Anwesh Bhattacharya

Gandhi Bhawan - 3131, BITS-Pilani, Pilani, Rajasthan - 333031, India
f2016590@pilani.bits-pilani.ac.in +919116702059
anwesh0304

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
- Modules: Numpy, Tensorflow, Keras, Astropy, OpenCV, BeautifulSoup, STL
- Version Control : git

Awards

- **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 an all-India rank of 1100 in JEE Mains 2016
- **Prabhat Award for Best Outgoing Student in Physics**
  Department of Physics (BITS-Pilani))

  Ascertained as the best student of the batch of Physics 2016 with respect to academic performance, projects and future research plans

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