Akshat Dave

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Research Goals

I focus on creating artificial **vision systems** that overcome the *limitations of the human eye* by integrating **computational cameras**, **differentiable simulations**, and **physics-based machine learning** algorithms.

Current Appointment

Massachusetts Institute of Technology   Cambridge, MA
Postdoctoral Associate, MIT Media Lab   2023 - Present
Advisor: Ramesh Raskar

Education

Rice University   Houston, TX
Ph.D. in Electrical and Computer Engineering   2017 - 2023
Advisor: Ashok Veeraraghavan

Indian Institute of Technology Madras   Chennai, India
M.Tech. and B.Tech. in Electrical Engineering   2012 - 2017
Advisor: Kaushik Mitra

Honors and Awards

Ralph Budd Award for the best engineering Ph.D. thesis at Rice University.	2024
INK Fellowship recognizing young achievers redefining their fields.	2024
ACM SIGGRAPH Asia Doctoral Consortium for PhD thesis research.	2023
Lodieska Stockbridge Vaughn Fellowship for outstanding graduate research.	2023
Rice D2K Research Mentoring Fellowship for applied data science innovation.	2023
Best Student Paper Prize at the Optica Imaging and Applied Optics Congress.	2020
Texas Instruments Fellowship for Ph.D. thesis research.	2017
Qualcomm Innovation Fellowship for Masters thesis research.	2016
Svaagata Erasmus Mundus Scholarship for semester exchange in Stockholm.	2015
KVPY National Fellowship for research by the Government of India.	2011

Publications Summary

24 peer-reviewed publications across computer vision (CVPR, ICCV, ECCV), computer graphics (TOG), and optics/imaging (Optics Express, ICCP, TCI) venues—including **9** first-author papers (1 best paper prize) and **10** papers (2 under review) with my advised mentees as first authors.

Grants

Generative Cameras: Automated Camera Design for Next-generation XR by Leveraging AI as a Scientist *Samsung Research America, $150,000* Role: Co-investigator	2024
Distributed and Private ML for Automotive Datasets *Hyundai America Technical Center, $250,000* Role: Co-investigator	2024
A Roadmap for Generative Design of Visual Intelligence *An MIT Exploration of Generative AI, Seed Grant, $70,000* Role: Co-investigator	2024

Mentorship

Graduate Research Mentor

Hank Lin, MIT	ICCP 2024
Zaid Tasneem, Rice	ECCV 2024
Siddharth Somasundaram, MIT	CVPR 2023
Kushagra Tiwary, MIT	CVPR 2023
Tianyi Zhang, Rice	ICCP 2022

Undergraduate Research Mentor

Nikhil Behari, Harvard → MIT	CVPRW 2024
Chaitanya Kapoor, BITS Pilani → UCSD	2024
Evelyn Zhu, MIT	2024
Abbas Shaikh, Rice	2023

Research Mentoring Fellow

Abdullah Zaher, Bridget Lee, Harry Golen, Natan Rivera Rice D2K Lab Capstone Program with Houston Fire Department	2023

Teaching

Instructor

Polarization-based Visual Computing, SIGGRAPH Course	2023

Teaching Assistant

Introduction to Computer Vision, Rice University	2020
Computational Imaging, Rice University	2019
Fundamentals of Electrical Engineering, Rice University	2018
Machine Learning for Computer Vision, IIT Madras	2016
Data Structures and Algorithms, IIT Madras	2016

Theses

Seeing the Invisible: Next-generation vision systems leveraging polarization and time-of-flight of light (Ralph Budd Thesis Award) *Ph.D Thesis, Rice University*	2023
Compressive and Coded Image Recovery using Deep Recurrent Priors (Qualcomm Innovation Fellowship) *Masters Thesis, Indian Institute of Technology Madras*	2017

Manuscripts Under Review

* indicates equal contribution and † indicates advised student

What if Eye...? Computationally Recreating Vision Evolution 2024
K. Tiwary [†], A. Young, Z. Tasneem, T. Klinghoffer,
A. Dave, T. Poggio, D. Nilsson, B. Cheung, R. Raskar

Event Cameras Meet SPADs for High-Speed, Low-Bandwidth Imaging 2024
M. Muglikar[†], S. Somasundaram, **A. Dave**, E. Charbon, R. Raskar, D. Scaramuzza

Publications

* indicates equal contribution and † indicates advised student

NeST: Neural Stress Tensor Tomography by leveraging 3D Photoelasticity TOG 2025
A. Dave, T. Zhang*, A. Young*, R. Raskar, W. Heidrich, A. Veeraraghavan
Accepted for ACM Transactions on Graphics

Enhancing Autonomous Navigation by Imaging Hidden Objects using Single-Photon LiDAR ICRA 2025
A. Young*[†], N. M. Batagoda*, H. Zhang, **A. Dave**, A. Pediredla, Dan Negrut, R. Raskar
Accepted for IEEE International Conference on Robotics and Automation 2025

