JAIVARDHAN KAPOOR

Masters Student, Electrical Engineering ⋄ Indian Institute of Technology Kanpur

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EDUCATION

2019-Present	M.Tech. (Electrical Engineering)	IIT Kanpur (Grade till 2018-19-II)	10/10
2015-2019	B.Tech. (Electrical Engineering)	IIT Kanpur (Grade till 2018-19-II)	8.3/10
2015	Class XII (CBSE)	Nezamia Public School	92.8%
2013	Class X (ICSE)	Seth Anandram Jaipuria School	96.8%

ACADEMIC ACHIEVEMENTS

- Secured all India rank of **496** (amongst 150,000 candidates) in JEE Advanced, 2015
- Secured a rank of **485** in Kishore Vaigyanik Protsahan Yojana (KVPY)

PUBLICATIONS

- J. Kapoor, A. Vergari, M. Gomez-Rodriguez and I. Valera, "**Bayesian Nonparametric Hawkes Processes**", Accepted at the Bayesian Nonparametrics Workshop at NeurIPS 2018, Montreal.

RESEARCH INTERESTS

Modeling	ODE Models, Normalizing Flows, Variational Autoencoders, Bayesian Nonparametrics, Graphical Models, Bayesian Neural Networks
Temporal Data	Ordinary Differential Equations, Temporal Point Processes
Approximate Inference	Stochastic Gradient MCMC, Particle-based Inference, Variational Inference

ONGOING RESEARCH

MTech Thesis IIT Kanpur

August 2019 - ongoing *Supervised by Dr. Vipul Arora, EE*

- Thesis revolves around accelerated and controlled simulation of XY model in statistical physics
- Data simulated using classical MCMC at different temperatures is used in learning
- A conditional Variational Autoencoder with Normalizing Flows is used as a deep generative model
- Additional targets of learning phase transitions and vorticities in the model are to be worked upon

INTERNSHIPS

Aalto University Espoo, Finland

May 2019 - July 2019 *Supervised by Dr. Harri Lahdesmaki, CS*

- Surveyed machine learning approaches employing continuous-time dynamics
- Implemented several recent gradient-based MCMC samplers in Pytorch
- Performed Bayesian inference in ODEs modeled with Gaussian Process using MCMC
- Computed benchmarks for popular gradient-based optimizers and MCMC schemes on ODE models
- Obtained uncertainty estimates for trajectories of multiple dynamical systems

Max Planck Institute for Intelligent Systems Tuebingen, Germany

June 2018 - December 2018 *Supervised by Dr. Isabel Valera, Empirical Inference*

- Developed a methodology to combine count-based Bayesian nonparametrics with Hawkes processes
- Proposed framework ensures a proper prior on a variety of modeling scenarios
- Devised an approximate inference scheme for the methodology based on Sequential Monte Carlo
- Implemented the inference and generative model of novel models for different use-cases.
- Executed experiments on synthetic as well as real-world data, and compared to relevant baselines
- Evaluated the framework with datasets on online user activity, citation networks, and corporate mail servers

RESEARCH PROJECTS

On Hamiltonian Descent Methods [Link] IIT Kanpur
February 2019 - April 2019 *Supervised by Dr. Ketan Rajawat, EE*

- Reviewed a paper proposing a full-batch gradient-based optimizer employing Hamiltonian dynamics
- Empirically showed some properties of the optimizers on different objectives.
- Proposed a proof sketch for a convergence of a stochastic extension of the deterministic optimizer

Incremental Training of a 2-layer Neural Network [Link] IIT Kanpur
February 2018 - May 2018 *Supervised by Dr. Purushottam Kar, CSE*

- Rephrased training of a 2-layer neural network in the form of Gradient Boosting with convergence guarantees
- Applied boosting to the hidden layer nodes for incremental training, serving as a warm start for backpropagation
- Evaluated the training on MNIST with different activation functions, observing significant pretraining gains

Survey on Convergence of Gradient Based Optimization Algorithms [Link] IIT Kanpur
March 2018 - April 2018 *Supervised by Dr. Purushottam Kar, CSE*

- Reviewed popular deterministic and stochastic gradient-based optimization algorithms
- Provided convergence analyses of variants such as SGD, Momentum, AdaGrad, NAG and ADAM
- Reviewed and paraphrased recent work showing non-convergence of ADAM in certain cases

Statistical Identification of Multiple Bugs IIT Kanpur
September 2017 - November 2017 *Supervised by Dr. Subhajit Roy, CSE*

- Reviewed current trends and surveyed various papers on statistical bug localization using graphical models
- Used ROSE compiler to instrument predicates for multiple runs of test programs
- Implemented an existing model based on biclustering approach on relevant bug identification datasets

Variational Inference using Normalizing Flows [Link] IIT Kanpur
January 2017 - May 2017 *Supervised by Dr. Piyush Rai, CSE*

- Used normalizing flows to obtain a richer approximate posterior family for variational methods
- Implemented MNIST digit generation & classification with VAE and normalizing flows using TensorFlow
- Analyzed results on the MNIST dataset, with qualitative improvements over pre-existing posterior assumptions

TECHNICAL STRENGTHS

Computer Languages	Python, Octave/MATLAB
Software & Libraries	LaTeX, PyTorch, Numba, autograd, Unix, pandas, Sphinx, git, matplotlib
Machine Learning	MCMC, Sequential MC, Variational Inference, Bayesian Nonparametrics, Optimization

RELEVANT COURSES

Mathematics of Signal Processing[1]	Statistical Inference	Bayesian Machine Learning
Detection & Estimation Theory	Introduction to Bayesian Analysis	Computational Cognitive Science
Convex Optimization	Topics in Learning Theory	Data Structures & Algorithms
Signals, Systems & Networks	Linear Algebra & Calculus	Natural Language Processing
Communication Systems	Partial Differential Equations	Data Driven Program Analysis

POSITIONS OF RESPONSIBILITY

Counselling Service, IIT Kanpur April 2016 - April 2017
Student Guide *IIT Kanpur*

- Organized the Fresher Orientation Program for smooth induction of freshers' batch of 800 students
- Mentored and guided 6 freshmen in dealing with their emotional and academic predicaments

[1] Ongoing Course