Hammad Afzal, PhD

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Right To Work In UK: I hold a Global Talent Visa to work and reside in UK. I do not need a sponsorship from Employer.

ABOUT ME

A seasoned professional with a strong background in academics, teaching, research (project as well as publications oriented) and leadership, I am currently serving as a Professor, Head of the Research Department and lead of the "Data and Text Engineering and Mining Research Lab". My research interests span Machine Learning, Data Sciences, Natural Language Processing and their applications in various domains such as healthcare and cyber security etc. I have successfully secured grants and managed research projects of worth more than 98k GBP. I have professional memberships of ACM, IEEE, and Pakistan Engineering Council. I have supervised 61 MS, 3 PhD students and currently supervising 5 PhD students.
Age: 42 Years | Address: 39 Crewe Street Derby, DE23 8QN, UK | Phone: +44 7448108340

QUALIFICATION

PhD Computer Science
The University of Manchester, UK   01/2006 – 11/2009
Thesis: A Literature-Based Framework for Semantic Descriptions of e-Science Resources

MSc Advanced Computing Science
The University of Manchester, UK   08/2004 – 09/2005
Thesis: Topic Focused Web Crawler
Honour: Peter Jones Prize for highest score among all MSc student in the Department of Informatics

BEng Software Engineering
National University of Sciences and Technology (NUST), Pakistan   12/1999 – 06/2003

Professional Certifications (AI, ML, Data Science)
- LangChain for LLM Application Development (DeepLearning.AI)   02/2024
- Neural Networks and Deep Learning (DeepLearning.AI)   09/2020
- Improving DNNs: Hyper-parameter Tuning, Regularization and Optimization (Google Cloud)   10/2020
- Big Data and Machine Learning Fundamentals (Google Cloud)   01/2021
- Fundamentals: Core Infrastructure (Google Cloud)   10/2021

Teaching Trainings
- New Learning: Principles and Patterns of Pedagogy (University of Illinois at Urbana-Champaign)   2024
- Effective Problem-Solving and Decision-Making (University of California, Irvine)   2020
- Effective Class Planning (NUST, Islamabad)   2012/2015/2019/2023
- Outcome Based Education (NUST, Islamabad)   2012/2015/2019
- Assessment and Feedback (NUST, Islamabad)   2012/2016

WORK HISTORY

Professor Of Computer Science; Data Science
National University of Sciences and Technology (NUST), Pakistan   12/2022 – Present
    Major Responsibilities:

- **Teaching**: Actively involved in delivering high quality, research-led teaching courses related to computer science, data science, and artificial intelligence at UG and PG levels.
- **Supervision and Mentoring**: Advising and mentoring students on various academic matters as well as on projects and theses/dissertations. Successfully graduated more than 35 Final Year Projects, 61 MS and 3 PhD students. Currently involved in the supervision of 5 PhD students.
- **Curriculum Development**: At National Level, I have served as "Lead sub-group Software Engineering Curriculum Development" at Pakistan Engineering Council from Jan, 2021 to Dec, 2022. My tasks included, (i) Assess the industry trends, technology advancements, and educational needs; (ii) Align curriculum with accreditation standards (Washington Accord) and industry expectations. (iii) Design a dynamic curriculum integrating theory, practical skills, and emerging technologies. The developed curriculum is available here: https://www.pec.org.pk/wp-content/uploads/2021/03/Software-Engineering.pdf
  At local departmental level, I am currently serving as a focal person for *Curriculum Development*.
- **Developing New Degree Programs**: Played a major role in starting the MS Computer Science, MS Artificial Intelligence, and MS Data Sciences in NUST, Pakistan. Furthermore, I have played key role in introducing many courses at BEng and MSc level in the curriculum such as Data Mining, and Deep Learning.
- **Assessments**: Participated in the assessment process for courses (setting, marking, and moderation of students' work), final year projects, as well as PG thesis/dissertations. I am also a member of "Continuous Quality Assessment", providing assessment/feedback at the end of the semester for evaluation of courses as well as end-of-degree Graduate surveys by the students.
- **Research Output**: 87 Journal and Conf papers with a Cumulative Impact Factor of 211; 33 papers in Q1 journals. Collaborated with other researchers, both within and outside the institution. Won various national/international grants worth more than 98K GBP. Completed various industrial projects.
- **Awards**: Won various awards including Best Researcher of the Year; Best Teacher of the Year; Best Final Year Project.

