Zoha Khan

Email: khan530@purdue.edu | Linkedin: linkedin.com/in/zoha-khan | Github: github.com/khan-zoha | khan-zoha.github.io

EDUCATION

Purdue University August 2023 - Present
Master of Science in Computer Science
- Courses: Algorithms, Information Security

Lahore University of Management Sciences September 2019 - June 2023
Bachelors of Science in Computer Science
- cGPA: 3.90
- Relevant courses:
  * Algorithms, Data Structures, Discrete Mathematics, Software Engineering, Theory of Automata, Internet of Things
  * Networks: Topics in Computer and Network, Network Security, Topics in Internet Research, Network-Centric Computing
  * Programming: Advance Programming, Introduction to Programming, Computational Problem Solving
  * Systems: Operating Systems. Fundamentals of Computer System
  * Data Science: Principles and Techniques of Data Science, Databases, Computer Vision
  * Machine Learning, Introduction to Artificial Intelligence, Mathematical Foundation of Machine Learning
  * Mathematics: Calculus-I & II, Linear Algebra, Introduction to Differential Equation, Operational Research
  * Life Sciences: Chemistry+Lab, Biology+lab, Physics+lab

TECHNICAL SKILLS

Languages: C/C++, Python, SQL (MySQL, Postgres), Haskell, JavaScript, HTML/CSS, MATLAB
Frameworks: React, Node.js, Express.Js
Developer Tools: GitHub, Figma, Wireshark, Trello, VS Code, Visual Studio, PyCharm, Amazon Cloud9, Google Colab, Jupyter Notebook, Heroku, Sublime, Firestore, MongoDB, Proteus, Praat, LATEX
Libraries: Pandas, NumPy, SciPy, Matplotlib, Keras, PyTorch, TensorFlow, Scrapy, Scitkit-Learn, BeautifulSoup, cv2, Seaborn, Selenium, OpenCV, Joblib.Parallel, Passport JS, PIL, re, Psycopg (Not an exhaustive list)
Operating Systems: MacOS, Linux, Windows

RESEARCH EXPERIENCE

Accelerate Differentially private stochastic gradient descent performance via GPU July 2023 – Present
Advisors: Dr. Mohammadkazem Taram

Lab: Security and Architecture Lab (Purdue University)
- Completed Literature review
- Computed current performance for several frameworks including JAX, Tensorflow, Pytorch, and Opascus for both private and non-private epochs for MNIST Convolutional Neural Network

Privacy leakage by Classifying Encrypted IoT-Camera Traffic January 2022 – May 2023
Advisors: Dr. Hammad Ali Zai

Lab: Internet of Things

Idea: The study will concentrate on a Xiaomi IP camera and utilise data analysis of network packets to identify human vs object motion using encrypted data blocks sent by the camera utilising the UDP and TCP protocols. The project entails utilising a "Alfa awus036nh" router's monitor mode to record and analyse the IP camera's network activity. The proposed initiative seeks to enhance the privacy and security of Internet of Things (IoT) devices, particularly IP cameras.

- Used Adapter's monitor mode and capture packets in pcap or cap file.
- Compared Packet Lengths and rate of Packet transfer to detect Motion and Live Streaming
- Used Scapy to analyze network traffic in real time to detect motion and live stream.

Ad Accessibility October 2022 – May 2023
Advisors: Dr. Umar Iqbal, Dr. Muhammad Fareed Zaffar

Lab: Security and Privacy Research Lab (University of Washington)

Idea: The goal is to measure the ad accessibility systematically to understand the experience of visually impaired users.

- Scraped ads using Puppeteer from 20K websites of the Tranco list via an open-source web crawler.
- Measured the frequency of accessibility tokens (e.g., aria-labels, alt-text, aria-live, and aria-hidden) by using html parser.
- Developed a basic Node-based Web Application to classify ad's labels (aria-label and alt-text) as sufficient, limited, or misinformation (dark pattern) against the ad's screenshots.
- Designed survey to understand perception, understanding, and expectations of visually impaired users from advertisements.

Bias In Media (Senior Year Project)   August 2022 – May 2023

   Advisors: Dr. Yasir Zaki, **Dr. Talal Rahwan**, **Dr. Muhammad Fareed Zaffar**

Lab: Data Science and AI Lab (NYU)

Idea: We aim to expose biases (e.g., racial, gender) within media channels and compare biases across channels with different polarities in terms of leftist and rightist behavior using Natural Language Processing.

- Ran Word2Vec model on 5000 fox-news articles, observed significant bias against people of color.
- Scraped more than 1 million article content from New York Times and Fox News via Wayback machine, Selenium, and Beautiful Soup Library.
- Optimised text extraction from article links via joblib.parallel.
- Ran Word2Vec model for new data and calculated relative percentage difference of cosine similarities of different ethnicities with respect to white for past 10 years.

