# Soumyaratna Debnath

Final Year Postgraduate (M.Tech)
Department of Computer Science and Engineering
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## Research Interests

Rendering-based optimization, Photogrammetry, and 3D shape analysis.
**Broad areas.** Computer Vision | Deep Learning | Computer Graphics | Meta-Heuristics

## Educational Qualification

| DEGREE | INSTITUTION | CPI / CGPA | YEAR |
|---|---|---|---|
| M.Tech W&S (CSE) | IIT Gandhinagar, Gandhinagar, Gujarat, India | 9.25 / 10 | 2022-2025 |
| B.Tech (CSE) | CGEC, Coochbehar, West Bengal, India | 9.34 / 10 | 2018-2022 |
| Class XII | APS Binnaguri, Binnaguri, West Bengal, India | 92.6 % | 2018 |
| Class X | APS Binnaguri, Binnaguri, West Bengal, India | 10 / 10 | 2016 |

## Experiences

1. **Researcher at CVIG Lab, IIT Gandhinagar** **Mar 2024 – Present**
   Serving as a *Project Fellow* at the Computer Vision, Imaging, and Graphics (CVIG) Lab, IIT Gandhinagar, under the mentorship of Dr. Shanmuganathan Raman. I have contributed to the *Smart Farming* project with Larsen & Toubro Technology Services and the *Smart City Initiative* under the AI Centre of Excellence (AICoE), Ministry of Education, Government of India.
2. **Software Developer at IMS, IIT Gandhinagar** **Aug 2022 – Feb 2024**
   Developed and maintained modules of the Institute Management System (IMS), an ERP solution for IIT Gandhinagar to streamline operations across departments and facilities.
3. **Research Intern, Department of CSE, CGEC, West Bengal** **Sept 2020 – Feb 2022**
   Conducted research on soft computing and meta-heuristics based algorithms for multi-level image segmentation and thresholding. These works were concluded in two conference publications and a book chapter.

## Publications

1. **L3D-Pose: Lifting Pose for 3D Avatars from a Single Camera in the Wild** *Under peer-review*
   ***Soumyaratna Debnath***, *Shashikant Verma, Harish Khatti, and Shanmuganathan Raman*
2. **Simultaneous Tracking and Estimation of Pose** *Under peer-review*
   ***Shashikant Verma,*** *Harish Khatti, Soumyaratna Debnath, Yamuna Swami and Shanmuganathan Raman*
3. **Generating Scribble Art through Meta-heuristics**
   *SIGRAPH Asia 2024 - Long Art Paper Track*
   ***Soumyaratna Debnath***, *Ashish Tiwari and Shanmuganathan Raman*
4. **Modified Harris Hawk Optimization Algorithm for Multi-level Image Thresholding**
   *Published as a Chapter in Hybrid Computational Intelligent Systems*
   ***Soumyaratna Debnath***, *Abhirup Deb, Sourav De, Sandip Dey*
5. **Multilevel Image Segmentation Using Modified Red Deer Algorithm**
   *2021 11th International Conference on Cloud Computing, Data Science & Engineering*
   *Sandip Dey, Sourav De, Abhirup Deb,* ***Soumyaratna Debnath***
6. **A New Modified Red Deer Algorithm for Multi-level Image Thresholding**
   *2020 Fifth International Conference on Research in Computational Intelligence and Communication Networks*
   *Sourav De, Sandip Dey,* ***Soumyaratna Debnath****, Abhirup Deb*

## Research Projects

1. **Shadow Guided Optimal Packing and Assembly of General 3D Shapes.** Working on a novel approach for optimizing the packing of arbitrarily shaped objects by analyzing shadows cast from different angles, and extending this technique to guide the precise assembly of object components.
2. **AI-powered Traffic Management Solutions for Sustainable Cities.** Worked on a deployable AI-powered traffic management solution, *IndAINagar*, to monitor urban traffic using CCTV and drones in Indian settings. The project was undertaken by the AI Centre of Excellence (AICoE) under the Ministry of Education, Government of India.
3. **Analysis of Cotton Crop Fields using Aerial Imagery.** Leveraged drone-captured imagery to monitor and analyze cotton crops in agricultural fields. The initiative was carried out in collaboration with L&T Technology Services.
4. **Tracking and Pose Estimation of Primates.** Conducted research to develop a novel transformer-based architecture for tracking and estimating poses in primates simultaneously for wildlife monitoring and behavioral studies. The research was in collaboration with Dr. Harish Katti, from the Laboratory of Neuropsychology (LN), National Institute of Mental Health (NIMH), United States.
5. **ScribGen.** The research involved designing meta-heuristics algorithms that could interpret and transform images into complex, aesthetically pleasing scribble artworks.
6. **Augmented Reality-based Product Catalog.** Developed an AR-based Android application that displays 3D models of furniture directly above the physical catalog, enabling users to visualize items in realistic detail and scale for enhanced decision-making.
7. **Picrypt It.** Developed a desktop application for embedding password-protected text within color images, utilizing encryption techniques such as Vernam and Playfair Cipher.

## Achievements

1. Finalist, Qualcomm Innovation Fellowship India 2024-25 for the project proposal *"Shadow Guided Optimal Packing and Assembly of General 3D Shapes"*.
2. Granted a Copyright from the Government of India for the software project *"Picrypt It"* which introduces an innovative method for embedding password-protected texts within color images.
3. Qualified GATE 2021 *(92.8 percentile)* and GATE 2022 *(96.11 percentile)*
4. Second Runner-Up, *"Code Meets Art"* competition (2024) organized by the Department of Computer Science and Engineering, IIT Gandhinagar.
5. Finalist, *NanoArtography 2023*, an internationally acclaimed science image competition, organized by Anasori Lab at Purdue University.
6. Awarded the Chairman Medal of Excellence for extraordinary academic performance from Army Public School Binnaguri – 2018.
7. Awarded with Certificate of Merit from the Central Board of Secondary Education for outstanding academic performance *(a perfect 10 CGPA)* in the All India Secondary School Examination 2016.