

# SNEHAL SINGH TOMAR

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## Research Interests

Deep Generative Models for Computer Vision, Deep Vision-Language Models, Self-Supervised Deep Learning, Efficient Deep Learning, Biomedical Computer Vision, Graph Neural Networks, Computational Photography, Robotics

## Education

- Stony Brook University** New York, U.S.A
  - Ph.D. in Computer Science, GPA: 3.92/4.0 January, 2024 -
  - Advisor: [Prof. Klaus Mueller](#)
- Indian Institute of Technology Madras** Chennai, India
  - M.S. (by Research) in EE, Advisor: Prof. A.N. Rajagopalan; CGPA: 9.0/10.0 2020 - 2023
  - Area of Focus: Image Processing and Computer Vision
  - Recipient of the **IIT Madras Institute Research Award** for excellence in research. (Given to the top 3 out of the 746 MS students at IIT Madras)
  - Thesis:- Generative Self-Supervised Learning for Computer Vision: Applications & Causality Considerations
- Manipal Institute of Technology** Manipal, India
  - B.Tech. in ECE, Minor in Signal Processing; CGPA: 8.42/10.0 2016 - 2020
  - Activities: Member of the AI Robotics club, multiple research internships in robotics and control systems at IIT Delhi, research on applications of Fuzzy Logic
  - Awarded the Institute Research Incentive and was a part of the team that secured world rank 9 at the Intelligent Ground Vehicle Competition (IGVC) 2018, Michigan, USA.

## Publications

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|------------------------------------|--|
| Under Review                       | <b>GridiT: Resolution Factorization and Grid-Based Synthesis for Efficient Long Image Sequence Generation</b> , <a href="#">Snehal Singh Tomar</a> , Alexandros Graikos, Arjun Krishna, Dimitris Samaras, and Klaus Mueller  |
| TMLR 2024                          | <b>PNerV: A Polynomial Neural Representation for Videos</b> , Sonam Gupta, <a href="#">Snehal Singh Tomar</a> , Grigorios Chrysos, Sukhendu Das, and A.N. Rajagopalan, Transactions on Machine Learning Research 2024. <a href="#">Paper</a>   |
| AAAI 2024                          | <b>Latents2Semantics: Leveraging the Latent Space of Generative Models for Localized Style Manipulation of Face Images (Oral)</b> , <a href="#">Snehal Singh Tomar</a> and A.N. Rajagopalan, Workshop on AI for Digital Human at AAAI 2024. <a href="#">Paper</a>  |
| AAAI 2023                          | <b>Exploring the Effectiveness of Mask-Guided Feature Modulation as a Mechanism for Localized Style Editing of Real Images (Student Abstract)</b> , <a href="#">Snehal Singh Tomar</a> , Maitreya Suin, and A.N. Rajagopalan, Proceedings of the AAAI Conference on Artificial Intelligence, 37(13). <a href="#">Paper</a>   |
| ECCV 2022                          | <b>Hybrid Transformer Based Feature Fusion for Self-Supervised Monocular Depth Estimation (Oral)</b> , <a href="#">Snehal Singh Tomar*</a> , Maitreya Suin*, and A.N. Rajagopalan, Advances in Image Manipulation Workshop at the European Conference on Computer Vision (ECCV) 2022. <a href="#">Paper</a> , <a href="#">Code</a> <span style="float: right;">* Equal Contribution.</span>                |
| CVPR 2022                          | <b>Latents2Segments: Disentangling the Latent Space of Generative Models for Semantic Segmentation of Face Images</b> , <a href="#">Snehal Singh Tomar</a> and A.N. Rajagopalan, Workshop on Computer Vision for Augmented and Virtual Reality (CV4ARVR) at the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, LA, 2022. <a href="#">Paper</a> , <a href="#">Code</a> |
| SOCPROS 2017<br>(Best Paper Award) | <b>Python-Based Fuzzy Classifier for Cashew Kernels</b> , <a href="#">Snehal Singh Tomar</a> and Narendra V.G., Proceedings of the 7 <sup>th</sup> International Conference on Soft Computing for Problem Solving (SOCPROS) 2017, In: Advances in Intelligent Systems and Computing, vol 816 (2019). Springer, Singapore. <a href="#">Paper</a> , <a href="#">Best Paper Award</a>                         |

