Imran Khan

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Summary

Data Science and Machine Learning professional with expertise in analyzing 5G networks. Experience includes predictive modeling of fine-grained throughput, large-scale dataset analysis (4M+ measurements), and evaluating quality of experience (QoE) for latency-sensitive applications using Network KPIs and 5G/LTE signaling data.

Education

- **Northeastern University** — Boston, MA
  Ph.D. in Computer Engineering — *Jan 2021 - May 2025(expected)*
- **Southern Illinois University Carbondale** — Carbondale, IL
  Masters of Science in Electrical and Computer Engineering — *Jan 2018 - July 2020*

Skills Summary

- **Languages**: Python, C/C++, Android (JAVA/Kotlin), Unix/Kernel Programming, HTML, CSS
- **Tools**: Scikit-Learn, Numpy, Pandas, PyTorch, Keras, SQL, Tableau, Matplotlib Seaborn, Plotly, Principal Component Analysis, Graphana.
- **ML/DL Frameworks**: Regression, Classification, Ensemble Methods, Deep Learning, Reinforcement Learning, NLP, Recommendation systems.

Experience

- **Northeastern University** — Boston, MA
  Research Assistant — Institute for the Wireless Internet of Things — *Jan 2021 - Present*
  - Conducted a two-phase comprehensive performance evolution study of 5G networks. The initial phase involved designing and developing an **Android application** to measure user-perceived 5G bandwidth and latency, enabling the creation and analysis of a year-long, crowd-sourced dataset with 20K+ measurements across different countries. Conducted regression-analysis to identify trend in user-perceived performance and network coverage. Developed a **web-based visualization platform** to analyze network usage statistics, operator performance, and global 5G coverage growth.
  - The final phase of the 5G evolution study leveraged a large-scale 5G dataset provided by **Ookla®**, encompassing over **2.65M+** mobile network measurements collected over a four-year period globally. The analysis focused on identifying trends in 5G network coverage and performance, as well as correlating key network performance indicators (KPIs) with overall network performance.
  - Investigated the feasibility of predicting fine-grained throughput at 100 ms granularity using machine learning models in real-world cellular networks, incorporating mixed LTE/5G technologies. Implemented various **time-series forecasting techniques** to real-world cellular data to predict user-performance at fine-grained resolution.
  - Conducted an in-depth measurement study on user-perceived experience, evaluating network coverage, performance, and quality of experience (QoE) for latency-sensitive 5G applications (e.g., Low-latency live streaming, AR, 360°video streaming, and online gaming). The study involved analyzing low-level 5G metrics and signaling messages to correlate with application performance.
  - Worked on the project **X5G**: An Open, Programmable Platform to Conquer the 5G and 6G Wireless Spectrum. This project involved procuring the hardware and software necessary to build an 8-node O-RAN compliant 5G experimental testbed. Developed Xn-handover measurement report handling for the OAI codebase.
  - Employed bandwidth aggregation (802.11ad, 802.11ac, & Cellular) with MultiPath TCP on smartphones and exploring the impact on power consumption and resource utilization. Ported 10K+ lines of Multipath TCP source code into Android Kernels for COTS UE (Asus ROG II, Pixel 5).
- **AT&T Labs. Inc** — Boston, MA
  Research Intern & External Collaborator — *June 2021 - May 2022*
  - Investigated the impact on QoE of low-latency video streaming application over 5G networks.