Associate Professor
National University of Sciences and Technology (NUST), Pakistan   08/2019 – 12/2022

Assistant Professor
National University of Sciences and Technology (NUST), Pakistan   05/2010 – 08/2019

HoD Research (Management/Administration Role)
National University of Sciences and Technology (NUST), Pakistan   07/2023 – Present
Major Responsibilities:

- Monitoring of all research innovation commercialization related activities at campus.
- Managing internship programs, recruitment drives/ industry collaborations.
- Monitoring research resources such as budget, materials, and equipment of projects undergoing.
- Mentoring and guidance colleagues and coordinate the work of research and support staff.
- Focal person for Industry-Academia Linkage: Leading in the conduct of business engagement activities, and developing entrepreneurial links with external organizations.

PG Program Coordinator (Management/Administration Role)
National University of Sciences and Technology (NUST), Pakistan   12/2021 – 06/2023
Major Responsibilities:

- Managing admissions process for MS/PhD students. Oversaw curriculum development for MS in Computer Science, MS Data Science and MS in Software Engineering.
- Leading the Quality Assurance Assessments (conducted by Higher Education Commission, Pakistan) for MS/PhD programs.
- Facilitating and steering the proposal and final defenses of MS and PhD thesis.
- Conducting the surveys to gather valuable feedback from graduating students as a part of the Continous Quality Improvement Cycle.

Lead Research Lab (Management/Leadership Role)
Data and Text Engineering Lab (www.codteem.com) NUST, Pakistan   06/2012 – Present
Major Responsibilities:

- Securing Grants: Secured and managed grants to support research initiatives. A funding of over 98K GBP has been secured from various national/international grants.
- Industrial Projects: Delivered a number of projects related to the domain of Data Science (both in a leading role as well as a team member) Further details under Section "Selected Funding Grants"
- Mentorship: Supervised and mentored researchers, postdocs, and students.

Professional Trainer (Teaching/Course Design Role)
AI Bootcamp; Professional Development Centre, NUST, Pakistan   01/2018 – Present
Major Responsibilities:

- Delivered numerous training sessions covering various subjects related to AI, Data Science through online platforms and in-person settings. The audience comprised students and professionals from national and international organizations, spanning diverse sectors such as Data Science experts from various domains such as microfinance, telecom operators, accounting firms.
- Designed, and delivered one of the most popular AI Bootcamp programs (https://www.atomcamp.com/ai-bootcamp) in Pakistan. This also certifies that my method of delivering is well aligned and suited to deliver modern complex subjects.

Visiting Lecturer (Teaching Role)
National University of Modern Languages; Bahria University Islamabad   01/2016 – 12/2023

Major Responsibilities:

- Served as Visiting Faculty at several institutions, allowing me to extend my teaching expertise beyond my home university. In this capacity, I've taught a range of courses, including Semantic Web, Research Methodologies, and Data Sciences etc. This experience has been invaluable, offering me the opportunity to share and gain knowledge from diverse academic environments.

Research Fellow (Research Role)
University of Ireland, Galway   06/2009 – 12/2009

Major Responsibilities:

- My work focused on development of methods for the semi/automatic generation of multilingual lexicons for domain ontologies, exploiting web- based and language resources. The work has been carried out in cooperation with the Delft University of Technology, Karlsruhe University and DFKI on the definition and implementation of 'lexicalized ontologies' according to the LexInfo model: http://ontoware.org/projects/lexonto/. Supervised by Dr. Paul Buitelaar. LexInfo is an ontology that was defined to provide data categories for the Lemon (Lexicon Model for ontologies)

Junior Software Tester (Development and Quality Assurance – Part time Role)
IBM Transitive, Manchester, UK   08/2008 – 03/2009

Major Responsibilities:
- I was mainly responsible to test the applications to run on multiple platforms (CPU and Operating System). The applications compiled for one particular platform were tested to verify their run-ability on multiple platforms using Transitive's cross-platform virtualization software called "QuickTransit".

