Manish Kumar Bera

Department Of Computer Science & Engineering
Indian Institute Of Technology, Kanpur, India

Email: bera.manish.kumar@gmail.com
Phone: +91 8004241340

Education

Year	Degree / Exam	University / Board	CPI/%
2015 - Present	B.Tech Computer Science & Engineering	Indian Institute of Technology, Kanpur	9.7*/10
2015	AISSCE - Class XII	CBSE	95%
2013	AISSE - Class X	CBSE	10/10

* At the end of 6 semesters

Projects

- **Extreme Multi-label Learning via One-Class Classification | Prof. Piyush Rai (IIT Kanpur)** (*Fall 2018*)
  - Explored the use of one-class classifiers in solving multi-label classifications problems, both in binary relevance as well as multi-task setting.
  - Proposed a clustered multi-task one-class method for multi-label problems.
  - Proposed an alternating optimization scheme to speed up the multi-task approach.
- **On sharing aware cache replacement policies | Prof. Mainak Chaudhuri (IIT Kanpur)** (*Fall 2018*)
  - Worked on improving sharing-aware cache replacement policy for multi-threaded applications.
  - Integrated parsecmgmt(tool for managing PARSEC programs and kernels) with PIN to generate address trace.
  - Implemented three level cache architecture to simulate cache replacement policy.
  - Proposed modifications to existing evaluation metric of prediction strategy.
  - Presented a novel modification to existing prediction policy.
- **Reinforcement Learning in Partially Observable Environments | Prof. Anima Anandkumar (Caltech)**(*Summer 2018*)
  - Worked on Generalized Trust Region Policy Optimization Techniques for partially observable environments.
  - Explored variants of Proximal Policy Optimization Algorithms for POMDP setting (Partially Observable Markov Decision Process).
  - Looked into limitations of *roboschool* physics engine. Suggested modifications for increasing the convergent episode length of an agent.
- **SAT Based Motion Planning of a Multi-Robot System | Prof. Indranil Saha (IIT Kanpur)** (*Fall 2017*)
  - Designed a tool to find the trajectory of a multi-robot system under minimum make-span.
  - Reduced the problem of motion planning into a SAT problem. Used a SAT-solver to solve the SAT instance. Processed the output of the SAT solver is then processed to get meaningful information, in our case, the path of the robots.
  - Applied various optimization techniques to make clause generation faster.
  - Implemented the tool in C++ using the code-base of MiniSAT(a minimalistic, open-source SAT solver).
  - Used MAX-SAT to minimize sum-of-cost, once the minimum make-span is achieved.

Other Projects

- **Compiler Design | Prof. Subhajit Roy (IIT Kanpur)** (*Spring 2018*)
  - Developed a Java-to-x86 compiler using javascript, from scratch.
  - Was the only team to implement functionality for floats.
  - Judged as one of the best projects.
- **NachOS | Prof. Mainak Chaudhuri (IIT Kanpur)** (*Fall 2017*)
  - Project involved hacking NachOS to implement SysCalls, Process Scheduling and Memory Management.
  - Learned concepts of modern operating systems, including threads, remote procedure calls, memory hierarchies, protocol layering and object-oriented programming.
- **Smart Surveillance | Prof. Medha Atre (Oxford University)** (*Spring 2018*)
  - Came up with automated methods of surveillance.
  - Used recent developments in NLP to learn a definition of anomaly independent of the setting.
  - Proposed a context agnostic methodology to detect anomaly.
  - Proposed a self-reparametrizing model using concepts like Relative Entropy, Conditional Entropy from Information Theory.
  - Integrated our model with Tensorflow Object Detection API.
- **Detecting Semantically Similar Questions | Prof. Harish Karnick (IIT Kanpur)** (*Spring 2018*)
  - Formulated methods to detect whether two questions seek same answer.
  - Reviewed and implemented multiple architectures in Tensorflow from scratch.
  - Converted the questions to their vector representation and used Siamese Network to construct similarity space.

