Arka **Mitra**

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Education

Indian Institute of Technology, Kharagpur *Kharagpur, West Bengal*

B.Tech(Hons) in Electronics and Electrical Communication Engineering *July,2017 - Present*

- CGPA-9.39/10.00, till 6^{th} semester

Indian Institute of Technology, Kharagpur *Kharagpur, West Bengal*

Minor in Computer Science and Engineering *July 2017 - Present*

- CGPA-9.3/10.00 till 6^{th} semester

Central Board of Secondary Education(10+2) *Kolkata, West Bengal*

South Point High School *2015 - 2017*

- 94.8% in CBSE

Papers

Modified Particle Swarm Optimization Algorithms for the Generation of Stable Structures of Carbon Clusters, Cn (n= 3-6, 10) ***[PDF]***

Frontiers Chemistry *Prof. Shamik Sural,Pratim Chattaraj*

- Application of PSO (and comparism with other optimistaion techniques) integrated with Density Functional Theory for the optimisation of Molecule energy.
- Was the second author of the paper.

A Systematic Search over Deep Convolutional Neural Network Architectures for Screening Chest Radiographs ***[PDF]***

EMBC *Prof. Debdoot Sheet*

- Implemented various models in Pytorch to improve on the benchmark set by the ChexNet and tackled the uncertainties in the dataset in three distinct ways.
- Was the first author of the paper.

Towards Integrating Firefly Algorithm with Density Function Theory for Global Optimization of Al42- Clusters and its Implication in Aromaticity ***[PDF]***

TCA *Prof. Shamik Sural,Pratim Chattaraj*

- Studied more algorithms and further ways to optimize. Improved the rate of convergance by imposing planarity on certain molecules.
- Studied the correlation between Aromaticity and Energy of Aromatic Structures along with the application of Density Functional Theory.
- Was the first author of the paper.

Causality Detection Using Sentence Embeddings in Financial Reports ***[PDF]***

Accepted in FNP-FNS COLING2020

- Applied Bert Sentence embedding to predict if the sentence is causal or not.
- Was the first author of the paper.

Automated COVID-19 Detection from CT Images Using Deep Learning ***[PDF]***

Computer-aided Design and Diagnosis Methods for Biomedical Applications *Prof. Abdulhamit Subasi*

- Applied both classical machine learning techniques and deep learning algorithms to check their performance on COVID-19 dataset with low number of images.
- Was the first author of the book chapter.

Determination of Stable Structure of a Cluster using Convolutional Neural Network and Particle Swarm Optimization *[PDF]*

TCA *Prof. Shamik Sural,Pratim Chattaraj*

- Applied Machine learning to generate the approximate energy of a cluster and find best cluster using methods like PSO.
- Was the first author of the paper.

Drone-vs-Bird Detection: Deep Learning Algorithms and Results from a Grand Challenge *[PDF]*

Sensors

- Applied Faster-RCNN with a feature pyramid network to achieve the third position.
- Performed negative hard mining and analysed the problems on the dataset.

Quantum-inspired eXplainable Artificial Intelligence for early detection of early-stage Rheumatoid Arthritis in Primary Care *2020*

Ongoing Review in CIM *Prof. Samira A. Rahimi*

- Applied Quantum inspired PSO algorithm for detection of Rheumatoid Arthritis.
- Used Fuzzy Cognitive Maps to make the predictions explainable.
- Was the first author of the paper.

Double Blind Review *2021*

Ongoing Review in ECML PKDD *Prof. Suman Jana, Prof. Shamik Sural*

- Applied RBF Network for Adversarial Robustness.
- Showed effectiveness of RBF networks in Adversarial example identification.
- Was the first author of the paper.

Internships/Projects

Early Earthquake Detection System *prof. Tarun Kanti Bhattacharya*

Indian Institute of Technology Kharagpur *May 2019-July 2019*

- Helped in the detection of P and S waves from a series of miniseed data by using STA-LTA and other algorithms.
- Implemented an early detection system by detecting S wave from P wave.

