Ajeet Kumar

M.Sc - Mathematics and Computing
BHU, Varanasi 221005
B.Sc(hons) - Applied Mathematics
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Education

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
M.Sc	Banaras Hindu University, Varanasi	8.0+ (Current)	2023-Present
B.Sc(hons)	Jamia Millia Islamia Central University	8.9	2022
Senior Secondary	Uttar Pradesh Board of Education	77.6%	2019
Secondary	Uttar Pradesh Board of Education	82.3%	2017

Experience

- **QWorld** *Aug 2024 - Oct. 2024*
  Quantum Research Intern Remote
  – Implemented the HHL algorithm in Qiskit to solve PDE (Wave Equation) and ran quantum circuits on simulators and IBM quantum hardware, scaling up to 27 qubits.
  – Executed Qiskit code on both quantum simulators and IBM's quantum computers, significantly enhanced my proficiency in quantum programming and practical application of quantum algorithms
  – Implemented various algorithms like QFT, QPE and VQA and QSVM and a bit more explore about Quantum Noise and it's mitigation techniques

- **Devtern** *Feb. 2024 - Apr. 2024*
  Machine Learning Intern Remote
  – Gained hands-on experience in machine learning, including model design, training, testing, optimization, and API development for seamless integration.
  – Developed high-accuracy (>90%) ML models using Logistic Regression and Decision Trees for Heart Disease and House Price Prediction, identifying key risk factors for early diagnosis and estimating property values based on user-defined features.
  – Performed data cleaning, transformation, and exploratory data analysis (EDA) to extract insights and improve visualization. Applied feature engineering, hyperparameter tuning, and model evaluation techniques to enhance performance and interpretability.

Projects

- **Universal Differential Equation Model for Lotka Voltera Equation** *Dec. 2023 - Jan. 2024*
  Technologies Used: Julia, DifferentialEquations, Lux, Optimization, LinearAlgebra, Statistics, Plots. Github Link
  – Developed a UDE-based dynamical system model, integrating neural networks to learn missing interactions in Lotka-Volterra equations.
  – Implemented and optimized neural network training using ADAM and LBFGS, achieving accurate data-driven predictions of system dynamics.
  – Applied computational techniques with Julia (DifferentialEquations.jl, Lux.jl) to model real-world phenomena, including biological and chaotic systems.

- **Urban Chemical Safety - Modeling Potential Chemical Traces and Solving with PINNs** *Nov. 2024 - Jan. 2025*
  Technologies Used: Python, PyTorch, TensorFlow Github Link
  – Developed a PINN model to solve the Convection-Diffusion Partial Differential Equation (PDE) with 80% accuracy.
  – Designed and implemented a Physics-Informed Neural Network (PINN) architecture in TensorFlow and Keras, demonstrating its effectiveness over traditional mathematical approaches for solving convection PDEs.

- **Covid-19 Detection Web App – Disease Classification from X-Ray Images** *Dec. 2021 - Feb. 2022*
  Technologies Used: TensorFlow, Keras, Flask API, Git, GitHub, GitHub Actions, Heroku GitHub Link
  – Built and trained a CNN and ResNet-based transfer learning model on a preprocessed X-ray dataset.
  – Built a Flask API for real-time inference using the trained model's pickle file and designed the frontend with HTML, CSS, and JavaScript for seamless user interaction.
  – Automated deployment on Heroku using GitHub Actions CI/CD pipeline.

Skills

- **Applied Mathematics**: Mathematical Modeling, Solving, Design Algorithm, Improving and Analysis of Real-World Problems
- **Programming & Industry**: Python, C/C++, MATLAB, Julia
- **Industry**: Data Structures, Algorithms - Designing, Analysis and Implementation
- **Tools/Frameworks**: FEM & PDEToolBox, Tensorflow, Pytorch, OpenCV, Qiskit, Pennylane
- **Computing Machine**: based on Window and Linux, Quantum simulator
- **Non Technical**: Problem Solving, Collaborative, Analytical Thinking and Communication
- **Artificial Intelligence**: Building, Training, Testing and Deploying ML & DL models

Certificates & Key courses taken

- **Pure Mathematics**: Linear & Abstract Algebra, Real & Complex Analysis, Functional Analysis, Euclidean & Analytical Geometry, Differential Geometry, Differential Manifolds.
- **Applied Mathematics**: Numerical Methods, Vector Calculus, ODE & PDE, Integral Equations, Calculus of Variations, Classical Mechanics, Dynamical Systems, Mathematical Modeling & Simulations, Graph Theory & Applications, Statistical Techniques, Mathematical Optimization Techniques.
- **Computer Science**: Programming, Data Structures, Algorithm Design & Analysis, Computation Theory, Data Analytics, Machine Learning, Deep Learning, Data Science, Big Data Systems, Artificial Intelligence & Applications.
- **Quantum Computing**: Quantum Computing and Programming, Qiskit-Global Summer School 2023 & 2024, IBM Quantum Computing Challenge 2024
- **Social Science and Humanities**: Technical Writing, Hindu Religious Studies, English & Urdu Language, Communication Skills.

Achievements

- **Silver Medal**, Secured 2nd rank in class 9th, KPS Inter College, Azamgarh *2016*
- **Gold Medal**, Secured **1st rank** in class 10th, at KPS Inter College, Azamgarh *2017*
- **Kaggle Competition**,Secured **24th rank** in Scientific Machine Learning challenge *2024*

Extracurriculars

– Regularly attended workshops, lectures, and seminars on data science and mathematics.
– Managed the fresher's induction program and organized a seminar on mathematical applications.
– Enjoy playing badminton and cricket and reading newspapers and books in free time.

Research Articles

1. Numerical methods for solving non-linear systems of equations