Teaching Assistant/Lab Engineer (Teaching – Part time Role)
The University of Manchester, UK   01/2008 – 01/2009

Major Responsibilities:
- I have occasionally worked as Teaching Assistant/Lab Engineer at University of Manchester, UK. I assisted the Faculty members in conducting and evaluating the labs.

COURSES TAUGHT

Undergraduate Level
- Machine Learning (2023)
- Data Engineering and Data Mining
- Operating Systems
- Data Structures (2023)
- Computer Organization and Architecture
- Digital Logic Fundamentals
- Object Oriented Programming
- Fundamentals of Programming
- Software Quality Engg
- Distributed Computing

Postgraduate Level
- Machine Learning (2023)
- Deep Learning
- Natural Language Processing (2023)
- Semantic Web
- Research Methodologies
- Distributed Computing

INVITED TALKS, TRAININGS AND WORKSHOPS (2021-PRESENT)

- Keynote Talk: Transforming the Healthcare Industry: Role of AI
  Colloquium on AI-Based Interdisciplinary Research, Pak-UK Education Gateway;   08/2023
- Keynote Talk: AI Based Creative Content Generation: Era of Generative AI
  IEEE International Conference on Communication Technologies, 2023;   03/2023
- Keynote Talk: Machine Learning and its Applications
  IEEE International Conference on Communication Technologies, 2021;   09/2021
- Training: Data Analytics Using Python (60 hrs)
  Institute of Chartered Accountants Pakistan   02/2023 – 11/2023
- Training: Diploma in Data Sciences (30 hrs)
  Professional Development Center, NUST   11/2022 – 12/2022
- Training: Diploma in Artificial Intelligence (96 hrs)
  Professional Development Center, NUST   07/2022 – 10/2022
- Keynote Talk: AI in Healthcare
  Seminar organized by National University of Medicine, Pakistan;   12/2023
- Invited Talk: Early diagnosis of GDM using AI
  Organized by PHC Global, Colombo Sri Lanka   09/2023

HONOURS AND PROFESSIONAL MEMBERSHIPS

- Peter Jones Prize of the Year 2005 (Equivalent to Gold Medal) in the Department of Informatics, University of Manchester, UK.
- Lead Software Engg Curriculum (Pakistan Engg Council) (Jan 2021 onwards)
- Invited Domain Expert: Fully funded by the University of Tokyo, Japan for BioHackathon 2010,
- Best researcher of the Year at (NUST-MCS); 2017-2018
- 2 Times Rector's Gold Medal for best FYP Projects: "HTML Obfuscation" and "Crowd Sourced Intelligent Route Planner"
- Member ACM | Senior Member IEEE | PEC Recognized Engr | HEC Approved Supervisor;
- Member of Evaluation Panel for various national funding agencies including *Pakistan Science Foundation (PSF), ICT R&D, National Grassroots ICT Research Initiative NGIRI*
- Judge for Selection of Incubation Centres by National Expansion Plan of NIC (National Incubation Centres), PITB (Punjab IT Board)

FUNDING GRANTS

AI-Based Risk Predictive Tool for Early Diagnosis And Treatments   **Oct, 2023 – Mar, 2025**
Sponsorship (Competitive Grant): Canadian International Development Research Center (IDRC) for AI for Global Health (AI4GH)
Collaborators: PHC Global, Shifa International Hospital

