

# AMIT SETHI

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## Research Areas

Computational pathology, medical image analysis, deep learning, computer vision, image processing, machine learning, pattern recognition, signal processing, and algorithms.

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## Employment and Positions

Indian Institute of Tech. Bombay	Mumbai, MH, India	Professor, Associate Professor	Jul'17 – present
University of Illinois at Chicago	Chicago, IL, USA	Adjunct Instructor	Apr'14 – present
Indian Institute of Tech. Guwahati	Guwahati, AS, India	Associate, Assistant Professor	Feb'11 – Jul'17
ZS Associates	Chicago, IL, USA	Consultant/Assoc. Consultant	May'06 – Jan'11
NEC Labs America	Cupertino, CA, USA	Visiting Scholar	May'03 – Nov'03

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## Education

Ph D	Electrical and Computer Engineering	University of Illinois at Urbana-Champaign	2001-2005
M S	General Engineering	University of Illinois at Urbana-Champaign	1999-2001
B Tech	Electrical Engineering	Indian Institute of Technology Delhi	1995-1999

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## Selected Funded Projects

- Development of a cancer radiology and pathology biobank at Tata Memorial Hospital funded by Department of Biotechnology, Co-PI, Government of India (as AI lead in a team mostly of doctors)
  - Using Computer Vision to Detect Multiple Subtypes in Hormone Receptor Positive Breast Cancer, funded by Breast Cancer Alliance (USA), as Co-I with a faculty member at UIC
  - Value-added Analysis of Histological Images using Artificial Intelligence, as PI, funded by Department of Science and Technology, India
  - Development of a course on deep learning for working professionals for Great Learning (Byju's), India
  - Development of AI accelerator architecture exploration and implementation for Seagate as Co-I with a faculty member at IITB
  - Development of dermatology diagnosis AI engine for Skin AI (a startup in Delhi, India)
  - Development of cellphone cosmetic defects detection engine for Griffyn Robotech (India)
  - Development of AI technology for crop health monitoring and prediction for Accenture, India
  - Development of an app for oral cancer screening, funded by Tata Centre for Technology and Design
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## Awards and Honors

- Facebook Ethics in AI award: "Patient-Centric Frameworks for AI-Enabled Medical Tests," 2019
- One of the five finalists for Nvidia Global Impact Award 2017, for work on computational pathology
- Indo-US Science and Technology Forum Fellowship for sabbatical to UIC, 2014-15
- Microsoft Young Faculty Award (India), 2011
- Mentored students who received Erasmus-Mundus Fellowship, Qualcomm Innovation Fellowship, etc.

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## Professional Activities

- Review Editor and Guest Associate Editor, *Frontiers in Oncology*
- Challenges Track Chair, International Symposium on Biomedical Imaging (ISBI), 2022
- Technical Co-Chair, National Conference on Communications (NCC), 2022
- Finance Chair, Indian Conference on Computer Vision, Graphics, and Image Processing , ICVGIP 2016
- Reviewer, IEEE T-IP, IEEE Access, IEEE T-NNLS, SPIE Medical Imaging, and several conferences
- Member IEEE, and IEEE-CS

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## Selected Invitations

- AACR Conference on the Science of Cancer Health Disparities In Racial/Ethnic Minorities and the Medically Underserved, Invited talk, October, 2021
- International Conference on Learning Representations (ICLR 2020), Invited talk in AI for Overcoming Global Disparities in Cancer Care
- World Economic Forum and NITI Aayog deliberation on Ethics in AI, 2019 and 2020
- RAISE India 2020 (MEITY), Panelist for two sessions in Responsible AI for Social Good, 2020
- NASSCOM, Interview for Ethics framework for AI, 2020
- Google, Interview for Responsible Algorithms, 2020

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## Publications [\[Google Scholar link\]](#)

