Gurpreet Singh

B. Tech · Department of Computer Science and Engineering

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Education

Year	Degree	Institute	CPI / Score
2015 - 2019	B. Tech, Computer Science and Engineering	Indian Institute of Technology, Kanpur	9.3 / 10.0
2015	Class XII (CBSE)	Delhi Public School, Kalyanpur	94.4%
2013	Class X (CBSE)	Delhi Public School, Kalyanpur	9.6 / 10.0

Scholastic Achievements

Got Academic Excellence Award, IITK for the year 2016-2017	2018
Got selected for ACM ICPC Regionals, 2017 at two sites, Chennai and Amritapuri (Overall Rank - 70)	2017
Secured All India Rank 174 in the JEE Advanced examination amongst 1.2 lakhs shortlisted students	2015
Kishore Vaigyanik Protsahan Yojana (KVPY) Scholar with All India Rank 464	2015

Projects

DISCRETE VARIATIONAL AUTOENCODERS AND STOCHASTIC BLOCK MODELS

Fall 2018 (Ongoing)

Prof. Piyush Rai — *Undergraduate Project*

- Surveyed continuous relaxations to discrete latent variables such as Gumbel-Softmax, Spike-and-Exp, Overlapping, Gumbolt, etc.
- Implemented GumBolt relaxation for binary latent variables with RBM prior using tensorflow and performed analysis on MNIST dataset
- Augmented GVAEs with binary latent embeddings to offer interpretable latent representations, imitating mixed membership models
- Tested the resultant model for link prediction on graph datasets such as Citeseer and Cora and achieved superior results to baseline models

MIXTURE OF EXPERTS USING DISCRETE VAE

Fall 2018

Prof. Arnab Bhattacharya — *CS685: Data Mining*

- Proposed a novel model using the VAE framework for clustering in latent space, extending the ideas of the VaDE model
- Modeled the cluster assignment using a deep neural network, and added regularization using Virtual Adversarial training
- The proposed model worked comparable to VaDE on clustering tasks without the need for careful layer wise pretraining
- Extended the proposed model as a gating function for Mixture of Experts tasks and achieved better performance than naive baseline models

INCREMENTAL NEURAL NETWORKS TRAINING

Spring 2018

Prof. Purushottam Kar — *CS777: Statistical and Algorithmic Learning Theory*

- Two layer NNs can be represented as an ensemble of multiple single node hidden layer networks, which can be individually trained using generic boosting methods (gradient boosting), which also afford definite theoretical convergence guarantees
- Applied gradient boosting to train two layer networks incrementally and studied the convergence analysis under various constraints
- Implemented incremental NN training in python using sklearn, and applied for Softmax Regression on the MNIST Dataset
- Applied incremental training as pre-training, along with backpropagation for fine-tuning and observed remarkably better convergence

SURVEY ON METHODS FOR CONVEX OPTIMIZATION

Spring 2018

Prof. Purushottam Kar — *CS777: Statistical and Algorithmic Learning Theory*

- Surveyed prominent Gradient Descent based techniques (SGD, AdaGrad, etc.) for optimization and perused the convergence bounds of each
- Reviewed and paraphrased a paper which disproves guaranteed convergence of Adam for even convex objectives using a counterexample
- Identified inconsistencies within the convergence proof for Adam as an attempt to explain its incorrectness

CLUSTERING AND MOE FOR ARBITRARY SHAPED CLUSTERS

Spring 2018

Prof. Piyush Rai — *CS698X: Bayesian Modelling and Inference*

- Studied VAEs and surveyed clustering models (iWMM, SVAE, VaDE, etc.) for data existing in non-Gaussian shaped clusters
- Implemented Variational Deep Embeddings (VaDE) in Tensorflow to experiment on MNIST and spiral dataset to learn arbitrary shaped clusters
- Proposed gating functions based on VaDE and Stick Breaking-VAE for mixture of experts models

MACHINE COMPREHENSION USING MATCH-LSTM

Spring 2018

Prof. Harish Karnick — *CS671: Natural Language Processing*

- Surveyed various models for Machine Comprehension (FastQA, R-Net, Match-LSTM, etc.) and implemented Match-LSTM using Tensorflow
- Experimented with SQuAD and combated inefficiency of Match-LSTM to apply separate attention mechanisms for different question types
- Additionally, introduced simple changes to loss function to improve the EM score on SQuAD by a total of over 5%

* Code and reports for all projects are available at https://github.com/fat-fighter

Work Experience

GOLDMAN SACHS │ Summer Analyst *Bangalore, May'18 - Jul'18*
    Objectives
      (i) Introduce changes in existing models for asset liability gap management for deposits and clearing house initial margin, and
      (ii) Build a lite calculator for customer margin allocation for proper internalization
- Understood working of financial firms, along with basic concepts of Asset-Liability Gap (AL Gap) Management
- Identified bugs in pre-written code, augmented proper AL Gap Management, and built a waterfall logic for customer margin (CM) allocation
- Built a greedy strategy for CM allocation per stock taking various parameters into consideration, improving the run time of the allocation logic

INMOBI │ Data Science Intern *Bangalore, May'17 - Jul'17*
- Extracted Features from Ad creative images using OpenCV (in python) and Google Cloud Vision API
- Analysed Pearson Correlation with the Click Through Rate (CTR) and used variable selection (Weka) to detect explainable features
- Created a python server to handle feature extraction and prediction for building suggestions for possible Ad enhancements based on CTR

EXXAMM.COM │ Web Development Intern *Delhi + Remote, Jan'16 - Jul'16*

INMOBI │ Software Engineering Intern *Bangalore, Dec'15*

Other Projects

Spring 2018   **Java to X86 Assembly Compiler**, Prof. Subhajit Roy   *IITK*
Fall 2017   **Scaling Recommendation Systems using K-Means Clustering**, Prof. Purushottam Kar   *IITK*
Fall 2017   **NachOS Operating System**, Prof. Mainak Chaudhuri   *IITK*

Technical Skills

Programming/Scripting	C/C++, Python, Bash, Octave/MATLAB, R, LaTeX
Assembly Languages	MIPS, Verilog
Web Development	PHP, Javascript, JQuery, MySQL, CSS/HTML, node.js
Utilities and Tools	Git, Linux Shell Utilities, Tensorflow

Positions of Responsibility

TUTOR │ ESC101: Fundamentals of Computing *Prof. Swaprava Nath, IITK, Spring 2019 (Ongoing)*
- Tutored a class of 35 students; Responsible for taking a class and grading quizzes every week
- Mentored two students in a project on building a CF Recommendation System

COURSE MENTOR │ CS771: Introduction to Machine Learning *Prof. Piyush Rai, IITK, Fall 2018*

ACADEMIC MENTOR │ ESC101: Fundamentals of Computing *Counselling Service, IITK, 2016-17*
- Took multiple doubt clearing sessions, both hall level and institute level and also gave one-on-one tutoring to a few students