BHAVYA BHATT

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EDUCATION

Bachelor of Technology(Computer Science and Engineering)   *2016 - 2020*
Indian Institute of Technology, Mandi   Overall GPA: 8.07/10 (Upto 6th Semester)
School of Computing and Electrical Engineering

CBSE(Higer Secondary)   *2016*
MDS Public School, Udaipur, Rajasthan   Percentage: 93.5%

CBSE(Matriculation)   *2014*
St. Gregorios Sen. Sec. School, Udaipur, Rajasthan   CGPA: 9.6

TECHNICAL STRENGTHS

Computer Languages	C, C++, Python, JAVA (for android development)
Frameworks	PyTorch (Advanced), Keras (Medium), Android Studio (JAVA)
Physics Interests	quantum field theory, quantum gravity and it's origins in quantum foundations, cosmology, statistical mechanics and applications in computational learning theory
Mathematics Interests	differential geometry, stochastic processes and stochastic calculus group theory, abstract analysis, information theory

PUBLICATIONS

New Path integral formulation for "all particle dynamics"   June 2018 - August 2019
Summer Research Intern

· Proposed a new approach for path integral formulation of collapse models like GRW and other "all particle dynamics" theories. The work resulted into a paper "Path integrals, spontaneous localization and classical limit". https://arxiv.org/abs/1808.04178.

OPEN SOURCE PROJECTS

PyGlow - Information Theory of Deep Learning   June 2019 - Present
Author and Maintainer

· Author and maintainer of a python library for Information Theory in Deep Learning named 'PyGlow' which is currently on its 0.1.7 version on PyPI and can be installed from https://pypi.org/project/PyGlow/.
· GitHub Repository is available at: https://github.com/spino17/PyGlow
· PyGlow documentation is available on: https://pyglow.github.io/

EinsteinPy - Numerical Relativity in Python   February 2018 - Present
Coauthor

· Coauthor of a python library for numerical relativity and relativistic astrophysics related computations 'EinsteinPy' - https://einsteinpy.org/team/

EXPERIENCE

Tata Institute of Fundamental Research, Mumbai   June 2018 - July 2018
Summer Research Intern

· Proposed a new approach for path integrals of collapse models like GRW and other "all particle dynamics theories".

· Argued that h tends to zero is not the limit to classical mechanics but rather some more robust mechanism to kill macroscopic superpositions.

· Explained that the above mechanism can be achieved through appropriate limit on collapse model parameters and rigorously formalised these limits.

Siemens Technology & Services Pvt. Ltd.   December 2018 - Febraury 2019
Software Research Intern

· Processing internal service logs for building shift-right testing application.

· Used recurrent neural networks (LSTM) to predict most probable test cases which user can execute.

· Analyse the data for anomaly detection in the logs sequence dataset by probability estimation method.

· Also tested static probabilistic methods like PAM algorithm to achieve the above task.

· Documented the relevant codebase and procedures.

Siemens Technology & Services Pvt. Ltd.   June 2019 - August 2019
Software Research Intern

· Used program analysis tools like Atlas to run control flow analysis on large codebase which can further be used for extracting knowledge graphs.

· Implemented four different types (Tensor Product Composition, HOLE, ComplEx, QuatE) of Knowledge Graph embedding probabilistic architectures in PyTorch.

· Learned about Non-Euclidean real (for symmetric relations) and complex (for asymmetric relations) background geometries for embedding in order to learn effective hierarchical patterns from the Knowledge Graph.

· Proposed a model for learnable background geometry (components of metric tensor itself are learnable parameters) along with embedding (entity and relations) which can further be useful in manifold learning and other embedding visualization techniques.

COMPUTER SCIENCE PROJECTS

Why Neural Networks work ?   Major Technical Project

· This is an Ongoing final year major technical project in the field of theoretical deep learning.
· Project aims at developing new theoretical methods which can provide mathematically formal answers to some of the profound questions in the field of deep learning.
· These questions include the mechanism of generalization, optimal architectures, phase transitions between memorization and compression phase etc.
· The project demands the need for exploring cross field topics from information theory, statistical physics, group theory and complexity theory and experiment with these ideas in code.
· As a result of this project, a python package is made named **PyGlow: Information Theory of Deep Learning**. The package can be installed from PyPI with command "pip install PyGlow".
· All the experimentation related to the project is done uisng PyGlow.
· This package provides keras like API on PyTorch backend.

EinsteinPy: Python package for Numerical Relativity   Computational Physics

· A web application indented for hearing impaired people.
· The app processes the real-time speech data into text and produces short summaries of the whole speech lecture with the use of machine learning (used extensions).
· It identifies main keywords and produces educational links in the same interface.

Euler Notes 2nd year Topcoder Hackathon

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THEORETICAL PHYSICS PROJECTS

Emergent Gravity using collapse models   Quantum Gravity

· Having always been fascinated by Physics, Im currently working on an interesting and self-thought out project on formalising the stress vector being applied on cosmological fluid(fluid mechanics in Riemannian and Pseudo Riemannian geometry) and to study the motion of the resultant non-geodesic curves.
· It also include the formalism of fracture point of the material, mainly using the B tensor, its decomposition and Raychaudhuri equation, for non-geodesic congruences.

Non-Geodesic Raychaudhuri Equation   General Relativity

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ACADEMIC ACHIEVEMENTS

Secured 1st position in TopCoder Hackathon for-Eulers Notes.

Secured 1st position in paper presentation and debate event held at technical fest of STAC club - Astrax 2019.

Secured All India Rank (AIR) 2324 in JEE Advanced (IIT-JEE) examination 2016.

RELEVANT COURSES

Computer Science Courses	**Physics and Mathematics Courses**
Advanced Data Structures and Algorithms	Special topics in Quantum Mechanics
Pattern Recognition	Statistical Mechanics
Deep Learning and its Applications	Special topics in High-Energy Physics
Advance Database Practicum	Continuum Mechanics
Large Application Practicum	Real Analysis
System Practicum (Operating System and Networking)	Linear Algebra
	Probability and Stochastic Processes

POSITION OF RESPONSIBILITY

Speaker at STAC

Space Technology and Astronomy Cell *IIT Mandi*

· Held position as a speaker and gave two talks on various topics of mathematics.

Teaching Assistant

· for the course on Advanced Data Structures and Algorithms, and Data Science Lab.

EXTRA-CIRRUCULAR

Participated in Vibgyor event organised by Art and craft club - Art Geeks, for two years (2017-2018).

Participated in flash mob event in the Tech-Cult fest of IIT Mandi, Exodia.