### Journals (Peer-reviewed)

1. “Weakly supervised learning on unannotated hematoxylin and eosin stained slides predicts BRAF mutation in thyroid cancer with high accuracy,” D Anand, K Yashashwi, N Kumar, S Rane, PH Gann, A Sethi, *The Journal of Pathology*, 2021
2. “A 2021 update on cancer image analytics with deep learning,” N Cherian Kurian, A Sethi, A Reddy Konduru, A Mahajan, SU Rane, *WIRE Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 2021
3. “MoNuSAC2020: A Multi-organ Nuclei Segmentation and Classification Challenge,” R Verma, N Kumar, A Patil, NC Kurian, S Rane, S Graham, QD Vu, ..., A Sethi, *IEEE Transactions on Medical Imaging* 2021
4. “A 2021 update on cancer image analytics with deep learning,” NC Kurian, A Sethi, AR Konduru, A Mahajan, SU Rane, *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 2021
5. “Deep Learning to Estimate HER2 Status from H&E Stained Breast Tissue Images,” Deepak Anand, Nikhil Kurian, Shubham Dhage, Neeraj Kumar, Swapnil Rane, Peter Gann, Amit Sethi, in *Journal of Pathology Informatics*, 2020
6. “Fast design of plasmonic metasurfaces enabled by deep learning,” by Abhishek Mall, Abhijeet Patil, Dipesh Tamboli, Amit Sethi, and Anshuman Kumar, *Journal of Physics D: Applied Physics* 2020, 53(49).
7. “A cyclical deep learning based framework for simultaneous inverse and forward design of nanophotonic metasurfaces”, by Abhishek Mall, Abhijeet Patil, Amit Sethi, and Anshuman Kumar, in *Scientific Reports*, 2020; 10: 19427.

8. "A Multi-organ Nucleus Segmentation Challenge," N Kumar, R Verma, D Anand, Y Zhou, ..., A Sethi, in IEEE transactions on medical imaging, 2019
9. "Quantification of Intrinsic Subtype Ambiguity in Luminal A Breast Cancer and its Relationship to Clinical Outcomes", by Neeraj Kumar, Dan Zhao, Dulal Bhaumik, Amit Sethi, and Peter Gann, in BMC Cancer 2019
10. "Replicating and identifying large cell neuroblastoma using high-dose intra-tumoral chemotherapy and automated digital analysis," JS Taylor, L Sha, N Ikegaki, J Zeki, R Deaton, J Harris, J Coburn, B Yavuz, Amit Sethi, Hiroyuki Shimada, David L Kaplan, Peter Gann, Bill Chiu, in J. of Pediatric Surgery, 2019
11. "Hyperspectral Tissue Image Segmentation using Semi-Supervised NMF and Hierarchical Clustering", by N Kumar, P Uppala, K Duddu, H Sreedhar, V Varma, G Guzman, M Walsh, A Sethi, in IEEE Transactions on Medical Imaging, 2018.
12. "A Learnable Distortion Correction Module for Modulation Recognition", by K Yashashwi, A Sethi, P Chaporkar, in IEEE Wireless Communications Letters, 2018.
13. "Computer vision detects subtle histological effects of dutasteride on benign prostate", A Sethi, L Sha, N Kumar, V Macias, RJ Deaton, PH Gann, in BJU International, Feb 2018
14. "Super Resolution by Comprehensively Exploiting Dependencies of Wavelet Coefficients", N Kumar, A Sethi, in IEEE Transactions on Multimedia 20, no. 2 (2018): 298-309.
15. "A Dataset and a Technique for Generalized Nuclear Segmentation for Computational Pathology" by Neeraj Kumar, Ruchika Verma, Sanuj Sharma, Surabhi Bhargava, Abhishek Vahadane, and Amit Sethi, IEEE Transactions on Medical Imaging 2017
16. "Convolutional neural networks for wavelet domain super resolution," by Neeraj Kumar, Ruchika Verma, Amit Sethi, in Pattern Recognition Letters, Volume 90, 15 April 2017, Pages 65–71
17. "Structure-Preserving Color Normalization and Sparse Stain Separation for Histological Images," by Vahadane, A.; Peng, T.; Sethi, A., et. al. in IEEE Transactions on Medical Imaging, 2016
18. "Empirical comparison of color normalization methods for epithelial-stromal classification in H and E images," by Amit Sethi, Lingdao Sha, Abhishek Ramnath Vahadane, Ryan J Deaton, Neeraj Kumar, Virgilia Macias, Peter H Gann in Journal of Pathology Informatics 2016
19. "Fast Learning-Based Single Image Super-Resolution," by Neeraj Kumar, Amit Sethi, in IEEE Transactions on Multimedia 2016
20. "The role of higher order image statistics in masking scene gist recognition," by Lester C. Loschky, Bruce C. Hanse, Amit Sethi, Tejaswi N. Pydimarri, in Attention, Perception, & Psychophysics, 2010.
21. "The Importance of Information Localization in Scene Gist Recognition," by LC Loschky, A Sethi, DJ Simons, TN Pydimarri, D Ochs, and JL Corbeille, in Journal of Experimental Psychology: Human Perception and Performance, 2007, 33(6):1431-1450.
22. "Robust Structure and Motion from Outlines of Smooth Curved Surfaces," by Yasutaka Furukawa, Amit Sethi, Jean Ponce, David Kriegman, in IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI) 2006, 28(2)
23. "Curve and Surface Duals and the Recognition of Curved 3D Objects from their Silhouettes," by Amit Sethi, David Renaudie, David Kriegman, Jean Ponce, in International Journal of Computer Vision (IJCV) 2004.

