

MOHIT GUPTA

Computer Sciences Department, University of Wisconsin-Madison

Lab website: <http://wisionlab.cs.wisc.edu/>

Research Interests

Computer Vision, Computational Imaging

Education

Ph.D. in Robotics, Carnegie Mellon University	2005 - 2011
M.S. in Computer Science, Stony Brook University	2003 – 2005
B.Tech. in Computer Science, Indian Institute of Technology, Delhi	1999 – 2003

Work Experience

Assistant Professor, University of Wisconsin-Madison	2016 -
Post-doctoral Research Scientist, Columbia University	2011 - 2015
Research Intern, Mitsubishi Electric Research Labs	Summer 2009, 2010

Awards and Honors

Sony Faculty Innovation Award	2020, 21
Marr Prize Honorable Mention, IEEE Int. Conf. on Computer Vision (ICCV)	2019
Finalist, Most Influential Research Category, AutoSens Conference Awards	2019
Paper Selected for IJCV Special Issue on Best Papers of ECCV	2018
Plenary Talk, Int. Conf. on Quality Control by Artificial Vision (Tokyo)	2017
Keynote Talk, Workshop on Computational Cameras and Displays, IEEE CVPR	2014
Best Paper Honorable Mention, IEEE Int. Conf. on Computational Photography	2014

Professional Activities

Organization

Workshop Chair: IEEE CVPR 2022

Program Chair: IEEE International Conference on Computational Photography (ICCP) 2019, Tokyo

Program Chair: Workshop on Computational Cameras and Displays (with IEEE CVPR 2017, 2018)

Finance Chair: IEEE ICCP 2018, Demos and Posters Chair, IEEE ICCP 2016

Program Committees and Editorial Boards

Area Chair (Program Committee): ICCV 2021, CVPR 2021, SIGGRAPH Asia 2018, Pacific Graphics 2018

Guest Editor: IJCV Special Issue on Computational Photography (2017-2018)

Professional Service Awards

Outstanding reviewer award, ECCV 2020

Tutorials

Co-organized (invited) tutorial on computational imaging at ICIP 2015, ICIP 2016

Co-organized tutorial on time-of-flight (ToF) imaging at ICCV 2015

Co-organized tutorial on compressive sensing of videos at CVPR 2012

Co-organized the symposium on volumetric scattering at CVPR 2007

Publications

Journal Publications: ¹

Quanta Burst Photography

Sizhuo Ma^S, Shantanu Gupta^S, Arin Ulku^C, Claudio Bruschini^C, Edoardo Charbon^C, and Mohit Gupta
ACM Transactions on Graphics (SIGGRAPH 2020)

Differential Scene Flow from Light-Field Gradients

Sizhuo Ma^S, Brandon Smith^S, and Mohit Gupta
International Journal of Computer Vision (IJCV 2019)
Special Issue on Best Papers of ECCV 2018

Coding Scheme Optimization for Fast Fluorescence Lifetime Imaging

Jongho Lee^S, JV Chacko^O, B Dai^O, SA Reza^O, AK Sagar^O, K Eliceiri^C, A Velten^C, and Mohit Gupta
ACM Transactions on Graphics (ACM TOG 2019), presented at SIGGRAPH 2019

¹Collaborators are denoted by^C, thesis and post-doc advisors by^A, students and post-docs under my supervision by^S, and students/post-docs under the supervision of others by^O. ACM Transactions on Graphics (TOG) and ACM SIGGRAPH are the top journal/conference in computer graphics, with an acceptance rate around 20%. IEEE PAMI, IJCV, and IEEE TIP are the top journals in computer vision and image processing.

What are Optimal Coding Functions for Time-of-Flight Imaging?

Mohit Gupta, Andreas Velten^c, Shree Nayar^c, and Eric Breitbach^c

ACM Transactions on Graphics (ACM TOG 2018), presented at SIGGRAPH 2018

CoLux: Multi-Object 3D Micro-Motion Analysis Using Speckle Imaging

Brandon Smith^s, Pratham Desai^s, Vishal Agrawal^s, and Mohit Gupta

ACM Transactions on Graphics (SIGGRAPH 2017)

High-depth-resolution Range Imaging with Multiple-wavelength Superheterodyne Interferometry using 1550-nm Lasers

Fengqiang Li^o, Joshua Yablon^o, Andreas Velten^c, Mohit Gupta, and Oliver Cossairt^c

