

## Education

<b>North Carolina State University, Raleigh, North Carolina, USA</b>	<b>Aug 2018 – Present</b>
<ul style="list-style-type: none"> <li>Ph.D. in Computer Science (<i>Graduation Expected May 2023</i>)</li> <li><i>Research Areas:</i> Networking, Systems, Machine Learning</li> </ul>	
<b>Lahore University of Management Sciences (LUMS), Pakistan</b>	<b>Aug 2016 – June 2018</b>
<ul style="list-style-type: none"> <li>M.Sc. in Electrical Engineering</li> </ul>	
<b>NUCES-FAST, Lahore, Pakistan</b>	<b>Aug 2008 – June 2012</b>
<ul style="list-style-type: none"> <li>B.Sc. in Telecommunication Engineering</li> </ul>	

## Experience

<b>Research Assistant</b>	<b>NCSU</b>	<b>Aug 2018 – Present</b>
<b>Cloud Gaming:</b> Dissecting the quality of experience of cloud gaming platforms: Google Stadia, Amazon Luna, Nvidia GeForceNow		
<ul style="list-style-type: none"> <li>Develop a novel deployable deep-learning based automated tool featuring video processing, image recognition, optical character recognition, and measuring round trip video delay in gaming as server-end, network, and client-end delay with model accuracy <math>\geq 99\%</math> (<i>CNN, TensorFlow, Keras, Pandas, FFmpeg, Python3</i>)</li> <li>Implement a lightweight chromium module for video stream logging and off-line analysis, thus identifying factors that degrade bitrate by <u>6.6-times</u> and frame-rate by <u>2-times</u> (<i>Chromium, WebRTC, FFmpeg, usbmon, C++, Python3</i>)</li> </ul>		
<b>AWS Network Measurement:</b> Analyze the availability and latency of AWS network for elastic compute cloud and serverless		
<ul style="list-style-type: none"> <li>Build a large-scale longitudinal measurement system for 210 region pairs/ 244 availability zone pairs, collect data comprising 20 billion packets, while identifying several cases of cloud unavailability and latency spikes on AWS network infrastructure (<i>AWS, Cloud formation, Serverless Lambda, Kubernetes, EC2, EBS, BPF, Python3, C</i>)</li> <li>Use machine learning (long short-term memory) to forecast packet losses in the network with <u>92%</u> accuracy, thus, enabling preemptive measures for improving application performance (<i>LSTM, TensorFlow</i>)</li> </ul>		
<b>Spam Political Biases:</b> Model and evaluate political biases in spam filtering algorithm of Gmail, Outlook, and Yahoo		
<ul style="list-style-type: none"> <li>Develop tool to collect data and extract over <u>1.3</u> million emails from <u>300</u> email accounts (<i>IMAP, Selenium WebDriver, Python3</i>)</li> <li>Apply propensity score matching to estimate the effect of treatment and minimizing the effect of confounding variables in the data</li> </ul>		
<b>Research Assistant</b>	<b>LUMS</b>	<b>January 2017 – May 2018</b>
<b>Scylla:</b> Develop a software control layer on contiki-OS, interleaving multiple wireless stacks such as 6LoWPAN/Bluetooth 4.2 on a single radio, with priority-scheduling for multiple traffic types, to achieve near stack-native performance while simultaneously offering both wireless stacks ( <i>C, Contiki, Time-Slotted Channel Hopping, TI SensorTag CC2650</i> )		
<ul style="list-style-type: none"> <li>Delivered a talk on challenges of wireless heterogeneity in IoT and emerging opportunities at COMSYS, RWTH Aachen, Germany</li> </ul>		
<b>Software Engineer</b>	<b>Netsol Technologies</b>	<b>March 2013 – August 2015</b>
<ul style="list-style-type: none"> <li>Pursue front-end development and release of a consumer lease solution for an auto-financing client in Australia (<i>C#, SQL, SVN</i>)</li> <li>Lead on optimizing performance and bug fixing on a live asset financing application</li> </ul>		
<b>Project Engineer</b>	<b>Alstom Grid</b>	<b>July 2012 – December 2012</b>
<ul style="list-style-type: none"> <li>Lead a team of 5 for deployment and commissioning of telecom infrastructure in 14 power/grid stations and designed primary and backup routing plan for voice and data of 30+ sites of the national grid of Pakistan (<i>SDH, NEC PABX, AREVA PLC</i>)</li> </ul>		

## Projects

- Multi-Server Queuing System:** Implement a simulator for M/M/m and M/G/m system and evaluate their performance for First Come First Serve and Shortest Job First service disciplines (*Python3*)
- Web-Server:** Develop a web-server simulator, with multiple I/O disks, for queuing service disciplines First Come First Serve, Shortest Job First, and Priority Preemptive/Non-Preemptive, and evaluated on 10 million requests (*Python3*)
- Blockchain in IoT:** Design prototype for access management in IoT using permissioned blockchain with PBFT (python)
- Ramdisk:** Implement a virtual disk drive using system call interface of filesystem in userspace (*C, FUSE*)
- User Shell:** Develop a shell command interpreter with parsing, I/O redirection, command execution, and signal handling (*C*)
- Thread Library:** Implement a user-level threading library supporting create, yield, join, and exit operations (*C*)
- Smart Energy Metering:** Design and implement a complete smart energy metering system involving data acquisition, concentration, transmission over GSM link to base station, and bill generation (*C, C#, SQL, Zigbee, GSM*)

## Publications

- Dissecting Cloud Gaming Performance with DECAF (*ACM SIGMETRICS 2022*) [DOI]
- Characterizing the Availability and Latency in AWS Network from the Perspective of Tenants (*To appear in IEEE ToN 2022*)
- Interleaving Multiple IoT Stacks on a Single Radio (*ACM CoNEXT 2018*) [DOI]
- Taming Link-layer Heterogeneity in IoT (*ACM SenSys 2017*) [DOI]

(Two submissions under review in *ACM TheWebConference* and *ACM SIGCHI*)

## Technical Skills

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- **Languages:** Python, C++, C, R, SQL,  $\LaTeX$
- **Technologies & Platforms:** AWS, Serverless Lambda, Kubernetes, Docker, Linux, TensorFlow, Keras, NumPy, Pandas, PIL, Matplotlib, TCP/IP, WebRTC, FFmpeg, MATLAB, BPF, ns-3, netem, IMAP, Visual studio, Eclipse, GitHub, SVN

## Academic Services

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- Mentor two undergrad students on convolutional neural networks and transfer learning (GEARS Summer 2021)
- Mentor two undergrad students on high accuracy video time-stamping (GEARS Summer 2021)
- Reviewer IFIP Networking 2020
- Reviewer journal IEEE Access
- Mentor two undergrad students on web application algorithm analysis (GEARS Summer 2020)
- Mentor two undergrad students on performance evaluation of cloud applications (Spring 2020)

## Honors and Awards

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- NSF Travel Grant for ACM CoNEXT, 2018
- NCSU Student Travel Grant for ACM IMC 2018
- College of Engineering Graduate Merit Award, NCSU, 2018
- Graduate School Scholarship for fully-funded PhD at NCSU
- DAAD Summer Research Exchange Grant, 2017

## Leadership

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- **CoVID-19 Relief:** Initiate and organize ration distribution campaign during pandemic, serving 130+ affected families in Pakistan
- **Head Software Competition:** In SOFTEC 2012, manage nationwide software competition with 36 shortlisted teams
- **Vice President:** In NUCES Circuits Society 2011, manage 3 national programming and circuit design competitions

## References

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