## Conference and Workshop Proceedings (Peer-reviewed)

1. "Resource-efficient Hybrid X-formers for Vision," Pranav Jeevan, Amit Sethi, IEEE/CVF Winter Conference on Applications of Computer Vision, 2022
2. "Robust Classification of Histology Images Exploiting Adversarial Auto Encoders," Nikhil Cherian Kurian, Gurparkash Singh, Poorvi Hebbar, Shreekanya Kodate, Swapnil Rane, Amit Sethi, IEEE Engineering in Medicine & Biology Society (EMBC), 2021
3. "Domain Generalisation for Mitosis Detection Exploring Preprocessing Homogenizers," Sahar Almahfouz Nasser, Nikhil Cherian Kurian, Amit Sethi, International Conference on Medical Image Computing and Computer-Assisted Intervention, 2021
4. "Fast, Self Supervised, Fully Convolutional Color Normalization of H&E Stained Images," Abhijeet Patil, Mohd. Talha, Aniket Bhatia, Nikhil Cherian, Sammed Mangale, Sunil Sunil, Amit Sethi, International Symposium of Biomedical Imaging (ISBI) 2021
5. "Sample Specific Generalized Cross Entropy for Robust Histology Image Classification" Nikhil Cherian Kurian, Pragati Shuddhodhan Meshram, Abhijeet Patil, Sunil Sunil, Amit Sethi, International Symposium of Biomedical Imaging (ISBI) 2021
6. "Visualization for Histopathology Images using Graph Convolutional Neural Networks", M Sureka, A Patil, D Anand, A Sethi, 2020 IEEE 20th International Conference on Bioinformatics and Bioengineering
7. "Roll threader manufacturing process control for miniature fasteners", A Sethi, H Reis, Health Monitoring of Structural and Biological Systems XIV 11381, 113812A 2020.
8. "Self-Supervision vs. Transfer Learning: Robust Biomedical Image Analysis Against Adversarial Attacks", D Anand, D Tank, H Tibrewal, A Sethi, 2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI), 1159-1163
9. "Functional Space Variational Inference for Uncertainty Estimation in Computer Aided Diagnosis," Pranav Poduval, Hrushikesh Loya, Amit Sethi, in Medical Imaging using Deep Learning (MIDL) 2020.
10. "Uncertainty Estimation in Cancer Survival Prediction," H Loya, P Poduval, D Anand, N Kumar, A Sethi, in International Conference on Learning Representations (ICLR) Workshop 2020
11. "A Bayesian framework to quantify survival uncertainty," H Loya, D Anand, P Poduval, N Kumar, A Sethi, in Annals of Oncology 30 (Supplement\_7, Molecular Analysis for Personalised Therapy (MAP)), mdz413. 116, 2019
12. "Histograms: Graphs in histopathology," S Gadiya, D Anand, A Sethi, in SPIE Medical Imaging - Digital Pathology, 2019
13. "Quantification of intratumoral heterogeneity in individual luminal A breast cancers from whole transcriptome data through semi-supervised learning," N Kumar, Y Dharmamer, A Sethi, P Gann, in Cancer Research 79 (13 Supplement, American Association for Cancer Research Annual Conference), 2019
14. "Fast GPU-Enabled Color Normalization for Digital Pathology," D Anand, G Ramakrishnan, A Sethi, in International Conference on Systems, Signals and Image Processing 2019
15. "Computer vision detects morphological correlates of HER2 positive breast cancer in H&E stained histological images", by S Dhage, D Anand, N Kumar, PH Gann, A Sethi, in Cancer Research 79 (4 Supplement, American Association for Cancer Research Annual Conference), 2019.

