa, and A. Srivastava, “Algorithmic and architectural design methodologies for particle filters in hardware,” ICCD, 2005

Other Publications in Conferences and Workshops (select)

23. A. C. Sankaranarayanan, J. Wang, and M. Gupta, “Radon transform imaging: Low cost compressive sensing at extreme resolutions,” SPIE Sensing and Analysis Technologies for Biomedical and Cognitive Applications, 2016
24. V. Saragadam, A. C. Sankaranarayanan, and X. Li, “Cross-scale predictive dictionaries for image and video restoration,” in IEEE Intl. Conf. Image Processing (ICIP), 2016
25. M. S. Asif, A. Ayremlou, A. C. Sankaranarayanan, A. Veeraraghavan, and R. G. Baraniuk, “FlatCam --- Thin, bare-sensor camera using coded-aperture and computation,” IEEE ICCV Workshop on Extreme Computational Imaging, 2015.
26. A. C. Sankaranarayanan and A. Veeraraghavan, “Parallel Compressive Imaging,” in Computational Optical Sensing and Imaging (COSI), 2015
27. C. Tsai, A. Veeraraghavan, and A. C. Sankaranarayanan, “What does a single light ray reveal about a transparent object ?” in ICIP 2015
28. S. Lohit, K. Kulkarni, P. Turaga, J. Wang, and A. C. Sankaranarayanan, “Reconstruction-free inference from compressive measurements,” in CCD workshop (CVPW), 2015
29. J. Mota, N. Deligiannis, A. C. Sankaranarayanan, V. Cevher, and M. Rodrigues, “Dynamic sparse state estimation using l1-l1 minimization: Adaptive rate measurement bounds, algorithms, and applications,” in ICASSP 2015

30. 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
31. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Lie operators for compressive sensing," ICASSP 2014
32. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Learning measurement matrices for redundant dictionaries," SPARS, 2013
33. L. Xu, A. C. Sankaranarayanan, C. Studer, Y. Li, R. G. Baraniuk, K. F. Kelly, "Multi-scale compressive video acquisition," COSI, 2013
34. 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
35. 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
36. C. Hegde, A. C. Sankaranarayanan, and R. G. Baraniuk, "Near isometric linear embeddings of manifolds," Statistical Signal Processing (SSP) Workshop, 2012
37. 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
38. 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
39. A. C. Sankaranarayanan and R. Chellappa, "Stochastic fusion of multi-view gradients," ICIP, 2008
40. D. Reddy, A. C. Sankaranarayanan, V. Cevher, and R. Chellappa, "Compressed sensing for multi-view tracking and 3-D voxel reconstruction," ICIP, 2008
41. V. Cevher, A. C. Sankaranarayanan, and R. Chellappa, "Factorized variational approximations for acoustic multi source localization," ICASSP, 2008
42. A. C. Sankaranarayanan and R. Chellappa, "Optimal multi-view fusion of object locations," Workshop on Motion and Video Computing, 2008.
43. 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

03/2017 "Towards unconstrained 3D acquisition," NCC 2017, IIT Madras

01/2017 "Computational imaging," at the Indian Institute of Technology, Madras

05/2016 "Compressive sensing of very high dimensional images," SIAM Conf. Imaging Science, Albuquerque, NM

05/2016 "Lensless imaging," SIAM Conf. Imaging Science, Albuquerque, NM

04/2016 "Radon Transform Imaging", SPIE Defense & commercial sensing, Baltimore, MD

02/2016 "Computational Imaging", ECE Department, Tufts University

09/2015 "Efficient dimensionality reduction of large image datasets," NGA IC Academic Research Symposium

06/2015 "In defense of compressive imaging," Keynote talk at CCD workshop

06/2015 "Parallel compressive sensing," COSI

03/2015 "Learning near-isometric linear embeddings," ARL, Adelphi, MD

09/2014 "Computational imaging," University of Delaware

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 Sensable 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

Professional Service

Program Chair, ICCP 2018
Program Chair, CVPR Workshop on Computational Cameras and Displays, 2017
Industry Chair, ICCP 2017
Program Chair, CVPR Workshop on Computational Cameras and Displays, 2016
Finance Chair, ICCP 2016
Local Arrangements and Publications Chair, ICCP 2015

Reviewer (Conference)
ECCV 2012,2014, 2016
CVPR 2008 – 2017
ICCV 2007, 2011, 2013, 2015,2017
SIGGRAPH 2016, 2017
ICME 2007, 2008
ICCP 2015 - 2017
AISTATS 2017
CCD/Procams workshop 2014, 2015

Reviewer (Journal)
ACM Trans. on Graphics
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