DR. MUHAMMAD USMAN

Researcher | *Trainer* | *Software Developer* | *Freelancer*


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Objective

Pursuing a postdoc/job opportunity to enhance my research portfolio, foster interdisciplinary collaborations, and contribute to significant advancements in machine learning and artificial intelligence.

Education

1. **Ph.D.** (**Computer Science**) – (Sep. 2019- Dec. 2024)
   University of Science and Technology of China, Hefei, China.

2. **MS** (**Computer Science**) – (2013 - 2017)
   SZABIST, Islamabad, Pakistan.

3. **MCS** (**Computer Science**) – (2002-2006)
   International Islamic University, Islamabad, Pakistan.

4. **B.Sc.** (**Mathematics A & B, Statistics**) – (1999-2002)
   University of the Punjab, Lahore, Pakistan.

Experience

Apr. 2010 – upto date	**Manager Web/Database (2010-upto date)** **Pakistan Science Foundation, Islamabad, Pakistan.** **Responsibilities:** Specification, Analysis, Design, Development of PASTIC, PSF Website. Web application development of the tools for the promotion of Scientific Research Support Activities, Training Workshops on Research Tools
Jun. 2005 – Sep. 2009	**Software Developer, Marriala Consultants (Pvt. Ltd), Islamabad, Pakistan.** **Responsibilities:** Specification, Analysis, Design, Development of software systems. Text and voice communication with local and foreign clients. Typical Projects include Desktop, Web Application development with Visual Studio .Net, ,SQLSERVER, XML etc.
Sep. 2015 – Sep. 2017	**Lecturer - Department of Sociology, Quaid-e-Azam University, Islamabad, Pakistan.** **Responsibilities:** Undertaking course: App. of Computer in Sociology.
Sep. 2008 – upto date	**Freelancer (Developer)** at Freelancer.com

Major Skills

Research Experience	• Published research work in the field of Data Stream Learning, Knowledge Discovery in Large Data sets and Machine Learning.
Teaching/Training Experience	• Statistical Analysis Tool (SPSS) – 50+ three-days Trainings • Library Software (KOHA, Greenstone etc) – 5+ one-day Trainings • Applications of Computer in Sociology (1.5 years at QAU)
Software Development Experience	• Worked out research projects in Python, MATLAB. Proficient in Scikit MultiFlow, Pandas, etc. • Worked out projects in ASP.Net 1.1, 2.0, 3.5, 4.0 ,Visual C#, Visual Basic.Net ,SQL Server 2000 and 2005, ASP, PHP, MYSQL, MS-Access, Python • Worked out on 1000+ Web Applications, Websites as a freelancer. Ranked in Top-400 Freelancers all over the world at Freelancer.com (2017)

Research Experience

Ph.D. Thesis at USTC, 2024

Title: Binary classification in imbalanced and non-stationary data streams.

The thesis aims at proposing solutions to the binary classification problem in imbalanced and drifting data streams. As part of the thesis, Pro-IDD, EMRIL and Bin.INI are proposed. The studies in this thesis are published in KBS, NEUCOM, ESWA, and IEEE-TETCI.

Pro-IDD: Pro-IDD targets to resolve the class imbalance by handling class imbalance complexity, i.e. the small disjuncts problem and the class overlaps. A custom metric to evaluate classifiers based on individual class recall is proposed for drifting data environment. Additionally, Pareto-based multi-objective optimization is used to prune the ensemble pool using a custom metric and classifier diversity.

EMRIL: EMRIL is based on reinforcement Learning, and is proposed to tackle very high imbalance ratios and different types of concept drifts. For high imbalance ratios, a novel minority storage is proposed where in minority samples are stored/retrieved in the context of imbalance and concept drifts. Additionally, reinforcement learning framework is used to manage the ensemble pool through effective training and evaluation policies for the RL agent.

Bin.INI: Bin.INI is proposed for class imbalance learning in drifting data environment in presence of missing data. Linear regression-based imputation repository is maintained wherein rules are created from completely available minority subspaces. A custom metric is proposed to evaluate classifier using recall based weights under a Sigmoid function. A 2-step method is designed to prune the pool wherein first step clusters the classifiers using multiple diversity metrics and the second step applies the recall-based for classifier selection to build the ensemble model.

Each method has been rigorously tested and shown to outperform existing approaches in various scenarios of imbalanced and drifting data streams.

Journal/Conference Publications

1. Farooq, H., **Usman, M.**, Chen, H. (2024). MinoClust: Exploiting minority sub-cluster dynamics for classification in imbalanced and drifting data streams, IEEE Transactions on Emerging Topics on Computing, (Under Review).