16. "Quantifying intrinsic subtype admixture in luminal A breast cancer and its relationship to clinical outcomes", by N Kumar, D Zhao, A Sethi, PH Gann, in Cancer Research 79 (4 Supplement, American Association for Cancer Research Annual Conference), P3-08-14-P3-08-14, 2019.
17. "PAM50 subtype admixture in individual breast cancers and the relationship of this intratumoral heterogeneity to clinical variables" by PH Gann, N Kumar, D Zhao, A Sethi, in Cancer Research 78 (13 Supplement, American Association for Cancer Research Annual Conference), 1179-1179.
18. "Classification of Breast Cancer Histology Using Deep Learning" by A Golatkar, D Anand, A Sethi, in ICIAR 2018
19. "Convolutional Neural Networks for Prostate Cancer Recurrence Prediction" by Neeraj Kumar, Ruchika Verma, Ashish Arora, Abhay Kumar, Sanchit Gupta, Amit Sethi, and Peter H. Gann, in SPIE Medical Imaging Conference, Feb 2017
20. "Action Recognition using Spatio-Temporal Differential Motion," by Gaurav Kumar Yadav, Amit Sethi, in IEEE International Conference on Image Processing (ICIP) 2017
21. "Abnormal Event Detection on BMTT-PETS 2017 Surveillance Challenge," by Vignesh Kothapalli, Gaurav Kumar Yadav, Amit Sethi, in Joint BMTT-PETS Workshop on Tracking and Surveillance (in conjunction with CVPR) 2017
22. "Detecting multiple sub-types of breast cancer in a single patient," by Ruchika Verma, Neeraj Kumar, Amit Sethi, and Peter H. Gann, in IEEE International Conference on Image Processing (ICIP) 2016
23. "Super resolution of histological images," by Vahadane, A.; Kumar, N; Sethi, A., in 13th IEEE International Symposium on Biomedical Imaging (ISBI) 2016
24. "Action Recognition using Interst Points Capturing Differential Motion Information," by Gaurav Kumar Yadav, Prakhar Shukla, Amit Sethi, in IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP) 2016
25. "Computational pathology for predicting prostate cancer recurrence," by Amit Sethi, Lingdao Sha, Ryan J. Deaton, Virgilia Macias, Andrew H. Beck, and Peter H. Gann, in Proceedings: AACR 106th Annual Meeting 2015; April 18-22, 2015; Philadelphia, PA (Abstract)
26. "Structure-preserved color normalization for histological images," by Abhishek Vahadane, Tingying Peng, Shadi Albarqouni, Maximilian Baust, Katja Steiger, Anna Melissa Schlitter, Amit Sethi, Irene Esposito, Nassir Navab, in 12th IEEE International Symposium on Biomedical Imaging (ISBI) 2015
27. "A Flow-based Interest Point Detector for Action Recognition in Videos," by Gaurav Kumar Yadav, Amit Sethi, in Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP) 2014
28. "Interest Point Detection in Videos Using Long Point Trajectories," by Rahul Nallamothu, T. Vineeth, Gaurav Kumar Yadav, Amit Sethi, Tony Jacob, in Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP) 2014
29. "Drowsy Driver Detection using Representation Learning," by Kartik Dwivedi, Kumar Biswaranjan, Amit Sethi, in 4th IEEE International Advanced Computing Conference - IACC 2014
30. "Towards generalized nuclear segmentation in histological images," by Vahadane, A. ; Sethi, A., in 2013 IEEE 13th International Conference on Bioinformatics and Bioengineering (BIBE)
31. "Sports Video Classification from Multimodal Information Using Deep Neural Networks," by Devendra Singh Sachan, Umesh Tekwani, Amit Sethi, in 2013 AAAI Fall Symposium

