Archit Sharma

Senior Undergraduate, IIT Kanpur

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Education

2018	Bachelor of Technology, **Indian Institute of Technology, Kanpur**

Major: Electrical Engineering
Minors: Machine Learning, Linguistic Theory
CPI: 9.8/10

Research Experience

May-Aug 2017
⚲ github
🗋 summary

Synthetic Gradients across Discrete Latent Variables
Research Intern at Montreal Institute of Learning Algorithms (MILA)
Supervisor: Dr. Yoshua Bengio
- Proposed a **novel estimator for gradients across discrete latent variables**, with potential use in Reinforcement Learning and GAN training (for structured data like language).
- Formulated a synthetic gradient like auxiliary learner, with REINFORCE as the training signal, to produce **low-variance gradients** across discrete latent variables.
- Compared the performance with other gradient estimators (REINFORCE, Straight Through and Gumbel-Softmax). The proposed estimator provided **faster but poorer convergence** compared to REINFORCE, possibly, because of the **non-stationary input** or the **mismatch between objectives of the auxiliary learner and the main network**.

Ongoing
🗋 presentation
🗋 report

Flexible Framework for Large-Margin Mixture-of-Experts
Undergraduate Project at IIT Kanpur
Supervisor: Dr. Piyush Rai
- Leveraging recently developed **latent variable augmentation techniques**, we reformulate mixture-of-experts to provide efficient EM based learning algorithms.
- Our formulation provides **closed form EM updates** for a variety of gating networks, and even for **hierarchical mixture-of-experts**.
- Our models **achievs competitive results on various binary classification** datasets.

May-Jul 2016

Privacy Analysis of DSRC enabled Cars
Research Intern at Texas A&M University
Supervisor: Dr. Srinivas Shakkottai
- Analyzed user privacy in DSRC enabled cars (vehicle to vehicle/infrastructure communication).
- Successfully **demonstrated the lack of privacy in Random ID Switching protocol** by reconstructing car routes with 98.37% accuracy.

Selected Projects

Ongoing
🗋 report

Improved Variational Inference using Real NVP
Course Project for Probabilistic Machine Learning under Dr. Piyush Rai
- Proposed **Real NVP** as an alternate to Normalizing Flows in a VAE setup for generative modelling of images.
- Compared Real NVP and Normalizing Flows on **Binarized MNIST, with promising initial results for the former**.
- Further analysis with higher number of transformations, and on different datasets planned.

Jan-Apr 2017
⚲ github

Visual Dialog
Undergraduate Project under Dr. Vinay P. Namboodiri
- Implemented **encoder-decoder framework** based deep learning models for visual dialog, with the aim to answer sequence of questions based on an image.
- Created a **memory network based encoder** for the input image, questions and the past conversation and a **deep LSTM based decoder** to generate the answers.

Mar-Apr 2017
🗋 poster

GANs for Single Image Dehazing
Course Project for Visual Recognition under Dr. Vinay P. Namboodiri
- Formulated a **deep architecture, along the lines of pix2pix, for single image-dehazing** with a weighted combination of GAN and L1 loss.

Sep-Nov 2016	**VIDEO SUMMARIZATION**
github	*Course Project for Machine Learning under Dr. Piyush Rai*

- Implemented and compared different video summarization techniques like VSUMM, VGRAPH on different features extracted at the frame level.

ACHIEVEMENTS

2018	**Departmental Rank 1** out of 140 undergraduates in Electrical Engineering, IIT Kanpur.
2018	Awarded **Academic Excellence Award** by IIT Kanpur for CONSECUTIVE ACADEMIC YEARS 2014-17.
2018	Awarded LALIT NARAIN DAS MEMORIAL SCHOLARHIP by IIT Kanpur for the best B.Tech final year student in EE.
2017	Awarded SRI SINGHASAN SINGH SCHOLARSHIP for **highest CPI** in Electrical Engineering, IIT Kanpur.
2017	Awarded A^* for **exceptional performance in ten courses**.
2016	Selected for **Texas A&M-IITK Summer Research Internship Program**, only SOPHOMORE to accomplish this.
2014	Secured **All India Rank 376** in JEE ADVANCED among 150,000 students.
2010	Awarded **National Talent Search Scholarship** (NTSE) by Govt. of India.

RELEVANT COURSEWORK

Visual Recognition	A	Machine Learning	A	Probabilistic Machine Learning	A*
Fundamentals of Computing	A*	Data Structures and Algorithms	A	Image Processing	A*
Digital Signal Processing	A	Probability and Statistics	A*	Convex Optimization	#
Introduction to Real Analysis	A	Partial Differential Equations	A	Statistical Learning Theory	#
Linear Algebra and ODE	A	Algorithms-II	A	Natural Language Processing	#

A* ≡ Outstanding, # ≡ Spring 2018

TECHNICAL SKILLS

Proficient	C++, C, Python, LaTeX
Comfortable	JAVA, Shell (Bash), MATLAB
Tools	Tensorflow, Theano, Git, NumPy, Scikit-Learn

MISCELLANEOUS

TALKS: Presented a talk on **Gradients for Discrete Latent Variables** on Machine Learning Research Day (MLRD) organized by SIGML, IIT Kanpur.

PROJECT MENTOR: Mentoring student projects in "Topics in Probabilistic Modelling and Inference". Chosen on the basis of exceptional performance in courses and relevant research experience.

COMPETITIVE PROGRAMMING: CODECHEF LONG CHALLENGE RATING: 8190.89. Over 80 problems solved on SPOJ. Secured **63 rank** in online qualification round for **ACM ICPC Regionals 2017**, appearing thereafter in AMRITAPURI AND CHENNAI REGIONALS. Also, appeared in Round 2 of Facebook Hackercup 2017.

STANDARDIZED SCORES: **GRE**: 336/340, **TOEFL**: 115/120.

SOFTWARE CORNER MANAGER, TECHKRITI'16: Handled logistics for software events in Techkriti, *annual technical festival of IIT Kanpur.*

ANDROID DEVELOPMENT: Integrated the Facebook API in *GoSuraksheit*, a women safety application developed at HUGHES SYSTIQUE.Developed an android application to collect location and travel data at TEXAS A&M UNIVERSITY.

NASA AMES SPACE SETTLEMENT DESIGN CONTEST, 2012: **Awarded first position** in IX-X category amongst **participants from over 10 countries** for designing a space settlement capable of hosting nearly 10,000 humans independently.

STUDENT GUIDE, COUNSELLING SERVICE: Mentored seven freshmen through their first year.

SECRETARY, PROGRAMMING CLUB: Organized lectures, workshops and contests for 200 freshmen.

MUSIC: Played guitar in various competitions and events organized by Music Club, IIT Kanpur.