Aalok Gangopadhyay

Visiting Fellow. · Tata Institute of Fundamental Research

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Employment

Tata Institute of Fundamental Research — Mumbai, India

Visiting Fellow, School of Technology and Computer Science — Sept 2023 - present

- Advisor: Dr. Hariharan Narayanan

Education

Indian Institute of Technology Gandhinagar — Gandhinagar, India

PhD, Electrical Engineering — 2017 - 2023

- Advisor: Dr. Shanmuganathan Raman

Indian Institute of Technology Gandhinagar — Gandhinagar, India

B.Tech, Electrical Engineering with minors in Computer Science — 2011 - 2015

- CGPA 9.17/10

Technical Skills

- Programming Languages: C, C++, Python, Matlab, OCaml
- Libraries and Platforms: Tensorflow, PyTorch, OpenCV, Blender
- Operating systems: Linux, MacOSX, Windows

Awards & Honors

- Awarded TCS Research Fellowship (July 2018 - June 2022)
- Qualified for Indian National Physics Olympiad (INPhO) 2010-11 after clearing National Standard Examination in Physics (NSEP) as top 400 students from India

Publications

Accepted

- **Gangopadhyay, Aalok**, Paras Gupta, Tarun Sharma, Prajwal Singh, and Shanmuganathan Raman. "Search Me Knot, Render Me Knot: Embedding Search and Differentiable Rendering of Knots in 3D." In COMPUTER GRAPHICS forum, vol. 43, no. 5. 2024.
- **Gangopadhyay, Aalok**, Prajwal Singh, Ashish Tiwari, and Shanmuganathan Raman. "Hand Shadow Art: A Differentiable Rendering Perspective." The Eurographics Association, 2023.
- **Gangopadhyay, Aalok**, Prajwal Singh, and Shanmuganathan Raman. "APEX-net: automatic plot extraction network." 2022 National Conference on Communications (NCC). IEEE, 2022.
- **Gangopadhyay, Aalok**, Shashikant Verma, and Shanmuganathan Raman. "DMD-Net: Deep Mesh Denoising Network." 2022 26th International Conference on Pattern Recognition (ICPR). IEEE, 2022.
- Ramakrishnan, Sainandan, Shubham Pachori, **Aalok Gangopadhyay**, and Shanmuganathan Raman. "Deep generative filter for motion deblurring." In Proceedings of the IEEE International Conference on Computer Vision Workshops, pp. 2993-3000. 2017
- **Gangopadhyay, Aalok**, Shubham Pachori, and Shanmugananthan Raman. "Automatic silhouette photography." In 2016 Twenty Second National Conference on Communication (NCC), pp. 1-6. IEEE, 2016.
- **Gangopadhyay, Aalok**, Shivam Mani Tripathi, Ishan Jindal, and Shanmuganathan Raman. "Dynamic scene classification using convolutional neural networks." In 2016 IEEE Global Conference on Signal and Information Processing (GlobalSIP), pp. 1255-1259. IEEE, 2016.

Preprints

- **Gangopadhyay, Aalok**, Dwip Dalal, Progyan Das, and Shanmuganathan Raman. "Flow Symmetrization for Parameterized Constrained Diffeomorphisms." arXiv preprint arXiv:2312.06317 (2023).
- **Gangopadhyay, Aalok**, Abhinav Narayan Harish, Prajwal Singh, and Shanmuganathan Raman. "A Graph Neural Network Approach for Temporal Mesh Blending and Correspondence." arXiv preprint arXiv:2306.13452 (2023).

Internships and Research Positions

Deep Learning algorithms for detection and recognition of food items inside a refrigerator — *Innit Inc. and IIT Gandhinagar*

Supervisor : Dr. Shanmuganathan Raman (IIT Gandhinagar), Dr. Hristo Bojinov (CTO, Innit Inc.) — *August 2016 - July 2017*

- A deep learning algorithm was designed that performed object detection to extract the information about the food objects inside a refrigerator environment.
- A sticker based visual encoding-decoding scheme was developed that allowed us to faithfully encode information onto a physical sticker and decode that information content when viewed by a camera.

