

HARSHVEER SINGH

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EDUCATION

Thapar Institute of Engineering and Technology, July '17 - Present
Bachelor of Engineering (B.E.) in Electronics and Computer Engineering

INDUSTRY EXPERIENCE & TECHNICAL PROJECTS

Academic Head, ACM Student Chapter, T.I.E.T. July '19 - July '20

Planned the academic curriculum : topics, number of classes, mentor assignment.

Mentored the Machine Learning research group

Mentored teams for PECFEST Hackathon '19, SATURNALIA Hackathon '19

Tinotifications Dec '18

Developed an event management and publicity platform for Thapar Institute of Engineering and Technology, (currently in use, exclusive for TIET students), backboneed with a Transformer based attention model (Poly Encoders), to pick next favourable task to operate on, ensuring smooth functioning of a given student organisation at TIET.

Hackathons 2017-2018

SATURNALIA Hackathon '17, used bayesian prior to regress rural health service data.

PECFEST Hackathon '17, used VAEs for clustering supply chain records of a given organisation. A Jensen-Shannon divergence metric performed better for estimating the posterior than basic KL-divergence.

PECFEST Hackathon '18, developed a question answering system based on gpt2, to help under privileged students to learn subjects on their own.

RESEARCH EXPERIENCE

Adversarial training for Facebook's blender bot June'20 - Present

Aiming at a self play regime for conversational agents, and extending that to competitive conversation where an agent discriminates the output distribution of the other agent against human dialogue distribution.

Poly encoder regime for fine-tuning decoder-only model (GPT-2) May' 20

Decoder model fine tuned like such, apparently is more robust to inductive bias than encoder model even though encoder reached better recall@k/C score.

Analytical study of success of Batch Norm Nov'19 - Dec'19

Showed that batch normalization smoothens the loss surface and how it brings that effect, through the study of eigen-values of the hessian of input matrix.

Beta2 variation regime for Adam May '18 - July '18

Developed a novel regime for varying beta2 hyperparameter of Adam (adaptive momentum), preventing Adam from getting stuck in sub-optimal minima. A similar result was also shown in the parallel but completely independent research Sashank J. Reddi et al. (ON THE CONVERGENCE OF ADAM AND BEYOND)

SKILLS

Mathematics: Linear algebra, Statistics, Bayesian Inference, Probabilistic modelling

Programming: Python, PyTorch, C, C++, HuggingFace, NumPy, TensorFlow, Keras, scikit-learn, pandas, matplotlib. **Web:** NodeJS, ReactJS, VanillaJS, MongoDB, Nginx, Multiple Third-party APIs. **Utilities:** Git/Github, Linux(Kernel Programming), Atom, SublimeText, LaTeXs

PUBLICATIONS

“The real reason why BatchNorm works”

<https://towardsdatascience.com/why-batchnorm-works-518bb004bc58>

Code for Poly-encoder got featured at the official [paperswithcode.com profile of Poly-encoders\[Humeau et al.\]](#),

my code repo - [llStringll/Poly-encoders](#)

TALKS AND PRESENTATIONS

Causality and its importance in variational inference and EM, Thapar University	Jan '20
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Inductive bias in machine learning models, Thapar University	Oct '19
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Effect of constraining the posterior to a Gaussian in VAEs, PECFEST	Nov '17
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CURRENT WORK

Evolution of ML algorithms from scratch using only basic mathematical operations as building blocks, applying evolutionary methods to automatically find the code for complete ML algorithms. Finally aiming at creating such a regime of environment and agents, where agents can learn to code their environment and eventually act as an evolved drop-in replacement of their environment, hence bootstrapping the process. Inspired by neural architecture search and AutoML-Zero by GoogleAI.