# Meher Shashwat Nigam

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## Education

**International Institute of Information Technology, Hyderabad** — *Hyderabad, India*
*Bachelor of Technology (Honors) in Computer Science and Engineering (CSE)* — Aug 2017 – May 2021

- Honors in Computer Vision and Robotic Perception
- Dean's List Awardee (for being in the top 10% of the batch) for 5 semesters, CGPA: 9/10
- Research Award List - in recognition of undergraduate research contribution (2020-2021)

**Delhi Public School, Navi Mumbai** — *Navi Mumbai, Maharashtra*
*All India Senior School Certification Examinations (AISSCE), CBSE* — Aug 2011 – Apr 2017

- AISSCE, Grade 12, 98.2%. Ranked 1st position in Maharashtra state region.

## Publications

- ***RackLay: Egocentric Multi-Layered Layout Estimation for Warehouses with Sim2Real Transfer****
  A Prabhu, **M S Nigam**, T Karandikar, A Sahu, P Pathre, H Pandya, R K Sarvadevabhatla, KM Krishna. *Under review at IEEE International Conference on Robotics and Automation (ICRA, 2022), Philadelphia, USA [Project Page]

- ***Monocular Multi-Layer Layout Estimation for Warehouse Racks***
  **M S Nigam**, A Prabhu, A Sahu, P Gupta, T Karandikar, R K Sarvadevabhatla, KM Krishna. Published in ACM Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP, 2021), Jodhpur, India [Project Page]

- ***Synthetic 3D Data Generation Pipeline for Geometric Deep Learning in Architecture***
  S Fedorova, A Tono, **M S Nigam**, J Zhang, A Ahmadnia, C Bolognesi, D Michels. Published in International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (ISPRS, 2021), Nice, France [Project Page]

- ***Review of Geometric Deep Learning Algorithms for Monocular 3D Reconstruction in Architecture***
  A Tono, **M S Nigam**, S Fedorova, A Ahmadnia, C Bolognesi. Published in Representation Challenges: Augmented Reality and Artificial Intelligence in Cultural Heritage and Innovative Design (REAACH-ID, 2020), Milan, Italy

## Research Experience

**Centre for Visual Information Technology(CVIT), Robotics Research Center(RRC)** — *Hyderabad, India*
*Undergraduate Researcher in Robotics and Vision, IIIT Hyderabad* — May 2019 – Oct 2021

- Conducted research under Dr Ravi Kiran Sarvadevabhatla and Dr Madhav Krishna, on 3D computer vision tasks.
- Developed a procedural generation framework for synthetic warehouse scenes combined with an automated data capture and annotation piepline. Designed a network that generates bird's-eye view layouts for warehouse rack shelves from monocular images, which can be used to generate 3D reconstructions.
- Worked on monocular 3D reconstruction, ego-centric vision, semantic scene understanding and robotic navigation tasks.

**Department of Architecture and Construction Engineering** — *Remote*
*Undergraduate Researcher in Vision, Politecnico di Milano* — Sep 2020 – Aug 2021

- Involved in a research project with a diverse team from Stanford, Polytechnic University of Milan and KAUST where we worked on exploring applications at the intersection of Geometric Deep Learning and Architecture.
- Worked with Alberto Tono and Dr Cecilia Bolognesi on reviewing Geometric Deep Learning solutions for AEC applications and developing a synthetic data generation pipeline.

**Data Sciences and Analytics Center(DSAC)** — *Hyderabad, India*
*Undergraduate Researcher in Social Computing, IIIT Hyderabad* — Jan 2021 – Present

- Worked with Dr Nimmi Rangaswamy on literature survey and experimental analysis of algorithmic unfairness in network-based AI algorithms particularly in community detection and knowledge graph-based methods.
- Currently working on analysing twitter data for SOS tweets during the second COVID wave in India, for developing a framework for generating situational awareness for targeted relief efforts.

## Selected Coursework

**Artificial Intelligence**: Statistical Methods in AI, Artificial Intelligence, Optimization Methods, Information Theory
**Computer Vision and Robotics**: Computer Vision, Robotic Vision and Path Planning, Digital Image Processing, Graphics
**Systems**: Operating Systems, Computer System Organization, Networks, Database Systems, Formal Methods, Compilers
**Mathematics**: Probability and Statistics, Calculus, Linear Algebra, Discrete Structures
**Misc**: Blockchain, Information Security, Securities and Derivatives, Financial Markets, Portfolio Theory

## Work Experience

**Goldman Sachs** — *Bangalore, India*
*Quantitative Analyst, Global Markets Division* — Jul 2021 – Present

- Systematic Trading Strategies (STS) Team: Working in the algorithmic structuring team. Responsible for implementing and maintaining systematic quantitative strategies and indices for a wide range of clients and institutions.
- Developing sophisticated proprietary trading models and algorithms across different asset classes and markets.

Summer Analyst, Global Markets Division — May 2020 - Jul 2020

- Worked on managing high net worth multi-asset portfolios and increasing the daily analytics offered to clients on index level computation. Received a full-time offer for good performance.
- Improved and automated the generation of Index level attribution reports which was previously a partially manual process, making the overall process 7 times faster.

**DreamVu Inc.** — *Hyderabad, India*
*Computer Vision Engineer* — May 2019 – Jul 2019

- DreamVu has developed the world's first monocular omni-stereo camera hardware and software platform.
- Responsible for benchmarking the product output on various standard vision applications, to compare performance with similar products in the market, and created an SDK for future testing of camera output.
- Developed an image processing tool that could identify and remove glare(specularity) automatically from the stereo image pairs using a novel heuristic.