## Experience

### Consultant-TCS Research Pre-doctoral Fellowship

New Delhi, India

June, 2023 - December, 2023

- Visual and Embodied AI group, Tata Consultancy Services
- Engaged with Tata Consultancy Services on a retainership basis.
- Research focus: Efficient and physically consistent 3D Particle Mesh simulation using Graph Neural Networks.
- Worked on improving the state of the art in Garment Simulation and Animation for virtual try-on applications.

## Projects & Internships

### Polynomial Expression fusion for Instant Volumetric Head Avatars

Prof. Dimitris Samaras

Spring 2024

- Computer Vision course research project at Stony Brook University
- The project explored the employment of Polynomial Neural Network (PNN) based architectures for fusing controllable expressions in learned 3D Morphable Model (3DMM) driven head avatars.
- To this end, I modified the INSTA ([Zielonka et al.](#), CVPR 2023) architecture with PNNs to achieve superior expression transfer with fewer parameters.

### LLM based Math-QA with improved reasoning

Prof. Andrew H. Schwartz

Spring 2024

- NLP course research project at Stony Brook University
- Math Question Answering is an important application of Auto-Regressive Transformer based NLP models. In this project, our team's endeavor was to improve the State of the Art (SOTA) to provide solutions in a structured step-by-step manner.
- We did so by fine-tuning a Chain of Thought (CoT) and a Program of Thought (PoT) pretrained model (Meta Llama 3 -8B) to build an ensemble model that combines the best of both to yield accurate answers with mathematically consistent and plausible reasoning.

### Low-Light Light Field Restoration

Prof. Kaushik Mitra

Spring 2021

- Computational Photography course research project at IIT Madras
- The project was geared towards building a Deep Neural Network capable of restoring raw Light Fields captured in Low-Light using the Lytro camera sans any pre-processing or decoding operation. [Slides](#).
- To this end, our team extended the L3FNet ([Lamba et al.](#), IEEE TIP 2021). We replaced all pre-processing operations used by L3FNet that were derived from the MATLAB Light-field toolbox with python functions for integration with the pytorch model. We retained minimal preprocessing steps in doing so.
- We applied post-capture data augmentations to the L3F-wild dataset and experimented with the L3FNet's objective function to attain restoration PSNR and SSIM metrics comparable to those achieved by the vanilla L3FNet which uses decoded and pre-processed LF-views.

### Undergraduate Internships in Robotics and Control Systems

Prof. Shubhendu Bhasin

2019 - 2020

- Indian Institute of Technology Delhi
- 1. **Torque-Based Position Controller for a Five DOF Robotic Manipulator** (B.Tech. Project, Spring 2020):
  - (a) Objective: To control a position controlled robotic manipulator (the ROBOTIS Open Manipulator-X) using torque input returned by a pre-designed control algorithm
  - (b) Tasks:
    - i. Tele-Operated the ROBOTIS Open Manipulator-X in position control mode using its Robot Operating System (ROS) packages and characterized its transfer function
    - ii. Implemented a torque-position transformer in line with (Khatib et al., ICRA 2008) using the knowledge of the Open Manipulator's inertia tensor, forward kinematics, and inverse kinematics. The cascaded transfer functions were tested in a Gazebo simulation
- 2. **Torque Transformer for Position Controlled Robotic Joints** (Summer Internship, 2019):
  - (a) Selected through the Global Internship Program in Engineering Design and Innovation (GIPEDI) 2019
  - (b) Interfaced the Herkulex-DRS 0101 DC servo motor on an Arduino-Mega to get continuous position feedback
  - (c) Modeled the motor's transfer function as a PID controller
  - (d) Implemented a torque-position transformer on the lines of (Khatib et al., ICRA 2008) to provide torque input as a control signal to the motor

