PhD Researcher
Muhammad Mohsin

RESEARCH INTERESTS

Machine Learning, Medical Imaging Analysis, Deep Learning, Computer Vision, Circular Economy

EDUCATION

PhD in Computer Science (In progress)   January 2022 – December 2024
Department of Computer Science, Bioengineering, Robotics and Engineering (DIBRIS), University of Genova, Italy

Master of Science (MS) in Computer Engineering (Research-Based)   September 2017 – August 2021
College of Electrical & Mechanical Engineering (CEME) National University of Sciences & Technology (NUST), Islamabad

Bachelor of Science (BSc) in Computer Engineering   September 2013 – July 2017
University of Engineering and Technology (UET), Taxila

RESEARCH EXPERIENCE AND PROJECT

Selective disassembly of electronic components from WEEE using Artificial Intelligence

- The recycling of WEEE allows the recovery of many raw materials to be reused in new production processes.
- In present, out of 50 different materials including plastics and rubbers present in WEEE only fifteen are recycled.
- Preparing data acquisition environment for robust waste PCBs dataset and developing light weight object detection algorithm to detect different electronic components on the waste circuit boards.
- Development of a computer vision and deep learning-based disassembly method for selecting different electronic components on waste circuit boards.
- Implementing a robotic sorting system that eases the physical and chemical processes for the extraction of specific critical raw materials.
- Enhancing the density of specific critical raw materials and making their extraction more efficient.

Automatic Prostate Cancer Grading Using Deep Architecture

- Conducted research for developing Automatic Prostate Cancer Grading model using latest Artificial Intelligence-based Deep learning technique.
- Participated internationally in Gleason 2019 Challenge and achieved good rank.
- The model was selected in JEJU National University South Korea in a Machine Learning Camp 2019.

Segmentation of Glioma Tumor in Brain MRI Images

- The research focused on abnormal cell growth in brain tissues.
- This research aimed to design an automatic brain tumor segmentation model that separates tumor tissue, i.e., edema, tumor core, from the healthy tissues, i.e., white cells, Cerebrospinal Fluid, and gray matter.
- The latest deep learning algorithms were used with Python to complete this research.

Towards Automatic Recognition of Sounds Observed in Daily Living Activity

- The aim of this research was to observe different sounds from the daily living activity of humans.
- Proposed a sound detection model that can assist humans and caretakers in recognizing any abnormal sound activity of an individual.
- Deep learning algorithms were used with conventional machine learning classification techniques to achieve state-of-the-art results.

Intelligent Monitoring Robot for Navigation and Assistance

- Developed autonomous robot to monitor or observe a particular person or location on his/her designated position within the office environment.

- It was an on-board computer vision and maneuvering system using Raspberry Pi and Arduino microcontrollers, which reduces the human involvement of finding a specified person within a building/department.

RESEARCH PUBLICATIONS

1. **Muhammad Mohsin,** Francesco Masulli, Stefano Rovetta, Danilo Greco, Alberto Cabri (2024). Deep Learning-Powered Computer Vision System for Selective Disassembly of Waste Printed Circuit Boards. 2024 IEEE 8th Forum on Research and Technologies for Society and Industry (RTSI), at Politecnico di Milano – Polo Territoriale di Lecco. (In press)

2. **Muhammad Mohsin,** Xianlai Zeng, Stefano Rovetta, Francesco Masulli (2024)**.** Measuring the Recyclability of Electronic Components to Assist Automatic and Sorting Waste Printed Circuit Boards. The 19th International Conference on Solid Waste Management and Technology (ICWMT19), Hangzhou, China. https://doi.org/10.48550/arXiv.2406.16593

3. Fatima Batool, **Muhammad Mohsin** (2024). Impact of Green Innovation on Business Sustainability of Firms and the Mediating Role of Green Intellectual Capital. Educational Administration: Theory and Practice 30(4). https://doi.org/10.53555/kuey.v30i4.1528

4. **Muhammad Mohsin,** Francesco Masulli, Stefano Rovetta, Alberto Cabri (2023). Virtual Mines – Component-level recycling of printed circuit boards using deep learning. The Italian Workshop on Neural Networks (WIRN 2023), Vietri sul Mare (SA), Italy. https://doi.org/10.48550/arXiv.2406.17162

