Preeti Verma

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EDUCATION

Eötvös Loránd University, University of Girona (UdG) **Sept. 2022 - June 2024**
Master in Intelligent Field Robotic Systems (IFRoS); Erasmus+ Scholar *Hungary, Spain*

ZHCET, Aligarh Muslim University (AMU) **Aug. 2017 – Jul. 2021**
Bachelor of Technology in Electrical Engineering; GPA: 9.24/10 (in top 5%) *Aligarh, India*

TECHNICAL SKILLS

Programming Languages: Python (Proficient), C++ (Intermediate)
Software Skills: ROS, Gazebo, MATLAB/Simulink, Microsoft Visio, Proteus, Latex, Microsoft Office
Libraries and Frameworks:

NumPy, pandas, Shapely, scikit-learn, open3d, OMPL, py_trees, SciPy, OpenCV, PIL, simpleITK

Deep Learning: Proficient in PyTorch, TensorFlow

Reinforcement Learning: Stable Baselines, OpenAI Gym

Tools: Git, Docker, CAN
Operating Systems: Linux, Windows
Sensors: 2D/3D LIDAR, Event-based/Standard Cameras, GPS, IMU.

WORK EXPERIENCE

Artificial Intelligence Researcher **January 2025 – Present**
Micelab, UdG *Girona, Spain*

- Designed, implemented, and validated MPC and PID controllers in MATLAB for personalized glucose dosing using a simulated diabetes patient model.
- Developing and testing a real-time glucose controller for clinical trials at a local hospital.
- Contributing to EU AI project proposals as part of a cross-functional bid team, writing technical sections and defining project scope.

Research Assistant **November 2021 – June 2022**
Non-Conventional Energy Laboratory, AMU *Aligarh, India*

- Conducted seminars on Typhoon HIL training for undergraduate students.
- Performed research on optimal maximum power point tracking for photovoltaic systems using Typhoon HIL, focusing on optimization through metaheuristic algorithms.
- Co-supervised Master's thesis and guided Bachelor's students in research projects.

RESEARCH EXPERIENCE

Autonomous Navigation using Deep Reinforcement Learning (DRL) **Feb 2024 – June 2024**
Master thesis student at UdG *Girona, Spain*

- Developed a custom Gymnasium environment tailored to test DRL algorithms in autonomous navigation scenarios.
- Implemented a lidar data downsampling method to reduce computational costs while maintaining navigation efficiency.
- Conducted a comparative analysis of Soft Actor-Critic and Proximal Policy Optimization algorithms, using the Stable-Baselines3 library, providing insights into their performance in various environments.
- Read the full thesis

Medical Imaging Quality Assessment with Radiomics **July 2023 – August 2023**
Research intern at BCN-AIM lab, University of Barcelona *Barcelona, Spain*

- Evaluated synthetic data generation techniques, emphasizing clinically relevant features and biomarkers, addressing the lack of standardized evaluation metrics.
- Investigated Radiomics Fréchet inception distance (FID) and FID ratio robustness against normalization, comparing them with regular FID metrics.

- Explored the influence of image quality on Radiomics FID performance, particularly with lower-quality images. Outcome: Established the proposed metric's heightened sensitivity to noise, indicating its potential in noisy imaging environments.
- Examined the correlation between Radiomics FID and downstream task performance, assessing its predictive value in clinical decision-making.
- Utilized various libraries, including os, numpy, torch, PIL, scipy, SimpleITK, Pyradiomics, and other important libraries for comprehensive data analysis.

Autonomous Robotic Explorer and Manipulator **February 2023 – July 2023**

Master student at UdG *Girona, Spain*

- Engaged in a 2-month project collaboratively, focusing on transforming a differential drive robot equipped with a 4-DOF robotic arm into an autonomous explorer and mobile manipulator using ROS (Robot Operating System).
- Took an active role in the project by contributing to the implementation of a frontier-based exploration algorithm, merging Rapidly Exploring Random Trees and the Dynamic Window Approach. This solution was rigorously tested in both Gazebo and Stonefish simulator environments. [Planning project]
- Played an integral part in developing Pose-based EKF SLAM, integrating Iterative Closest Point (ICP) scan matching for real-time localization and mapping using data from lidar odometry and IMU sensors. [Localization project]
- Implemented an efficient event-based feature tracking methodology using the ICP algorithm for Dynamic and Active-pixel Vision sensor (DAVIS) data, optimizing computational processing for high-frequency event streams. [Perception project]
- Participated in enhancing the robot's perception capabilities by integrating a RealSense camera and implementing an ArUco marker detection pipeline to achieve precise object identification.
- Collaborated in designing and developing Task Priority Redundancy Resolution algorithms, ensuring efficient and secure manipulation of objects, including tasks like object picking, transportation, and placement. [Intervention project]
- Contributed to the collaborative effort to achieve autonomous decision-making, leveraging the power of Behavior Trees through the py_trees library. This effort resulted in a robot capable of making intelligent and seamless decisions in its operations. [Project Video1, Project Video2]

Multi-Span Medical Question Answering **June 2022 – August 2022**

Research Intern at IIT Patna *Aligarh, India*

- Team of five developed a transformer-based query semantic and knowledge-guided multi-span question-answering model (QueSemKnow) for Medical Question Answering (MedQA) tasks.
- Proposed a two-phased approach: a multi-task model for extracting query semantics, including intent identification and question type prediction, and context selection and answer extraction based on semantic information and relevant knowledge from a knowledge graph.
- Built a semantically aware medical question-answering corpus called QueSeMSpan MedQA, tagging each question with its semantic information.
- Demonstrated the effectiveness of the QueSemKnow model by outperforming several baselines and existing state-of-the-art models on multiple datasets.