## Scholastic Highlights

- Selected for the AAAI 2024 Travel Scholarship.
- Awarded the IIT Madras Institute Research Award for excellent research contributions as an MS (by Research) student (3/746)
- Awarded the IIT Madras Institute Travel Grant for attending CVPR 2022 at New Orleans, Louisiana, U.S.A.
- Awarded Half Time Research Assistantship (HTRA) as funding support for pursuing graduate studies by Ministry of Education, Govt. of India
- Awarded Research Incentive and Certificate of Appreciation in October, 2018 by Manipal Academy of Higher Education (MAHE) for producing award winning research work at SOCPROS 2017
- Was a part of the team that stood 9<sup>th</sup> overall at the Intelligent Ground Vehicle Competition (IGVC) 2018 and was a finalist in the *Mahindra Rise Prize Challenge*, India's first autonomous vehicle competition
- Qualified the National Talent Search Examination (Stage-I), conducted by National Council of Educational Research and Training (NCERT) in 2011 & 2013 (Selected among top the 500 students from Uttar Pradesh, India)
- National Cyber Olympiad 2007 - All India Rank: 11, Unified Cyber Olympiad 2008 - All India Rank: 50, National Cyber Olympiad 2009 - All India Rank: 35

## Academic Service & Teaching

- Served as a reviewer for NeurIPS 2025, ICCV 2025, CVPR 2025, and CVPR 2024.
- Served as a reviewer for the Advances in Image Manipulation Workshop at ECCV 2022
- Served as a Teaching Assistant for the courses mentioned below at Stony Brook University (SBU) and IIT Madras (IITM). My responsibilities included the preparation and evaluation of tutorials, assignments, and exams.
  - CSE527 (Computer Vision at SBU) offered by Prof. Haibin Ling in Fall, 2024
  - ISE316 (Introduction to Networking at SBU) offered by Prof. Jalaa Hoblos in Spring, 2024
  - EE5175 (Image Signal Processing at IITM) offered by Prof. A.N. Rajagopalan in Spring, 2022 and 2023
  - EE5178 (Modern Computer Vision at IITM) offered by Prof. A.N. Rajagopalan in Fall, 2022
  - EE6132 (Deep Learning for Imaging at IITM) offered by Prof. A.N. Rajagopalan in Fall, 2021
  - EE5180 (Introduction to Machine Learning at IITM) offered by Prof. Avhishek Chatterjee in Spring, 2021

## Presentations and Talks

- Attended and presented at AAAI 2023 and AAAI 2024 virtually.
- Attended (in-person) and presented at CVPR 2022. [Video](#).
- Attended (virtually) and presented at ECCV 2022. [Video](#).
- Attended and presented at the 7<sup>th</sup> International Conference on Soft Computing for Problem Solving (SOCPROS) 2017. The presentation led to a best paper award.

## Technical Skills

- **Programming Languages:** Python, C, C++, HTML/CSS
- **Deep Learning Frameworks:** Pytorch, Tensorflow
- **Tools and Packages:** MATLAB, Swift(Xcode), OpenCV, Scikit-Fuzzy, Blender, MeshLab

## Relevant Coursework

Computer Vision (Prof. Dimitris Samaras, SBU), Natural Language Processing (Prof. Andrew Schwartz, SBU), Machine Learning (Prof. Yifan Sun, SBU), Deep Learning (Prof. Mitesh Khapra, IITM), Image Signal Processing (Prof. A.N. Rajagopalan, IITM), Computational Photography (Prof. Kaushik Mitra, IITM), and System Security (Prof. R. Sekar, SBU)