

Varun Sundar

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Education

University of Wisconsin Madison

PhD Student, Computer Science

Madison, Wisconsin

Jan 2021–Present

Indian Institute of Technology Madras

BTech, Electrical Engineering (9.67/10.0)

Chennai, India

2016–2020

Awards & Honours

- Placed 2nd and 5th in the Under Display Challenge at ECCV 2020: in the POLED and TOLED tracks respectively.
- Graduate Scholarship at UW Madison: two-semester scholarship awarded as an incoming graduate student.
- Selected for the IUSSTF¹-Viterbi REU (15 of 1,000+ applicants): Guided during summer 2019 by Prof. Ram Nevatia, IRIS Lab, USC.
- Regional finalist at the HULT Prize 2018 (Singapore): dubbed as the *Nobel Prize for Students* for work on Waste Segregation and Management in Chennai, India.
- Invited to Global Entrepreneurship Summit 2018 (Hyderabad, India): under the *young innovators* category.
- Secured All India Rank of 501: in the Joint Entrance Examination (JEE Mains) 2016 (out of 13,00,000+ candidates) and All India Rank of 2917 in JEE-Advanced 2016 (out of 1,50,000+ candidates).
- Awarded KVPY Scholarship: offered provisional admission to the Indian Institute of Science (IISc) in 2016.
- Special Mention at INMO 2015: among the top 33 in the country at the Indian National Mathematical Olympiad.

Publications & Presentations

J: Journal Publication, W: Workshop Poster/ Paper, †: Under Review

[J2†] V Sundar, R Dwaraknath: “[Reproducibility Report] Rigging the Lottery: Making All Tickets Winners”, ML Reproducibility Challenge 2020 (Rescience C Journal), under peer-review, January 2021. [openreview](#).

[J1] SS Khan*, V Sundar*, V Boominathan, A Veeraraghavan and K Mitra: “Towards Photorealistic Scene Reconstruction of Lensless Measurements”, *IEEE TPAMI*, October 2020. [arXiv](#) | [DOI](#) | [project page](#).

[W2] V Sundar*, S Hegde*, D Kothandaraman and K Mitra: “Deep Atrous Guided Filter for Image Restoration in Under Display Cameras”, *Proc. of ECCV Workshops*, September 2020. [arXiv](#) | [project page](#).

[W1] SS Khan*, V Sundar*, V Boominathan, A Veeraraghavan and K Mitra: “Towards Photorealistic Scene Reconstruction of Lensless Measurements”, *CVPR CCD Workshop*, June 2020. [video](#).

Relevant Coursework

All taken at the graduate level.

- | | | |
|-----------------------------|-----------------------|-----------------------------|
| ○ Computational Photography | ○ Fourier Optics | ○ Convex Optimization |
| ○ Computer Vision | ○ Multi-Armed Bandits | ○ Reinforcement learning |
| ○ Deep learning | ○ Estimation Theory | ○ Theoretical Deep Learning |

Research Experience

High Contrast Imaging with SPADs

WISION Lab, UW Madison

Guide: [Prof. Mohit Gupta](#)

Nov 2020 - Present

- Exploring the utility of Single Photon Avalanche Diodes (SPADs) in applications involving high contrast patterns and images.

Megapixel Restoration for Under Display Cameras

CILab, IIT Madras

Guide: [Prof. Kaushik Mitra](#)

May 2020 - Aug 2020

- Proposed a image restoration approach for Under Display Cameras, where the front camera is mounted behind OLED screens- leading to severe blur and low-light artefacts.
- Demonstrated direct training of deep networks on megapixel images by using trainable guided filters in conjunction with atrous convolutions. Outperforms existing methods in severe degradation scenarios.
- Placed 2nd in UDC Challenge, ECCV 2020 (POLED track).

Image Recovery for Lensless Cameras

CILab, IIT Madras

Guide: [Prof. Kaushik Mitra](#)

Nov 2019 - May 2020

- o Proposed physics-aware, data-driven method for scene recovery from lensless cameras. Such cameras lack a focussing element resulting in highly multiplexed measurements.
- o Outperforms existing methods in performance and computational efficiency. Demonstrated lensless photography under ambient light for the first time with our method.
- o Accepted at IEEE TPAMI 2020. Presented as a spotlight talk at CVPR CCD 2020.

Attribute Transfer in GANs

IPCV Lab, IIT Madras

Guide: [Prof. AN Rajagopalan](#)

June 2019 - Oct 2019

- o Developed a Generative Adversarial Network (GAN) based approach for transferring unseen attributes from a source to a target dataset. Working in the context of image manipulation using natural language, while preserving faithfulness.
- o Examined role of text and spatial attention in text-guided image manipulation. Proposed ranking loss based discriminators which can effectively decouple attributes and subjects.

Decoupling Attributes from Object features

IRIS Lab, USC

Guide: [Prof. Ram Nevatia](#)

May 2019 - July 2019

- o Studied role of object features in attribute detection. Analysed properties of composition and contextuality. Showed the importance of object features in sparse and noisy datasets such as the Genome Question Answering dataset.
- o Work presented at the Viterbi-IUSSTF REU Seminar. [technical report](#).

Projects

Automatic Waste Segregator

Chennai, India

[News Article](#)

Aug 2017 - Jan 2019

- o Designed the deep learning backend and fabricated electronics for creating a low-cost, fast response segregator at source. Piloted prototypes and a service-based model in two housing societies.
- o Won the campus round of the 9th HULT Prize, 2018. Shortlisted for the regional round at NTU, Singapore.

Simulating LiDARs from OpenDRIVE Layouts

Diamler, India

[Blog Post](#)

Dec 2018 - Jan 2019

- o Worked on simulating LiDAR Point clouds given a specific *OpenDRIVE* file, comprising of road layouts, present objects and reflectivity coefficients. Utilised the *CARLA simulator* as the physics engine.
- o Demonstrated utility of segmentation and detection in order to improve simulation outputs.

Survey of Deep RL Algorithms for Realistic Scenarios

DON Lab, IIT Madras

[Report](#)

Oct 2018 - Nov 2018

- o Defined contexts for evaluating performance of multiple RL Agents under various state-space formulations: *MuJoCo* based physics simulation, car steering in *CARLA* and drone navigation in *AirSim*.
- o Showed that control pipelines can outdo RL agents when dealing with large state spaces.

Leadership

Head, KAIST-IITM student collaboration

IIT Madras

Oct 2019 - Mar 2020

- o Headed a task force of 14 students to draft goals and contextual research agenda for undergraduate research collaboration with the *Korean Advanced Institute of Science and Technology (KAIST)*.

Head, Computer Vision and Intelligence Group

IIT Madras

[Webpage](#)

Mar 2018 - Feb 2019

- o Led an undergraduate community of 40 students working enthusiastically towards impacting real-world problems by harnessing Computer Vision. Have conducted open sessions for an audience of 200+ strong multiple times in IIT Madras and elsewhere. Frequently interact with startups, companies, NGOs and professors.

Additional Activities

- o Conducted an introductory session on *Git* and version control at the [5G Testbed](#), IIT Madras headed by [Prof. R Ganti](#). Content used may be found [here](#).
- o Delivered a workshop lecture at [PySangamam 2018](#) on "data-driven computer vision". [slides](#).

References

[Prof. Kaushik Mitra](#),
Assistant Professor in EE,
IIT Madras.

[Prof. Mohit Gupta](#),
Assistant Professor in CS
University of Wisconsin Madison.

[Prof. AN Rajagopalan](#),
Professor in EE,
IIT Madras.