A computer Vision based Disease and Quality prediction technique **June 2021 – July 2021**

Research group member *Aligarh, India*

- Team of five researched the classification of potatoes and lemons based on their quality into three classes, i.e., healthy, diseased, and rotten.
- Utilized a quality based-classification technique using a Convolutional Neural Network, followed by several computer vision procedures like colour, shape, and texture extraction.
- Responsible for data curation and software visualization.
- Achieved accuracy of 94.1% for classification.

PUBLICATIONS

- R. Osuala, D. Lang, **P. Verma**, S. Joshi, A. Tsirikoglou, G. Skorupko, K. Kushibar, L. G. Morras, W. L. Pinaya, O. Diaz, J. A. Schnabel, and K. Lekadir, "Towards Learning Contrast Kinetics with Multi-Condition Latent Diffusion Models," 27th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2024), Oct. 6 - Oct. 10, 2024, Marrakesh, Morocco.
- A. Tiwari, S. Bera, **P. Verma**, J. V. Manthena, S. Saha, P. Bhattacharyya, M. Dhar, and S. Tiwari, "Seeing is believing! Towards Knowledge-Infused Multi-modal Medical Dialogue Generation," 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation (LREC-COLING 2024), May 20 - May 25, 2024, Torino, Italy.

- A. Tiwari, A. Bhansali, S. Saha, P. Battacharya, **P. Verma**, and M. Dhar, "Local context is not enough! Towards Query Semantic and Knowledge Guided Multi-Span Medical Question Answering," 26th European Conference on Artificial Intelligence (ECAI 2023), Sept. 30 - Oct. 4, 2023, Kraków, Poland.
- **P. Verma**, A. Alam, A. Sarwar, M. Tariq, H. Vahedi, D. Gupta, S. Ahmad, and A. Shah Noor Mohamed, "Meta-Heuristic Optimization Techniques Used for Maximum Power Point Tracking in Solar PV System," *Electronics*, vol. 10, no. 19, p. 2419, Oct. 2021.

PROJECT

Pomona 3D Graph SLAM Online Environment Mapping **September 2023 – December 2023**

Robotics Project *Budapest, Hungary*

- Led a 2-member team in implementing the Pomona 3D Graph SLAM online environment mapping project, employing ROS as the primary implementation platform.
- Integrated sensor data from 3D Lidar, GPS, IMU, and CAN protocol with ROS, utilizing advanced sensor fusion techniques to enhance pose graph accuracy and optimize mapping results for the Pomona robot.
- Customized and fine-tuned algorithms within the hdl_graph_slam GitHub repository, tailoring them specifically for the ROS framework and the unique requirements of the Pomona robot.
- Conducted comprehensive comparative analyses of mapping performance using GPS, IMU, and their combination within the ROS ecosystem, emphasizing the importance of ROS in facilitating seamless integration and communication among system components.

Meta-heuristic Optimization Algorithms **August 2020 – May 2021**

Undergraduate Final Year Project *Aligarh, India*

- Led the 3-member team to work on meta-heuristic optimization algorithms for following the maximum power point of PV arrays under partial shading conditions.
- Reviewed 18 optimization techniques and executed simulation on Simulink software for Particle Swarm Optimization, Cuckoo Search, Jaya Algorithm.
- Critiqued the algorithms based on various parameters such as complexity, tracking speed, tracking accuracy, steady-state oscillations, etc., and documented the findings like Jaya Algorithm outperforms the other two in terms of accuracy.

LANGUAGE PROFICIENCY

- English (Fluent)
- Spanish (Beginner)
- Hindi (Native)

POSITION OF RESPONSIBILITY

- **Reviewed** two articles related to optimization algorithms for Scientific Reports, an open-access journal, in 2022.
- Served as **Research Assistant** at AMU for the period of three months for a Project on optimization algorithm implementation in real time using Typhoon HIL in collaboration with UNSW-Canberra, Australia.
- Supervised a five-member team for organizing Vazeto and Picturesque events in College Fest ZARF 2019.
- Elected as the House-captain of my school in 2014 and 2015, consecutively. My role was to communicate the relevant news to house members, motivate the students to participate in extracurricular activities, and assist the solidarity campaigns events.

ACHIEVEMENTS

- Awarded Global Korea Scholarship (GKS), and Banach Scholarship for pursuing Masters in Computer Science and Erasmus Mundus Joint Masters scholarships - Erasmus+, prestigious scholarship for Master's program in Intelligent Field Robotic SYstems (IFRoS), based on academic merit and demonstrated potential in the field.
- Participated in EMBARK 2021 organized by Upraised and qualified to the pre-final round among top 2% performers out of 4,55,534 participants in design track.
- Awarded AWS Machine Learning Scholarship in 2021. This scholarship program aimed to up-level the machine learning skills to all and cultivate the next generation of ML leaders worldwide.
- Awarded Chiragdeep Scholarship in 2017. This scholarship promotes girls to pursue higher education goals by providing monthly stipends that abide by the academic excellence for full degree programs.
- Took part in Women's Power Race of 2.5 km on Home-guard Day Celebration in 2014 and obtained the tenth rank among 250 candidates.
- Granted Merit Certificate for securing more than 50 percentile in the National Financial Literacy Assessment Test, 2014 in India.

REFERENCES

Dr. Palomeras Rovira, Narcis

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University of Girona (UdG)
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