- **Small Variance Asymptotics for Non-parametric Bayesian Clustering | Prof. Piyush Rai (IIT Kanpur)**(*Spring 2018*)
  - Studied the problem of evolving model size with growing amount of data
  - Implemented small variance asymptotics to speed up bayesian methods in C++
  - Applied Dirichlet Process and its hierarchical variants for clustering using Bregman Divergences
- **Nano ML | Prof. Purushottam Kar (IIT Kanpur)** (*Fall 2017*)
  - Looked at improving on the current techniques of implementation of Machine Learning algorithms in IoT(Internet of Things) devices, particularly we looked at the formulation of k-NN based implementations.
  - Optimizing the trade-off between amount of data sent to central computing unit and accuracy.
  - Implemented heuristics to intelligently train very small models on resource scarce devices.
- **Finding Maximum Area Triangle in a Convex Polygon | Prof. Ovidiu Daescu (UT Dallas)** (*Summer 2017*)
  - Studied an $O(n^2)$ algorithm for finding maximum area triangle in a convex polygon.
  - Explored approaches for extending the problem to 3-D.
- **Combinatorial Game Theory | Prof. Nitin Saxena (IIT Kanpur)** (*Fall 2016*)
  - Project involved analysis of various combinatorial games like NIM, HEX etc. & mathematical notion of n-person games.
- **Front-end Web Development | Prof. Manindra Agrawal (IIT Kanpur)** (*Summer 2017*)
- **Socio-Interactive Bot | Electronics Club (IIT Kanpur)** (*Summer 2016*)

Selected Courses

- **Machine Learning:**
  Topics in Probabilistic Modelling & Inference, Natural Language Processing, Machine Learning Techniques
- **Computer Systems:**
  Advanced Computer Architecture, Computer Networks, Compiler Design, Operating Systems, Computer Organization
- **Algorithms and Automata:**
  Theory of Computation, Design & Analysis of Algorithms, Data Structures & Algorithms
- **Theoretical Computer Science:**
  Logic in Computer Science, Abstract Algebra, Probability & Statistics

Scholastic Achievements

- Selected for **SURF 2018(Summer Undergraduate Research Fellowship, Caltech)**, for summer research at Caltech.
- Received **SURGE (Summer Undergraduate Research and Graduate Excellence, IIT Kanpur)** fellowship.
- Received **Academic Excellence Award** for good academic performance in session 2015-16 and 2016-17.
- Secured **All India Rank 416** in **JEE(Advanced) 2015**.
- Secured **All India Rank 1023** in **JEE(Mains) 2015**.
- Qualified with AIR 78 for **Kishore Vaigyanik Protsahan Yojana (KVPY)** scholarship 2013 in SA stream, organized by IISc, Bangalore.
- Selected for scholarship under **National Talent Search Examination (NTSE)** organized by NCERT.
- Qualified **Regional Mathematics Olympiad(RMO)**.

Technical Skills

- **Programming Language:** C, C++, Java(J2SE), python, javascript
- **Software, Tools and Libraries:** Arduino IDE, ocatave, R, bash scripting, git, pytorch, tesorflow, roboschool, PIN
- **Assembly Languages:** MIPS, x86

Work Experience

- **Teaching Assistant [Data Structures and Algorithms] | IIT Kanpur** (*Fall 2018*)
  - Job entails assisting the instructor to conduct the course harmoniously.
- **Intern | California Institute of Technology | SURF** (*Summer 2018*)
  - Worked as a research intern in the lab of Prof. Anima Anandkumar.
- **Intern | IIT Kanpur | SURGE** (*Summer 2017*)
  - Worked with Prof. Indranil Saha on path planning problems.
- **Academic Mentor | Counselling Service, IIT Kanpur** (*April'16 - March'17*)
  - Mentored freshmen in the compulsory engineering drawing course(TA101), with classes at hostel level.