(805)869-9735
punnalismail@ucsb.edu

Punnal Ismail Khan

github.com/punnal
linkedin.com/in/punnal

Education

PhD Computer Science - University of California, Santa Barbara - *CGPA:* 3.63 / 4.0 **September 2021 - Present**

Relevant Courses: Scalable Internet Services, Runtime Systems, Distributed Systems, ML for Networked Systems.

BS Computer Science - Lahore University of Management Sciences - *Major CGPA:* 3.85 / 4.0 **September 2017 - July 2021**

Relevant Courses: Algorithms, Data Structures, Data Science, Advanced Programming, Operating Systems, Databases, Network-Centric Computing, Network Security, Software Engineering, Artificial Intelligence, Theory of Automata.

Experience

Research Assistant - Systems and Network Lab (UCSB) January 2022 - Present

Realistic Network traffic generator under different network conditions using Docker Containers:

- Created a system in Python for network traffic generation by orchestrating Docker containers from >74K public GitHub repositories.
- Successfully deployed Docker containers across a **distributed network of 25 nodes** strategically positioned on the UCSB campus.
- Enabled docker container deployments in a virtual network and supported precise network conditions control using **Linux TC**.
- Scaled the system by deploying the containers from repositories in parallel on multiple AWS instances using Python SDK Boto3.
- Used ML foundation models to fingerprint services using this network data and got a weighted f1 score of 0.83.

Measuring Network latency using less bandwidth - *Collaborations: Microsoft Research and UCSB.*

- Engineered a system that Measures network latency and reduces bandwidth by ~60% between the data plane and control plane.
- Utilized advanced techniques like Huffman coding and modified Time division multiple access to achieve this goal.

Reporting distribution of flow sizes and flow IDs of heavy hitters in the data plane(*Published work*):

- Implemented the system on a hardware network switch using **P4 programming language**.
- Achieved 15x performance improvement(i.e. 400 ns to process one packet) on data plane(**network switch**) compared to the control plane(server with 12 core 2.4Ghz, 192Gb memory) implementation(in Python).
- Attained a low max quantile error of 0.11 and reported heavy hitter flows with an F1 score of 0.99.
- Published this work in top tier database conference: **VLDB 2023** (Acceptance rate **18.6%**)

Research Assistant - Systems and Network Lab (LUMS) January 2020 - July 2021

Detecting inconsistencies in Linux Audit System - *Collaborations: SRI International, UBC, Bristol, and LUMS.*

- Modified Syzkaller(kernel fuzzer) written in C and Go Programming language to fit our needs like logging more information.
- Fuzzed the **Linux kerne**l with over 5 million random system calls while generating system call logs through the Linux Audit system.
- Developed efficient programs to analyze log files(over 5 million entries) to **detect loss of information in the Linux audit system**.
- Found the reasons(i.e. buffer overflow) behind these inconsistencies(loss of information) using system-level tools.

Measurement of PII leakages in Online Job portals - *Collaborations: Meta, and LUMS.*

- Collected network traffic from 15 job portal websites and apps.
- Found API calls in the network traffic that leaked the personal information of over 10 million users using **penetration testing apps**.
- Reported the vulnerabilities to these job portals which **saved the data of over 10 million users** from potential attacks.

Co-Founder/Software Developer - Madadgaar (LUMS) June 2020 - August 2020

Madadgaar - A Convenient Blood Plasma Donation Platform:

- Co-founded and developed a Blood Plasma Donation Platform(link) for COVID-19 using **Javascript, React, and nodeJS**.
- Successfully advertised the system to get around 6 thousand blood donors registered to this platform.
- **Helped over 10 thousand blood recipients** find blood donors.

Summer Research Internship - Mixed Reality Lab (Koc University) June 2019 - August 2019

Driving Experience in Virtual Reality:

- Developed a virtual reality car driving experience using a **Unity game engine and C#**.

Teaching Assistant

Data Structures and Algorithms(UCSB Fall 2021): Data structures, proofs, design, and analysis of programs.

Programmable Networks(UCSB Winter 2022): Software-defined networks and programmable switches.

Advanced Programming(LUMS Fall 2019): Functional, asynchronous, and parallel programming using **Haskell, Javascript, and Go**.

Coding Projects Highlights

SmokeGrill: Developed a Food Ordering System using **Javascript, React, and NodeJS**.

Human Activity Recognition: Developed an ML model that predicts human activity with the help of Phone Sensors Data.

Bug Reports Classification: Classified categories and priorities of bug reports using a **Bert** with an f1 score of 0.91.

Awards and Honours

Academic Excellence Fellowship - UCSB: Awarded to students with excellent academic standing.

Full Merit Scholarship in A-Level - LGS JT: Awarded to students with at least 4As and 4A*s in their GCE O-Level exams.

Languages and Technologies

Python, C++, C, Haskell, GoLang, JavaScript, HTML, P4 programming

React, Vue.js, PySpark, Docker, Vagrant, LaTeX, MATLAB. NumPy, Matplotlib, pandas, scikit-learn, TensorFlow(Keras)