

ANNUS ZULFIQAR

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EDUCATION

Purdue University Ph.D. in Computer Science Area: <i>Programmable Networks, Domain-Specific Architectures</i> Advisor: Muhammad Shahbaz	West Lafayette, IN 2021-Present
National University of Sciences and Technology (NUST) Bachelor of Electrical Engineering (Batch rank: 3/150) Thesis: <i>End-to-End Forest Cover Detection and Change Estimation</i> Advisors: Muhammad Shahzad, Faisal Shafait	Islamabad, Pakistan 2015 - 2019

ACADEMIC RESEARCH

Next Generation Architectures Lab (Purdue University) Graduate Research Assistant Advisor: Muhammad Shahbaz	Aug 2021 - Present West Lafayette, IN
<ul style="list-style-type: none">Building architectures for the <i>slow-path</i> at the control-plane/data-plane interface in SDN Collaborators: Ben Pfaff (VMware) and teamBuilt a Neural Architecture Search framework for emerging ML-capable data planes Collaborators: Kunle Olukotun (Stanford) and team	
Pervasive Parallelism Laboratory (Stanford University) Remote Researcher Mentor: Muhammad Shahbaz (Postdoc)	Sep 2020 - Jan 2021 Stanford, CA
<ul style="list-style-type: none">Designed discrete-event network simulations for data center load balancing algorithms	
Technical University of Kaiserslautern (TUK) Research Intern Funded by DAAD	Jun - Sep 2018 Kaiserslautern, Germany
<ul style="list-style-type: none">Worked on multi-temporal forest cover change detection to analyze the largest afforestation drive in Pakistan using remote sensing imagery and deep learning	
TUKL Lab, NUST Research Intern Advisors: Faisal Shafait, Muhammad Shahzad	Jun 2017 - May 2019 Islamabad, Pakistan
<ul style="list-style-type: none">Worked on document processing and land cover classification problems using object detection and sequence learning techniques from deep learning	

INDUSTRY EXPERIENCE

VMware Research Group (VRG) Research Intern Mentor: Ben Pfaff	May - Aug 2022 Palo Alto, CA
<ul style="list-style-type: none">Characterized the Open vSwitch <i>slow path</i> performance bottlenecks and proposed to build an accelerator for the <i>slow path</i>	
Center for Advanced Research in Engineering (CARE) Design Engineer	Jun 2019 - Jul 2021 Islamabad, Pakistan
<ul style="list-style-type: none">Designed Ethernet/Wi-Fi/LTE-capable PoE-enabled IoT Sensor Networks for industrial machine sensing and telemetry	

PUBLICATIONS

1. Gigaflow: Line-Rate, Pipeline-Aware Caching for Modern SmartNICs
Annus Zulfiqar, Ali Imran, Venkat Kunaparaju, Gianni Antichi, Ben Pfaff, Muhammad Shahbaz
In Submission
2. A Smart Cache for a SmartNIC! – Scaling End-host Networking to 400Gbps & Beyond (poster)
Annus Zulfiqar, Ali Imran, Venkat Kunaparaju, Gianni Antichi, Ben Pfaff, Muhammad Shahbaz
HotChips 2024
Poster
3. GigaFlow: A Scalable and Efficient Hardware Fast-Path for Open vSwitch (poster)
Annus Zulfiqar, Venkat Kunaparaju, Muhammad Shahbaz
TECHCON 2024
Poster
4. The Slow-Path Needs an Accelerator Too!
Annus Zulfiqar, Gianni Antichi, Ben Pfaff, William Tu, Muhammad Shahbaz
ACM SIGCOMM CCR 2023
Paper
5. Homunculus: Auto-Generating Efficient Data-Plane ML Pipelines for Datacenter Networks
Tushar Swamy, *Annus Zulfiqar*, Muhammad Shahbaz, Luigi Nardi, Kunle Olukotun
ACM ASPLOS 2023
Distinguished Artifact Award
Paper, Artifact
6. AI-ForestWatch: Semantic Segmentation Based End-to-End Framework for Forest Estimation and Change Detection using Multi-Spectral Remote Sensing Imagery
Annus Zulfiqar, Muhammad M. Ghaffar, Muhammad Shahzad, Christian Weis, Muhammad I. Malik, Faisal Shafait, Norbert Wehn
SPIE Journal of Applied Remote Sensing 2021
Paper

TUTORIALS

- Tutorial: In-Network Machine Learning using Taurus
Tushar Swamy, *Annus Zulfiqar*, Alex Rucker, Muhammad Shahbaz, Kunle Olukotun
ACM SIGCOMM 2022
Webpage, Artifact

TALKS AND DEMOS

- Gigaflow: Line-Rate, Pipeline-Aware Caching for Modern SmartNICs (with Demo) May 2024
SRC JUMP 2.0
- Homunculus: Auto-Generating Efficient Data-Plane ML Pipelines for Datacenter Networks Jul 2023
SRC JUMP 2.0
- The Slow Path Needs an Accelerator Too! Aug 2022
VMware Research Group

TEACHING

- CS 38100 – Introduction to the Analysis of Algorithms (Graduate TA) Fall 2023

CERTIFICATIONS

- Tofino Native Architecture (TNA) & P4
Intel Connectivity Academy – Level 1A/B

February 2022

HONORS AND AWARDS

- Distinguished Artifact Award for Homunculus (ASPLOS 2023)
- Ross Fellowship recipient at Purdue University
- Travel award for ASPLOS (2022), and SIGCOMM (2022)
- National (Pakistan) P@SHA ICT Awards Winner (with *WiserMachines*, IoT spin-off of CARE)
- Travel award for EECamp at KAIST, South Korea
- Funded internship offer for one year at DFKI, Kaiserslautern, Germany (passed)
- DAAD-funded internship at Technical University of Kaiserslautern (TUK), Germany
- NUST merit scholarship recipient from 2015 - 2019

REFERENCES

1. Muhammad Shahbaz (mshahbaz@purdue.edu)
Purdue University
2. Gianni Antichi (gianni.antichi@polimi.it)
Politecnico di Milano
3. Ben Pfaff (bpfaff@vmware.com)
VMware