- I secured a competetive grant of ~44K GBP for this project that aims to implement an AI-based GDM screening tool for both rural and urban populations of South Asia. Gestational Diabetes Mellitus (GDM), a complex disease with multiple risk factors affecting its diagnosis and outcomes, is taken as case study.
- Impact: Work is being done in collaboration with Shifa International Hospital (one of the leading healthcare providers in Pakistan). Approx 1 in 6 live births are affected by diabetes during pregnancy out of which 84% are diagnosed as GDM. We have gathered the data of more than 5000 patients. I am responsible for supervising the development of predictive model that can identify the significant risk factors and predict the possibility of developing GDM and other related outcomes
- More details: https://codteem.com/gdm/

AI Short Term Project: Disease Early Warning System   Apr, 2022-Aug, 2023
Sponsorship (Industrial): C4I Directorate
Collaborators: CMH Hospitals, Pakistan
- I am Co-PI in this ~51K GBP project. My team collaborated with Post Graduate Medical Institute, Pakistan to develop a Disease Early Warning System.
- Impact: Our Disease Early Warning System has been integrated and deployed in more than 30 hospitals country wide. The project includes Descriptive and Predictive analysis. I supervised and led the development of descriptive module that provides live updates on the current situation of disease spread over various branches of Hospitals, Data Entry form to enter details of patients; Vaccination/ lab tests hist track GUI with time-series plots, net production numbers, threshold-based alerts etc.

An Automated Teeth Lesion Diagnosis Based On Deep Learning   Aug, 2022 - Aug, 2023
Sponsorship (Industrial): Medical Directorate, Govt of Pakistan
Collaborators: AF Institute of Dentistry, Pakistan
- I worked as a collaborator in this ~20K GBP project where my team work on automating the process of dental disease detection using X-ray imgery. We prepared a dataset of a total of 534 periapical images, labeled by experienced radiologists and dentists. A lightweight Mask-RCNN model is developed for periapical disease detection using X-ray imagery, thus automating the tedious and error-proned task. The novelty of our system is that, instead of just doing binary classification, it is capable of further classify the lesions into 5 further categories, thus reducing the diagnosis time and manual effort.
- More details: https://codteem.com/teeth

Incident Prediction Through ML And AI   Jun 2017- Jun 2018
Sponsorship (Industrial): C&IT Branch
- Acting as PI as well as the Team Lead, I secured a grant of 250K PKR for this project.
- Impact: We addressed the unpredictability of terrorist incidents in Pakistan by developing a model that conducts trend/cluster analysis, identifying patterns from historical data related to location, involved groups, victims, and incidents. The methodology involves extracting these patterns to formulate incident clusters, contributing to the creation of a risk model for predicting potential threats in real time.
- More details: https://codteem.com/incidents/

Autonomous Surface Vehicle With AI Powered Route Planning System   Oct, 2022-Dec, 2023
Sponsorship (Industrial): Research and Academic Collaboration, NESCOM
- Acting as PI as well as the Team Lead, I secured a grant of 100K PKR for this project. My team trained the boat agent using Proximal Policy Optimization (PPO) to learn how to navigate to a target while avoiding obstacles in a virtual environment.
- Impact: Pakistan is often hit by floods, resulting in huge loss of human lives as well as other resources. The project aims to provide an initial prototype for autonomous boats that can be utilized for rescue activities during he flood in remote areas.
- More details: https://codteem.com/asv/

Flash Flood Detection Systems   Jun 2017- Jun 2018
Sponsorship (Competitive): National Grassroots ICT Research Initiative (NGIRI) Scheme
- Acting as PI as well as the Team Lead, I secured a grant of 70K PKR for this project.
- The project aims to provide real time river water level and speed to the main server via a remote embedded system. At the main server this information is stored, manipulated and graphs are generated to get a near to

accurate flood prediction. System also provides flood warnings based on the collected data. All this information is also uploaded on a web portal automatically to make it public.

