Soumyaratna Debnath

Final Year Postgraduate (MTech Work & Study)
Department of Computer Science and Engineering
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Research Interests

Rendering based optimization 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 (CBSE Board)	APS Binnaguri, Binnaguri, West Bengal India	92.6 %	2018
Class X (CBSE Board)	APS Binnaguri, Binnaguri, West Bengal India	10 / 10	2016

Experiences

1. **Researcher at CVIG Lab, IIT Gandhinagar** **Mar 2024 – Present**
   Researcher in the Computer Vision, Imaging, and Graphics (CVIG) Lab at IIT Gandhinagar. Working under the guidance of Prof. Shanmuganathan Raman on multiple projects in the field of Computer Vision.
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 IITGN to streamline operations across departments and facilities. Worked with Angular, DotNET, C# and MS-SQL
3. **Research Intern, Department of CSE, CGEC, West Bengal** **Sept 2020 – Feb 2022**
   Conducted research on meta-heuristics-based optimizations for multi-level color image segmentation and thresholding. Explored image processing for theme modulation and image-based steganography.

Publications

1. **Generating Scribble Art through Meta-heuristics**
   Under proceedings.
   Soumyaratna Debnath*, Ashish Tiwari and Shanmuganathan Raman*.
2. **CottonDAD: Cotton Data Analysis Dataset**
   Under proceedings of Neural Information Processing Systems (NeurIPS) 2024
   Mahek Vyas, ***Soumyaratna Debnath****, Akbar Ali, Jaidev Khalane, Reuben Devanesan, Prakram Rathore, Subramanian Sankaranarayanan, Pankaj Khanna, Shanmuganathan Raman*
3. **Simultaneous Tracking and Estimation of Pose**
   Under proceedings.
   Shashikant Verma, Harish Khatti, ***Soumyaratna Debnath****, Yamuna Swami and Shanmuganathan Raman*.
4. **A New Modified Red Deer Algorithm for Multi-level Image Thresholding**
   Published in 2020 Fifth International Conference on Research in Computational Intelligence and Communication Networks.
   Sourav De, Sandip Dey, ***Soumyaratna Debnath****, Abhirup Deb*
5. **Multilevel Image Segmentation Using Modified Red Deer Algorithm**
   Published in 2021 11th International Conference on Cloud Computing, Data Science & Engineering.
   Sandip Dey, Sourav De, Abhirup Deb, ***Soumyaratna Debnath***

6. **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*

Projects

1. **AI-powered Traffic Management Solutions for Sustainable Cities –** Working on deployable AI-powered traffic management solutions to optimize urban traffic systems. This project involves training deep learning models for traffic analysis using CCTV and drones in Indian settings, incorporating both 2D and 3D perspectives to ensure comprehensive coverage and accuracy.
2. **Analysis of Cotton Crop Fields using Aerial Imagery –** Utilized drone-captured images to monitor and analyze cotton crops in the agricultural fields. Implemented modules for cotton crop detection, segmentation, and cotton buds counting. Applied low-light enhancement, deblurring, and super-resolution to improve image clarity and utility. Designed and implemented a UI based web application to facilitate seamless interaction. The project was in association with L&T Technology Services Vadodara.
3. **Tracking and Pose Estimation of Primates –** Developed a transformer-based architecture for tracking and estimating poses in primates, enhancing real-time analysis and understanding of their movements for advanced wildlife monitoring and behavioral studies.
4. **ScribGen –** The project involved designing meta-heuristics algorithms that could interpret and transform images into complex, aesthetically pleasing scribble artworks.
5. **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.
6. **Picrypt It! –** Web based application designed to embed password-protected text within color images, utilizing encryption techniques such as Vernam Cipher and Playfair Cipher.

Achievements

1. Finalist, Qualcomm Innovation Fellowship India 2024 for the project “Shadow Guided Optimal Packing and Assembly of General 3D Shapes”.
2. Granted a copyright for the software project “Picrypt It” for proposing a method for inscribing color images with password-protected texts.
3. Qualified GATE 2021 (92.8 percentile) and GATE 2022 (96.11 percentile)
4. Secured third position in “Code Meets Art” competition (2024) organized by Dept of CSE, IIT Gandhinagar.
5. Selected as finalists in NanoArtography 2023, an internationally acclaimed science image competition, organized by Anasori Lab at Purdue University.
6. Awarded with Chairman Medal of Excellence (Army Public School Binnaguri – 2018)