AYAN CHAKRABARTI

https://projects.ayanc.org/

RESEARCH INTERESTS

Machine Learning, Computer Vision, Computational Photography.

EDUCATION

2011	Ph.D.	**Harvard University**, Cambridge, MA Engineering Sciences Thesis: Visual Inference with Statistical Models for Color and Texture Advisor: Todd Zickler
2008	S.M.	**Harvard University**, Cambridge, MA Engineering Sciences
2006	M.Tech.	**Indian Institute of Technology Madras**, Chennai, India Electrical Engineering (Communication Systems)
2006	B.Tech.	**Indian Institute of Technology Madras**, Chennai, India Electrical Engineering

PROFESSIONAL EXPERIENCE

Jan 2021 -*Present*	**Research Scientist**, Google Research, New York, NY.
Sep 2017 -Dec 2020	**Assistant Professor**, Computer Science & Engineering, Washington University in St. Louis, St. Louis, MO. *(Affiliated but on leave Jan-Oct 2021)*
Sep 2014 -Aug 2017	**Research Assistant Professor**, Toyota Technological Institute at Chicago, Chicago, IL.
Sep 2011 -Aug 2014	**Post-doctoral Fellow**, Harvard University, Cambridge, MA.
Jun 2007 -Aug 2011	**Graduate Research Assistant**, Harvard University, Cambridge, MA.
Jun 2009 -Aug 2009	**Research Intern**, Advanced Technology Labs, Adobe Systems, Newton, MA.
Jun 2004 -Aug 2004	**Research Intern**, Industrial Imaging and Modeling Lab, GE Global Research, Bangalore, India.

PUBLICATIONS   Available at https://projects.ayanc.org/

Refereed

1. Srinadh Bhojanapalli, Ayan Chakrabarti, Daniel Glasner, Daliang Li, Thomas Unterthiner, and Andreas Veit, "Understanding Robustness of Transformers for Image Classification," **IEEE/CVF Intl. Conf. on Computer Vision (ICCV),** 2021.

2. Adith Boloor, Tong Wu, Patrick Naughton, Ayan Chakrabarti, Xuan Zhang, and Yevgeniy Vorobeychik, "Can Optical Trojans Assist Adversarial Perturbations?," **IEEE/CVF Intl. Conf. on Computer Vision (ICCV) Workshops: Adversarial Robustness in the Real World,** 2021.

3. Ayan Chakrabarti, Roch Guérin, Chenyang Lu, and Jiangnan Liu. "Real-Time Edge Classification: Optimal Offloading under Token Bucket Constraints," **ACM/IEEE Symposium on Edge Computing (SEC),** 2021.

4. Zhihao Xia, Michaël Gharbi, Federico Perazzi, Kalyan Sunkavalli, and Ayan Chakrabarti, "Deep Denoising of Flash and No-Flash Pairs for Photography in Low-Light Environments," **IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR),** 2021.

5. Francesco Pittaluga, Zaid Tasneem, Justin Folden, Brevin Tilmon, Ayan Chakrabarti, and Sanjeev J. Koppal, "Towards a MEMS-based Adaptive LIDAR," **International Conference on 3D Vision (3DV),** 2020.

6. Zhihao Xia, Patrick Sullivan, and Ayan Chakrabarti, "Generating and Exploiting Probabilistic Monocular Depth Estimates," **IEEE Conf. on Computer Vision and Pattern Recognition (CVPR),** 2020. (oral)

7. Zhihao Xia, Federico Perazzi, Michaël Gharbi, Kalyan Sunkavalli, and Ayan Chakrabarti, "Basis Prediction Networks for Effective Burst Denoising with Large Kernels," **IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR),** 2020.

8. Kyle Yee and Ayan Chakrabarti, "Fast Deep Stereo with 2D Convolutional Processing of Cost Signatures," **IEEE Computer Society Winter Conference on Applications of Computer Vision (WACV),** 2020.

9. Zhihao Xia and Ayan Chakrabarti, "Identifying Recurring Patterns with Deep Neural Networks for Natural Image Denoising," **IEEE Computer Society Winter Conference on Applications of Computer Vision (WACV),** 2020.

10. Jinghan Yang, Ayan Chakrabarti, and Yevgeniy Vorobeychik, "Protecting Geolocation Privacy of Photo Collections," **AAAI Conference on Artificial Intelligence (AAAI),** 2020.

