Shivam Pal

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Summary

- I completed my Bachelor's and Master's degree in Physics and am currently delving into the fields of Deep Learning and AI. My areas of interest include Computer Vision and Geometric Deep Learning. I am open to interdisciplinary research opportunities. Currently, I am working on a project involving the application of computer vision to medical images.

Employment

- Junior Research Fellow (JRF)
  VisDom Lab IISER-Bhopal (Jan. 2023)
  Here, I am working on computer vision specially on medical images.

Education

- **Indian Institute of Science Education and Research Bhopal**,
  Degree - BS-MS (Integrated Bachelor of Science and Master of Science),
  Major - **Physics**
  Aug. 2015 - April, 2020
  Overall CPI : 7.72/10.00
  Major CPI : 8.33/10.00

Qualified National Examinations

- Gate 2020 Physics
- Gate 2022 Computer Science

Publications and Preprints

- Estimation of Cheeger Constant using machine learning (2020)
  Preprint: ArXiv:2005.05812.

Projects and Internships

- May 2019 - April 2020
  MS Thesis Research - Estimation of Cheeger Constant using machine learning
  Supervisor - Dr. Ambar Jain.
  The aim of this project was to best approximate the value of Cheeger Constant for a graph. In general calculating this quantity for an arbitrary graph is computationally infeasible. It is a well known NP-Hard problem in theoretical computer science. My thesis can be found here.

- Jan. 2020 - April 2020
  Graph Neural Networks and its Application.
  Supervisor - Dr. Parthiban Srinivasan
  In this project we studied about graph neural network and its variants. Graph neural networks are very essential where data is non euclidean. We studied about their applications in different domains of science and their limitations.

- Aug 2019 - Nov 2019
  Part of speech(PoS) tagging for hindi language using Recurrent Neural Network.
  Supervisor - Dr. Rajakrishnan P. Rajkumar
  In this project, we did part of speech tag analysis of Hindi sentences using RNNs and validated it against interpolated Bigram tagger.

- Jan. 2018 - April 2018
  Programming Project - Tight Binding Model
  Supervisor - Dr. Nirmal Ganguly

The aim of this project was to implemented tight binding model in python programming language to calculate the electronic band structure of a semiconductor numerically. Using this module we can only calculate the band structure of tetrahedral semiconductor having FCC crystal lattice and two atom basis e.g Silicon,Diamond etc.

- 15 May 2017 - 30 June 2017
  Summer Internship - Quantum Foundation, Quantum Information and Quantum Computation.
  Supervisor - Prof. Guru Prasad Kar, ISI Kolkata
  In this project, I studied EPR paradox and hidden variable theories, quantum teleportation, superdense coding, projective and POVM measurements, Krauss operators, measures of entanglement, quantum key distribution and other protocols in quantum cryptography. I also learned important concepts in quantum information theory like the Shannon entropy, Von Neumann entropy, the Holevo bounds etc.

Talks and Presentations

- Poster Presentation: Connectivity of graph through machine learning. 27^{th} Jan. 2020, The Fourth Paradigm From Data to Discovery - IISER Bhopal.
- Compton Scattering: Cross-Section Determination - 7^{th} April. 2019 - Department of Physics IISER Bhopal.
- Hall effect - 11^{th} Nov. 2018 - Department of Physics IISER Bhopal.
- Michelson Interferometer - 13^{st} April 2018 Department of Physics IISER Bhopal.
- Atomic spectra of Iodine vapor - 7^{st} Nov. 2017 - Department of Physics IISER Bhopal.

Courses Taken

- **Physics**
  Basic Electronics, Quantum Mechanics, Classical Mechanics, Statistical Mechanics, Quantum Field Theory, Electrodynamics and Special Relativity, General Theory of Relativity, Nuclear and Particle Physics, Computational Physics, Quantum Computation, Atomic and Molecular Physics, Condensed Matter Physics.
- **Computer Science**
  Theory of Computation and Computational Complexity, Graph Theory, Machine Learning, Computational Linguistics, Artificial Intelligence and its Application, Data Structures and Algorithms.

Programming Experience

- 2+ year of experience in C/C++ and Python programming language.
- 2+ year of experience in major Machine Learning and Data Science libraries and tools e.g. Numpy, Pandas, Pytorch.
- genreg: Build a C++ library for generating random regular graphs and calculating their spectrum.