ANANYAE KUMAR BHARTARI

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Education

2019-2023(EXPECTED)	BS. (Mathematics and Scientific Computing), IIT Kanpur	**8.7/10.00**
April 2019	Class XII (CBSE) Delhi Public School,Bokaro	**91.4 %**
April 2017	Class X (ISCE) Brightlands School,Dehra Dun	**96.8 %**

Academic Achievements

- Secured an All India Rank **2760** in Joint Entrance Exam (Advanced) among 200,000 candidates *2019*
- Secured an All India Rank **6494** in Joint Entrance Examination(Mains). *2019*
- Qualified first round for the prestigious **NSEP** held by IAPT *2019*

Internship

- **Solving Quantile crossing for prediction interval of forecast(ORACLE Intern)** *May'22-July'22*
  Objective
  - To solve the problem of Quantile Crossing which plagues the Quantile regression.
  - To benchmark SARIMA and SARIMAX on data having long seasonality (around 30).

  Strategy
  - Implemented a **Seq-2-Seq** model using LSTM in encoder and decoder on a standard data-set.
  - Trained the model on various loss functions such as **pinball loss, multi-pinball loss, Continuous Rank Probability Score** and penalized crossing to reduce the number of Quantile crossing.
  - Implemented approach such as **Incremental Quantile Functions(IQF) and Distributional Output** instead of point estimation thereby fully eliminating the Quantile Crossings.
  - Evaluated the results using **Weighted Quantile loss(WQL), Mean Squared Error(MSE), Mean Absolute Error(MAE), Symmetric Mean Squared Error** for each model.
  - Implemented SARIMA and SARIMAX using **Statsmodel**(a library in Python) on a self generated dataset; Used Fourier Features of various lengths as exogenous features for SARIMAX.

  Result
  - Evaluated the different model performances using **Mean Squared Error** on validation and test, finally recommending to use IQF layer with multi-pinball loss to train the model.
  - Recommended using SARIMAX with one Fourier Feature as if performed better than SARIMA.

Projects

- **Application of Firefly Algorithm for optimizing of cost function.**
  (under the supervision Professor Shaktipad Ghorai of IIT Kanpur) *August'22-Nov'22*
  - Studied about stochastic algorithms especially **meta-heuristic** algorithms which are derived from nature.
  - Implemented gradient free algorithms like **Firefly Algorithm, Bat Algorithm ,Particle Swamp Optimization**, to solve the for minima of Eggcrate function having continous domain.
  - Extend the approach by discretizing Firefly algorithm to solve problems having discreet domain.
  - Applied 1-D Discretize Firefly Algorithm to loss function of **M/M/m/-/m** and **M/M/m/FIFO/m+N** Queuing systems. Bench-marking the results obtained by naive approach.
  - Applied Firefly algorithm to NP-hard **Flow Shop Scheduling** problem and verified that Firefly algorithm indeed produces quality results in minimal time compared to naive approaches.
  - Visit **https://github.com/ananyae-24/TBC**
- **Ewald summation for a system of Ionic Charges**
  (under the supervision Dr. Vishal Agarwal of IIT Kanpur) *June'21-Sep'21*
  - Implementation of Ewald summation to calculate potential energy and forces acting in an ionic system with **periodic cell boundary condition** and **minimum image convention**.
  - Applied **Piece-wise Lagrangian and Basis Spline** interpolations to approximate the Structure factor.
  - Implemented **3D convolution** using **Fast Fourier Transform** which reduced the complexity from $O(N^2)$ to $O(Nlog(N))$ in **3-dimensional** Ewald Summation.
  - Benchmarking of the code was done by calculating the potential energy of many particle systems in **LAMMPS**.
  - Extended the approach to **2-Dimensional Ewald** by changing the particle box size in the z-direction and adjusting for inter dipole attraction by finally subtracting it from the result.

