Anubhav Mittal

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Education

2015-2020 **Indian Institute of Technology**, Kanpur, India
B. Tech in Electrical Engineering
Second major in Computer Science and Engineering
GPA: **9.3/10** (Nine semesters)

Fall 2018 **École Polytechnique Fédérale de Lausanne**, Lausanne, Switzerland
Semester Exchange in Computer Science
GPA: **5.66/6** (One semester)

2013-2015 **St. Michael's High school**, Patna, India
All India Senior School Certificate Examination, XII Board
Percentage: **97%** (State Rank 2)

2013 **International school**, Patna, India
Council for the Indian School Certificate Examinations, X Board
Percentage: **96.8%** (State Rank 2)

Research & Work Experience

April-June 2020 — Sparse EWC: Learning Longer by Picking Winning Lottery Tickets
Research Intern at Berkeley Artificial Intelligence Research Lab
Supervisor: Kartikkeya Mangalam and Prof. Jitendra Malik

- Performed a thorough literature survey on the recent work in Catastrophic forgetting in Neural Networks, especially the various techniques proposed to mitigate it.
- Designed a regularization based continual learning method that extends the previously proposed Generalized Elastic Weight Consolidation (EWC++).
- Performed extensive experiments on a variety of standard continual learning benchmarks to show that the method achieves state of the art performance across a variety of metrics.

June 2019-March 2020 — Online constrained convex optimisation using mirror descent
report
Research Intern at SPiN Lab, IIT Kanpur
Supervisor: Prof. Ketan Rajawat

- Performed a thorough literature survey on the existing work in Online Convex Optimization (OCO).
- Designed a No constraint violation algorithm with theoretical guarantees for sublinear dynamic regret for the OCO problem.
- Extended the algorithm to the distributed setting by imposing an extended Slater's condition to establish strong duality for feasible optimization.

May-July 2018 — Study of competitiveness of TI Isolators
Applications team, Isolation Product Line of Texas Instruments
Mentor: Koteshwar Rao, Team Lead - Applications Engineering at Texas Instruments

- Worked on isolation devices across Texas Instruments, Analog Devices, and Maxim, among others, to find and improve upon specifications which are not part of the standard datasheet, but may be critical in certain scenarios.
- The knowledge of these specifications of the devices will be used to aid product definitions and in improving marketing strategies. It will also help in the better analysis and addressing of customer's issues.
- Performed many device and system level tests, including CMTI, Surge, ESD, EFT, etc., tests. Learned about the working and applications of isolators, RS485, CAN and I2C protocols.

Selected Projects

Aug-Nov 2019 | report

Video Generation using Multimodal VAE

Undergraduate project under Prof. Vinay P. Namboodiri

- Performed a literature survey on generative models and video generation using GANs/VAEs.
- Designed and implemented a video generation model in PyTorch, based on the MVAE model by Wu and Goodman, 2018.
- Proposed improvement of the model by replacing the MSE error with a GAN discriminator, and training the model from end-to-end.

Jan-Apr 2019 | report

Conceptual motivation of MCMC using Hamiltonian Dynamics

Undergraduate project under Prof. Satyadev Nandakumar

- Provided a comprehensive conceptual account of the theoretical foundations of Hamiltonian Monte Carlo
- Focused on developing a principled intuition behind the HMC method and its optimal implementations. The discussion also included some of the popular extensions to Hamiltonian Monte Carlo and how they address specific problems.

Oct-Dec 2018

Restart Strategies for SGD

Machine Leaning and Optimization Labaratory (MLO), EPFL

Supervisor: Prof. Martin Jaggi and Prof. Aymeric Dieuleveut

- Developed theoretical convergence guarantees for different strategies to restart SGD algorithms in the convex setting.
- Worked with and compared different existing SGD algorithms including the new SGD1/2. Implemented variations of the same to see if any improvements are obtained.

Jan-Apr 2018 | report

Small Variance Asymptotics for Non-parametric Bayesian Clustering

Course project for Probabilistic Machine Learning under Prof. Piyush Rai

- Studied recent attempts to reach a middle-ground (between performance and simplicity) for large scale data, using small variance asymptotics, to get a non parametric model which is scalable .
- Implemented the existing approaches to tackle the problem like Dirichlet Process Mixture Models, and extended this algorithm to a hierarchical structure using Hierarchical Dirichlet process. Generalized the clustering algorithm to use Bregman divergences.
- Used the models to perform clustering on the *iris* dataset, among others, while evaluating the performance using standard (NMI) and custom validation techniques.

Sep-Dec 2017 | report

Deep Reinforcement Learning for Atari Games

Course project for Machine Learning under Prof. Purushottam Kar

- Used Deep Reinforcement learning to learn models which can achieve super-human performance on the popular game 'Flappy bird'.
- Used DQN to accept raw pixels as input from a pygame simulation, and took actions based on the output which estimated future rewards (Q-values for actions possible).
- Designed and implemented a policy-gradient version separately, and compared the performance of the two methods.

Achievements

2019 Awarded **Academic Excellence Award** for consecutive academic years 2015-18 at IIT Kanpur

2018 Awarded Sri Singhasan Singh Scholarship for consistent academic excellence.

2016 Secured **2nd Runner up** in ABU Robocon 2016 with a team of 30 members.

2015 Secured **All India Rank 474** in JEE Advanced among 150,000 students

2015 Secured **All India Rank 420** in JEE Mains among 1.5 million candidates

2015 Recipient of the prestigious Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship.

Relevant Coursework

Intelligent Agents*	Visual Recognition	Machine Learning
Probabilistic Machine Learning	Data Structures and Algorithms	Convex Optimization*
Image Processing	Randomized Algorithms	Neural Networks
Natural Language Processing*	Probability and Statistics	Information and coding theory
Algorithms-II	Theory of Computation	Algorithmic Information Theory
Linear Algebra and ODE	Partial Differential Equations	Digital Signal Processing

* = courses completed at EPFL.

Miscellaneous

Creating Face caricatures: As course project of Image processing under Prof. Venkatesh K S, created caricatures of the face (presentation) from the given image of face of an individual. Caricature is a comical representation highlighting of the distinct features of the face of that individual.

Talks: Presented a talk and prepared a report on **Personal Identity and Teleportation** at EPFL, supervised by Prof. Michael-Andreas Esfeld and Dustin Lazarovici

Designed an auctioning agent (report) for the **Pickup and Delivery Problem** as part of the Intelligent agents course at EPFL, and competed with other students' agents to decide whose implementation can bid and deliver their packages most efficiently.

Building GemOS: As part of the Operating Systems course under Prof. Debadatta Mishra, implemented operating system functions (fork, mmap, mprotect, etc.) on a truncated GemOS code (provided) in C++ programming language. Implemented a parallel hashing code and a read-write lock.

Standardized scores: **GRE**: 331/340 **ToEFL**: 110/120

Android Development: Developed an app, PhoneAway, that allows the user's android phone to be securely and remotely accessed by another phone via its messaging facility.

Secretary, Programming Club: Organized lectures, workshops and contests for freshmen.

Coordinator-Events, 51st Inter IIT Sports Meet 2016: Handled logistics for events while managing secretaries for the same.