Blurred LiDAR for Sharper 3D: Robust Handheld 3D Scanning with Diffuse LiDAR and RGB CVPR 2025
N. Behari[†], A. Young, S. Somasundaram, T. Klinghoffer, **A. Dave**, R. Raskar
Accepted for IEEE/CVF Conference on Computer Vision and Pattern Recognition 2025

A Roadmap for Generative Design of Visual Intelligence MIT 2024
K. Tiwary [†], T. Klinghoffer, A. Young, S. Somasundaram, N. Behari,
A. Dave, B. Cheung, D. Nilsson, T. Poggio, R. Raskar
An MIT Exploration of Generative AI: From Novel Chemicals to Opera, MIT Press

Handheld Mapping of Specular Surfaces using Consumer-Grade Flash LiDAR ICCP 2024
T. Lin [†], C. Henley, S. Somasundaram, **A. Dave**, M. Laifenfeld, R. Raskar
IEEE International Conference on Computational Photography 2024

DecentNeRFs: Decentralized Neural Radiance Fields from Crowdsourced Images ECCV 2024
Z. Tasneem [†], **A. Dave**, A. Singh, K. Tiwary, P. Vepakomma, A. Veeraraghavan, R. Raskar
European Conference on Computer Vision 2024

SUNDIAL: 3D Satellite Understanding through Direct Ambient and Complex Lighting Decomposition CVPRW 2024
N. Behari [†], **A. Dave**, K. Tiwary, W. Yang, R. Raskar
Earthvision CVPR Workshop 2024

First-Arrival Differential Counting for SPAD Array Design Sensors 2023
M. White, T. Zhang, **A. Dave**, S. Ghajari, A. C. Molnar, A. Veeraraghavan
MDPI Sensors Special Issue 2023

ORCa: Glossy Objects as Radiance Field Cameras (MIT Frontpage Spotlight) CVPR 2023
K. Tiwary*, **A. Dave***, N. Behari, T. Klinghoffer, A. Veeraraghavan, R. Raskar
IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023

Role of Transients in Two-Bounce Non-Line-of-Sight Imaging   CVPR 2023

S. Somasundaram[†], **A. Dave**, C. Henley, A. Veeraraghavan, R. Raskar

IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023

PANDORA: Polarization-Aided Neural Decomposition Of Radiance   ECCV 2022

A. Dave, Y. Zhao, A. Veeraraghavan

European Conference on Computer Vision 2022

Snapshot Polarimetric Diffuse-Specular Separation   OE 2022

A. Dave, Y. Hold-Geoffroy, M. Hašan, K. Sunkavalli, A. Veeraraghavan

Optica Optics Express 2022

First Arrival Differential LiDAR   ICCP 2022

Tianyi Zhang[†], Mel White*, **A. Dave***, S. Ghajari, A. Raghuram, A. Molnar, A. Veeraraghavan

International Conference on Computational Photography 2022

A Differential SPAD Array Architecture in 0.18 um CMOS for HDR Imaging   ISCS 2022

M. White, S. Ghajari, Tianyi Zhang, **A. Dave**, A. Veeraraghavan, A. Molnar

International Symposium on Circuits and Systems 2022

A Deep Network-based Image Processing Framework for Thermal Images   ICCVW 2021

V. Saragadam, **A. Dave**, A. Veeraraghavan, R. Baraniuk

Learning for Computational Imaging Workshop at ICCV 2021

Foveated Non Line of Sight Imaging (Best Student Paper Prize)   COSI 2020

A. Dave, M. Balaji, P. Rangarajan, A. Veeraraghavan, M. Christensen

Opti Imaging and Applied Optics Congress 2020

Convolutional Approximations to the General NLOS Imaging Operator (Oral)   ICCV 2019

B. Ahn, **A. Dave**, A. Veeraraghavan, I. Gkioulekas, A. C. Sankaranarayanan

International Conference of Computer Vision 2019

SNLOS: Non-line-of-sight Scanning through Temporal Focusing   ICCP 2019

A. Pediredla*, **A. Dave***, A. Veeraraghavan

International Conference on Computational Photography 2019

Solving Inverse Computational Imaging Problems Using Deep Pixel-Level Prior   TCI 2018

A. Dave, A. K. Vadathya, R. Subramanyam, R. Baburajan, K. Mitra

IEEE Transactions on Computational Imaging 2018

SILC: Smoother Imitation with Lipschitz Costs   ICMLW 2018

S. Chaudhary*, **A. Dave***, B. Ravindran

Workshop on Goal Specification in Reinforcement Learning at ICML 2018

Compressive Image Recovery Using Recurrent Generative Model   ICIP 2017

A. Dave, A. K. Vadathya, K. Mitra

IEEE International Conference on Image Processing 2017

IITMSAT Communications System - A LeanSat Design Approach   USMCW 2015

A. Gulati, S. Chavan, **A. Dave**, et al.

IAA Conference on University Satellites Missions and CubeSat Workshop 2015

Invited Talks

Optics and Quantum Electronics Seminar, Massachusetts Institute of Technology   Feb 2025
Host: Dirk Englund