Applied Optics 2017

DisCo: Display-Camera Communication Using Rolling Shutter Sensors

Kensei Jo^o, Mohit Gupta, and Shree Nayar^a

ACM Transactions on Graphics (ACM TOG 2016), presented at SIGGRAPH 2016

Phasor Imaging: A Generalization of Correlation Based Time-of-Flight Imaging

Mohit Gupta, Shree Nayar^a, Matthias Hullin^c, and Jaime Martin^c

ACM Transactions on Graphics (ACM TOG 2015), presented at SIGGRAPH 2015

Efficient Space-Time Sampling with Pixel-wise Coded Exposure for High Speed Imaging

Dengyu Liu, Jinwei Gu, Yasunobu Hitomi, Mohit Gupta, Tomoo Mitsunaga and Shree Nayar

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI 2013)

3D Scanning in the Presence of Interreflections, Subsurface Scattering and Defocus

Mohit Gupta, Amit Agrawal, Ashok Veeraraghavan and Srinivasa Narasimhan

International Journal of Computer Vision (IJCV 2012)

When Does Computational Imaging Improve Performance?

Oliver Cossairt, Mohit Gupta and Shree Nayar

IEEE Transactions on Image Processing (TIP 2012)

A Combined Theory of Defocused Illumination and Global Light Transport

Mohit Gupta, Yuandong Tian, Srinivasa Narasimhan and Li Zhang

International Journal of Computer Vision (IJCV 2011)

High Resolution Tracking of Non-Rigid 3D Motion Using Harmonic Maps

Yang Wang, Mohit Gupta, Song Zhang, Sen Wang, Xianfeng Gu, Dimitris Samaras and Peisen Huang

International Journal of Computer Vision (IJCV 2008)

Acquiring Scattering Properties of Participating Media by Dilution

Srinivasa Narasimhan, Mohit Gupta, Craig Donner, Ravi Ramamoorthi, Shree Nayar, Henrik Wann Jensen

ACM Transactions on Graphics (SIGGRAPH 2006)

Conference Publications: ²

Blocks-World Cameras

Jongho Lee^S, and Mohit Gupta
CVPR 2021, * oral presentation

Passive Inter-Photon Imaging

Atul Ingle^S, T Seets^C, M Buttafava^C, Shantanu Gupta^S, A Tosi^C, Andreas Velten^C, and Mohit Gupta
CVPR 2021, * oral presentation

Invisible Perturbations: Physical Adversarial Examples Exploiting the Rolling Shutter Effect

Athena Sayles^C, Ashish Hooda^C, Mohit Gupta, Rahul Chatterjee^C, and Earlence Fernandes^C
CVPR 2021

Smart Time-Multiplexing of Quads Solves the Multicamera Interference Problem

Tomislav Pribanic^C, Tomislav Petkovi^C, David Bojani^C, Kristijan Bartol^C, and Mohit Gupta
International Conference on 3D Vision (3DV) 2020

Inertial Safety from Structured Light

Sizhuo Ma^S, and Mohit Gupta
ECCV 2020

Asynchronous Single-Photon 3D Imaging

Anant Gupta^S, Atul Ingle^S, and Mohit Gupta
ICCV 2019, * oral presentation, * Marr Prize Honorable Mention

Stochastic Exposure Coding for Handling Multi-ToF-Camera Interference

Jongho Lee^S, and Mohit Gupta
ICCV 2019, * oral presentation

Micro-Baseline Structured Light

Viswa Venkata^{SC}, Jian Wang^C, Mohit Gupta, and Shree Nayar^C
ICCV 2019

Practical Coding Function Design for Time-of-Flight Imaging

Felipe Gutierrez-Barragan^S, Syed Reza^C, Andreas Velten^C, and Mohit Gupta
CVPR 2019

Photon-Flooded Single Photon 3D Cameras

Anant Gupta^S, Atul Ingle^S, Andreas Velten^C, and Mohit Gupta
CVPR 2019, * oral presentation

²ICCV, ECCV and CVPR are the top three conferences in computer vision, with acceptance rates typically around 25%. A few selected papers (typically 2 – 4%) are awarded an oral presentation. 3DV and ICCP are smaller conference for 3D vision and computational imaging and photography. Acceptance rates are typically around 30 – 40%.

