Muhammad Aneeq Asif

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Education

Pakistan Institute of Engineering and Applied Sciences (PIEAS) **Sep 2019 – July 2023**
Bachelor of Science in Physics *Nilore, Islamabad, Pakistan*

Punjab Group of Colleges (PGC) **Sep 2017 – July 2019**
Higher Secondary School Certificate with Mathematics *Bahawalpur, Pakistan*

Relevant Coursework

- Solid State Physics I, II
- Electromagnetic Theory
- Physics of Semiconductor Devices
- Thermal and Statistical Physics
- Computer Simulations in Physics
- Quantum Mechanics
- Introduction to Quantum Optics
- Modern Physics
- Applied Chemistry
- Mathematical Methods of Physics
- Optics

Experience

National Centre for Physics **July 2022 - Sep 2022**
Intern *Islamabad, Pakistan*

- Designed and developed ANN model in **PyTorch** to predict the lattice energy of the crystal based on elemental properties and structural features.
- Hands on experience on using **PROPhet** machine learning C++ library.
- Thorough study of various fundamental machine learning models, including Decision Trees, PCA, Linear, Polynomial, Ridge, Logistic, and Lasso Regression, as well as splines, curve fitting, and Cross Validation techniques.
- Cleaning and pre-processing of Data generated by VASP in Python.

PIEAS CISD HPC Department **May 2019 – August 2019**
Volunteer *Islamabad, Pakistan*

- Offered Linux expertise to deploy the EasyBuild framework and install 15 different computational software packages, including VASP, Quantum ESPRESSO, OpenFOAM and many machine learning libraries in HPC cluster **Dunamis** at my university. I Configured installations to work with different compiler toolchains, ensuring compatibility and optimization for diverse computational needs.
- Setup and deployed Apptainer and Docker engine and installed the GPU-compliant Quantum Espresso Docker container from NVIDIA NGC Docker registry.

Projects

Machine Learning Assisted Discovery of Superconductivity Equations | *Final Year Research Project* **Sep 2022 - May 2023**

- Successfully employed the Sure Independence Screening and Sparsifying Operator (SISSO) framework to enhance the Allen-Dynes Equations for modeling the critical temperature (Tc) of superconductivity.
- This involves Symbolic regression of Material predictors that extracted form spectral functions, generated from Quantum Espresso EPW Package.
- We successfully introduce a correction factor to Allen-Dynes equation of superconductivity that make the new formula more accurate and realistic in modeling the phenomenon.

3 node Open-Mpi mini Cluster | *Linux, Bash, OpenMpi* **March 2023**

- Single-handedly built a three-node HPC cluster using OpenMPI, a leading message passing interface (MPI) implementation for parallel computing.
- Configured Quantum Espresso and ensured seamless communication among nodes.
- Implemented secure SSH access to the cluster nodes, ensuring remote accessibility for administration and job execution.
- Created user-friendly documentation for cluster usage and Provided hands-on training to Junior fellows.

Ising model Mote-Carlo Simulation | *Python, Numpy, Matplotlib* **December 2022**

- Completed term project on Monte Carlo study to explore the behavior of the two-dimensional Ising model, a fundamental system in statistical mechanics.
- Analyzed the system's phase transitions and critical phenomena.

Spherical Voronoi Diagrams | *Python, Numpy, Matplotlib* **December 2022**

- Developed Python program employing Spherical Voronoi Diagrams to map Earth's surface.
- Determined vertex coordinates in geographic coordinate system and accurately measured areas of individual Voronoi polygons, facilitating spatial analysis and geographic information systems (GIS) applications.

Divorce Prediction Deep Neural Network | *Python, Tensorflow, Keras, Matplotlib* **Sep 2022**

- Developed an Artificial Neural Network using Python's Keras Sequential API to predict divorce probabilities between couples based on questionnaire data, achieving up to 95% accuracy.

Simulation of Boltzmann Distribution | *Python, Matplotlib* **Nov 2022**

- Utilized Python to simulate Boltzmann Distribution, effectively modeling the velocity distribution of gas molecules and recovering the characteristic Boltzmann distribution of molecular speeds.

Custom Linux Configuration | *Bash, Linux, Python, Lua, Elisp* **Active**

- Designed and implemented a comprehensive Linux Desktop environment in python using Qtile library for efficient multitasking in daily workflow.
- Implemented scripts to deploy and configure system services, automating daily tasks such as automated Git backups, log monitoring, and push notifications for job completions to my Android.
- Maintain a functional Neovim configuration written in Lua spanning 2,000 lines of code,and an 3K LOC Emacs configuration written in Elisp.

Technical Skills

Programming Languages:	Python, Lua, Julia, C, Bash, Mathematica
Libraries:	Numpy, Pytorch, Matplotlib, Pandas, Qtile, scipy
Operating Systems:	Debian based Distros, Arch Linux, Fedora, Centos
Tooling:	GNU Plot, VS Code, Git, Github, Emacs, Neovim

Online Courses

- **Discrete Optimization**
  The University of Melbourne
- **Simulation and modeling of natural processes**
  University of Geneva
- **The Finite Element Method for Problems in Physics**
  The University of Melbourne
- **Julia for Beginners in Data Science**
  Coursera Project Network
- **Crash course in Gnuplot**
  Coursera Project Network
- **Computational Thinking for Problem Solving**
  University of Pennsylvania

Workshops

Introduction to Docker **March 2024**
Guest Speaker *PIEAS*
Data Science with Python **Jan 2022**
Attendee *PIEAS*
Deep Learning and its Application **Dec 2022**
Attendee *PIEAS*
Linux for Everyone **Oct 2022**
Guest Speaker *PIEAS*

Leadership / Extracurricular

PIEAS Society for Physics **Nov 2021 – Jan 2023**
President *PIEAS*

- Co-founded the Physics Society at PIEAS, leading a team to establish a platform for academic and social engagement among physics students.
- Organized multiple talks by renowned speakers and researchers, enriching members' understanding of cutting-edge research and developments.
- Led meetings, events, and activities to foster community and collaboration within the physics department.
- Developed strategic initiatives for academic and professional development, including guest lectures and workshops.
- Represented the society in meetings with university stakeholders, advocating for physics students' interests.

Step Ahead Welfare Society **Nov 2020 – April 2021**
Volunteer *Rawalpindi*

- Taught at a street school camp in Liaquat Bagh, providing essential education to underprivileged children from neighboring slum areas. Implemented educational programs focusing on foundational literacy and numeracy skills.
- Coordinated and executed community outreach initiatives to boost awareness and involvement, leading to a notable increase in attendance and active participation among the target demographic.