Junior Research Fellow in the field of Computer Vision and Deep Learning — *IIT Gandhinagar*

Supervisor : Dr. Shanmuganathan Raman — *August 2015 - July 2016*

- Automatic Silhouette Photography: An algorithm for detecting the silhouette in a photograph was developed. This was complemented by a color transform mechanism that made the image aesthetically appealing.
- LDR to HDR: A dataset of HDR images was curated from various online sources. These HDR images were converted to LDR images with varying exposure time. A deep learning network was trained to map LDR images to HDR images.
- Image Denoising using Sparse Coding and non-local means: A large scale patch database was generated using images from the ImageNet and Places dataset. WTA (Winner Takes All) hash was used for computationally efficient implementation of a similarity based patch retrieval.
- Image morphing using Autoencoders with representational constraints in the latent space: The representational constraint models the relation between three images in the latent space while the decoder simultaneously tries to generate the images from the latent features.

Discovering rare transient event using data catalogs from CRTS sky survey — *Caltech*

Supervisor : Dr. Ashish Mahabal — *May 2014 - July 2014*

- We develop filtering algorithms to search for rare transient events by analyzing billions of uncategorized transient events present in Catalina Real-Time Transient Survey (CRTS). This also involved cross comparison with other sky survey catalogs. The list of potential events was reduced from billions to an order of thousands. An annotation tools was designed for citizen science, where potential events obtained after the filtration process could be labelled as a potential rare transient event upon visual inspection.

Development of Android applications — *Grid Ants Pvt. Ltd.*

Supervisor : Sarthak Jain, Prathamesh Juvatkar, Prashant Borde — *May 2013 - July 2013*

- Development of front end (UI + UX) and the backend (database integration) of android applications for various clients.
- Designing of an audio recommendation engine, with server based playback methodology.

Design of parallel computing algorithms — *IIT Gandhinagar*

Supervisor : Dr. Murali Damodaran — *Jan 2013 - April 2013*

- A stochastic method was implemented for plotting various fractals using Iterated Function Systems. A program was designed in C/CUDA that generated Mandelbrot sets and Julia sets using Escape time algorithm. The program included added functionality of zooming, panning and varying the color patterns during run-time.
- Parallel computing algorithms for a variety of numerical methods were implemented using MPI, OpenMP, Pthreads, and CUDA on multicore systems. This was followed by a detailed performance analysis of the algorithms in terms of speedup, efficiency, etc. The performance metrics of the HPC Machine (SMA Hydra Linux Cluster) was estimated in terms of bandwidth, message latency and startup cost.

Teaching Experience

Assisted in teaching the following courses at IIT Gandhinagar:

- Deep Learning, (Spring 2022, Spring 2021)
- Probability and Random Processes, (Fall 2021, Fall 2019, Fall 2018)
- 3D Computer Vision, (Spring 2020)
- Signals and Systems, (Spring 2018)
- Mathematical Foundation for Computer Vision and Computer Graphics, (Fall 2017)

Invited Talks and Seminars

- Differentiable Algorithms for Representation, Processing and Rendering of Shapes, IIT Bombay, August 2023
- Differentiable Algorithms for Representation, Processing and Rendering of Shapes, TIFR, June 2023
- Mesh Denoising using Graph Neural Networks, TCS Virtual Research Cafe, August 2022
- GANs for Computer Vision, NASSCOM CoE xChange Program, IIT Gandhinagar, November 2019
- Introduction to Deep Learning, CSE Seminar, IIT Gandhinagar, February 2017

Reviewer

- Indian Conference on Computer Vision, Graphics and Image Processing, 2022
- International Conference on Computer Vision and Image Processing, 2021

References

Dr. Hariharan Narayanan

Associate Professor , School of Technology and Computer Science

Tata Institute of Fundamental Research, India

Dr. Shanmuganathan Raman

Jibaben Patel Chair Associate Professor , Computer Science and Engineering

Indian Institute of Technology, Gandhinagar, India

Dr. Indranath Sengupta

Associate Professor , Mathematics

Indian Institute of Technology, Gandhinagar, India

Dr. Nithin V. George

TEOCO Chair Associate Professor, Electrical Engineering

Indian Institute of Technology, Gandhinagar, India