

# ARCHIT SHARMA

SENIOR UNDERGRADUATE, IIT KANPUR

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## EDUCATION

2018 BACHELOR OF TECHNOLOGY, **Indian Institute of Technology, Kanpur**  
(Expected) *Major:* ELECTRICAL ENGINEERING  
*Minor:* ARTIFICIAL INTELLIGENCE, LINGUISTIC THEORY  
CPI: 9.8/10

## RESEARCH EXPERIENCE

- MAY-AUG 2017 **SYNTHETIC GRADIENTS ACROSS DISCRETE LATENT VARIABLES**  
Research Intern at Montreal Institute of Learning Algorithms (MILA)  
Supervisor: DR. YOSHUA BENGIO  
[github](#)  
[summary](#)
- 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 **MIXTURE OF BAYESIAN SVM EXPERTS**  
[presentation](#)  
[report](#)  
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 a novel **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 **IMPROVED VARIATIONAL INFERENCE USING REAL NVP**  
[report](#)  
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 **VISUAL DIALOG**  
[github](#)  
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. The embeddings are fed into **deep LSTM based decoder** to generate the answers.
- MAR-APR 2017 **GANs FOR SINGLE IMAGE DEHAZING**  
[poster](#)  
Course Project for Visual Recognition under Dr. Vinay P. Namboodiri
- Formulated a **deep architecture, along the lines of pix2pix**, for single image-dehazing using 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

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- 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 seven 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

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Visual Recognition	A	Machine Learning	A	Probabilistic Machine Learning	#
Fundamentals of Computing	A*	Data Structures and Algorithms	A	Image Processing	#
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	#	Natural Language Processing	*

A\* ≡ Outstanding, # ≡ Fall 2017, \* ≡ Spring 2018

## TECHNICAL SKILLS

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

## MISCELLANEOUS

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### 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.