

Aniket Das

UNDERGRADUATE, ELECTRICAL ENGINEERING AND MATHEMATICS, IIT KANPUR

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| EDUCATION | Indian Institute of Technology Kanpur, India <i>BTech in Electrical Engineering and BS in Mathematics (Double Major)</i> GPA: 9.1/10 (5 Semesters) Aalto University, Finland <i>Year-long Academic Exchange in Aalto University School of Science</i> GPA: 4.8/5.0 (2 Semesters) | <i>Aug' 17 - Jun' 22 (Expected)</i> <i>Jan' 20 - Jan' 21</i> |
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| RESEARCH INTERESTS | Optimization, High Dimensional Statistics, Approximate Inference, Gradient-based MCMC, Continuous Time Deep Learning, Generative Models |
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| PUBLICATIONS | <p>Yatin Dandi, Aniket Das, Soumye Singhal, Vinay P. Namboodiri, Piyush Rai “Jointly Trained Image and Video Generation using Residual Vectors” <i>Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2020</i> [Paper]</p> <p>Avinandan Bose*, Aniket Das*, Yatin Dandi*, Piyush Rai “NeurInt : Learning to Interpolate through Neural ODEs” <i>International Conference on Computer Vision 2021 (ICCV'21)</i> [Under Review]</p> <p>Aniket Das, Prateeti Mukherjee, Debashis De “Missing Data Imputation at Edge through Continuous-Discrete Bayesian Filtering of Stochastic Differential Equations” <i>Information Fusion</i> [Under Review]</p> <p>Avik Pal*, Aniket Das* “TorchGAN: A Flexible Framework for GAN Training and Evaluation” <i>Journal of Open Source Software (JOSS)</i> [Under Review] [Preprint]</p> <p><i>* indicates equal contribution</i></p> |
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| WORK EXPERIENCE | <p>Research Assistant, IIT Kanpur <i>Prof. Piyush Rai, CSE, IIT Kanpur</i> <i>Mar '19 - Present</i></p> <ul style="list-style-type: none">- Developing an extension of the Model Agnostic Meta Learning (MAML) algorithm for meta-learning of continuous time dynamical systems, and deriving theoretical guarantees for the same- Investigating results from SDE theory to improve the performance of Stochastic Gradient MCMC and Particle VI algorithms- Previously worked on generative models for joint image and video generation (Published, WACV'20) and on non-parametric generative models for images using Second Order Neural ODEs (Submitted, ICCV'21) <p>Research Assistant, Aalto University <i>Dr. Markus Heinonen and Prof. Harri Lahdesmaki, Aalto University</i> <i>Mar '20 - Sep'20</i></p> <ul style="list-style-type: none">- Developed approximate inference and adversarial learning algorithms for continuous-time generative models governed by Ordinary and Stochastic Differential Equations- Particular focus on Adversarial Learning of Second Order ODE based generative models for high dimensional time series, and Bayesian Inference in SDE models |
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SELECTED PROJECTS

Nonparametric Models for Image Generation and Interpolation

Prof. Piyush Rai, IIT Kanpur

Oct '20 - Mar '21

- Developed a generative model for images that learns a distribution of smooth continuous-time interpolation trajectories for a given source-target pair and generates images by subsampling random interpolation curves drawn from the trajectory distribution
- Parameterised the conditional distribution of interpolation trajectories with Probabilistic Second Order Neural ODEs and formulated the resultant model as a modified Generative Adversarial Network with a nonparametric data-dependent prior for the latent code
- Benchmarked against appropriate GAN and Bidirectional GAN baselines that employ a fixed latent code prior and obtained significant improvements in image generation and interpolation
- Work is submitted to the *International Conference on Computer Vision (ICCV) 2021*

Probabilistic Models for Joint Image and Video Generation

Prof. Piyush Rai and Prof. Vinay P. Nambodiri, IIT Kanpur: [\[Paper\]](#)

Mar '19 - July '19

- Developed a hierarchical probabilistic model for joint image and video generation that generates a summary frame for the video, and models individual frames by adding residual vectors to the summary frame representation at each timestep
- Developed an analogous hierarchy for models that disentangle content from motion by adding a residual content vector to the content summary representation at every timestep
- Designed VAE and GAN variants of the proposed models and observed significant improvements in both image and video generation when benchmarked against appropriate baselines
- Paper published at the *Winter Conference on Applications of Computer Vision (WACV) 2020*

OTHER PROJECTS

Continuous-Discrete Bayesian Filtering for Stochastic Differential Equations

Prof. Simo Sarkka, Aalto University [\[Code\]](#) [\[Report\]](#)

Feb '20 - Apr '20

- Studied the theory of Brownian Motion, Continuous-time Markov Chains, Stochastic Differential Equations (SDEs), Ito Calculus and the Fokker Planck PDE
- Investigated the continuous-time Bayesian Filtering problem for SDEs, and studied the Kushner-Stratonovich and Zakai Equations for likelihood calculation in SDE models
- Studied and implemented exact and approximate Kalman Filters for various Continuous-Discrete State Space Models

TorchGAN: A Flexible Framework for GAN Training and Evaluation

Independent Open Source Project : [\[Code\]](#) [\[Docs\]](#) [\[Preprint\]](#)

Dec'18 - Sep'19

- Developed a lightweight customizable PyTorch framework for training and evaluation of Generative Adversarial Networks (GANs)
- Wrote efficient implementations of various GAN models, losses, evaluation metrics and stability enhancement features, and designed a customizable framework for effortlessly extending them
- Project hosted on Github has over 1200 stars. Paper is currently submitted to the *Journal of Open Source Software (JOSS)*

RELEVANT COURSEWORK

Computer Science

Introduction to Programming, Data Structures and Algorithms, Advanced Algorithms*, Toolkit for Theoretical Computer Science[@]

Machine Learning and Statistics

Optimization in ML*, Kernel Methods and Learning Theory*, Probabilistic ML, Bayesian Filtering and State Space Models*, Statistical Signal Processing, ML for Signal Processing, Probability and Statistics

Mathematics

Functional Analysis*, Measure Theory*, Real Analysis[@], Stochastic Processes, Linear Algebra and ODE, Dynamical Systems*, Partial Differential Equations*, Complex Variables, Scientific Computing[@]

* - Course done at Aalto University @ - Ongoing Course