Archit Sharma

Senior Undergraduate, IIT Kanpur
✉ architsh@iitk.ac.in | architsharma97.github.io | architsharma97

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

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 2** 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.

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 over 200 freshmen.

Music
Avid guitarist. Participated in various competitions and events organized by Music Club, IIT Kanpur.