Computational Chemistry Integrated with Machine Learning *Prof. Shamik Sural*

Indian Institute of Technology Kharagpur *October 2018 - January 2020*

- Applied PSO and other optimisation techniques for finding most stable cluster of Molecules.
- Reduced time of convergence of the various algorithms in chemical structure search by imposing planarity on plausible molecules.
- Showed correlation between aromacity and energy for aromatic molecules.
- Developed a neural network and integrated it with other optimisation techniques to further improve the optimisation time.

Adversarial Attacks on iris dataset *Prof. Pabitra Mitra*

Indian Institute of Technology Kharagpur *May 2020 - Ongoing*

- Implemented different white model attacks on IRIS datasets.
- Developing a new form of attack that can be applied against iris detection.
- Drew correlation between uncertainty and visual gradient based localization as a term paper for ”Advanced Machine Learning”.

Deep Radial Basis Function against Adversarial Attacks *Prof. Shamik Sural, Prof. Suman Jana*

Indian Institute of Technology Kharagpur *August 2020 - November 2020*

- Implemented deep radial basis function networks trainable to high accuracy as a part of Bachelor Thesis Project.
- Showed the robustness of the model for out of distribution samples.
- Performed various experiments to compare the different attacks and training procedures.

Analysis of Diseases from Embedding Space *Prof. Jackie N.K. Cheung*

MILA Institute *September 2020 - Ongoing*

- Data mining different medical abstracts from different sources.
- For a particular disease, trying to find important correlation among the symptoms of the disease.

Artificial Intelligence in Medical Domain *Prof. Samira A. Rahimi*

McGill University *April 2020 - Ongoing*

- Calculated feature importance of various factors on death of a person affected by Covid-19.
- Developing an interactive platform for predicting the number of cases.
- Explored the impact of reopening of schools on the number of Covid-19 cases.
- Implemented Fuzzy Cognitive Maps for explaining Rheumatoid Arthritis detection.

Honors & Awards

2014 **NTSE**, Secured State Rank 14 in State of West Bengal in National Talent Search Examination.

2015-16 **KVPY**, Qualified for fellowship under Indian Institute of Science for pursuing basic science research.

2017 **JEE Advanced**, Obtained a rank within top 0.1% students of India for admission to IITs.

2017 **WBJEE**, Secured rank 22 in West Bengal Joint Entrance Examination out of 0.1 million candidates.

2017 **NSEC,RMO**, Cleared RMO and NSEA.

2017 **ISI**, Cleared ISI Kolkata with a rank of 14.

2020 **Google Research India Summer School**, Selected in Natural Language Understanding Track.

Technical Skills

Indian Institute of Technology,Kharagpur

Programming Languages and Frameworks

- Programming Languages: C, C++, Python, Java, Julia, MATLAB, Verilog, CUDA, Intel x86 Assembly, HTML, CSS, JavaScript.
- Frameworks: PyTorch, Tensorflow, Keras.
- Other libraries and softwares: LaTeX, Git, cuDNN, OpenCV, BeautifulSoup.

Coursework

Indian Institute of Technology,Kharagpur *L -> With Lab*

Relevant Coursework

- Data Structures and Algorithms (L) | Probability and Stochastic Processes | Differential Equations | Linear Algebra | Machine Learning | Microprocessors and Embedded Systems | Digital and Analog Communication (L) | VLSI Engineering (L) | Computational Number Theory | Digital Signal Processing (L) | Digital and Analog Electronics (L) | Electromagnetism | Control Systems | Semiconductor Devices (L) | Advanced Machine Learning(O) | Natural Language Processing(O) | Reinforcement Learning(O) | Information Retrieval(O)

Massive Open Online Courses *C -> With Certificate*

Online coursework

- Deep Learning Specialization[C] | Convex Optimization (Stanford University) | Stanford Online Courses (Cs231 224) | Mathematics Behind Machine Learning Specialization[C]

Extracurricular Activities

2017-2019 **NSS**, Best Volunteer Award in NSS Annual Camp.

2019-2020 **Student Welfare Group**, Mentor to a group of sophomores in their campus related problems.

2018-2020 **IEEE**, Webmaster at IEEE Student Branch.

2019-2020 **Tutorbin**, Tutor in an online portal with a rating of 4.8.

2020 **Deeplearning.ai**, Mentor of the NLP,Tensorflow and Deeplearning specialization.