2. **Usman, M**., & Chen, H. (2024). EMRIL: Ensemble method based on ReInforcement Learning for Imbalanced and Drifting Data streams, Neurocomputing, Accepted, In Press.
3. **Usman, M.,** & Chen, H. (2024). Bin.INI: An Ensemble Approach for Dynamic Data streams, Expert Systems and Applications, Accpeted, InPress.
4. Y. Zhu, B. Huang, Y. Fan, **M. Usman**, and H. Chen(2024). Iterative Polygon Deformation for Building Extraction, IEEE Transactions on Geoscience and Remote Sensing, Accepted, In Press.
5. **Muhammad Usman** and Huanhuan Chen(2024). Intensive Class Imbalance Learning in Drifting Data Streams, IEEE Transactions on Emerging Topics on Computational Intelligence, Accepted, In Press.
6. Zaka-Ud-Din Muhammad, **Usman Muhammad**, Zhangjin Huang, Naijie Gua(2023). MMFIL-Net: Multi-Level and Multi-source Feature Interactive Lightweight Network for Polyp Segmentation. Displays, Accepted, In Press.
7. Xiangyu Wang, Taiyu Ban, Lyuzhou Chen, **Muhammad Usman**, Yifeng Guan, Derui Lyu, Jian Cheng, Huanhuan Chen, Cyril Leung, Chunyan Miao (2023). Decentralised Knowledge Graph Evolution via Blockchain. IEEE Transactions on Services Computing, Accepted, In Press.
8. Buliao Huang, Yunhui Zhu, **Muhammad Usman**, Huanhuan Chen(2023). Semi-supervised Learning with Missing Values Imputation. Knowledge-Based Systems, Accepted, In Press.
9. **Usman, M.,** & Chen, H. (2023). Pro-IDD: Pareto-based ensemble for imbalanced and drifting data streams. Knowledge-Based Systems, 111103.
10. Wang, X., Ban, T., Chen, L., **Usman, M**., Wu, T., Chen, Q., & Chen, H. (2023). A distribution-based representation of Knowledge Quality. Knowledge-Based Systems, 111054.
11. Zhou, X., Chen, A., **Usman, M**., Chen, Q., Xiong, F., Wu, J., & Chen, H. (2023). "Underground Pipeline Mapping from Multi-positional Data: Data Acquisition Platform and Pipeline Mapping Model". IEEE Transactions on Geoscience and Remote Sensing.
12. Wang, Xiangyu, Yuan Li, Taiyu Ban, Jiarun Zhu, Lyuzhou Chen, **Muhammad Usman**, Xin Wang et al. "Dynamic Link Prediction for Discovery of New Impactful COVID-19 Research Approaches." IEEE Journal of Biomedical and Health Informatics 26, no. 12 (2022): 5883-5894.
13. Huang, Buliao, Yunhui Zhu, **Muhammad Usman**, Xiren Zhou, and Huanhuan Chen. "Graph Neural Networks for Missing Value Classification in a Task-driven Metric Space." IEEE Transactions on Knowledge and Data Engineering (2022).
14. Chen, Lyuzhou; Wang, Xiangyu; Ban, Taiyu; **Usman, Muhammad**; Liu, Shikang; Lyu, Derui; Chen, Huanhuan. Research Ideas Discovery via Hierarchical Negative Correlation, IEEE Transactions on Neural Networks and Learning Systems, 2022.
15. Jiarun Zhu, Xingyu Wu, **M. Usman**, Xiangyu Wang, Huanhuan Chen. Link Prediction in Continuous-Time Dynamic Heterogeneous Graphs with Causality of Event Types, International Journal of Crowd Science, 2022.
16. Xiangyu Wang, Lyuzhou Chen, Taiyu Ban, **Muhammad Usman**, Yifeng Guan, Shikang Liu, Tianhao Wu, Huanhuan Chen, Knowledge graph quality control: A survey, Fundamental Research, Volume 1, Issue 5, 2021.
17. Ali SM, Anjum N, Naureen F, Rashid A, Tahir A, Ishaq **M, Usman** M., Satisfaction Level of Tuberculosis Patients Regarding Their Access to TB Care and Prevention Services, Delivered Through a Public–Private Mix Model in Pakistan. Healthcare. 2019; 7(4):119. https://doi.org/10.3390/healthcare7040119
18. **Usman, Muhammad**, and Muhammad Akram Shaikh. "Real Time Events Detection from the Twitter Data Stream: A Review." Pakistan Journal of Computer and Information Systems 3.2 (2018): 47-60.
19. **Usman, Muhammad,** M. Usman, Multi-Level Mining of Association Rules from Warehouse Schema, Kuwait Journal of Science 44.1 (2017)
20. **Usman, Muhammad**, M. Usman, and Sohail Asghar, A fuzzy-based methodology for accurate classification and prediction in large datasets, Journal of Intelligent & Fuzzy Systems Preprint (2016): 1-10.