Passive High Flux Imaging with Single Photon Cameras

Atul Ingle^S, Andreas Velten^C and Mohit Gupta

*CVPR 2019, * oral presentation*

A Geometric Perspective on Structured Light Coding

Mohit Gupta, and Nikhil Nakhate^S

ECCV 2018

3D Scene Flow from 4D Light Field Gradients

Sizhuo Ma^S, Brandon Smith^S, and Mohit Gupta

*ECCV 2018, * oral presentation; * Selected for IJCV Special issue on 'Best of ECCV'*

Tracking Multiple Objects Outside the Line of Sight using Speckle Imaging

Brandon Smith^S, Matt O'Toole^C, and Mohit Gupta

*CVPR 2018, * spotlight oral presentation*

Trapping Light for Time-of-Flight

Ruilin Xu^O, Mohit Gupta, and Shree Nayar^C

*CVPR 2018, * oral presentation*

SH-ToF: Micro Resolution Time-of-Flight Imaging with Superheterodyne Interferometry

Fengqiang Li^O, F Willomitzer^O, P Rangarajan^C, Mohit Gupta, Andreas Velten^C, Oliver Cossairt^C

ICCP 2018

Dual Structured Light 3D using a 1D Sensor

Jian Wang^O, Aswin Sankaranarayanan^C, Mohit Gupta, and Srinivasa Narasimhan^C

*ECCV 2016, * oral presentation*

SpeDo: 6 DOF Ego-Motion Sensor Using Speckle Defocus Imaging

Kensei Jo^O, Mohit Gupta, and Shree Nayar^A

ICCV 2015

LiSens: A Scalable Architecture for Video Compressive Sensing

Jian Wang^O, Mohit Gupta, and Aswin Sankaranarayanan^C

ICCP 2015

MC3D: Motion Contrast 3D Scanning

Nathan Matsuda^O, Oliver Cossairt^C, and Mohit Gupta

ICCP 2015

Digital Refocusing with Incoherent Holography

Oliver Cossairt, Nathan Matsuda and Mohit Gupta

ICCP 2014

** Best paper honorable mention*

Recovering Scene Geometry Under Wavy Fluid Via Distortion And Defocus Analysis
Mingjie Zhang, Xing Lin, Mohit Gupta, Jinli Suo and Qionghai Dai
ECCV 2014

Fibonacci Exposure Bracketing for High Dynamic Range Imaging
Mohit Gupta, Daisuke Iso and Shree Nayar
ICCV 2013

Structured Light in Sunlight
Mohit Gupta, Qi Yin and Shree Nayar
ICCV 2013

Micro Phase Shifting
Mohit Gupta and Shree Nayar
*CVPR 2012, * oral presentation*

Diffuse Structured Light
Shree Nayar and Mohit Gupta
ICCP 2012

Video from a Single Exposure Coded Photograph using a Learned Over-Complete Dictionary
Yasunobu Hitomi, Jinwei Gu, Mohit Gupta and Shree Nayar
ICCV 2011

Multiplexed Illumination for Scene Recovery in the Presence of Global Illumination
Jinwei Gu, Toshihiro Kobayashi, Mohit Gupta and Shree Nayar
*ICCV 2011, * oral presentation*

Structured Light 3D Scanning Under Global Illumination
Mohit Gupta, Amit Agrawal, Ashok Veeraraghavan and Srinivasa Narasimhan
CVPR 2011

Flexible Voxels for Motion-Aware Videography
Mohit Gupta, Amit Agrawal, Ashok Veeraraghavan and Srinivasa Narasimhan
ECCV 2010

Optimal Coded Sampling for Temporal Super-Resolution
Amit Agrawal, Mohit Gupta, Ashok Veeraraghavan and Srinivasa Narasimhan
CVPR 2010

(De) Focusing on Global Light Transport for Active Scene Recovery
Mohit Gupta, Yuandong Tian, Srinivasa Narasimhan and Li Zhang
*CVPR 2009, * oral presentation*

On Controlling Light Transport in Poor Visibility Environments

Mohit Gupta, Srinivasa Narasimhan and Yoav Schechner
CVPR 2008

Legendre Fluids: Reduced Space Modeling and Rendering of Participating Media

Mohit Gupta and Srinivasa Narasimhan
Eurographics/ ACM SIGGRAPH Symposium on Computer Animation (SCA 2007)

High Resolution Tracking of Non-Rigid 3D Motion Using Harmonic Maps

Yang Wang, Mohit Gupta, Song Zhang, Sen Wang, Xianfeng Gu, Dimitris Samaras and Peisen Huang
*ICCV 2005, * oral presentation*

Multilevel Modeling and Rendering of Architectural Scenes

A. Kushal, G. Chanda, K. Srivastava, M. Gupta, S. Sanyal, T.V.N. Sri Ram, P. Kalra and S. Banerjee
Eurographics 2003

Selected Patents

Systems, Methods, And Media For Generating And Using Spiking Neural Networks With Improved Efficiency

Inventors: Matthew Dutson and Mohit Gupta, Filing Date: May 2021

Systems, Methods, And Media For Directly Recovering Planar Surfaces In A Scene Using Structured Light

