

**The Hong Kong Polytechnic University
Department of Applied Mathematics**

Colloquium

Normalizing field flow: solving forward and inverse stochastic differential equations using physics-informed flow model

**By
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Abstract

We introduce normalizing field flows (NFF) for learning random fields from scattered measurements. More precisely, we construct a bijective transformation (a normalizing flow characterizing by neural networks) between a reference random field (say, a Gaussian random field with the Karhunen-Loève (KL) expansion structure) and the target stochastic field, where the KL expansion coefficients and the invertible networks are trained by maximizing the sum of the log-likelihood on scattered measurements. This NFF model can be used to solve data-driven forward, inverse, and mixed forward/inverse stochastic partial differential equations in a unified framework. We demonstrate the capability of the proposed NFF model for learning Non-Gaussian processes, mixed Gaussian processes, and forward & inverse stochastic partial differential equations.

Bibliography

Prof. Zhou Tao is currently an Associate Professor at Institute of Computational Mathematics, Chinese Academy of Sciences. His research interest is uncertainty quantification, Scientific machine learning, Parallel-in-time algorithms, Fractional PDEs, Phase field models, Numerical FBSDEs. He has received many honors, including the Outstanding Youth Science Foundation (优秀青年科学基金), Youth Science and Technology Award (青年科技奖) from China Society of Industrial and Applied Mathematics, and Chen Jing-Run Future Star Award (陈景润未来之星). He is the Chief Scientist of the National Science, Technology and Industry Commission's scientific challenge project (国防科工委专题项目首席科学家). Prof. Zhou is Associate Editor of many important journals, including SIAM Journal on Scientific Computing, Communication in Computational Physics, International Journal for Uncertainty Quantification, and Numerical Mathematics: Theory, Methods & Applications. He is the managing editor of East Asian Journal on Applied Mathematics.

Date: 21 October 2021 (Thursday)

Time: 15:00-16:00 (Hong Kong Standard Time GMT +8)

Venue: Online Talk via Zoom (Meeting ID: 916 7130 2052)

Speaker: Prof. Tao Zhou, Chinese Academy of Science

Host: Dr. Zhi Zhou, The Hong Kong Polytechnic University

Click to join:

<https://polyu.zoom.us/j/91671302052?pwd=eHZOMkJPVnJLQTdPNGFpZTNtbDVhUT09>



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