Zahra Khan

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Profile

Robotics and AI Engineer with expertise in intelligent systems, autonomous navigation, and learning-based control. Skilled in developing and evaluating algorithms for motion planning, perception, and decision-making in robotic environments. Strong background in Python programming, mathematical modeling, and deep learning frameworks. Experienced in integrating robotics with machine learning and reinforcement learning to create adaptive and efficient systems. Passionate about advancing research and innovation in robotics and artificial intelligence.

Area of expertise include:

- Artificial Intelligence: Machine Learning, Reinforcement Learning, Computer Vision, Deep Learning, Neural Networks, Proactive Learning, Large Language Models (LLMs)
- Robotics: Robot Operating System (ROS1, ROS2), SLAM, Motion Planning, Trajectory Optimization, Medical Soft Robotics, Surgical Robotics
- Programming: Python, C++, MATLAB
- Tools and Frameworks: StableBaselines3, Gymnasium, MuJoCo, Gazebo
- Software Development: Git, Linux, Agile Methodology
- Languages: Proficient in English

Objective: To contribute to cutting-edge research and development in Robotics and Artificial Intelligence by applying my skills in machine learning, deep learning, and intelligent system design.

Work Experience

AI Researcher – Center of Excellence in Artificial Intelligence, Baharia University
Islamabad, Pakistan – October 2024- Present

- Contributed to industrial projects, including AI-driven drone technologies for warehouse automation.
- Applied Large Language Models (LLMs) for automated literature review and adaptive decision-making systems.
- Designed AI-based solutions for industrial applications.
- Designed AI-based systems for clinical diagnostics and robotic workflows.
- Collaborated with teams to ensure timely project delivery and knowledge sharing.

Research Student – Intelligent Robotics Lab (NCAI), National University of Science and Technology (NUST)
Islamabad, Pakistan – 2022- 2025

- Conducting advanced research on motion planning in cluttered environments using reinforcement learning techniques.
- Developed and implemented novel algorithms to optimize path planning in complex environments, contributing to advancements in autonomous navigation.
- Collaborating with a multidisciplinary team to integrate reinforcement learning-based models into autonomous robotic systems for real-world applications.

Teaching Assistant - National Vocational and Technical Training Commission (NAVTTC)
Islamabad, Pakistan – May 2024 – July 2024

- Delivered courses on Robotics, Artificial Intelligence, 3D Printing, Arduino Programming, and Machine Learning to students, focusing on both theoretical and practical aspects.
- Developed comprehensive instructional materials and provided hands-on guidance to ensure effective learning.
- Fostered an engaging and interactive learning environment, encouraging student participation and enhancing their problem-solving skills.

Research Intern - Aerial Robotics Lab National University of Science and Technology (NUST)
Islamabad, Pakistan - June 2022 – Aug 2022

- Spearheaded research involving the development of a Machine Learning model for the detection of COVID-19 in HRCT lung images.
- Curated and processed HRCT images of COVID-19 patients, preparing them for analysis.
- Employed Transfer Learning techniques to create a robust model achieving 86% accuracy in identifying COVID-19 from HRCT images.

Research Intern - International Center of Chemical and Biological Sciences (ICCBS)
Karachi, Pakistan - June 2021 – Aug 2021
- Ensured safety and functionality of various spectrometry and Electrical equipment through effective maintenance procedures.
- Conducted field surveys and analyzed data to troubleshoot and resolve power systems and equipment issues.
- Supervised the installation of electrical systems within the building, ensuring adherence to industry standards.

Relevant Projects

Automated Literature Review with Large Language Models – Center of Excellence in AI, Islamabad, Pakistan
- Developed an automated literature review system using Python, Flask, and the LLaMA 3.0 8B model to extract, summarize, and synthesize research trends in robotics and AI.
- Designed a user-friendly web interface for querying research papers, enabling efficient knowledge discovery and reducing manual effort.
- Demonstrated the potential of combining reinforcement learning concepts with LLM-driven text processing, highlighting the adaptability of conversational AI for research automation and decision support.

Robot Trajectory Planning – NUST, Islamabad, Pakistan
- Researched and implemented trajectory optimization algorithms in MATLAB.
- Enhanced robotic motion efficiency in simulated environments.

Motion Planning with SLAM Integration - IRL, NCAI, NUST, Islamabad, Pakistan
- Integrated SLAM-based localization with motion planning algorithms.
- Compared performance of DWA, TEB Planner, and MPC Planner.

COVID-19 Detection in HRCT Scans - Aerial Robotics Lab, NUST, Islamabad, Pakistan
- Developed a robust machine learning model for COVID-19 diagnosis with 95% accuracy.
- Leveraged advanced image processing and transfer learning techniques.

Autonomous Car Controller Prototype - COMSATS University, Islamabad, Pakistan
- Designed an autonomous driving prototype using MATLAB.

Image Classification with UNET and DeepLabv+ - NUST, Islamabad, Pakistan
- Implemented state-of-the-art image segmentation models for classification tasks.

Education

MS in Robotics and Intelligent Machine Engineering - National University of Science and Technology (NUST), Islamabad, Pakistan – 2021 - 2025
CGPA: 3.85/4.00 | Thesis: Motion planning of Differential Derive robots in Cluttered Environments using Deep Reinforcement Learning
BS in Electrical Telecommunication Engineering – COMSATS University Islamabad, Pakistan – 2016 - 2020
CGPA: 3.21/4.00 | Thesis: designing of the holographic microscopic device for the detection of pathogenic samples.

Certifications

- **Da Vinci Surgical Robot Workshop 1** – Johns Hopkins University
- **Da Vinci Surgical Robot Workshop 2** – Johns Hopkins University:
  Hands-on training in robotic-assisted surgery using Da Vinci system, emphasizing surgeon-robot interaction, control systems, and clinical integration.
- **Workshop on Deep Reinforcement Learning** – Coventry University
- **AI- NUEX Tutor** – National Center of Artificial Intelligence
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Honors and Awards

- **Prime Minister's Laptop Scheme**: by Higher Education Commission (HEC) for academic excellence.
- **Leader Shift Program**: Selected for leadership initiatives at COMSATS University.

Publications

Z. Khan, K.F. Iqbal, Y. Ayaz, and M.T. Nasir, "A Map-Informed Dense Reward Function for Efficient Robot Motion Planning Using Deep Reinforcement Learning", Knowledge-Based Systems **(Submitted)**
Impact Factor: 7.8

References

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