Archit Sharma

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Education

2018 (Expected) — Bachelor of Technology, **Indian Institute of Technology, Kanpur**
Major: Electrical Engineering
Minor: Artificial Intelligence, 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

Mixture of Bayesian SVM Experts (Submitted to IJCAI 2018)

Undergraduate Project at IIT Kanpur
Supervisor: Dr. Piyush Rai

- Formulated a **novel and interpretable classification model** with Bayesian SVM as *experts* in a Mixture of Experts setting.
- Introduced **polya-gamma augmented softmax gating network** and derived an EM based algorithm for training the model.
- The model **achieves competitive results on various binary classification** datasets. Currently, other variants and extensions (Multiclass classification, Online EM) are being formulated.

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

2017 **Departmental Rank 1** out of 140 undergraduates in Electrical Engineering, IIT Kanpur.
2017 Awarded Sri Singhasan Singh Scholarship for **highest CPI** in Electrical Engineering, IIT Kanpur.
2017 Awarded A^* for **exceptional performance in ten courses**.
2016 Awarded **Academic Excellence Award** by IIT Kanpur for consecutive academic years 2014-16.
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.