Publications

- **5G Metamorphosis: A Longitudinal Study of 5G Performance from the Beginning**
  Imran Khan*, Omar Basit*, Moinak Ghoshal, Y. Charlie Hu, Dimitrios Koutsonikolas.
  Under Submission
- **On the Predictability of Fine-grained Cellular Network Throughput using Machine Learning Models**
  Imran Khan*, Omar Basit*, Phuc Dinh*, Z. Jonny Kong*, Y. Charlie Hu, Dimitrios Koutsonikolas, Myungjin Lee, Chaoyue Liu.
  IEEE MASS 2024

- **How Mature is 5G Deployment? A Cross-Sectional, Year-Long Study of 5G Uplink Performance.**
  Imran Khan, Moinak Ghoshal, Joana Angjo, Sigrid Dimce, Mushahid Hussain, Paniz Parastar, Yenchia Yu, Claudio Fiandrino, Charalampos Orfanidis, Shivang Aggarwal, Ana C Aguiar, Ozgu Alay, Carla F. Chiasserini, Falko Dressler, Y. Charlie Hu, Steven Y. Kox, Dimitrios Koutsonikolas, Joerg Widmer.
  IFIP Networking 2024
- **An Open, Programmable, Multi-vendor 5G O-RAN Testbed with NVIDIA ARC and OpenAirInterface.**
  Imran Khan*, D Villa*, Florian Kaltenberger, Nicholas Hedberg, Ruben Soares da Silva, Anupa Kelkar, Chris Dick, Stefano Basagni, Josep M Jornet, Tommaso Melodia, Michele Polese, Dimitrios Koutsonikolas.
  IEEE INFOCOM NG-OPERA, 2024
- **An Experimental Study of Low-Latency Video Streaming over 5G.**
  Imran Khan*, Tuyen X. Tran, Matti Hiltunen, Theodore Karagioules, Dimitrios Koutsonikolas.
  IEEE MeditCom 2024
- **Performance of Cellular Networks on the Wheels.**
  Imran Khan*, M. Ghoshal*, Z. Jonny Kong*, Phuc Dinh, Jiayi Meng, Y. Charlie Hu, Dimitrios Koutsonikolas.
  ACM IMC, 2023
- **Can 5G mmWave Enable Edge-Assisted Real-Time Object Detection for Augmented Reality?**
  Moinak Ghoshal, Z Jonny Kong, Qiang Xu, Zixiao Lu, Shivang Aggarwal, **Imran Khan**, Jiayi Meng, Yuanjie Li, Y Charlie Hu, Dimitrios Koutsonikolas
  ACM IMC, 2023
- **Demo: NextG-up: a tool for measuring uplink performance of 5G networks.**
  Imran Khan*, Moinak Ghoshal*, Qiang Xu, Z. Jonny Kong, Y. Charlie Hu, and Dimitrios Koutsonikolas
  ACM Mobisys, 2022
- **An In-Depth Study of Uplink Performance of 5G mmWave Networks.**
  Moinak Ghoshal, Z. Jonny Kong, Qiang Xu, Zixiao Lu, Shivang Aggarwal, **Imran Khan**, Yuanjie Li, Y. Charlie Hu, Dimitrios Koutsonikolas
  ACM SIGCOMM 5G-MEMU, 2022

Source Code and Dataset

- **Dataset** for Cross-Sectional, Year-Long Study of 5G Uplink Performance. [IFIP 2024]
- **Dataset** for Predictability of Fine-grained Cellular Network Throughput using Machine Learning Models. [IEEE MASS 2024]
- **Dataset** for 5G network performance on the wheels. [ACM IMC 2023]
- **Android app** NextG-UP app for a crowd-sourcing based measurement study of 5G performance.
- MPTCP **source code** for Pixel-5 Phone and **source code** for ROG Phone 2, from our WiNTECH'21 paper.

Professional Services

- Reviewer : Computer Networks 2024, IEEE Internet of Things 2024, IEEE GLOBECOM 2021, IEEE ICC 2024, COMCOM 2025, IEEE VTC2025
- Web Chair: IEEE LANMAN 2024, WoWMoM 2023
- TPC Member: IEEE WCNC [2023, 2024]
- Got selected for NSF Funded Student travel grant for Mobicom'2021
- Got selected for NSF Funded POWDER Network and Wireless Week, Salt Lake City , Utah 2019

Certifications

- Udacity Data Science Nano-Degree