11. Zhihao Xia and Ayan Chakrabarti, "Training Image Estimators without Image Ground-Truth," **Advances in Neural Information Processing Systems (NeurIPS),** 2019. (spotlight)

12. Ayan Chakrabarti and Benjamin Moseley, "Backprop with Approximate Activations for Memory-efficient Network Training," **Advances in Neural Information Processing Systems (NeurIPS),** 2019.

13. Weidong Cao, Liu Ke, Ayan Chakrabarti, and Xuan Zhang. "Neural Network-Inspired Analog-to-Digital Conversion to Achieve Super-Resolution with Low-Precision RRAM Devices," **IEEE International Conference on Computer Aided Design (ICCAD),** 2019.

14. Zhuo Hui, Ayan Chakrabarti, Kalyan Sunkavalli, and Aswin C. Sankaranarayanan, "Learning to Separate Multiple Illuminants in a Single Image," **IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR),** 2019.

15. Charles Schaff, David Yunis, Ayan Chakrabarti, and Matthew R. Walter, "Jointly Learning to Construct and Control Agents using Deep Reinforcement Learning," **IEEE International Conference on Robotics and Automation (ICRA),** 2019.

16. Weidong Cao, Xin He, Ayan Chakrabarti, and Xuan Zhang. "NeuADC: Neural Network-Inspired Synthesizable Analog-to-Digital Conversion," **IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD),** 2019.

17. Weidong Cao, Xin He, Ayan Chakrabarti, and Xuan Zhang. "NeuADC: Neural Network-Inspired RRAM-Based Synthesizable Analog-to-Digital Conversion with Reconfigurable Quantization Support," **IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE),** 2019.

18. Francesco Pittaluga, Sanjeev J. Koppal, and Ayan Chakrabarti, "Learning Privacy Preserving Encodings through Adversarial Training," **IEEE Computer Society Winter Conference on Applications of Computer Vision (WACV),** 2019.

19. Charles Schaff, David Yunis, Ayan Chakrabarti, and Matthew R. Walter, "Jointly Optimizing Placement and Inference for Beacon-based Localization," **IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS),** 2017.

20. Ayan Chakrabarti, "Learning Sensor Multiplexing Design through Back-propagation," **Advances in Neural Information Processing Systems (NeurIPS),** 2016.

21. Ayan Chakrabarti, Jingyu Shao, and Gregory Shakhnarovich, "Depth from a Single Image by Harmonizing Overcomplete Local Network Predictions," **Advances in Neural Information Processing Systems (NeurIPS),** 2016.

22. Ayan Chakrabarti, and Kalyan Sunkavalli, "Single-image RGB Photometric Stereo With Spatially-varying Albedo," Proc. of **IEEE Intl. Conf. on 3D Vision (3DV),** 2016. (oral)

23. Ayan Chakrabarti, "A Neural Approach to Blind Motion Deblurring," Proc. of **European Conf. on Computer Vision (ECCV),** 2016.

24. Ayan Chakrabarti, "Color Constancy by Learning to Predict Chromaticity from Luminance," **Advances in Neural Information Processing Systems (NeurIPS),** 2015. (spotlight)

25. Ayan Chakrabarti, Ying Xiong, Steven J. Gortler, and Todd Zickler, "Low-Level Vision by Consensus in a Spatial Hierarchy of Regions," Proc. of **IEEE Conf. on Computer Vision and Pattern Recognition (CVPR),** 2015.

26. Ying Xiong, Ayan Chakrabarti, Ronen Basri, Steven J. Gortler, David W. Jacobs, and Todd Zickler, "From Shading to Local Shape," **IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI),** no. 37, vol. 1, pp. 67-79, 2015.

27. Ayan Chakrabarti, Ying Xiong, Baochen Sun, Trevor Darrell, Daniel Scharstein, Todd Zickler and Kate Saenko, "Modeling Radiometric Uncertainty for Vision with Tone-mapped Color Images," **IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI),** no. 36, vol. 11, pp. 2185-2198, 2014.

28. Ayan Chakrabarti, William T. Freeman and Todd Zickler, "Rethinking Color Cameras," Proc. of **IEEE Intl. Conf. on Computational Photography (ICCP),** 2014.

29. Ayan Chakrabarti and Todd Zickler, "Depth and Deblurring from a Spectrally-varying Depth-of-Field," Proc. of **European Conf. on Computer Vision (ECCV),** 2012.

30. Ayan Chakrabarti, Keigo Hirakawa and Todd Zickler, "Color Constancy with Spatio-spectral Statistics," **IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI),** no. 8, vol. 34, pp. 1509-1519, 2012.

