Dr. Muhammad Rehman Zafar, PhD

Email: muhammadrehman.zafar@torontomu.ca | **Location:** Toronto, Canada | **Web:** https://rehmanzafar.github.io
LinkedIn: https://www.linkedin.com/in/mrzafar
Google Scholar: https://scholar.google.ca/citations?user=O5Nu1IAAAAAJ

RESEARCH INTERESTS

Explainable Artificial Intelligence, Interpretable Machine Learning, Healthcare AI, Medical Imaging

SUMMARY OF QUALIFICATIONS

- 5+ years of teaching experience at both graduate and post-graduate levels in Canadian institutes.
- 8+ years of experience in data science, developing interactive dashboards, optimizing SQL queries, and driving strategic business growth.
- Proven track record of designing, validating, and deploying machine learning models in production environments, ensuring reliability and high performance.
- Expertise in Explainable AI, enabling transparent and actionable insights from complex models.
- Skilled in leveraging machine learning techniques for clustering, classification, regression, anomaly detection, simulation, and optimization on large-scale datasets.
- Strong leadership abilities with experience mentoring teams, communicating complex technical concepts, and collaborating with multidisciplinary stakeholders to achieve business objectives.

EDUCATION

Doctor of Philosophy (PhD) Electrical and Computer Engineering Jan 2018 - Aug 2024
Toronto Metropolitan University (formerly Ryerson University), Ontario, Canada
PhD Thesis: A framework to Interpret, Visualize and Analyze the decisions of black box models for trustworthy AI
Research Domains: Explainable Artificial Intelligence, Interpretable Machine Learning, Few-shot Learning
Advisor: Dr. Naimul Khan

Master of Science in Computer Science Sep 2015 - Aug 2017
Bahria University, Islamabad, Pakistan
Dissertation Title: A Context-aware Approach to News Article Retrieval
Research Domains: Recommendation Systems, Natural Language Processing
Advisor: Dr. Arif-Ur-Rahman

Bachelor of Science in Computer Science
International Islamic University, Islamabad, Pakistan Sep 2007 - Mar 2012
Thesis: Lungs Tumor Detection from CT Scan Images
Application Domains: Healthcare, Digital Image Processing, Machine Learning
Advisor: Dr. Ayyaz Hussain

PUBLICATIONS

- **Muhammad Rehman Zafar**, and Naimul Khan. "Attentional Feature Fusion for Few-Shot Learning." 2024 International Joint Conference on Neural Networks (IJCNN). IEEE, 2024.
- Zeeshan Ahmad, Syeda Rabbani, **Muhammad Rehman Zafar**, Syem Ishaque, Sridhar Krishnan, Naimul Khan. "Multi-level Stress Assessment from ECG in a Virtual Reality Environment using Multimodal Fusion," in IEEE Sensors Journal, 2023.
- **Muhammad Rehman Zafar** and Naimul Mefraz Khan. "Deterministic Local Interpretable Model-Agnostic Explanations for Stable Explainability". Machine Learning and Knowledge Extraction. 2021, 3, 525-541.
- **Muhammad Rehman Zafar** and Naimul Mefraz Khan. 2019. "DLIME: A Deterministic Local Interpretable Model-Agnostic Explanations Approach for Computer-Aided Diagnosis Systems". In Proceedings of Anchorage'19: ACM SIGKDD Workshop on Explainable AI/ML (XAI) for Accountability, Fairness, and Transparency (Anchorage'19).
- **Muhammad Rehman Zafar** and Munam Ali Shah. "Fingerprint authentication and security risks in smart devices." 22nd International Conference on Automation and Computing (ICAC), 2016, pp. 548-553. IEEE, 2016.
- **Muhammad Rehman Zafar** and Muhammad Asfand-e-Yar, "Scheduling on Heterogeneous Multi-core Processors Using Stable Matching Algorithm" International Journal of Advanced Computer Science and Applications (IJACSA), 7(6), 2016 .
- **Muhammad Rehman Zafar** and Arif Ur Rahman "Urdu Text Ambiguities and Their Impact on Named Entity Recognition, Word and Sentence Segmentation." 5th Student Conference on Engineering Sciences and Technology (SCONEST), IEEE, 2016.

PATENTS

- Biggs, Edward W., L. O. W. E. Brianna, Justin Robert Caguiat, Naimul Mefraz Khan, Nabila Miriam Abraham, **Muhammad Rehman Zafar**, Syeda Suha Shee Rabbani, Zeeshan Ahmad, Mihai Constantin Albu, and Jacky Zhang. "Stress management in clinical settings." U.S. Patent Application 16/663,223 filed April 29, 2021.

WORK EXPERIENCE

Professor
Seneca Polytechnic College, Toronto, Ontario, Canada Jan 2023 – Present
Contract, Part-time
At Seneca, I teach the following courses:

- DBD800 Accessing Big Data
- BAN110 Data Preparation and Handling

Professor
Humber Polytechnic College, Toronto, Ontario, Canada Jan 2023 – Present
Contract, Partial Load
At Humber, I teach the following courses:

- ITC5104 Introduction to Database and SQL
- ITE5324 Big Data 1
- ITE5424 Big Data 2
- ITE5432 J2EE Business Components

Doctoral Researcher
Toronto Metropolitan University, Toronto, Canada Jan 2018 – Aug 2024

- Conducted advanced research on Explainable AI, Interpretable Machine Learning, and Few-Shot Learning.
- Designed and implemented algorithms for interpretable decisions, improving transparency and trust in AI models.
- Published highly cited papers in peer-reviewed journals and presented findings at international conferences.
- Collaborated with multidisciplinary teams of academics, industry professionals, and stakeholders to deliver impactful research.

