Anshuk Uppal

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ACADEMIC DETAILS

Education	Institute/School	Year	CGPA/%
PhD candidate	DTU Compute(CogSys)	Current	–
Integrated MTech. in ECE	IIIT Bangalore, India	2020	3.3/4.0
Schooling (12th CBSE)	Indore Public School(Indore, India)	2015	83.4%

EXPERIENCE

- **PhD Candidate** in the section for Cognitive Systems, DTU Compute (Sep '21 - current)

  - Broadly working on uncertainty and robustness in deep learning. I am supervised by associate professors Wouter Boomsma(DIKU) and Jes Frellsen(DTU). I am one of the first PhD students to be funded by the Center for Basic Machine Learning Research in Life Sciences(MLLS).
  - Currently, I am excited about diffusion models, identifiability, and geometry-aided sampling.

- **Visiting Research Scholar** at Courant Institute and Center for Data Science, NYU (Oct '24 - March '25)

  - Extended research stay in Rajesh Ranganath's group at CILVR.
  - Researching the theory of generative models including Diffusion Models, Continuous Normalising Flows and Stochastic interpolants.

- **Research Scientist Intern** at Sony AI, Tokyo (June '24- Oct '24)

  - Worked with the Deep Generative Modelling team on disentanglement and controllable generation in Latent Diffusion Models. Research article under peer review.
  - Investigations included study of generative models like GANs, Continuous Normalising Flows and non-linear Diffusion Models.

- **Project Associate** at RBCDSAI, IIT Madras (Aug '20 - Feb '21)

  - Obtaining global rankings for a set of participants given noisy pairwise preferences drawing from works in Spectral Ranking, Matrix completion theory and going beyond the Bradley-Terry-Luce model.
  - Probability theory, Linear Algebra and Markovian theory. (Pytorch, Kubernetes)

- **Research Intern**, Approximate Bayesian Inference team at RIKEN-AIP, Tokyo (June '19 - Dec '19)

  - Scaling Natural Gradient Variational Inference for Mixture of Exponential family approximations.
  - Approximating Deep Neural Networks with Gaussian Processes and applications of acquired Marginal Likelihood.
  - Pruning Bayesian Neural Networks using learned posterior approximations from Natural Gradient Variational Inference.

- **Summer Intern,Machine learning** at Turtle Shell Technologies,Bengaluru (June '17 - July '17)

  - K-means clustering and PCA applied to Bio-Medical Signals captured via sensors.
  - Optimizing implementation and increasing the accuracy of the results by modifying the code for cluster formation.

SELECTED PUBLICATIONS

- Bounded Implicit Variational Inference
  Anshuk Uppal, Wouter Boomsma & Jes Frellsen [ICML 2022 workshop on Distribution free Uncertainty Quantification].

- Implicit Variational Inference for High-Dimensional Posteriors (arxiv)
  Anshuk Uppal, Kristoffer Stensbo-Smidt, Wouter Boomsma & Jes Frellsen [NeurIPS 2023 Spotlight]

TEACHING

- Deep Learning for Industry, special course at Technical University of Denmark, December 2021

- Deep Learning, 02456 at Technical University of Denmark, Fall semester 2022
- Deep Learning, 02456 at Technical University of Denmark, Fall semester 2023

SUMMER SCHOOLS

- Human in the loop and Learning With Limited Labels, Technical University of Denmark 2022
- Generative modelling Summer School, Copenhagen 2023 [Teaching Support & organisation]

TOPICS OF INTEREST

- Deep generative modelling, approximate inference & uncertainty quantification
- Natural gradients, higher-order optimisation & gradient estimation
- Applications of Bayesian methods to life sciences
- High-dimensional geometry & measure theory

PROGRAMMING LANGUAGES

- **Languages**: C, Python & BASH
- **ML Packages & PPLs:** PyTorch, JAX, Pyro, NumPyro
- **Nostalgic about**: Octave, MATLAB, GNUSim8085 & Simulink, C++, OpenCV, Chainer

ML Projects(masters')

- **Estimating multimodal posteriors using natural gradients** (Master's Project, Fall '19)

  Prof G Srinivasaraghavan

  - Exploring recently proposed fast natural gradient variational inference algorithms(VADAM, VOGN) and deeply analysing the parameters updates which utilized natural gradients.
  - Reformulating parameter updates for Gaussian mixture model to improve sampling efficiency. The ideas were centred around distributed training strategies.
  - Incorporating control variates devised by collaborators from Prowler(now Secondmind) to reduce gradient variance.
  - Dissertation submitted in July '20(draft)

- **Spatial reasoning in VQA** (Project Elective, Summer '18)

  Prof Dinesh Babu J

  - Generating spatial positions of objects relative to other objects in the environment in nuance language when presented with a question in the same language.
  - Proper nouns in question presented are used to drive attention in the image(inspired). This requires a good correlation between features picked up from word embedding and ones learnt from the image.
  - Given input image is parsed by the network in a row by row or column by column fashion in order to create history of previous parses and relate current parsing with accumulated history(essentially locations of objects). Accomplished using Temporal Convolutional Networks.