Shantanu Gupta

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Research Interests

Low-level computer vision under constraints: memory, power, latency, low light, *etc.*

Education

- **University of Wisconsin-Madison** — Madison, WI
  Ph.D. in Computer Science; Advisor: Dr. Mohit Gupta; GPA: 3.895/4 — *Aug. 2020 – present*

- **University of Wisconsin-Madison** — Madison, WI
  Master's in Electrical Engineering; GPA: 3.952/4 — *Aug. 2017 – May 2019*

- **Indian Institute of Technology-Madras** — Chennai, India
  Bachelor's & Master's in Computer Science and Engineering; GPA: 8.78/10 ($\equiv$ 3.512/4) — *Aug. 2011 – July. 2016*

Scholastic Achievements

- Rank 345 from $\sim$ 468,000 applicants in the 2011 Indian Institutes of Technology Joint Entrance Exam (IIT-JEE).
- Rank 511 from $\sim$ 1,000,000 applicants in the 2011 All India Engineering Entrance Exam (AIEEE).
- Rank 2 in the 2010 Special Class Railway Apprentices Exam of India (SCRA).

Professional Experience

- **University of Wisconsin-Madison** — Madison, WI
  Research Intern, then Ph.D. student under Dr. Mohit Gupta — *June 2019 – present*

  - **Eulerian Single-Photon Vision** (*ICCV 2023*; https://wisionlab.com/project/eulerian-single-photon-vision)
    Authors: Shantanu Gupta and Mohit Gupta.
    Directly extracts low-level features (edges and optical flow) from extremely high frame-rate ($\sim$ 100,000 FPS) video captured by Single-Photon Avalanche Diode (SPAD) sensors, without reconstructing individual images.
    Currently exploring its applications to Simultaneous Localization and Mapping (SLAM).

  - **Photon Inhibition** (*ECCV 2024 Oral Presentation*; https://wisionlab.com/project/inhibition)
    Lucas Koerner, Shantanu Gupta, Atul Ingle, and Mohit Gupta.
    A new image capture approach to reduce signal-dependent power consumption in SPAD sensors.
    Contributed towards the development of the algorithms proposed, as well as the design and implementation of experiments to validate them, on both simulated and real sensor data.

  - **Passive Inter-Photon Imaging** (*CVPR 2021 Oral*; https://wisionlab.com/project/ip-spad)
    Atul Ingle, Trevor Seets, Mauro Buttafava, Shantanu Gupta, Alberto Tosi, Mohit Gupta, and Andreas Velten.
    A proposal to use photon arrival time-stamps instead of counts to represent images.
    Designed and implemented neural network architectures to recover images from noisy photon arrival timestamps.

  - **Quanta Burst Photography** (*SIGGRAPH 2020*; https://wisionlab.com/project/quanta-burst-photography)
    Sizhuo Ma, Shantanu Gupta, Arin C. Ulku, Claudio Bruschini, Edoardo Charbon, and Mohit Gupta.
    An algorithm to recover high-quality images from a sequence of binary frames captured by a SPAD sensor, based on robust motion compensation. Contributed towards development and implementation of the algorithm.

- **University of Wisconsin-Madison** — Madison, WI
  Teaching Assistant (various classes) — *9$\times$, between Fall 2017 and Spring 2023*

- **Xerox Research Center India (later Conduent Labs, India)** — Bengaluru, India
  Junior Scientist — *July 2016 - July 2017*

  - **Neural Signatures for License Plate Recognition** (*ICVGIP 2018*; https://arxiv.org/abs/1712.00282)
    Abhinav Kumar, Shantanu Gupta, Vladimir Kozitsky, and Sriganesh Madhvanath.
    A neural embedding ("signature") to re-identify known vehicles passing through a tollbooth, using image retrieval techniques. Contributed towards the design, and the implementation and validation of a research prototype.

- ○ **Monitoring Respiration in Real-Time through Selective Ensemble Aggregation**
  with Prathosh A.P., Pragathi Praveena, and Himanshu Madhu.

  An algorithm to non-invasively measure the breathing of subjects (including infants) from a smartphone camera's video feed. Implemented Android- and PC-based prototypes with real-time (> 25 FPS) performance.

- **Microsoft India Development Center**   Hyderabad, India
  Software Developer Intern   *Summer 2014*
  - ○ **Logging for the Bing Health and Fitness App**: A data store for logs, using Azure tables and Windows Communication Framework. Developed a schema and asynchronous frontends for Windows and Android.

INVITED TALKS

- **Photon Inhibition for Energy-Efficient Single-Photon Imaging**   Sony Research, Japan
  joint with Dr. Lucas Koerner; part of the Sony Research Award Program ("Sony RAP")   *July 03, 2024*
- **Implicit Burst Vision for Scalable Single-Photon Sensing**   Sony Research, Japan
  Sony RAP talk   *March 13, 2023*

PROGRAMMING SKILLS

- **Languages**: MATLAB, Python, C++, C, SQL, Java
- **Libraries**: PyTorch, OpenCV

COURSEWORK

- **Artificial Intelligence**: Machine Learning; Robustness Theory; Computer Vision; Image Processing; Computational Photography; Speech Technology; Medical Image Analysis; Data Visualization.
- **Computer Systems**: Parallel Computer Architecture; Embedded Systems; Computer Networks; Operating Systems.
- **Mathematics, Algorithms, Programming**: Numerical Analysis; Introduction to Optimization; Data Structures and Algorithms; Programming Languages; Program Analysis.