Graduate Teaching Assistant
Toronto Metropolitan University, Toronto, Ontario, Canada Jan 2018 – Apr 2022
Contract, Part-time
At TMU, I served as a Graduate Teaching Assistant, where I was responsible for preparing and evaluating assignments and lab activities, as well as providing tutoring and support during lab sessions for the following courses:

- DS8003 Management of Big Data and Big Data Tools
- CIND830 Python Programming for Data Science
- CIND123 Data Analytics: Basic Methods
- CIND110 Data Organization for Data Analysts
- COE318 Software Systems
- COE628 Operating Systems

Senior Software Engineer
ARB Labs, Toronto, Canada
Permanent, Part-time Aug 2017 – Mar 2020

- Spearheaded the design and deployment of an optical bet recognition system, automating data capture for real-time player and table metrics.
- Eliminated manual data entry processes by implementing automated analytics, driving revenue growth and ensuring accuracy in decision-making.
- Utilized machine learning, computer vision, and artificial intelligence to resolve complex challenges in real-time systems.

Assistant Manager Data Analytics and Mobile Applications
Interactive Group of Companies, Islamabad, Pakistan Sep 2016 – Jul 2017
Permanent, Full-time

- Launched machine learning models to predict patient drop-offs and health shocks by mining hospital data.
- Led large-scale application development, driving revenue growth and improving user experience.
- Managed a research and development team, achieving key project milestones and delivering user-centric mobile solutions.
- Led analytics initiatives to extract actionable insights, optimize processes, and enhance decision-making.

Lead Software Engineer
Interactive Group of Companies, Islamabad, Pakistan Dec 2014 – Aug 2016
Permanent, Full-time

- Directed the development of Pakistan's first on-board entertainment system for national transport company.
- Designed and implemented prediction models using machine learning algorithms, enabling data-driven decision-making.
- Conducted data analytics and visualization using various tools to generate actionable insights.
- Designed and managed database architectures to support scalable and efficient data-driven applications.

Senior Software Engineer
Medical Transcription and Billing Company, Rawalpindi, Pakistan Apr 2013 – Jun 2014
Permanent, Full-time

- Designed and implemented scalable backend systems, optimizing performance and ensuring seamless integration with web services and APIs.
- Led a team of backend developers, providing technical guidance, conducting code reviews, and enhancing team efficiency.
- Streamlined database management through optimized queries and script development, improving data retrieval and storage processes.

Software Engineer
Medical Transcription and Billing Company, Rawalpindi, Pakistan May 2012 – Mar 2013
Permanent, Full-time

- Developed and maintained backend systems, including web services and APIs, ensuring functionality and scalability.
- Collaborated with senior developers to debug code, implement database scripts, and improve application performance.

RELEVANT PROJECTS & TECHNOLOGY STACK (SELECTED)

DLIME: Deterministic Local Interpretable Model-Agnostic Explanations

- Developed a robust framework to address stability issues in local interpretability, ensuring consistent and reliable explanations.
- **Technologies:** Python, R, PyTorch, TensorFlow, Scikit-learn, Matplotlib, Pandas, NumPy, OpenCV, Google Cloud Platform (GCP), Jupyter

Stress Detection using VR

- Designed a VR-based stress detection system integrated with Azure Cloud, improving stress recognition accuracy by 9%.
- **Technologies:** Python, TPOT AutoML, Scikit-learn, Pandas, NumPy, pyHRV, Microsoft Azure Cloud

Health-Shock Prediction: Cloud enabled framework for Data Analytics and Visualization

- Developed a cloud-enabled predictive framework integrated with GIS, aiding stakeholders in understanding health shock causal factors.
- **Technologies:** Python, R, JAVA, Scikit-learn, Matplotlib, Pandas, NumPy, MongoDB, Oracle, Amazon Web Services (AWS), D3, Highcharts, Spring Rest APIs, Tableau, SQL

IntuiRA

- Developed IntuiRA, an enterprise information retrieval system enabling intelligent, context-based document searches with advanced access rights management.
- **Technologies:** JAVA, MySQL Database, Apache Solr, GATE, Apache OpenNLP, Hadoop, Spark

Bet Recognition and Hand Count System

- Developed and implemented an advanced table bet recognition system for casinos, achieving 96% prediction accuracy and enhancing operational efficiency.
- **Technologies:** Python, TensorFlow, Scikit-learn, Pandas, NumPy, Django, Flask, SQLAlchemy, RabbitMQ, Celery, Microsoft SQL Server, MySQL, Cosmos DB, MongoDB, Docker, FastAPI

TECHNICAL SKILLS

- **Programming Languages:** Python, R, Java, SQL
- **Machine Learning Frameworks:** AutoML, Scikit-learn, TensorFlow, PyTorch
- **Databases:** Oracle, SQL Server, MySQL, NoSQL (MongoDB, Neo4J)
- **Natural Language Processing:** Apache OpenNLP, Stanford CoreNLP
- **Cloud Infrastructures:** Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP)
- **Big Data Technologies:** Hadoop, Spark, D3, Power BI, Tableau

- **Project Management Tools:** Jira, Monday.com
- **Soft Skills:** Microsoft Office 365, Windows, Linux, Mac OS, MS Visio
- **Version Control Systems:** TFS, Git
- **Good knowledge of:** LLM Models, Generative AI, Transformers

AWARDS AND SCHOLARSHIPS

PhD:

- Toronto Met Graduate Development Award
- Toronto Met International Student Scholarship
- Toronto Met Graduate Fellowships
- Toronto Met Graduate Travel Award

Master's:

- Gold Medal for Academic Excellence
- Magna Cum Laude honor
- Recognized in Rector's Honor list (2015-2017)
- Open merit scholarship