31. Ayan Chakrabarti and Todd Zickler, "Statistics of Real-world Hyperspectral Images," Proc. of **IEEE Conf. on Computer Vision and Pattern Recognition (CVPR),** 2011.

32. Trevor Owens, Kate Saenko, Ayan Chakrabarti, Ying Xiong, Todd Zickler and Trevor Darrell, "Learning Object Color Models from Multi-view Constraints," Proc. of **IEEE Conf. on Computer Vision and Pattern Recognition (CVPR),** 2011.

33. Ayan Chakrabarti, Todd Zickler and William T. Freeman, "Analyzing Spatially-varying Blur," Proc. of **IEEE Conf. on Computer Vision and Pattern Recognition (CVPR),** 2010.

34. Ayan Chakrabarti, Daniel Scharstein and Todd Zickler, "An Empirical Camera Model for Internet Color Vision," Proc. of **British Machine Vision Conference (BMVC),** 2009.

35. Ayan Chakrabarti, Keigo Hirakwa and Todd Zickler, "Color Constancy Beyond Bags of Pixels," Proc. of **IEEE Conf. on Computer Vision and Pattern Recognition (CVPR),** 2008.

36. Ayan Chakrabarti and Keigo Hirakawa, "Effective Separation of Sparse and Non-Sparse Image Features for Denoising", Proc. of **The IEEE Conf. on Acoustics, Speech, and Signal Proc. (ICASSP),** 2008.

37. Ayan Chakrabarti, A.N. Rajagopalan and Rama Chellappa, "Super-resolution of Face Images Using Kernel PCA-Based Prior," **IEEE Trans. on Multimedia,** no. 4, vol. 9, pp. 888-892, 2007.

Pre-prints & Reports

• Srinadh Bhojanapalli, Ayan Chakrabarti, Andreas Veit, Michal Lukasik, Himanshu Jain, Frederick Liu, Yin-Wen Chang, and Sanjiv Kumar, "Leveraging Redundancy in Attention with Reuse Transformers," **arXiv:2110.06821,** 2021.

• Srinadh Bhojanapalli, Ayan Chakrabarti, Himanshu Jain, Sanjiv Kumar, Michal Lukasik, and Andreas Veit, "Eigen Analysis of Self-Attention and its Reconstruction from Partial Computation," **arXiv:2106.08823,** 2021.

• Jinghan Yang, Adith Boloor, Ayan Chakrabarti, Xuan Zhang, and Yevgeniy Vorobeychik, "Finding Physical Adversarial Examples for Autonomous Driving with Fast and Differentiable Image Compositing," **arXiv:2010.08844,** 2020.

• Behnam Neyshabur, Srinadh Bhojanapalli, and Ayan Chakrabarti, "Stabilizing GAN Training with Multiple Random Projections," **arXiv:1705.07831,** 2018.

• Igor Vasiljevic, Ayan Chakrabarti, and Gregory Shakhnarovich, "Examining the Impact of Blur on Recognition by Convolutional Networks," **arXiv:1611.05760,** 2017.

• Ayan Chakrabarti and Todd Zickler, "Image Restoration with Signal-dependent Camera Noise," **arXiv:1204.2994,** 2012.

STUDENTS ADVISING & COLLABORATION

• Zhihao Xia. PhD. CS, WashU 2017-2021. (PhD. Advisor)

• Gustavo Gratacos. PhD. CS, WashU. (Co-Advised with Tao Ju till 2021.)
• Annie Lee. BS/MS CS, WashU 2020. (MS Project Advisor)
• Xiaochen Zhou. MS CS, WashU 2020. (MS Project Advisor)
• Jiahao Li. MS CS, WashU 2020. (MS Project Advisor)
• Fangying Zhai. MS CS, WashU 2019. (MS Project Advisor)

- Kyle Yee. Visiting UG student, WashU Summer 2018.
- Hanlin Tian. Visiting UG student, WashU Summer 2018.
- Patrick Sullivan. MS CS, WashU 2017. (MS Project Advisor)
- David Yunis. Visiting UG Student, TTIC 2016-17. (Co-advised with Matthew R. Walter)
- Igor Vasiljevic. Visiting MS Student, TTIC 2016-17. (Co-advised with Greg Shakhnarovich)
- Francesco Pittaluga. Visiting PhD. Student, TTIC Fall 2016.
- Jingyu Shao. Visiting Student, TTIC Summer 2015. (Co-advised with Greg Shakhnarovich)

