

JAIWARDHAN KAPOOR

(+91) 983 993 7479 \diamond jkapoor@iitk.ac.in \diamond jaiwardhankapoor.com

EDUCATION

2019-2020	M.Tech. (Electrical Engineering)	IIT Kanpur	10/10
2015-2019	B.Tech. (Electrical Engineering)	IIT Kanpur	8.4/10
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	Graphical Models, Deep Generative Models, Continuous-time Models
Inference	Variational Inference, Second-order Gradient Methods
Applications	Scientific Data, Dynamical Systems, Unsupervised Learning

MASTERS THESIS

Accelerated Simulation of the XY Model using Conditional Normalizing Flows IIT Kanpur
August 2019 - December 2020 *Supervised by Dr. Vipul Arora, EE*

- Developed Conditional Normalizing Flows to generate XY model lattice configurations at any given temperature
- Used circular splines to transform angle-valued spins, while respecting discrete translational symmetry
- Compared performance to MCMC and relevant ML methods, speeding up simulation by orders of magnitude while outperforming ML baselines
- Continued work includes equivariant flows to capture global $U(1)$ rotational symmetry

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

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

- Employed 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	L ^A T _E X, PyTorch, Tensorflow, Numba, Unix, pandas, Sphinx, git, matplotlib
Machine Learning	MCMC, Neural Networks, Bayesian Modeling, Approximate Inference

RELEVANT COURSES

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

POSITIONS OF RESPONSIBILITY

Antaragni 2016 - Cultural Festival of IIT Kanpur

April 2016 - October 2016

Senior Executive, Design

IIT Kanpur

- Organized the social initiatives of the festival to spread awareness among the youth
- Ideated and designed creative elements of the festival website from scratch
- Designed posters, ID card templates, backdrops, banners and festival merchandise on Adobe Photoshop

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