

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: 9.9/10

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 **achieve 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.

- 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 SCHOLARSHIP by IIT Kanpur for the best B.Tech final year student in EE.
- 2018 Awarded **A*** for **exceptional performance in 11 courses**.
- 2017 Awarded SRI SINGHASAN SINGH SCHOLARSHIP for **highest CPI** in Electrical Engineering, IIT Kanpur.
- 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	A*
Introduction to Real Analysis	A	Partial Differential Equations	A	Statistical Learning Theory	A
Linear Algebra and ODE	A	Algorithms-II	A	Natural Language Processing	A

A* \equiv Outstanding

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.