21. **Usman, Muhammad**, and M. Usman., Multi-Level Mining and Visualization of Informative Association Rules, Journal of information Science and Engineering 32.4 (2016): 1061-1078.
22. **Usman, Muhammad**, and M. Usman, A conceptual model for multi-level mining and visualization of association rules at Ninth International Conference on Digital Information Management (ICDIM), 2014. IEEE, 2014.

Book

Usman, Muhammad, and **Muhammad Usman**, eds. "Predictive Analysis on Large Data for Actionable Knowledge: Emerging Research and Opportunities: Emerging Research and Opportunities." (2018). DOI: 10.4018/978-1-5225-5029-7

Funded Projects

Networking and Capacity Building of Women Entrepreneurs (SMEs) from SAARC Countries – SAARC Development Fund

- Worked as Co-PI/Software Project Manager in NCBWES (2017-2019).
- Designed/Developed the NCBWES portal.
- Conducted software trainings in Bangladesh, Nepal, and Bhutan for Women SMEs.

Science Talen Farming Scheme, Pakistan Science Foundation - PSDP

- Worked as IT Expert in STFS.
- Responsible to precure Laptops, Internet Devices, LMS for the project.
- Responsible to manage the activities Moving Science Labs (Science Buses).

Other Projects

- Worked as IT Expert in UNESCO-PMNH Biodiversity Project (2011-15).
- Worked as IT Expert in National Library Automation Software Project - ICT R&D Fund (2017-18).
- Worked as IT Expert in “National Digital Archive of Research Published in Pakistani Journals” Project (2019).

Software Dev. Experience

Major Projects

- Research Grants Management System for Pak. Science Foundation (ASP.Net 4.0, SQL Server 2010)
- Online Exam System for STFS, Pak. Science Foundation (ASP.Net 4.0, SQL Server 2010)
- Pakistan Science Abstracts App. (Catalogue for Pak. Research) (ASP.Net 2.0, SQL Server 2005)
- Projects for Pak. Science Foundation, ECO Science Foundation and PASTIC. (ASP.Net 2.0, SQL Server 2005)
- eClinic (Web and Desktop Versions) (ASP.Net 2.0, SQL Server 2000)
- PINUM Patient Tracking and Management System(ASP.Net 2.0, SQL Server 2000)
- Completed 1000+ medium size websites, applications and desktop softwares as a freelance developer. http://www.freelancer.com/u/RockStone435.html

Additional Qualifications

- CCNA (Cisco Certified Network Associate), Sherwani Syndicate, Islamabad (2002)
- IELTS (2008)

Honors / Misc.

- CSC Scholarship for PhD (CS) at USTC, Hefei. China. (2019-2024)
- Procured LMS, 1200+ Laptops and internet devices under "Science Talent Farming Scheme", a PSDP funded project at Pakistan Science Foundation (2015-2018).
- Worked as Software Project Manager in "Science Talent Farming Scheme", a PSDP funded project at Pakistan Science Foundation (2015-2018).
- Conducted IT Software trainings for Women SMEs in Bangladesh, Nepal and Bhutan under SAARC Development Fund project titled "NCBWSC", 2018.
- Participated in Bilateral IT Training Program at Wuhan, China under B&RI Programme (2018)
- Conducted 50+ Training Workshops on Research Tools and Techniques (SPSS, WEKA), Different Library Automation Softwares (Greenstone, KOHA) courses at PASTIC National Center, AHK-NCRD, PSF etc. Trained over 3000 participants (2015-2018).
- Co-PI for National Library Automation Software Project at ICT R&D Fund (2015-2018).
- Worked in Committees for UNESCO-PMNH and Pak. Science Foundation Automation Projects(2011-2015).
- Participated in KOHA Software Training at Ahmadabad, India by SAARC Doc. Center (2012)
- Participated as a Judge for Computer Science Projects in Intel Science Fair (2013)
- Worked as Organizer in Seminar on Information Security at Pak. Science Foundation (2011-2012)
- Scholarship holder in MCS at International Islamic University, Islamabad. (2002-2006)