Pacific Northwest Chapter Seminar, Society for Information Display   Jan 2025
Host: Arka Majumdar

Computational Imaging Group Talk, Harvard University   Dec 2024
Host: Todd Zickler

Oral Presentation, NECV Workshop, Yale University   Nov 2024
Host: Alex Wong

Computer Graphics Seminar, POSTECH South Korea   Jul 2024
Host: Seung-Hwan Baek

Invited Talk, CVPR CCD Workshop   Jun 2024
Hosts: Salman Asif, Yi Xue, Mark Sheinin, Kristina Monakhova

Invited Talk, Janelia Computational Optics Conference   May 2024
Hosts: Srini Turaga, Hari Shroff, Ruth Sims, Laura Waller

Invited Talk, Meta Polarization Workshop   Feb 2024
Host: Onur Akkaya

Doctoral Consortium Talk, SIGGRAPH Asia   Dec 2023
Hosts: Aaron Quigley, Mashhuda Glencross, Simon See

ECE Group Talk, University of Washington Seattle   Aug 2023
Host: Arka Majumdar

Grundfest Lecture Series, University of California Los Angeles   Apr 2023
Host: Achuta Kadambi

PixelCafe Seminars, University of California San Diego   Feb 2023
Host: Manmohan Chandraker

Computational Imaging Group Talk, Stanford University   Jan 2023
Host: Gordon Wetzstein

Computer Graphics Group Talk, Massachusetts Institute of Technology   Sep 2022
Host: Fredo Durand

Graphics Talk, Carnegie Mellon University   Aug 2022
Host: Ioannis Gkioulekas

Computational Imaging Group Talk, University of Maryland College Park   Apr 2022
Host: Chris Metzler

Oral Presentation, Imaging and Applied Optics Congress   Jun 2020

Oral Presentation, International Conference On Computational Photography   Jun 2019

Professional Service

Publications Chair
IEEE ICCP 2024

Organizer
Workshop on Neural Fields Beyond Conventional Cameras, ECCV 2024
Workshop on Extreme Sensing, MIT Media Lab Fall Meeting 2023

Journal Reviewer	Conference Reviewer
ACM Transactions on Graphics	*SIGGRAPH*
IEEE T. Pattern Analysis and Machine Intelligence	*SIGGRAPH Asia*
IEEE T. Computational Imaging	*ICCP*
IEEE Signal Processing Letters	*CVPR*
Optica Applied Optics	*ECCV*
Nature Communications	*IROS*

Other Research Experience

Massachusetts Institute of Technology   Cambridge, MA
Visiting Student, MIT Media Lab   2022
Advisor: Ramesh Raskar

Adobe Research   San Jose, CA
Research Intern   2020
Manager: Kalyan Sunkavalli

KTH Royal Institute of Technology   Stockholm, SE
(Svaagata Erasmus Mundus Scholarship)   2015
Semester Exchange Research
Advisor: Satyam Dwivedi

Patent Applications

First Arrival Differential LiDAR
A. Veeraraghavan, A. Molnar, M. White, T. Zhang, **A. Dave**, A. Raghuram, S. Ghajari   2024
US Patent App. 18/676,223, 2024

Generating physically-based material maps
A. Dave, K. Sunkavalli, Y. Hold-Geoffroy, M. Hasan   2022
US Patent App. 17/233,861, 2022

Media Coverage and Outreach

Superhuman Vision: AI sees what you can't   2024
TEDxBoston Talk, 'Quin House Boston

Seeing Beyond: Unlocking the Invisible with AI   2024
INK Fellow Talk, Bangalore, India

The Role of AI in Surgery   2024
ISOPARB India Webinar

ORCa: Glossy Objects as Radiance Field Cameras   2023
MIT Front Page Spotlight. Featured in SciTechDaily, MarkTechPost and more.

References

Ramesh Raskar (a3ramesh@media.mit.edu)   MIT
Associate Director and Associate Professor, MIT Media Lab
Massachusetts Institute of Technology

Ashok Veeraraghavan (vashok@rice.edu)   Rice
Department Chair and Professor, ECE Department
Rice University

Wolfgang Heidrich (wolfgang.heidrich@kaust.edu.sa)   KAUST
Professor, CS and ECE Departments
King Abdullah University of Science and Technology

Aswin Sankaranarayanan (saswin@andrew.cmu.edu)   CMU
Professor, ECE Department
Carnegie Mellon University