Anwesh Bhattacharya

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Education

Birla Institute of Technology and Science — Pilani, Rajasthan
M.Sc (Hons) Phyiscs + B.E. (Hons) Computer Science
CGPA : 9.14 — August 2016 - Present

National Public School, Koramangala — Bangalore, Karnataka
Elective : Computer Science. — June 2014 - April 2016
Percentage : 97.2%

Baldwin Boys High School — Bangalore, Karnataka
Elective : Computer Applications. — June 2005 - April 2014
Percentage : 95.6%

Research Experience

National Institute of Advanced Studies (NIAS) — Bangalore
Research Intern — May 2020 - Present

- Improving **PSO** algorithm with the application of **chaotic flows/maps**
- Scientifically reasoning the improvement of performance
- Approximation of gradients in **non-differentiable** objective functions
- Transferring the technique to chaotic firing of **neural network** for **classification problems**

Indian Institute of Astrophysics (IIA) — Bangalore
Research Intern — May 2019 - July 2019

- Worked towards catalouging Double Nuclei Galaxies from SDSS with **Image Processing** under *Dr. Mousumi Das*. Developing such a catalog is crucial to studying galaxy mergers
- Used Python and utilized libraries such as **Numpy/OpenCV/Astropy/Web Scraping** libraries to process the FITS images of galaxies in the R-band.
- Implemented **Optimization Techniques** (Gradient Ascent) and **Graph Algorithms** to classify galaxies having single or double nuclei
- Obtained an accuracy of **94%** on the catalog by *Gimeno* et. al. (2004)
- Tested the pipeline for stability and released it on GitHub. Code available at - `https://github.com/anwesh0304/anwesh-DAGN`. Preprint at `https://bit.ly/31ifeUP`

Inter-University Centre for Astronomy and Astrophysics (IUCAA) — Pune
Research Intern — May 2018 - July 2018

- Supervised by the Director of IUCAA, *Dr. Somak Raychaudhury*
- Worked towards The Detection of Patterns in the Cosmic Web in the COMA Supercluster using **Mathematical Morphology**
- Revamped the DisPerSE source code, which was released in 2011, to run on Ubuntu 16.04 LTS
- Fully installed all code dependencies and obtained experience in using the UNIX shell
- Identified a set of five clusters, including the **Abell cluster**, and the connecting filaments in COMA.

Publications

Stirling Numbers Via Combinatorial Sums — June 2019

- Analysed summations of the type $\sum_{r=0}^{n} r^k \binom{n}{r}$ for general k.
- Obtained the recurrence for the Stirling Numbers of the First and Second Kind in a **novel Manner**
- Verified the results with Online Encylcopedia of Integer Sequences (OEIS)

- Presented at the **International Conference on Modelling, Machine Learning and Astronomy** 2019, at PES University, Bangalore.
- Preprint available at `http://bit.ly/2k951dF`

Academic Projects

ERPLAG Compiler (BITS-Pilani) January 2020 - May 2020

- Created a 64-bit compiler for the toy language **ERPLAG** in **C** without the help of any additional libraries
- Implemented features such as **expressions**, **dynamic array abstraction** and **multi-return function calls**
- Tested rigorously for **portability** on various Linux distributions and Windows.

Machine Learning on FPGA (CEERI) January 2020 - May 2020

- Learning to use High Level Synthesis (**HLS**) in **C++** for synthesis of accelerators
- Designing a simple classifier on hardware to perform handwritten digit recognition from **MNIST**.

Special Topics in Quantum Mechanics (BITS-Pilani) August 2019 - December 2019

- Studying the historical aspects and subtle topics of Quantum Mechanics which are not taught in detail in an undergraduate course
- Read the work by *Tomonaga* on the foundations of **blackbody radiation, Planck's hypothesis** and **Einstein's corpuscular theory**
- Studied topics such as **EPR Paradox, Bell's Inequality**.
- Exposed to advanced topics such as **Feynman's Path Integral Formulation, Hamilton-Jacobi theory.**

Dark Energy Modelling and Gravitational Lensing (BITS-Pilani) August 2019 - December 2019

- Studying the **FLRW** metric and background cosmology to model the equation of state for dark energy.
- Used the **7-CPL model** to obtain Hubble parameter, luminosity and angular-diameter distances as a function of redshift.
- Used the available code of Eisenstein et. al. to obtain growing mode and power spectrum

Courses

- Math: Linear Algebra, Differential Equations, Numerical Techniques
- Physics: Classical Mechanics, Electromagnetic Theory, Quantum Computing, Statistical Physics, General Relativity, Solid-State Physics, Nuclear Physics
- Computer Science: Data Structures & Algorithms, OOP, Database Systems, Operating Systems, Computer Architecture, Theory of Computation, Compiler Construction, Computer Networks, Parallel Computing
- Coursera (Completed):
  - Machine Learning (Certificate : 6WSURAQVC6PF)
  - Tensorflow Specialisation - I (Certificate : LUFURSD8ABEK)
  - Deep Learning Specialisation - I (Certificate : WLJ3EQ3Z5BPD)

Skills

- Programming Langauges
  - Proficient: C, Python, MATLAB, LaTeX
  - Intermediate : C++, Java, Verilog, bash
  - Beginner : Haskell, Scheme, batch
- Python Modules: Numpy, Tensorflow, Pandas, Keras, Astropy, OpenCV, BeautifulSoup
- Version Control : git

Scholarships

Innovation in Science Pursuit for Inspired Research (INSPIRE) Scholarship
Department of Science and Technology (DST)

Awarded the scholarship for excellent performance in AISSCE (CBSE 12th) board examinations and for securing a rank of 1100 in JEE Mains 2016

Extra-curricular Activities

- Music : I play guitar, keyboard, drums and I'm interested in music production
- Animal Welfare : I raised Rs 11,000 for an injured dog in my college dorm
- Gymming : I take a keen interest in body-building

Languages

English, Hindi and Bengali