**Virtual Labs Engineering and Architecture Division, MHRD India** — *Hyderabad, India*
*Software Engineering and Product Development Intern* — Nov 2018 – Apr 2019

- Worked with Dr.Venkatesh Chopella to create interactive applications to explain core CS concepts to engineering college students, in collaboration with MHRD, Government of India.
- Conducted outreach programs for women and students from 2nd and 3rd tier engineering colleges in the backward regions of Telangana.

**Reliance Jio** — *Mumbai, India*
*Web Analytics Intern* — Jun 2018 – Jul 2018

- Worked in the Digital Analytics team, responsible for implementing analytics and tracking on the Jio website and app.
- Implemented user behavior flows, performance tracking and visualization on products and services introduced during the period to identify market trends, primary customer base and exploring new business opportunities.

## Teaching Experience

**International Institute of Information Technology, Hyderabad** — *Hyderabad, India*
*Teaching Assistant* — Aug 2020 – May 2021

- Teaching assistant for the courses on Digital Image Processing (Monsoon'20) under Dr. Ravi Kiran Sarvadevabhatla and Computer Vision (Spring'21) under Dr.Anoop Namboodiri
- Responsibilities included teaching, conducting weekly tutorials, mentoring projects, designing assignments, grading assignments, projects, and examinations for class size of 250 students.

**Robotics Research Center Summer School, Hyderabad** — *Hyderabad, India*
*Tutor and Mentor* — May 2021 – Jul 2021

- Worked as a tutor for the Summer School 2021 organized by RRC for new lab entrants and interns. Introduced students to various research topics in robotic vision.
- Conducted introductory lessons on deep learning, computer vision, transfer learning, optimization, and computational photogrammetry.

## Technical Skills

**Languages**: Python, C/C++, MATLAB, Javascript, Golang, SQL
**Machine Learning**: PyTorch, Torchvision, Tensorflow, OpenCV, Numpy, Pandas, Sklearn, Matplotlib, CVXPY, ROS
**Web Development**: Flask, React, Node, Express, MySQL, DynamoDB, Serverless, S3 bucket, Bootstrap, jQuery
**Misc**: Unity, Blender, OpenGL, Git, Linux, Solidity, Bash, LATEX, SEO

## Projects

**CertNet** | *Blockchain*
- Decentralized Blockchain Certificate Verification system, built using Solidity, deployed on Ganache

**SkillWallet** | *Blockchain, Recommendation Systems*
- SkillWallet is a platform for providing users with a blockchain-verified learning portfolio along with personalized learning recommendations. Runner up at the World Blockchain Hackathon, 2020.

**Stereo Reconstruction and Pose Estimation** | *Mobile Robotics*
- Generated a dense 3D point cloud reconstruction of a scene from a stereo image sequence by computing disparity maps, retrieved the pose of an arbitrary camera using iterative PnP and Gauss-Newton minimization

**Foreground extraction using GrabCut** | *Computer Vision*
- Python implementation of SIGGRAPH 2004 paper titled, *"GrabCut"* for foreground identification/extraction

**Reflection Removal using Ghosting Cues** | *Computer Vision*
- MATLAB implementation of paper titled "Reflection Removal using Ghosting Cues", CVPR 2015.

**3D, 2D Games and Simulators** | *Game Development*
- 3-D flight simulator of an aircraft with different viewing, movement, firing options. Made in C++ using OpenGL.
- Jetpack Joyride clone. Implemented movements of players in continuously moving 2D frame in C++ using OpenGL.
- Subway Surfers, browser version. Worked with shading, textures and lighting for better visuals. Made in WebGL.
- Built an imitation of the classic Space Invaders using PyGame and Terminal version of SuperMario in python, without external libraries.

**EKF for Trajectory Estimation** | *Mobile Robotics*
- Estimated the 2D pose and trajectory of a robot using sensor measurements from a wheel odometer and laser rangefinder, by applying an Extended Kalman Filter.

**Role of Information theory in Stock Market Analysis** | *Information Theory, Finance*
- Report on Sharpe-Markowitz portfolio theory, Kuhn Tucker characterization of optimal portfolios, Capital asset pricing models, Gambling theory.

**Ultimate Tic Tac Toe Bot** | *Artificial Intelligence*
- Used combination of search techniques(A* search, Minimax tree search, Alpha-Beta pruning) for lookup, searching and maximising winning chances for AI bot playing ultimate Tic-Tac-Toe (3x3 board, further divided into more 3x3 blocks).

**Linux Shell** | *Operating Systems*
- Developed a bash shell clone, a command line interpreter in C. It supports features such as piping, redirection, signal handling and background and foreground process management.

**Planning and Navigation Algorithms** | *Mobile Robotics*
- Implemented RRT: Rapidly-exploring Random Tree algorithm and Model Predictive Control Optimization for an omni-wheel robot to reach a goal in a 2D environment with obstacles.
- Implemented Velocity Obstacle/Collision Cone formulation for reaching a goal while avoiding moving obstacles

## Achievements and Others

- Selected for the Dean's List for Academic Excellence for 5 out of 8 semesters
- Selected for the Research List, 2021 in recognition of undergraduate research contributions
- Runner's up at World blockchain hackathon out of 1000 participants from 69 countries for proposed idea SkillWallet
- Runner's up at Megathon 2019 for the problem statement by PwC
- House sports captain at university, part of batch football team. Silver medalist in 25km cycling competition.
- JEE Mains 2017: Secured 99.94 percentile among 1.4 million candidates, JEE Advanced 2017: Ranked 2034 among 0.2 million candidates
- CBSE XII Boards Maharashtra topper, secured 98.2%. Received Letter of Appreciation for outstanding Academic Performance, Ministry of Human Resource Development, India
- Awarded KVPY fellowship under SA stream, secured ranked 205 among 0.2 million students across country