Fake News   June 2021 – May 2022

   Advisors: Dr. Ayesha Ali , **Dr. Ihsan Ayyub Qazi** , **Dr. Agha Ali Raza**

Lab: National Center of Big Data and Cloud Computing (NCBC, Pakistan)

Idea: The research aims to analyze the relationships between digital literacy and truth discernment, sharing intentions, emotional responses, and confirmation bias especially among low- and middle-income users. This can help in determining which social media users are most prone to fake news.

- Worked as team lead for the whole project.
- Recruited and trained other interviewees.
- Conducted extensive literature review and designed the survey on KoboToolbox.
- Surveyed 200 people.
- Performed data analysis and found that older individuals, females, those less educated, and people with lower household expenses are likely to have poor digital literacy, strong emotional response and more prone to fake news.

Modelling User Quality of Experience for Live Video Streaming   January 2022 – May 2022

   Advisors: Dr. Zaffar Ayub Qazi

Idea: Our project's primary goal is to understand optimal user experience when it comes to watching live events within an online setting.

- Developed a MERN-based web application that serves the same stream at three distinct bitrates.
- Collected TV streams and used Open Broadcasting System to serve over RTMP protocol at a fixed bitrate to the server, which then used FFmpeg to convert the video to different bitrates.
- Used a simple HTML video player to show the video to the user.
- Results showed that a stream that facilitated a less frequent rebuffering rate and moderate quality was the most preferred.

PROJECTS

Choka.com (Web Application)   January 2022 – May 2022
Github: https://github.com/choka

Idea: My team of five members developed a web application, choka.com, which inspires to revolutionise the tutoring industry by streamlining the matching process between tutors and students. Students can compare and select tutors. Likewise, tutors can have flexibility over their schedules and teach students a specific subjects. We followed agile methodology.

- Conducted students' and teachers' interview to analyse requirements of the user.
- Designed our prototype on Figma.   **(link)**
- Developed web app using FERN stack (Google Firebase, Express, React, Node.JS)
- Tested the app and corrected the errors.

The Unix Shell   November 2021 – December 2021

- Designed a C program to serve as a shell interface that accepts user commands and then executes each command in a separate process
- Supported input and output redirection, as well as pipes as a means of IPC between a pair of commands
- Used the UNIX fork(), exec(), wait(), dupe(), and pipe() system calls

Language Recognition Model   November 2021 – December 2021

- Collected data by recording 600 hundred sentences (Urdu, English and Mixed Languge) using Praat software.
- Built language recognition models using different techniques such as Kernelized Support Vector and Neural Networks.
- Achieved 91% accuracy.

Mask/Non-Mask Person Detection   October 2021 – December 2021

Idea: The project used Multi-Camera System and combined visual recognition and multi-camera geometry and build a application to detect mask and non-mask people.

- Recorded data using a Multi-camera Setup.
- Achieved 87% accuracy for Mask/Non-Mask Person Detection using YOLO object detector.
- Visualise Object Detection on Orthographic Top-View.
- Detected COVID-19 SOP Violation and generated a Heatmap Visualization on the top-view.

Peer-to-peer Communication System   13 February 2021 – 8 March 2021

Idea: Implementing a Chat Application introduced me to some fundamental concepts of socket programming and Computer Networking. I implemented a chat application (like messenger) that will allow users to reliably transfer messages and files using UDP in python.

TEACHING EXPERIENCE

Teaching Assistant for Network Security   January 2023 – May 2023
Teaching Assistant for Computer Vision   September 2022 – December 2022

Designed programming assignments, held bi-weekly office hours to assist a class of approximately 80 students. I also graded quizzes, written homework, and programming assignments and held tutorials to assist better learning. I designed semester long project on Lane Analysis for Autonomous Vehicle as well.

Teaching Assistant for Computational Problem Solving   July 2022 – August 2022
Teaching Assistant for Data Structures   January 2022 – June 2022

Designed and graded assignments on Linked Lists, Stacks, Queues, Trees, Hashing and Sorting algorithms. I held tutorial and office hours twice a week to help a class of approximately 100 students.

Teaching Assistant for Computational Problem Solving   September 2021 – December 2021

Assisted, graded, and mentored students in groups of up to 11 during weekly labs. Additionally, I supported student learning objectives through personalized and small group assistance during weekly office hours and holding weekly tutorials. I also mentored and graded groups of students in their final project.

Awards and Honors

Graduated with High Distinction in Undergraduate   June 2023
Dean's Honor List

  Year: 2019-2020 & 2020-2021 & 2021-2022 & 2022-2023 (Awarded to students who had cGPA more than 3.6/4.0.)

Merit Scholarship

  Year: 2020-2021 & 2022-2023

Successfully completed the Fundamentals of Deep Learning Workshop by NVIDIA   September 2021
Successfully completed the Python Data Structures course   June 2020

  Completed an online non-credit Python Data Structures course authorized by University of Michigan and offered through Coursera.

Gold Medalist in A-levels   June 2019
Valedictorian in O-levels   June 2017