32. "Unsupervised learning approach for abnormal event detection in surveillance video by revealing infrequent patterns," by Sandhan, Tushar ; Sethi, Amit ; Srivastava, Tushar ; Choi, Jin Young, in 2013 28th International Conference of Image and Vision Computing New Zealand (IVCNZ)
33. "Unusual event detection using sparse spatio-temporal features and bag of words model," by Mandadi, B. ; Sethi, A., in IEEE Second International Conference on Image Information Processing (ICIIP), 2013
34. "A frame-based decision pooling method for video classification," by Mohanty, Ambika Ashirvad ; Vaibhav, Bipul ; Sethi, Amit, in India Conference (INDICON), 2013 Annual IEEE
35. "Learning to Predict Super Resolution Wavelet Coefficients," by Neeraj Kumar, Naveen Kumar Rai, Amit Sethi, in International Conference on Pattern Recognition (ICPR) 2012
36. "On Image-Driven Choice of Wavelet Basis for Super Resolution," by Neeraj Kumar, Amit Sethi, in International Conference on Signal Processing and Communications (SPCOM) 2012
37. "A Spatial Neighbourhood Based Learning Setup for Super Resolution," by Amit Sethi, Neeraj Kumar, Naveen Kumar Rai, in Annual IEEE India Conference (INDICON) 2012
38. "Neural Network based Single Image Super Resolution," by Neeraj Kumar, Pankaj Deswal, Jatin Mehta, Amit Sethi, in Symposium on Neural Network Applications to Electrical Engineering (NEUREL) 2012
39. "Neural Network Based Image Deblurring," by Neeraj Kumar, Rahul Nallamothe, Amit Sethi, in Symposium on Neural Network Applications to Electrical Engineering (NEUREL) 2012
40. "An Ingenious Technique for Symbol Identification from High Noise CAPTCHA Images," by Dhruv Kapoor, Harshit Bangar, Abhishek Chaurasia, Amit Sethi, in IEEE India Conference (INDICON) 2012
41. "Event Detection Using "Variable Module Graphs" for Home Care Applications," by Amit Sethi, Mandar Rahurkar, Thomas S. Huang, in EURASIP Journal on Advances in Signal Processing 2007
42. "Variable Module Graphs: A Framework for Inference and Learning in Modular Vision Systems," by Amit Sethi, Mandar Rahurkar, Thomas S. Huang, in International Conference on Image Processing (ICIP) 2005
43. "Robust Speaker Tracing by Fusion of Complementary Features from Audio and Vision Modalities," by Mandar Rahurkar, Amit Sethi, Thomas S. Huang, in International Workshop on Image Analysis for Multimedia Interactive Services 2005
44. "Using Visual Masking To Explore The Nature Of Scene Gist," by Lester Loschky, Amit Sethi, Daniel J. Simons, Daniel Ochs, Jeremy Corbielle, Katie Gibb, in Psychonomics Society Annual Meeting 2005
45. "A Detection-Based Multiple Object Tracking Method," by Mei Han, Amit Sethi, Yihong Gong, in International Conference on Image Processing (ICIP) 2004
46. "Structure and Motion from Images of Smooth Textureless Objects," by Yasutaka Furukawa, Amit Sethi, Jean Ponce, David Kriegman, in European Conference on Computer Vision (ECCV) 2004
47. "On Pencils of Tangent Planes and the Recognition of Smooth 3D Shapes from Silhouettes," by Svetlana Lazebnik, Amit Sethi, Cordelia Schmid, David Kriegman, Jean Ponce, and Martial Hebert, in European Conference on Computer Vision (ECCV) 2002