Talha Mehboob

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EDUCATION

PhD., Computer Engineering. — Amherst, MA, USA | Sep 2021 - Present
UNIVERSITY OF MASSACHUSETTS AMHERST
ADVISORS: Michael Zink & David Irwin

BS., Electrical Engineering — Islamabad, Pakistan | Sep 2017 - June 2021
NATIONAL UNIVERSITY OF SCIENCES & TECHNOLOGY

- **Rector's Gold Medal** for best final year project (FYP) & thesis

WORK EXPERIENCE

GRADUATE RESEARCH ASSISTANT | SUSTAINABLE COMPUTING LAB — UMass Amherst | Sep 2021 - Present

- My research is focused on designing cost-aware distributed software systems, encompassing the datacenters, edge computing systems and cloud platforms.

JUNIOR INSTRUCTOR | AI-LOUNGE — Islamabad, Pakistan | May 2020 – Jun 2021

- I led & organized the daily class, managed student queries, and oversaw the learning management system (LMS) and website.

RESEARCH ASSISTANT | TUKL-NUST RESEARCH CENTER — Islamabad, Pakistan | May 2019 – Jun 2021

- I managed the tasks related to development of machine learning models in the on-going projects and provided training to the team members.

PROJECTS

COST-AWARE FEDERATED LEARNING — PYTHON, DISTRIBUTED SYSTEMS, COST OPTIMIZATION

We design a system, which uses adaptive cost-aware client selection policies to optimize an arbitrary cost metric (carbon footprint in our case) when training the federated learning (FL) models. Our policies extend and combine the utility-based client selection and critical learning periods by making them cost-aware and demonstrate significant reductions in carbon-cost compared to the state-of-the-art approaches.

ANALYZING CLOUD CLUSTER INCENTIVES — SHARED CLUSTERS, REAL-WORLD JOB TRACE ANALYSIS

This project empirically analyzes the user incentives under two different pricing models for shared cloud clusters using an 8-year job trace from a large, shared cluster for a major state University system. Our analysis shows, majority of the users are incentivized to fly solo than to participate in the shared cloud cluster.

CLOUDLAB ON ESI — PERL, C, PYTHON, C++, PHP, JAVASCRIPT, MySQL

This project aims at providing an interface between the Elastic Secure Infrastructure (ESI) and CloudLab. CloudLab is an Open Cloud Testbed which gives its users baremetal nodes to perform experimentation, where ESI enables rapid multiplexing of baremetal servers between clusters. Thus, we create an interface between the two where CloudLab becomes the user of ESI and acquire the servers without exchange of credentials (passwords / IDs).

LOW-COST PATHOLOGY IMAGE SCANNER — EMBEDDED C, DEEP LEARNING, IMAGE PROCESSING

We developed a low-cost Image scanner that employs precise stepper motor control through microcontroller to capture high-resolution digital images of biological slides. We further analyzed these whole slide images for cancer cells detection using deep learning techniques (Segmentation & Object Detection).

PUBLICATIONS

T. Mehboob, N. Bashir, D. Irwin, M. Zink," Is Sharing Caring: Analyzing the incentives for Shared Cloud Clusters.", ACM ICPE'23
T. Mehboob, N. Bashir, J. Iglesias, M. Zink, D. Iwrin, "Cost-Aware Federated Learning.", *Under review*

SKILLS

Python, C, C++, PHP, Embedded C, HTML/CSS, Git, AWS, Docker, LaTeX