- More details: https://codteem.com/ffds/

Road And Object-Detection Based Assistant For Driving (ROAD)   Jun 2020- Jun 2021
Sponsorship (Competitive): National Grassroots ICT Research Initiative (NGIRI) Scheme

- Acting as PI, I secured a grant of 70K PKR for this project.
- ROAD is a desktop-based application that detects lane and objects from a dash cam video using CNN based trained models.
- More details: https://codteem.com/road/

FUNDED PROJECTS (AS TEAM MEMBER/CONSULTANT)

National Cyber Security Auditing and Evaluation (NCSAEL) Lab At NUST   06/2018 – Present
Sponsorship (Competitive): ~80 Mil PKR from Higher Education Commission, Pakistan

- I am working as an AI consultant/advisor with a national lab (NCSAEL) that is designing, developing and implementing solutions related to Cyber Security for various governmental/private organizations in Pakistan.

Bio-Mita: Mining Term Associations From Literature To Support Knowledge Discovery In Biology
PI: Prof Dr. Goran Nenadic (University of Manchester, UK)
Grant Amount: 193,000 GBP | Sponsorship: BBSRC | 2006-2008

- My work invovled development of methods for automatic extraction of semantic descriptions of web resources from biomedical literature. My work in PhD was among the pioneering works in the creation of BioCatalogue, a project (funded by BBSRC) that offers a curated catalogue of Life Science Web services, comprising 1480 services, 266 service providers, and over 900 members. This work has later been expanded in many successful programmes, including Elixir, a European life sciences infrastructure, bringing together scientists from 23 countries and over 250 research institutes.

BRIEF RESEARCH PROFILE

Research Interests	Natural Langauge Processing, Machine Learning, Data Sciences
Cumulative Impact Factor Ranking	211 Top 10%: 8 | Q1: 33
Publications	Total: 87 Journals: 47 ; Conferences: 32 ; Book Chapters: 5 ; Datasets: 2
Google scholar Scopus	H-Index: 21 | Citations: 1601 H-Index: 17 | Citations: 1009
Notable Journals	Neurocomputing (Elsevier), Neural Computing and Applications (Springer), IEEE Communications Surveys & Tutorials, ACM Computing Survey, Journal of Medical Systems

JOURNAL PUBLICATIONS

Submitted (Under Review – To Showcase the Work Undergoing)

1. Mubashir Munaf, Hammad Afzal et al. "Low Resource Summarization using Pre-trained Language Models". ACM Transactions on Asian and Low-Resource Language Information Processing. TALLIP-23-0676
2. Maira Ali, Hammad Afzal et al. "Domain-Independent Black Box Adversarial Attacks for Deep Learning based NLP Classifiers". Neural Computing and Applications. NCAA-D-23-05376
3. Laraib Zainab, Hammad Afzal et al. "Light-weight Deep Learning Framework for Low Light Image Enhancement" Accepted in Multimedia Tools and Applications (2024)
4. Haider Kamal, Muaz Niazi, Hammad Afzal. "Replication of Learned Multi-Agent Reinforcement Learning Strategies for the "Hide and Seek" Problem". Expert Systems with Applications
5. Zeeshan Anwar, Hammad Afzal et al. "Mining the Opinions of Software Developers for Improved Project Insights: Harnessing the Power of Transfer Learning" IEEE Access
6. Zeeshan Anwar, Hammad Afzal et al. "Fuzzy Ensemble of Fined Tuned BERT Models for Domain-Specific Sentiment Analysis of Software Engineering Dataset". PLOS ONE

7. Muhammad Waheed Khan, Hammad Afzal et al. "Effects of Code Granularity on Software Vulnerability Analysis: A Survey", Submitted to ACM Survey" ACM Computing Surveys. CSUR-2023-0420

Publications (Selected Publications Are Highlighted in Bold)

1. **Muneeba Daud, Hammad Afzal, and Khawir Mahmood, 2024. Underwater image enhancement using lightweight vision transformer. Multimedia Tools and Applications, pp.1-23.**

2. Zeeshan Anwar, Hammad Afzal. "Mining crowd sourcing repositories for open innovation in software engineering". Automated Software Engineering 31, 11 (2024). https://doi.org/10.1007/s10515-023-00410-z.

