Debabrata Mandal

linkedin·debabrata-mandal — homepage — git·codejaeger

RESEARCH INTERESTS

Broad interests: Perception of 3D world, thin optics, real time imaging
Current: Computer graphics, computational imaging, generative models
Past: high-performance computing, 3D inverse rendering, human pose tracking

EDUCATION

University of North Carolina, Chapel Hill, United States — August 2023 — Present
Ph.D. in Computer Science — Grade: H (highest)
Advisor: Prof. Praneeth Chakravarthula

Indian Institute of Technology, Bombay, India — July 2017 — June 2021
Bachelor of Technology: Computer Science (8.69/10.0)
Research Focus: 3D hand mesh tracking and registration

EXPERIENCE

VCAIL Lab — UNC-CH
Research assistant — July 2023 - Present

- Optimize a thin nanophotonic meta-lens optical element for wide field of view and broadband imaging
- Develop a novel generative model based image restoration method to reach exceptional imaging performance nearing smartphone cameras
- Validate optimized metalens for applications in wearable displays and thin cameras
- Skills: Optical simulations (RCWA, FDTD), Zemax, differentiable optics frameworks

KLA-Tencor Corp. — Chennai, India
Algorithm Engineer — July 2021 — July 2023

- Optimised inference throughputs of defect detection networks by 6x (2x compute & 3x memory) on bare metal Nvidia Tesla cards (INT8) using GPU efficient algorithms
- Part of the development team responsible for building next-gen inference framework (in `CUDA` and C++17) shipped with memory improvements over Tensorflow
- Skills: CUDA (Nsight, CudaRT API), C/C++17, pthread

VIGIL Lab — IIT Bombay
URA, Prof. Parag Chaudhuri — December 2020 — July 2021

- Developed a hand mesh to point cloud registration algorithm from RGBD data using a non-linear entropy optimization in the presence of severe occlusions
- Showed improvements over previous state-of-art SMPL mesh refinement networks.
- Skills: Open3D, 3D registration, PointNets

PUBLICATIONS

Submitted

- UniCoRN: Latent Diffusion-based Unified Controllable Image Restoration Network across Multiple Degradations, **D. Mandal**, G. Tong, S. Chattopadhyay, J. Froech, A. Majumdar, P. Chakravarthula
- High Quality HDR on Metalens Cameras via Multi-Exposure Bursts, **D. Mandal**, P. Chakravarthula

Published

- (HiPC'2022) Split-Knit Convolution: Enabling Dense Evaluation of Transpose and Dilated Convolutions on GPU, A. Vadakkeveedu, **D. Mandal**, P. Ramachandran and N. Chandrachoodan

PROJECTS

Javis.jl, The Julia Project Remote,
Open Source contributor, GSOC'21 March 2021 — Sept 2021

- Fix issues and add features to Javis.jl, the highest-starred open source 2D animation package in the Julia community
- Start and independently maintain JavisGraphs.jl as a package to animate network graphs using Javis.jl (work started as part of GSoC'21)

Open Horizon (IBM), The Linux Foundation Remote,
LFX mentee March 2021 — June 2021

- Implemented (in Go) a secret sharing mechanism between isolated edge nodes (agbots) and management nodes using Hashicorp Vault.
- Eliminated secret-leaking within nodes using access control lists.

Boost.C++ Remote,
Open Source contributor, GSOC'20 March 2020 — Sept 2020

- Designed a generic multidimensional histogram container class tailored for Boost.GIL using template meta-programming in C++11
- Implementation supports image processing algorithms with superior quality and comparable speeds to ones in OpenCV.

Course poster IIT Madras, India
EE 5121 - Prof. Uday Khankoje Sept 2022 — Nov 2022

- Solved a network utility maximization problem in a distributed fashion using accelerated dual descent method proving super-linear convergence.
- Presented findings in a departmental poster fair, garnering suggestions and feedback to publish results in a journal.

AWARDS

Bertelsmann Technology Nanodegree Scholar, Udacity Remote
Free course enrollment to top 500/50k based on course performance 2021

Kaggle's November ML Research Spotlight global winner Remote
1000 $ awared to top 3 out of all submissions Nov 2022

x2 times LiFT scholar Remote
Scholarship to pursue any Linux foundation sponsored certification course 2021, 2020

OTHER EXPERIENCES

Automation in games Pune, India
Intern, Ubisoft May 2019 — June 2019

- Developed an AI based game scorer for `Steep` to automatically find scoring bugs
- Created an intelligent RL agent using Deep Q-Learning and mobile object detection to correct scoring bugs within game

Software developer intern Bangalore, India
Samsung RnD IoT May 2020 — June 2020

- Created a high capacity web server on a low memory platform using the GO websocket library 'gobwas' and Linux epoller
- Designed and simulated a hypothetical network environment using docker containers to benchmark performance

IITB Mars Rover team Mumbai, India
Mars Rover project Sept 2018 — April 2019

- Integrated the visual SLAM algorithm Gmapping's feedback with the rover's control system (in ROS)
- Improved rover's path-planning module using the A* algorithm

SELF PROJECTS

Chain Reaction in DrRacket 2018,

- Implemented the popular game in Racket's (functional) programming language based on Scheme (a dialect of Lisp)
- Used higher order functions to develop the artificial intelligence (based on Mini-Max algorithm) in single player mode

Spacecraft mission simulation in OpenGL 2019,

- Created a 3D point plotting interface using GLFW to create meshes, trajectories and key frames

- Wrote shader level code to create realistic lightning effects and shadows during the animation

Edge based compression of cartoon images 2019,

- Implemented a carton image compression technique (comparable to JPEG 2000) in MATLAB based on a research paper
- Used edge contour information for encoding and homogeneous diffusion process to decode to the original image

3D Lightning Rendering in WebGL 2020,

- Created a web based 3D Lightning Rendering library in ThreeJS providing different charge configurations
- Solved the Laplace Equation in three dimensions and implemented a fast simulation algorithm to create lightning arcs

CERTIFICATIONS

LFCS Remote
Linux Foundation Certified Systems Administrator 2022-25

SKILLS

- **Programming:** Python, C/C++(11/14/17), Julia, Matlab, GoLang
- **Software:** Linux systems, Tensorflow, OpenGL, WebGL (three.js), Scikit-Learn, CUDA, ONNX, Zemax OpticStudio, Blender
- **Soft Skills:** Technical writing, mentoring, communications, organising workshops

VOLUNTEERING

Summer of code, Mentor (IITB) 2019,

- Guided development of a 3D traffic congestion modelling and monitoring software using OpenGL rendering pipeline
- Devised a generic road network visualising algorithm using Bezier Curve interpolation and Dijkstra's algorithm