5. Alberto Cabri, Francesco Masulli, Stefano Rovetta, **Muhammad Mohsin** (2022). Recovering Critical Raw Materials from WEEE using Artificial Intelligence. 33rd European Modeling & Simulation Symposium 18th International Multidisciplinary Modeling & Simulation Multi conference https://www.msc-les.org/i3m2022/

6. **Muhammad Mohsin**; Arslan Shaukat; Usman Akram; Muhammad Kaab Zarrar (2021). 18th ACS/IEEE International Conference on Computer Systems and Applications AICCSA 2021, Tangier, Morocco. https://doi.org/10.1109/AICCSA53542.2021.9686869

7. Arslan Shaukat; Ammar Younis; Usman Akram; **Muhammad Mohsin**; Zartasha Mustansir (2019). Towards Automatic Recognition Sound Observed in Daily Activity. 2019 IEEE 18th International Conference on Cognitive Informatics & Cognitive Computing (ICCI*CC) Milan, Italy https://doi.org/10.1109/ICCICC46617.2019.9146067

8. Muhammad Kaab Zarrar; Farhan Hussain; **Muhammad Mohsin**; Rubab Sheikh (2019). Latest Trends in Automatic Glioma Tumor Segmentation and an Improved Convolutional Neural Network-based Solution. 2019 IEEE13th International Conference on Mathematics, Actuarial Science, Computer Science and Statistics (MACS), Karachi, Pakistan. https://doi.org/10.1109/MACS48846.2019.9024815

WORK EXPERIENCE

PhD Researcher   January 2022 - Present
University of Genoa, Genoa, Italy

- Working on a research project focused on advancing Artificial Intelligence based techniques for selective disassembly and sorting of waste PCBs.
- Developed custom dataset to assist automatic disassembly and sorting of waste PCBs.
- Designed and developed Computer Vision based models for automatic selective disassembly of waste PCBs.
- Actively participated and organized the PhD seminar series and workshops at DIBRIS University of Genoa, Italy
- Visited World Artificial Intelligence Cannes Festival (WAICF 2023) held in Cannes France to learn about latest advancements in AI-based innovations technologies.

Visiting PhD Researcher   December 2023 – May 2024
Tsinghua University, Beijing, China

- Collaborated with experts in e-waste recycling and circular economy at The School of Environment, Tsinghua University, Beijing, China.
- Performed data collection and experiments in Key State Laboratory of School of Environment for elemental analysis of waste PCBs to assist automatic disassembly systems.
- Developed multi-criteria algorithms based on innovative methods to measure the recyclability of electronic components present on waste circuit boards.
- Participated in Seminar series focused on recent status of e-waste and possible solutions for efficient recovery of high valued materials.

- Visited waste PCBs recycling plant in Zhengzhou China to explore the latest technology used for the recovery of precious metals and other critical raw materials.
- Attended and presented the research paper based on multi-criteria for recyclability measurement of electronic components in "The 19th International Conference on Solid Waste Management and Technology" (ICWMT19) held in Hangzhou, China.

Research Assistant | August 2019 – July 2021
College of Electrical and Mechanical Engineering (CEME)
National University of Sciences & Technology (NUST), Islamabad

- Conducted research and worked on projects related to medical imaging analysis using the tools Google Colab, PyCharm, Jupyter Notebook, Anaconda, MATLAB, Python.
- Documented the research work and publications.
- Created progress reports of projects in the English language.
- Published the research work in international conferences.
- Research work was selected in JEJU National University South Korea.

Machine Learning Expert at Fiverr and Upwork (Freelance) | February 2017 – Present
International Freelance Marketplace

- Designed different classification and segmentation models based on machine learning and deep learning.
- Completed more than 200 projects with sales of 10000$
- Regularly assisted students internationally in their courses like pattern analysis, machine learning, deep learning, image processing, and Python.

Internee Engineer at National Telecommunication Corporation Multan. | July 2016 – August 2016

- NTC is the official Telecom/ICT service provider to the government of Pakistan.
- Practically experienced the basic concept of switching and go smart data network techniques for better wireless connections.
- Visited the whole server room and learned how the switching techniques and power system works.