GRANTS AND GIFTS

- NSF: URoL: Epigenetics 2- Collaborative Research: Revealing how Epigenetic Inheritance Governs the Environmental Challenge Response with Transformative 3D Genomics and Machine Learning, 2019-21. Role: PI. Award Amount: **$494,454**.
- NSF: RI: Small: Collaborative Research: Structured Inference for Low-Level Vision, 2016-21. Role: PI. Award Amount: **$194,612**.
- Adobe Systems Inc. 2019, Research collaboration funding. Award Amount: **$10,000**.
- Adobe Systems Inc. 2014-15, Research collaboration funding. Award Amount: **$20,500**.
- NVIDIA Corporation 2015, Hardware donation.

PROFESSIONAL SERVICE

- Area Chair: CVPR 2021.
- Area Chair: ECCV 2020.
- NSF Ad-Hoc Reviewer, 2020.
- General and Program Chair: ICCP 2020. Guest Editor, T-PAMI special issue on Computational Photography.
- Area Chair: ICCV 2019.
- NSF Panelist, 2019.
- NSERC Proposal Review, 2019.
- Area Chair: CVPR 2018.
- Area Chair: 3DV 2017.
- Local Arrangements Chair, ICCP 2015.
- Conference Program Committee: CVPR 2011-2017,2019-20; ECCV 2012-2018; ICCV 2011-2017; ICCP 2013-2019; NeurIPS 2015-19; ICLR 2017-2019, ICML 2017-2019, AAAI 2015,2017; SIGGRAPH 2014,2017; SIGGRAPH Asia 2014,2016,2018; ACCV 2016.
- Journal Reviews: IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), IEEE Transactions on Image Processing, International Journal of Computer Vision, Journal on Pattern Recognition, Pattern Recognition Letters, IEEE Transactions on Multimedia, SPIE Journal on Electronic Imaging (JEI), IET Computer Vision, Journal of Visual Communication and Image Representation, Image and Vision Computing Journal, IEEE Transactions on Computational Imaging.
- Member, IEEE (2007-present).

TEACHING

As Instructor

- WashU: CSE 559A - Computer Vision. Fall 2020. Enrollment: 52 (16 BS, 22 MS, 14 PhD).
  Student Evaluation (median rating)—Course: 7/7, Instructor: 7/7.

- WashU: CSE 659A - Advances in Computer Vision. Spring 2020. Enrollment: 11 (2 BS, 6 MS, 3 PhD).
  Student Evaluation (median rating)—Course: 6.5/7, Instructor: 7/7.

- WashU: CSE 559A - Computer Vision. Fall 2019. Enrollment: 70 (21 BS, 35 MS, 14 PhD).
  Student Evaluation (median rating)—Course: 7/7, Instructor: 6/7.

- WashU: CSE 659A - Advances in Computer Vision. Spring 2019. Enrollment: 17 (2 BS, 8 MS, 7 PhD).
  Student Evaluation (median rating)—Course: 6/7, Instructor: 7/7.

- WashU: CSE 559A - Computer Vision. Fall 2018. Enrollment: 61 (8 BS, 43 MS, 10 PhD).
  Student Evaluation (median rating)—Course: 7/7, Instructor: 7/7.

- WashU: CSE 559A - Computer Vision. Fall 2017. Enrollment: 32 (7 BS, 18 MS, 7 PhD).
  Student Evaluation (median rating)—Course: 7/7, Instructor: 7/7.

As Course Staff
- Teaching Fellow: **CS283 - Computer Vision**, Harvard Fall 2009.
- Teaching Fellow: **ES251r - Advanced Machine Learning**, Harvard Spring 2008.
- Teaching Assistant: **EC 424: Image Signal Processing**, IIT Madras Spring 2006.
- Teaching Assistant: **EC 206: Principles of Communication**, IIT Madras Fall 2005.

AWARDS

- Outstanding Reviewer, IEEE International Conference on Computer Vision, ICCV (2021).

- Outstanding Reviewer, IEEE Conference on Computer Vision and Pattern Recognition, CVPR (2017).

- Outstanding Reviewer, IEEE Conference on Computer Vision and Pattern Recognition, CVPR (2015).

- Outstanding Reviewer, European Conference on Computer Vision, ECCV (2012).

- Fellowship, Harvard School of Engineering and Applied Sciences (2006-2008).