Gefan Yang

Øster Voldgade 3
1350 Copenhagen K
Denmark

Email: gy@di.ku.dk
Mobile:+45 55 22 65 34
LinkedIn: www.linkedin.com/in/gefanyang
Github: https://github.com/bookdiver

Education

- **University of Copenhagen** — Copenhagen, Denmark
  Ph.D. - Computer Science — *July 2023 - Present*
- **University of Copenhagen** — Copenhagen, Denmark
  M.Sc. - Computational Physics — *Sep. 2021 - June 2023*
- **Nankai University** — Tianjin, China
  B.Sc. - Applied Physics — *Sep. 2017 - July 2021*

Research Interests

- **Stochastic processes**: Conditional diffusion processes simulation and inference, stochastic differential equations, Bayesian computations.
- **Diffusion probabilistic models and deep learning**: Theory of score-learning techniques, score-based generative models, neural operators and neural SDEs
- **Shape analysis**: Stochastic shape analysis

Research Experience

- **Neural Guided Diffusion Bridges**
  ICML2025 Poster — *July 2024 - Jan. 2025*
  - Propose a simple diffusion bridge simulation method inspired by the guided proposal framework, avoiding the need for reverse-process modelling or intensive MCMC or SMC updates. Once the network has been trained, obtaining independent samples from the variational approximation is trivial and computationally cheap
  - The method is grounded to learn directly from conditional samples, unlike score-learning-based simulation methods, which rely on unconditional samples for learning. This results in greater training efficiency.
- **Infinite-dimensional Diffusion Bridge Simulation via Operator Learning.**
  AISTATS2025 Poster — *Mar. 2024 - June. 2024*
  - Derive the time reversal of the infinite-dimensional diffusion bridge, together with a computable optimization objective under finite discretization.
  - Design a time-dependent neural operator structure that can learn the infinite-dimensional object through finite samples, and demonstrate the method with various continuous function-data-valued conditioned stochastic processes.
- **Conditioning Non-linear and Infinite-dimensional Diffusion Processes.**
  NeurIPS2024 Spotlight — *Nov. 2023 - Feb. 2024*
  - Derive Doob's h-transform for infinite-dimensional non-linear processes, allowing conditioning without first discretizing the model.
  - Design the score matching object to learn the score arising from the h-transform by training on the coefficients of the Fourier basis, and demonstrate the method in modelling the changes in the shapes of butterflies over time.
- **A Denoising Diffusion Model for Synthetic Fluid Field Prediction**
  NeurIPS2023 Diffusion Model Workshop — *Oct. 2022 - June 2023*
  - Develop a denoising diffusion based fluid flow prediction model, FluidDiff by introducing a Physics-informed loss into the canonical DDPM loss, achieving more physically consistent prediction results.
  - Demonstrate the method on several synthetic fluid simulation tasks, achieving comparable or even outperformed results than other deep-learning-based surrogate models.

Projects

- **Hyperiax - A Tree-traversal Framework using JAX**: Involved in developing a framework for tree traversal and computations on large-scale tree called *Hyperiax*, whose primary purpose is to facilitate efficient message passing and operation execution on large trees for phylogenetic analysis of biological shape data. The package is under activate development and open-sourced on Github

Teaching Experience

- **NDAK24002U Deep Learning (DL)** — B.Sc./M.Sc. Course
  Teaching Assistance — *Nov. 2024 - Jan. 2025*
- **NDAK24003U Advanced Topics in Deep Learning (ATDL)** — M.Sc. Course
  Teaching Assistance — *Sep. 2024 - Nov. 2024*

Skills Summary

- **Programming Languages**: Python, MATLAB, Julia
- **Frameworks and Software**: JAX, FLAX, PyTorch, Transformers

Extracurricular Experience

- **From Shapes to Species: how deep Learning reveals evolutionary morphological secrets** — Presentation
  Symposium on Machine Learning and Ancient and Environmental DNA Analyses (Copenhagen) — *20 Aug. 2024*
- **Score Matching and Diffusion Bridges: deep learning the infinite-dimensional shape bridge** — Presentation
  Stochastic Morphometry Workshop (Copenhagen) — *11-13 June, 2024*
- **JAXGeometry and Hyperiax: Python implementations of computational differential geometry and tree traversal by JAX** — Presentation
  Geometric Sciences in Action: from geometric statistics to shape analysis (Marseille) — *27-31 May 2024*

Publications

- **Yang, G.**, van der Meulen, F.H., and Sommer, S. "Neural Guided Diffusion Bridges". *International Conference on Machine Learning 42 (2025).*
- Zhou, J., **Yang, G.**, and Sommer, S. "Conditioning Surface Shape Processes with Neural Operators". Under review of *International Conference on Geometric Science of Information 7 (2025)*
- **Yang, G.**, Baker, E. L., Severinsen, M. L., Hipsley, C. A., and Sommer, S. "Infinite-dimensional Diffusion Bridge Simulation via Operator Learning". *International Conference on Artificial Intelligence and Statistics 28 (2025).*
- Baker, E. L., **Yang, G.**, Severinsen, M. L., Hipsley, C. A., and Sommer, S. "Conditioning non-linear and infinite-dimensional diffusion processes". *Advances in Neural Information Processing Systems 37 (2025): 10801-10826.*
- Boserup, N., **Yang, G.**, Severinsen, M. L., Hipsley, C. A., and Sommer, S. "Parameter Inference via Differentiable Diffusion Bridge Importance Sampling". *arXiv preprint arXiv:2411.08993, 2024.*
- **Yang, G.** and Sommer, S. "A Denoising Diffusion Model for Synthetic Fluid Field Prediction" *NeurIPS 2023 Workshop on Diffusion Models, 2023*