DIGITAL SKILLS

- **Data Science & AI:** Keras, TensorFlow, PyTorch, NLTK, Pandas, NumPy, SciPy,Git, Github
- **Computer Languages:** Python, C/C++, JAVA, Assembly, Shell, R, HTML/CSS, JavaScript, HDL
- **Software's and IDEs:** Ubuntu, PyCharm, Jupyter Notebook, Google Colab, Dev C++, MATLAB, Eclipse, Visual Studio, MySQL, Spyder, R-studio, OpenCV, Xilinx
- **Embedded Systems:** FPGAs, Jetson Nano, Arduino, Microprocessors

TRAINING AND CERTIFICATIONS

Summer Schools/Courses at University of Genova Italy | January 2022 November 2023

- Machine learning: A Computational Intelligence Approach
- Machine learning Crash Course
- Deep Learning: hands-on introduction 2022
- High Performance Computing
- Paper Writing
- Effective Habits and Skills for Successful Young Researchers
- Trustworthy Artificial Intelligence
- Data Science Summer School by Herti School Data Science Lab

Online Coursera | January 2023 - February 2024

- Introduction to Docker: The Basics
- Linear Algebra for Machine Learning and Data Science
- Data Visualization with Python
- Docker for Absolute Beginners
- AI For Everyone
- Understanding Research Methods
- Utilized Linkdin for Career Search

INTERNATIONAL CERTIFICATIONS

IEEE Computer Society   January 2024 - Present

- Participating in online webinars and courses organized by IEEE Computer Society

Pakistan Engineering Council   April 2021 – June 2021

Continuing Professional Development Program (3.5 CPD Point)

- Entrepreneurship Development by Managing Technology Innovation in Water and Wastewater Treatment Projects.
- Self-Discovery with Talent Management Achieving Excellence in Your Professional Career.
- Indigenous Entrepreneurship Characteristics, Cases, and Stories

JEJU National University, JEJU South Korea   August 2019

- Invited as an attendee to attend University Machine Learning Camp in JEJU 2019 (UMLC2019).

Microsoft Office Certified   August 2018

- MOS-Microsoft Office Professional Certification.

HONORS AND AWARDS

Member DoCS-DIBRIS   January 2022 – Present
- Member organizing team of DoCS-DIBRIS responsible for organizing seminars and workshops for PhD students in University Genoa, Italy.

Reviewer   October 2022 – July 2024
- Program Committee Member at the Ninth International Conference on Advances in Computation, Communications and Services (ACCSE 2024), April 14, 2024, to April 18, 2024 – Venice, Italy.
- Reviewed conference paper for the Ninth International Conference on Optimization and Applications (ICOA 2023), October 5, 2023, to October 6, 2023 – Abu Dhabi, UAE.
- Program Committee Member at the Eighth International Conference on Advances in Computation, Communications and Services (ACCSE 2023), June 26, 2023, to June 30, 2023 – Nice, Saint-Laurent-du-Var, France.
- Student Committee Member at the Eighth International Conference on Optimization and Applications (ICOA 2022), October 6, 2022, to October 7, 2022 – Sestri Levante, Italy.

PON-PhD Scholarship   January 2022
- PhD in Computer Science with specialization in Machine Learning, Deep Learning, Computer Vision, Artificial Intelligence.

Research Grant – NUST, Islamabad   October 2019
- Collective grant of 350$ from National University of Science & Technology (NUST), Islamabad, for conducting & publishing research articles on four different topics as mentioned in next section.

Awarded Scholarship – National University of Science and   Technology (NUST), Islamabad   October 2017
- Secured PEEF scholarship worth 6500$ during MS Computer Engineering at CEME NUST Islamabad.

Awarded Scholarship – University of Engineering and Technology (UET) Taxila.   June 2014
- Secured HEC need-based scholarship worth 4000$ during bachelors

REFEREES

Prof. Francesco Masulli   **Prof. Stefano Rovetta**
Full Professor   **Associate Professor**
University of Genova   University of Genova
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