3. Naureen Zainab, Hammad Afzal, Taher al-Shehari, Muna Al-Razgan, Naima Iltaf, Muhammad Zakria, Muhammad Javed Hyder and Raheel Nawaz. "Detection and Classification of Temporal Changes for Citrus Canker Growth Rate using Deep Learning". In IEEE Access, vol. 11, pp. 127637-127650, **2023**, doi: 10.1109/ACCESS.2023.3331735.

4. Zeeshan Anwar, Hammad Afzal, Ali Ahsan, Naima Iltaf, and Ayesha Maqbool. "A novel hybrid CNN-LSTM approach for assessing StackOverflow post quality." Journal of Intelligent Systems 32, no. 1 **(2023)**: 20230057.

5. Shafi, Imran, Anum Fatima, Hammad Afzal, Isabel de la Torre Díez, Vivian Lipari, Jose Breñosa, and Imran Ashraf. **2023**. "A Comprehensive Review of Recent Advances in Artificial Intelligence for Dentistry E-Health" Diagnostics 13, no. 13: 2196.

   https://doi.org/10.3390/diagnostics13132196

6. **Saeed, Ramsha, Hammad Afzal, Sadaf Abdul Rauf, and Naima Iltaf. "Detection of Offensive Language and ITS Severity for Low Resource Language." ACM Transactions on Asian and Low-Resource Language Information Processing 22, no. 6 (2023): 1-27.**

7. Fatima, Anum, Imran Shafi, Hammad Afzal, Khawar Mahmood, Isabel de la Torre Díez, Vivian Lipari, Julien Brito Ballester, and Imran Ashraf. **2023**. "Deep Learning-Based Multiclass Instance Segmentation for Dental Lesion detection". Healthcare 11, no. 3: 347. https://doi.org/10.3390/healthcare11030347

8. Ali, Noor Ul Ain, Waseem Iqbal, and Hammad Afzal. "Carving of the OOXML document from volatile memory using unsupervised learning techniques." Journal of Information Security and Applications 65 (**2022**): 103096.

9. **Nadeem, Aleena, Muhammad Naveed, Muhammad Islam Satti, Hammad Afzal, Tanveer Ahmad, and Ki-Il Kim. 2022. "Depression Detection Based on Hybrid Deep Learning SSCL Framework Using Self-Attention Mechanism: An Application to Social Networking Data" Sensors 22, no. 24: 9775. https://doi.org/10.3390/s22249775.**

10. **Fatima, Anum, Imran Shafi, Hammad Afzal, Isabel De La Torre Díez, Del Rio-Solá M. Lourdes, Jose Breñosa, Julio César Martínez Espinosa, and Imran Ashraf. 2022. "Advancements in Dentistry with Artificial Intelligence: Current Clinical Applications and Future Perspectives" Healthcare 10, no. 11: 2188. https://doi.org/10.3390/healthcare10112188**

11. **Shahid, Waleed Bin, Baber Aslam, Haider Abbas, Hammad Afzal, and Saad Bin Khalid. "A deep learning assisted personalized deception system for countering web application attacks." Journal of Information Security and Applications 67 (2022): 103169.**

12. **Shahid, Waleed Bin, Baber Aslam, Haider Abbas, Saad Bin Khalid, and Hammad Afzal. "An enhanced deep learning based framework for web attacks detection, mitigation and attacker profiling." Journal of Network and Computer Applications 198 (2022): 103270.**

13. Hussain, Sajid, Hammad Afzal, Ramsha Saeed, Naima Iltaf, and Mir Yasir Umair. "Pharmacovigilance with transformers: A framework to detect adverse drug reactions using BERT fine-tuned with FARM." Computational and Mathematical Methods in Medicine (2021).

