Saurav Shekhar

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Education

2016-	**MSc Computer Science**, ETH Zürich ESOP scholar, awarded to 3 students among 150 in MSc Computer Science	-
2012-2016	**B.Tech Computer Science**, Indian Institute of Technology, Kanpur Academic Excellence Award for year 2012-13	9.1/10

Professional experience

Recurrent Neural Networks in ROOT *May '17 - Ongoing*

Google Summer of Code project under CERN-HEP Software Foundation, Geneva

- Project aims at introducing Recurrent Neural Networks in Tool for MultiVariate Analysis (TMVA) Module in the ROOT data analysis framework.
- Features include GPU support (using CuBLAS), BLAS and multi-threaded training support for CPUs.
- Restructured the entire Deep Learning module in TMVA to better suit advanced deep learning architectures like CNNs, RNNs and Autoencoders. Benchmarking on ECAL images dataset for event classification in particle physics.

Personalized feed algorithm *May '16 - August '16*

Internship at ShareChat, a vernacular language social media application, Bangalore

- Analyzed user's activity on the app's home feed and designed a new wilson score based popularity metric for posts. Tried collaborative filtering techniques for computing user-post relevance.

Real-time Market Data Monitor *May '15 - July '15*

Summer internship at Goldman Sachs, Bangalore

- Implemented monitoring and alerting for latency spikes and various market data sanity checks.
- Improved market data subscription and abstracted out various monitoring and alerting functionalities so that these can be reused across multiple market data source systems.

Projects

Dialogue generation using Seq2seq models *April '17 - June '17*

Course project in Natural Language Understanding under Prof. Thomas Hofmann

- Starting with a basic sequence to sequence model for conversational agent, improved upon the baseline using attention models, stacked RNNs, mutual information (for diversifying output) and beam search.
- Introduced histograms of word frequency as a metric to evaluate model performance (especially diversity) along with perplexity and BLEU score.

Speeding up deep semantic segmentation *May '17 - Ongoing*

Research project under Dr. Martin Oswald

- Aim of the project is to speed up Convolutional Network Architectures for real time Semantic Segmentation of images using depth data on mobile devices. Currently exploring how depth values affect the performance of various segmentation architectures and how the network can be simplified accordingly.

Twitter Sentiment Classification *March '17 - July '17*

Course project (Kaggle challenge) in Computational Intelligence Lab under Prof. Thomas Hofmann

- Used GloVe and Word2Vec to extract word embeddings from tweets, along with a combination of unsupervised sentence level embeddings to form feature vectors.
- Used an ensemble of LSTM and GRU Recurrent Networks along with different Convolutional Networks to achieve a classification accuracy of 89% on a dataset of 2.5 million tweets.
- This was the top scoring model on the leaderboard.

Optimized implementation of Latent Dirichlet Allocation *March '17 - June '17*

Course project in How to Write Fast Numerical Code under Prof. Markus Püschel

- Enhanced the performance of a standard Latent Dirichlet Allocation (LDA) implementation on single core using memory usage improvements, use of SIMD instructions, cache analysis etc.
- Achieved a speedup of 11x over original baseline written by authors of LDA.

Object detection and classification in Surveillance videos *Jan '16 - Apr '16*

Course project in Machine Learning, tools and techniques under Prof. Harish Karnick, IIT Kanpur

- Used selective search and background subtraction techniques to extract candidate region proposals for classification.
- Extracted feature using various methods like SIFT, HOG, Convolutional Neural Networks, Autoencoders and Restricted Boltzman Machines. Compared the classification accuracy obtained with different classification algorithms.

Random Graphs *July '15 - Nov '15*

Undergraduate project under Prof. Surender Baswana, IIT Kanpur

- Studied Erdos-Renyi phase transitions and expected linear time algorithms for finding biconnected components in Random graphs.
- Worked on average case analysis of an incremental algorithm for maintaining DFS tree in an undirected graph.

Concurrent data Structures in Haskell *July '15 - Nov '15*

Course project in Functional Programming under Prof. Piyush Kurur, IIT Kanpur

- Implemented Michael & Scott's lock-free queue algorithm in Haskell.
- Used atomic-primops package for CAS and other atomic operations.
- Project developed as an open source Cabal Package.

Scala to MIPS Assembly Compiler *Jan '15 - Apr '15*

Course Project in Compilers under prof. Subhajit Roy, IIT Kanpur

- Programmed a Scala to MIPS cross compiler with support for basic datatypes, conditional statements, looping statements, arrays, nested functions, recursion and object oriented features.
- Awarded as the 2^{nd} best project for the course out of 22 teams.

Extension of NACHOS *Aug '14 - Nov '14*

Course Project in Operating Systems under prof. Mainak Chaudhuri, IIT Kanpur

- Extended the standard system call library of NachOS and implemented Fork, Exec, Join, Yield, Sleep, Exit system calls. Implemented process scheduling algorithms like UNIX scheduling, FIFO, Round robin, SJF and non-preemptive scheduling.
- Programmed page replacement algorithms: Random allocation, FIFO, LRU and LRU-clock and evaluated relative performance.

Academic

- Teaching Assistant, Machine Learning, fall 2017.
- Teaching Assistant, Data Structures and algorithms, fall 2015-16.
- Secured All India Rank 958 in IIT-JEE among 500,000 candidates.
- Selected in Top 1% of each of the National Standard Examinations in Physics (NSEP), Chemistry (NSEC) and Astronomy (NSEA) and Regional Mathematics Olympiad.

Miscellanous

- Google Hash Code 2017 onsite Finalist, under top 50 worldwide among 3000 teams in the qualification round.
- Ranked 10^{th} among 60 teams and awarded a bronze medal at ACM ICPC SWERC 2016 Regionals.
- 6^{th} place among top 25 teams selected (among 8000 in online rounds) for the Codechef Snackdown onsite finale 2015.
- Secretary, Programming Club (*2013-2014*) - Assisted in organizing Programming competitions and took introductory programming lecture for the freshers.
- Advanced to Round 2 of Facebook Hackercup 2013 (position 287), and Round 2 of Google Code Jam 2014.
- Secured 1^{st} place in IHPC, high performance computing contest and 2^{nd} place in Battlecity, AI bot programming challenge in Techkriti 14.

Technical Skills

Coursework: Natural Language Understanding, Machine Learning, Hardware Architectures in Machine Learning, How to Write Fast Numerical Code, Probabilistic Artificial Intelligence, Algorithms Lab
Programming Languages: C, C++ (Proficient), Java, Python, Lua, Haskell, HTML, PHP, Bash Shell, Node.js
Software: Torch7, Tensorflow, CUDA (cuBLAS), Caffe, MySQL, MongoDB, GIT, MIPS Assembly, LaTeX, Gnuplot, Amazon Web Service