- **Mathematical Finance and Stochastic Process(under Stamatics Society)** *May'21-June'21*
  - Studied Finance and etiquette market and how to make and manage portfolio's using **Markowitz theory**.
  - Plotted efficient frontier for various portfolios on python using **Numpy and matplotlib** library.
  - Visit **https://github.com/ananyae-24/Mathematical-inance-**
- **App for Apna City Live** *May'21-June'21*
  - Developed platform that can be used by citizens to file complain about civic amenities in their area.
  - Developed a dynamic front-end integrated with **google maps API** and various features such as picture uploading, location selection using **react-native** for frontend.
  - Used **NodeJs, Mongodb** for back-end and **Express** framework for API.
- **Portal For India Covid Support** *April'21-May'21*
  - Developed website under the initiative of SIIC IIT Kanpur to help people in time of covid crises.
  - Used **Mongodb and Express framework** to store various kind of data including Geojson.
  - It was a client-side rendered website and hosted the backend server on an EC2 instance (AWS).
  - Visit **https://github.com/ananyae-24/Project-101**
- **Portal For Candidate Nomination Filling And Team Management** *Nov'20-Jan'21*
  - Developed a server side rendered site on **NodeJs** using **Mongodb** as a database and deployed it on AWS to file nomination and team management for candidates that wish to participate in Gymkhana Election.
  - Registered of 60+ candidates with 1000+ campaigners for 2021 Student Gymkhana Election.
  - Visit **https://github.com/ananyae-24/Nomination-portal**
- **Basic Algorithm in Machine Learning(self-Project)** *Aug'20-Nov'20*
  - Learned about the various types of algorithms regularly used in **Regression, Classification, Clustering**.
  - Used scikit-learn and matplotlib, seaborn library in Python 3 for data analysis and visualization.
  - Visit **https://github.com/ananyae-24/ML-repo**
- **Using Comsol Multi-Physics to analyse fluid flow through basic geometries** *Jan'20-March'20*
  - Learnt about various Fluid Dynamics concepts and **Numerical Estimation** methods involved in **CFD**.
  - Utilised **COMSOL Multi-Physics** software to execute the flow diagram of fluid along objects of different dimensions to analyse pressure and velocity gradient correlation.
  - Visualized the **effects of air drag** by extending the results to systems of different cross-sections.
  - Analysed Fluid Layer and its application in day to day events such as swing of golf ball, flying of aeroplane.

Teaching Experience

- **Mentor, Stamatics** *June'22-Aug'22*
  - Mentored **22** peers and juniors under the topic **Statistical Simulation**
  - The project included a brief introduction of random variables, **Monte Carlo** and Random sampling.
  - Classical sampling techniques were such as **Inverse Transform, Accept Reject Sampling, Box Muller Methods, Ratio of Uniform** were discussed as well as implemented in class.
  - The project ended with a introduction to TensorFlow and advance sampling techniques such as RNVP.
- **Academic Mentor, Counselling Service** *2020-2021*
  - Conducted doubt classes for 400+ freshmen.
  - Mentoring a group of 50+ freshmen academically and regularly taking classes and personal interactive sessions to ensure that they are able to cope with the institute academics.

Relevant Courses

Linear Algebra & ODEs	Several Variable Calculus & Deferential Geometry	Modern Cryptology
Probability and Statistics	Ordinary Differential Equations	Abstract Algebra
Advance Topics in Machine Learning	Statistical & AI Techniques in Data Mining	Data Structure
Statistical Simulation and Data Analysis	Applied Stochastic Process	Complex Analysis
Basic Probablity & Distribution Theory	Numerical Analysis and Scientific Computing-I	Analysis-I
Partial Differential Equations	Numerical Analysis and Scientific Computing-II	

Technical Skills

Languages and Tools:	C,C++,R,Python,react-native,MATLAB, HTML,CSS,Javascript,php,java
Utilities and Softwares:	LaTeX, AutoCAD,Mongodb,NodeJs,Comsol MultiPhysics,React,Illustrator
Operating Systems:	Linux, Windows

Positions of Responsibility

- **Secretary, Stamatics** *2021-2022*
  - Part of a team that helps in proper management and conduction of events.
  - Part of the team involved in building a portal for conduction of events like Mathematica.
- **Manager , Team 20-21, Unmukt IITK** *2020-2021*
  - **Leadership**
    –Worked in a team of **3** members and jointly led **5** secretary and **50+** volunteers for effective conduction of activities for **Campus Junta**.
    –Conducted meme and story writing competitions all over campus and managed pride month events in which eminent speakers took part from all over Indi .
  - **Initiatives**
    – Monthly conduction of promotional activities, competitions .
    – Conduct discussions and group talks to help students facing problems with gender related issues.
- **Senior Election Officer , Team 20-21, Election Commission** *2020-2021*
  - Part of a team that helps in the formulation of policy, drafts and managing portals.
  - Moreover assisting the team to maintain proper order during the Election.

Extra Curricular Activities

- Completed an online course on **'Machine Learning and data science'**. Studied usefulness of various algorithms. Even did reading of articles explaining the maths behind these algorithms. *July'20-Sep'20*
- Completed an online course on **'Ethical Hacking'**. Learned about how attacker make use of our vulnerability and employing the techniques learned in coarse to protect my self made portals. . *July'20-Sep'20*
- Worked as **Election Officer, Election Commission**- Helped maintaining order during institutes student body election. *2019*
- Occasionally indulge in **Competitive Coding** on geeks for geeks .
- Love **Digital Art** usually I design the posters and digital media that is circulated by my fellow group members.