14. **Saeed, Ramsha, Hammad Afzal, Haider Abbas, and Maheen Fatima. "Enriching conventional ensemble learner with deep contextual semantics to detect fake news in Urdu." Transactions on Asian and Low-Resource Language Information Processing 21, no. 1 (2021): 1-19.**

15. **Rauf, Bilal, Haider Abbas, Muhammad Usman, Tanveer A. Zia, Waseem Iqbal, Yawar Abbas, and Hammad Afzal. "Application threats to exploit northbound Interface vulnerabilities in software defined networks." ACM Computing Surveys (CSUR) 54, no. 6 (2021): 1-36.**

16. Waheed, Marvi, Hammad Afzal, and Khawir Mehmood. "NT-FDS—A noise tolerant fall detection system using deep learning on wearable devices." Sensors 21, no. 6 (2021).

17. Amjad, Muhammad Faisal, Hammad Afzal, Haider Abbas, and Abdul B. Subhani. "AdS: An adaptive spectrum sensing technique for survivability under jamming attack in Cognitive Radio Networks." Computer Communications 172 (2021): 25-34.

18. **Khan, Zafran, Naima Iltaf, Hammad Afzal, and Haider Abbas. "DST-HRS: A topic driven hybrid recommender system based on deep semantics." Computer Communications 156 (2020): 183-191.**

19. **Ullah, Kaleem, Imran Rashid, Hammad Afzal, Mian Muhammad Waseem Iqbal, Yawar Abbas Bangash, and Haider Abbas. "SS7 vulnerabilities—a survey and implementation of machine learning vs rule based filtering for detection of SS7 network attacks." IEEE Communications Surveys & Tutorials 22, no. 2 (2020): 1337-1371.**

20. **Khan, Zafran, Naima Iltaf, Hammad Afzal, and Haider Abbas. "Enriching non-negative matrix factorization with contextual embeddings for recommender systems." Neurocomputing 380 (2020): 246-258.**

21. Bangash, Yawar Abbas, Haider Abbas, Waseem Iqbal, Malik Muhammad Zaki Murtaza Khan, Bilal Rauf, and Hammad Afzal. "Delay Reduction Through Optimal Controller Placement to Boost Scalability in an SDDC." IEEE Systems Journal 14, no. 3 (2019): 4489-4499.

22. Sabeen Javaid, Hammad Afzal, Fahim Arif, Naima Iltaf, Haider Abbas and Waseem Iqbal. "CATSWoTS: Context Aware Trustworthy Social Web of Things System" Sensors 2019, 19(14), 3076;

23. Mehtab, Anam, Waleed Bin Shahid, Tahreem Yaqoob, Muhammad Faisal Amjad, Haider Abbas, Hammad Afzal, and Malik Najmus Saqib. "AdDroid: rule-based machine learning framework for android malware analysis." Mobile Networks and Applications 25 (2020): 180-192.

24. **Arif, Omar, Hammad Afzal, Haider Abbas, Muhammad Faisal Amjad, Jiafu Wan, and Raheel Nawaz. "Accelerated dynamic MRI using kernel-based low rank constraint." Journal of medical systems 43 (2019): 1-11.**

25. **Jahangir, Maham, Hammad Afzal, Mehreen Ahmed, Khawar Khurshid, Muhammad Faisal Amjad, Raheel Nawaz, and Haider Abbas. "Auto-MeDiSine: an auto-tunable medical decision support engine using an automated class outlier detection method and AutoMLP." Neural Computing and Applications 32 (2020): 2621-2633.**

26. Jadoon, Abid Khan, Waseem Iqbal, Muhammad Faisal Amjad, Hammad Afzal, and Yawar Abbas Bangash. "Forensic analysis of Tor browser: a case study for privacy and anonymity on the web." Forensic science international 299 (2019): 59-73.

27. Naeem, Rida Zojaj, Saman Bashir, Muhammad Faisal Amjad, Haider Abbas, and Hammad Afzal. "Fog computing in internet of things: Practical applications and future directions." Peer-to-Peer Networking and Applications 12 (2019): 1236-1262.

