Annus Zulfiqar

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Education

2021–2026   **PhD in Computer Science (Ross Fellow)**,
Department of Computer Science, Purdue University, West Lafayette, Indiana, USA.
- **Area**: *Domain Specific Architectures (DSA), Software Defined Networks (SDN), Next Generation Control Plane and Data Plane Architectures*
Research Advisor: *Muhammad Shahbaz*

2015–2019   **Bachelor of Electrical Engineering**,
School of Electrical Engineering and Computer Science (SEECS),
National University of Sciences and Technology (NUST), Islamabad, Pakistan.
- *CGPA* – **3.96/4.00**, *Major CGPA* – **4.00/4.00**, *Batch Rank* – **3/170**
Advisors: *Dr. Faisal Shafait* and *Muhammad Shahzad*

Experience

Academic Research

Sep 2021 – Present   **Graduate RA**, *NextGArchitectures Lab*, Purdue University,
Advisor: Muhammad Shahbaz.
- Designing applications for and improving an AutoML framework, *Homunculus*, for an intelligent data plane capable of line rate Machine Learning inference in programmable switches.
- Exploring Control Plane bottlenecks in modern data centers, the design of a new Domain-Specific Control Plane Architecture and the abstractions necessary to make it happen.

Sep 2020 – Jan 2021   **Remote Researcher**, *Pervasive Parallelism Laboratory*, Stanford University,
Advisor: Muhammad Shahbaz (PostDoc Researcher).
- Developed a discrete event network simulator to test AI-capable switches with flowlet- and per-packet load balancing algorithms such as CONGA, HULA, and Reinforcement Learning at data rate in multi-tier datacenter topologies.

Jun – Sep 2018   **Visiting Research Intern**, *Microelectronic Systems Design Research Group, Department of Electrical and Computer Engineering, Technical University of Kaiserslautern (TUK)*, Kaiserslautern, Germany, (DAAD funded project).
- Implemented semantic segmenation and patch-wise classification models for multi-temporal forest cover change detection and analysed the largest aforestation drive in Pakistan using remote sensing data sources including Sentinel-1, Sentinel-2, Landsat-8 and ALOS PALSAR.

Jun 2017 – May 2019   **Research Intern**, *TUKL lab*, SEECS, NUST,
(Supervisors: Dr. Faisal Shafait, Dr. Muhammad Shahzad).
Applied and analyzed machine learning techniques on document processing and remote sensing tasks.
- **Document Processing**
  - Applied object-detection algorithms for table detection in invoices and receipt images. Worked on logical layout analysis of scientific publications for entity recognition using Recurrent Neural Networks (RNNs), Neural Tensor Networks (NTNs) and GloVe vectors.

- **Remote Sensing** (Senior Year Project: ***Forest Cover Change Detection Using Remote Sensing Imagery***)
  - Digitized land cover paper maps for districts included in Billion Tree Tsunami (BTT) afforestation project in Pakistan and utilized Landsat-8 data and deep learning for multi-temporal forest cover change analysis to generate detailed pixel-level forest cover change maps for BTT districts from 2014 to 2020.

Industry

Jun 2019 – Jul 2021 **Design Engineer**, *Center for Advanced Research in Engineering (CARE)*, Islamabad, Pakistan.
- **Smart Sense Nodes (SSNs)** Designed multiple variants of IoT Gateways and Sensor Nodes capable of retrieving machine data from standard interfaces and custom sensors, and communicating over Ethernet, Wi-Fi and LTE.
- **Asynchronous Parallel Disassembly Planning (APDP)** Designed APDP algorithms for multiple manipulators, simultaneous disassembly problem using Genetic Algorithms for Pakistan Air Force.
- **Power Automation for Digitised Surveillance Control Reporting System (DSCR)** Developed a Telnet-based Power Automation Interface for Military Radar Servers powered using Schneider APC UPS systems for routine/emergency shutdown management.

Feb–May 2020 **Design Engineer (Part-time)**, *Technology Spirits*, Islamabad, Pakistan.
Designed a Brushless DC Motor Electronic Speed Controller (BLDC-ESC) rated at 88 Amperes of current around the STMicroelectronics STSPIN32F0 controller.

Publications

May 2021 *Annus Zulfiqar, Muhammad M. Ghaffar, Muhammad Shahzad, Christian Weis, Muhammad I. Malik, Faisal Shafait, Norbert Wehn,* ***AI-ForestWatch: Semantic Segmentation Based End-to-End Framework for Forest Estimation and Change Detection using Multi-Spectral Remote Sensing Imagery***, *J. of Appl. Remote Sensing 15(2), 024518 (2021)* | Paper | Code |

Dec 2019 *Annus Zulfiqar, Adnan Ul-Hasan, Faisal Shafait.* ***Logical Layout Analysis using Deep Learning***, *Digital Image Computing: Techniques and Applications (DICTA), IEEE, 2019* | Paper |

Honors and Awards

Mar 2021 MSEE offer from KAIST, South Korea, with KAIST scholarship

Feb 2021 PhD Computer Science offer from Purdue University with 4 year Ross Fellowship worth USD 231,101

Apr 2020 MSEE/MSECE offer from Stanford, University of Michigan, UCLA, Columbia University, Duke (USD 22K scholarship per semester)

Nov 2018 Travel award for EECamp at KAIST, South Korea.

Sep 2018 Funded internship offer for one year at DFKI, Kaiserslautern, Germany (Passed due to visa issues).

Jun 2018 DAAD-funded internship at Microelectronic Systems Design Research Group, Department of Electrical and Computer Engineering, Technical University of Kaiserslautern (TUK), Kaiserslautern, Germany.

2015-2019 NUST merit scholarship recipient for 7/8 semesters.