Anish Madan

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Research Interests

- 3D Vision
- Foundational Models
- Digital Twins
- Vision for Robotics

Education

- **Carnegie Mellon University (CMU)** — Pittsburgh, USA
  Masters of Science, Robotics; CGPA: 4.09/4.00 — *Aug 2022 - Aug 2024*
  Advisor: Prof. Deva Ramanan
- **Indraprastha Institute of Information Technology (IIIT), Delhi** — India
  B.Tech, Computer Science and Applied Maths; CGPA: 8.78/10.00 — *Aug 2016 - Jan 2021*
  Advisor: Prof. Saket Anand

Conference Publications

SMORE: Simultaneous Map and Object Reconstruction — **3DV 2025**
N. Chodosh, **A. Madan***, S. Lucey, D. Ramanan.* — *Webpage, Paper*

Revisiting Few-Shot Object Detection with Vision-Language Models — **NeurIPS D&B 2024**
A. Madan, N. Peri*, S. Kong, D. Ramanan.* — *Paper, Code*

SLI-pSp: Injecting Multi-Scale Spatial Layout in pSp — **WACV 2023**
AN Mathur, **A. Madan***, O. Sharma* — *Paper*

REGroup: Rank-aggregating Ensemble of Generative Classifiers for Robust Predictions — **WACV 2022**
*L. Tiwari, **A. Madan**, S. Anand, and S. Banerjee* — *Paper, Code*

B-SMALL: A Bayesian Neural Network approach to Sparse MAML — **ICASSP 2021**
***A. Madan**, R. Prasad.* — *Paper, Code*

Category Consistent Cyclic Visual Question Generation — **MMAsia 2020**
S. Uppal, **A. Madan***, S. Bhagat*, Y. Yu, R. Shah.* — *Paper, Code*

Workshop Challenges and Publications

Foundational FSOD Challenge — **VPLOW @ CVPR 2024**
A. Madan, N. Peri*, S. Kong, D. Ramanan* — *Paper Challenge*

NurtureNet:A Multi-task Video-based Approach for Newborn Anthropometry — **CVPM @ CVPR 2024**
*Y. Khandelwal, ..., **A. Madan**, ..., M. Tapaswi* — *Paper*

* Equal Contribution

Academic Experience

- **CMU Center for Autonomous Vehicle Research | CMU** — Pittsburgh, USA
  Graduate Research Assistant | Advisor: Prof. Deva Ramanan | NeurIPS '24, 3DV '25 — *Oct 2022 - Present*
  1. **Scalable Approach for Creating Digital Twins using LiDAR**
     - Developed **SMORE**: a space-time reconstruction technique for urban scenes using LiDAR
     - Demonstrated **10x** improvement in **LiDAR Novel View Synthesis** over SOTA
     - Achieved precise reconstruction of static and dynamic objects, enabling **high-quality depth map synthesis**
     - Currently, leading efforts to extend SMORE to support multiple modalities (RGB and LiDAR)
  2. **Foundation Model Priors for High-Quality Annotations**
     - Reformulated Few-Shot Object Detection (FSOD) as alignment of Foundational Vision-Language Models (VLMs) to multi-modal annotator instructions
     - Proposed **Foundational FSOD**: a new **benchmark** on nuImages, a popular Autonomous Vehicles dataset
     - Released a CVPR '24 Challenge and filed a patent based on this work (*under review*)
- **Graphics Research Group | IIIT-Delhi** — New Delhi, India
  Research Intern | Advisor: Dr. Ojaswa Sharma | WACV '23 — *Jan 2021 - July 2022*

- Proposed a StyleGAN based Image-to-Image Translation model to explicitly capture fine-grained semantics and structures in addition to the global style.
- Improved FID performance by 16 points over SOTA on CelebA (Label-to-Face generation).

- **Bayesian View of Meta-Learning** | **IIIT-Delhi** — New Delhi, India
  Undergraduate Researcher | Advisor: Dr. Ranjitha Prasad | ICASSP '21 — *Jan 2020 - Jan 2021*
  - Proposed a Bayesian neural network based approach to MAML to alleviate the problem of overfitting by introducing network sparsity.
- **Infosys Center of Artificial Intelligence** | **IIIT-Delhi** — New Delhi, India
  B.Tech Thesis | Advisor: Dr. Saket Anand | WACV '22 — *Aug 2018 - Feb 2020*
  - Developed a novel adversarial defense technique to secure Deep Neural Networks against adversarial attacks.
  - Benchmarked on ImageNet and demonstrated performance at-par with SOTA whilst requiring only a fraction of the data.

Industry Experience

- **Bosch Research** — Pittsburgh, USA
  Machine Learning Research Intern — *May 2024 - Aug 2024*
  - Setup automatic depth rendering pipeline using LiDAR reconstructions from SMORE
  - Achieved higher quality **depth synthesis from extreme viewpoints** when compared to **NeRF**-based SOTA
- **Wadhwani AI** — New Delhi, India
  Associate ML Scientist | Advisor: Dr. Makarand Tapaswi — *Jan 2021 - July 2022*
  - **Newborn Anthropometry Project**: Developed 3D mesh reconstruction based (SMPL, HMR) and parametric model-free (Contrastive Learning, Transformers) techniques to analyse low-birth weight babies from a video.
  - Contributed in developing a dataset of baby keypoints and joints.
    - Conducted annotation training exercises with external agencies.
- **Robert Bosch Research and Technology Centre** — Bangalore, India
  Research Intern — *Aug 2019 - Dec 2019*
  - Developed context-based *cut-and-paste* data augmentation techniques for semantic segmentation.
  - Improved performance by 5 AP on various categories, e.g., pedestrians on Bosch's Autonomous Vehicle dataset.
- **IIIT-D Autonomous Last mIle VEhicle (ALIVE)** — New Delhi, India
  Summer Intern | Advisor: Dr. Saket Anand — *May 2018 - July 2018*
  - Developed methods to detect speed breakers for AVs and improved existing lane detection algorithms.

References

- **Prof. Deva Ramanan**: Professor, Robotics Institute, Carnegie Mellon University
- **Prof. Makarand Tapaswi**: Assistant Professor, Computer Vision Group, IIIT Hyderabad | Senior ML Scientist, Wadhwani AI
- **Prof. Nathaniel E. Chodosh**: Assistant Professor, Department of Computing Sciences, Villanova University
- **Prof. Saket Anand**: Associate Professor, IIIT Delhi.

Services

- **Reviewer**: CVPR 2025, ECCV 2024, ICLR 2023
- **Mentorship @ CMU**: CMU AI Mentoring Program 2023
- **Mentorship @ Wadhwani AI** : Guided 2 interns for their projects on Uncertainty Estimation, Imbalanced Regression
- **Challenge Organizer**: Visual Perception and Learning in an Open World (**CVPR 2024**)
- **Invited Talks:** *AI Winter School*, IIIT-Delhi, 2019
- **Volunteering @ CSSAR NGO**: Taught basics of Science and English to students of classes 3-10.

Awards and Achievements

- **Dean's Award for Academic Excellence:** Excellent academic performance in a calendar year — *2019*
- **Technical Paper Award:** National Rank 1 for technical paper at AUVSI-SUAS competition — *2017*