Inventors: Jongho Lee and Mohit Gupta, Filing Date: August 2020

Systems, Methods, And Media For High Dynamic Range Quanta Burst Imaging

Inventors: Sizhuo Ma and Mohit Gupta, Filing Date: April 2020

Systems, Methods, And Media For Stochastic Exposure Coding That Mitigates Multi-Camera Interference In Continuous Wave Time-Of-Flight Imaging

Inventors: Jongho Lee and Mohit Gupta, Us Patent Applications 16/556119

Systems, methods, and media for asynchronous single photon Depth imaging with improved precision in ambient light

Inventors: Anant Gupta, Atul Ingle and Mohit Gupta, Us Patent Applications P190244US01

Systems, Methods, And Media For Single Photon Depth Imaging With Improved Precision In Ambient Light

Inventors: Anant Gupta, Atul Ingle, Andreas Velten and Mohit Gupta, Filing Date: March 2019

Systems, methods, and media for encoding structured light Imaging patterns and estimating depths in a scene

Inventors: Mohit Gupta, Patent granted, US 2020/0065985 A1

Systems, Methods And, Media For Determining Object Motion In Three Dimensions From Light Field Image Data

Inventors: Sizhuo Ma and Mohit Gupta, **Patent granted, U.S. Patent No. 10706564**

Systems, methods, and media for high dynamic range imaging Using dead-time-limited single photon detectors

Inventors: Atul Ingle, Andreas Velten and Mohit Gupta, **Patent granted, U.S. Patent No. 10616512**

Systems, methods, and media for encoding and decoding signals used in time-of-flight imaging

Inventors: Felipe Gutierrez, Eric Brietbach, Andreas Velten, Shree Nayar and Mohit Gupta, **Patents granted, US 10,645,367 B2 and US 10,739,447 B2**

* **Licensed**

Systems, methods, and media for determining object motion in 3D using speckle images

Inventors: Brandon Smith and Mohit Gupta, **Patent granted, U.S. Patent No. 10,152,798**

* *Nominated as one of six finalists out of 400 applications in WARF Innovation Awards*

Systems, methods, and media for performing shape measurement

Related paper: Micro Phase Shifting

Publication number WO2013078349 A1

* **Licensed**

Methods, systems, and media for high dynamic range imaging

Related paper: Fibonacci exposure bracketing for HDR imaging

Publication number WO2014099320 A1

Video Camera for Acquiring Images with Varying Spatio-Temporal Resolutions

Related paper: Flexible voxels for motion-aware videography

Publication number US20110243442 A1

Invited Book Chapters:

Shape From Scatter

Mohit Gupta

Computer Vision: A Reference Guide, 2014, Publisher: Springer

Performance Limits for Motion Deblurring Cameras

Oliver Cossairt and Mohit Gupta

Motion Deblurring: Algorithms and Systems, 2014, Publisher: Cambridge University Press

Selected Grants

Quanta Computational Imaging with Single-Photon Cameras (PI)

NSF CAREER Award, 2020-2025

How many Photons are needed to Recognize an Object? (PI)

SONY Faculty Innovation Award, 2020-2021

Next Generation Time-of-Flight Imaging (PI)

ONR, 2016-2019

Scene Recovery Using an Extended Plenoptic Function (co-PI)

DARPA, 2016-2020

Time-of-Flight Imaging (PI)

SONY (Research Gift), 2017-2018

Talks

Computational Imaging, One Photon at a Time

University of Florida (April 2021)

Stanford University SCIEN Seminar Series (October 2020)

Towards Next Generation 3D Cameras

Omron R&D Center, Kyoto, Japan (May 2017)

SONY R&D Center, Atsugi, Tokyo, Japan (May 2017)

Oculus Research, Seattle (March 2016)

University of Washington, Seattle (June 2015)

Amazon, Seattle (June 2015)

Microsoft Research Labs, Seattle (June 2015)

Robotics Institute, Carnegie Mellon University (April 2015)

University of Wisconsin-Madison (December 2014)

Time-of-Flight Revolution

Dagstuhl Seminar on Computational Imaging (May 2015)

Workshop on Computational Photography and Intelligent Cameras, UCLA (February 2015)

MIT Media Labs (November 2014)

Keynote talk, CCD Workshop at IEEE CVPR (June 2014)

Measuring 3D Shape When Light Misbehaves

University of Toronto (June 2011)

Harvard University (June 2011)

Probing Scenes with Programmable Illumination

Intel Research Labs, Seattle (April 2010)

University of California, Berkeley (June 2010)

Columbia University (June 2010)

Scene Recovery in the presence of Global Light Transport

Stony Brook University (July 2009)

Columbia University (July 2009)