28. Javaid, Sabeen, Hammad Afzal, Muhammad Babar, Fahim Arif, Zhiyuan Tan, and Mian Ahmad Jan. "ARCA-IoT: an attack-resilient cloud-assisted IoT system." IEEE Access 7 (2019): 19616-19630.

29. **Afzal, Hammad, and Tayyeba Mukhtar. "Semantically enhanced concept search of the Holy Quran: Qur'anic English WordNet." Arabian Journal for Science and Engineering 44 (2019): 3953-3966.**

30. **Yunus, Raza, Omar Arif, Hammad Afzal, Muhammad Faisal Amjad, Haider Abbas, Hira Noor Bokhari, Syeda Tazeen Haider, Nauman Zafar, and Raheel Nawaz. "A framework to estimate the nutritional value of food in real time using deep learning techniques." IEEE Access 7 (2018): 2643-2652.**

31. **Ahmed, Mahreen, Hammad Afzal, Imran Siddiqi, Muhammad Faisal Amjad, and Khawar Khurshid. "Exploring nested ensemble learners using overproduction and choose approach for churn prediction in telecom industry." Neural Computing and Applications 32 (2020): 3237-3251.**

32. **Anwaar, Fahad, Naima Iltaf, Hammad Afzal, and Raheel Nawaz. "HRS-CE: A hybrid framework to integrate content embeddings in recommender systems for cold start items." Journal of computational science 29 (2018): 9-18.**

33. Anwar, Zeeshan, Hammad Afzal, Nazia Bibi, Haider Abbas, Athar Mohsin, and Omar Arif. "A hybrid-adaptive neuro-fuzzy inference system for multi-objective regression test suites optimization." Neural Computing and Applications 31 (2019): 7287-7301.

34. Asim, Muhammad, Muhammad Faisal Amjad, Waseem Iqbal, Hammad Afzal, Haider Abbas, and Yin Zhang. "AndroKit: A toolkit for forensics analysis of web browsers on android platform." Future Generation Computer Systems 94 (2019): 781-794.

35. Khaliq, Saim Bin Abdul, Muhammad Faisal Amjad, Haider Abbas, Narmeen Shafqat, and Hammad Afzal. "Defence against PUE attacks in ad hoc cognitive radio networks: a mean field game approach." Telecommunication Systems 70 (2019): 123-140.

36. Khan, Rashid Masood, Waseem Iqbal, Muhammad Faisal Amjad, Haider Abbas, Hammad Afzal, Abdul Rauf, and Maruf Pasha. "Forensic investigation to detect forgeries in ASF files of contemporary IP cameras." The Journal of Supercomputing 74 (2018): 5060-5081.

37. Nizami, Imran Fareed, Muhammad Majid, Hammad Afzal, and Khawar Khurshid. "Impact of feature selection algorithms on blind image quality assessment." Arabian Journal for Science and Engineering 43 (2018): 4057-4070.

38. **Ahmed, Mahreen, Asma Ghulam Rasool, Hammad Afzal, and Imran Siddiqi. "Improving handwriting based gender classification using ensemble classifiers." Expert Systems with Applications 85 (2017): 158-168.**

39. Toshiaki Katayama, Mark D Wilkinson, Gos Micklem, Shuichi Kawashima, Atsuko Yamaguchi, Mitsuteru Nakao, Yasunori Yamamoto, Shinobu Okamoto, Kenta Oouchida, Hong-Woo Chun, Jan Aerts, Hammad Afzal, et al. (2013) "The 3rd DBCLS BioHackathon: improving life science data integration with semantic Web technologies", Journal of Biomedical Semantics 2011, 4:6; Feb, 2013.

40. **Afzal, Hammad, James Eales, Robert Stevens, and Goran Nenadic. "Mining semantic networks of bioinformatics e-resources from the literature." Journal of biomedical semantics 2 (2011): 1-18.**

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