Rui Li

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Skills

Machine Learning

- Trustworthy AI (Uncertainty Quantification)
- Transfer Learning
- Deep Learning
- Bayesian Methods

Programming

- Python
- Pytorch
- Numpy, Pandas, Sklearn
- Matlab

Tools

- Git

Education

2022 – Present **Ph.D. in Machine Learning**
Aalto University, supervised by Prof. Arno Solin
Final year, five publications

2020 – 2021 **M.Sc. in Machine Learning**
University College London
Distinction (84%), Dean's List

2015 – 2019 **B.Sc. in Physics**
Sun Yat-sen University
GPA: 3.8 / 4.0

Summary

- Experienced doctoral researcher with top-tier conference publications.
- Proficient in Machine Learning, Deep Learning, Python, and Pytorch.
- Strong mathematical skills in linear algebra, calculus and probability.

Selected Projects

- Streamlining Prediction in Bayesian Deep Learning. *Under Review*

  Collaborator: Arno Solin, Martin Trapp, and Marcus Klasson.

  Summary: While estimating posterior is being actively researched in Bayesian deep learning, making predictions with posterior has been being largely overlooked. We propose an efficient method for making prediction through a single forward pass without sampling by local liberalization and Gaussian approximation. We showcase our approach for both MLP and transformers.

- Post-hoc Probabilistic Vision-Language Models. *Under Review*

  Collaborator: Arno Solin, Martin Trapp, Marcus Klasson, Anton Baumann, Santeri Mentu, Shyamgopal Karthik and Zeynep Akata.

  Summary: While Vision-Language models have shown remarkable performance in various tasks, they lack uncertainty over predictions, which limits their reliability in high-stakes applications. We propose a post-hoc uncertainty quantification method based on Laplace approximation, which provides useful predictive uncertainties and better calibration.

- Flatness Improves Backbone Generalisation in Few-shot Classification.

  Published in WACV 2025

  Collaborator: Arno Solin, Martin Trapp, and Marcus Klasson.

  Summary: In few-shot classification most efforts focus on adapting the backbone to the target domain without considering the importance of backbone training. We show flatness-aware backbone training can lead to better generalization through theoretical and empirical results.

- Improving Hyperparameter Learning under Approximate Inference in Gaussian Process Models. *Published in ICML 2023*

  Collaborator: Arno Solin and ST John.

  Summary: Variational inference and expectation propagation are two commonly used approximate inferences in Gaussian process models with complementary advantages. We developed a hybrid training procedure to bring the best of both worlds.

Awards

- Dean's list at University College London, 2021

  The Dean's List is awarded to the top 5% of graduating students.
- First, third, and second price scholarship at Sun Yat-sen University, 2019, 2018, 2017
- Meritorious Winner of Interdisciplinary Contest in Modeling, 2017

Full Publications

- Rui Li, Marcus Klasson, Arno Solin, Martin Trapp. Streamlining Prediction in Bayesian Deep Learning. *Under Review*
- Anton Baumann, Rui Li, Marcus Klasson, Santeri Mentu, Shyamgopal Karthik, Zeynep Akata, Arno Solin, Martin Trapp. Post-hoc Probabilistic Vision-Language Models. *Under Review*
- Rui Li, Martin Trapp, Marcus Klasson, Arno Solin. Flatness Improves Backbone Generalisation in Few-shot Classification. *Winter Conference on Applications of Computer Vision (WACV)* 2025.
- Anton Baumann, Marcus Klasson, Rui Li, Martin Trapp. Probabilistic Active Few-Shot Learning in Vision-Language Models. *NeurIPS Workshop on Bayesian Decision-making and Uncertainty* 2024.
- Rui Li, Marcus Klasson, Arno Solin, Martin Trapp. Posterior Inferred, Now What? Streamlining Prediction in Bayesian Deep Learning. *NeurIPS Workshop on Bayesian Decision-making and Uncertainty* 2024.
- Marlon Tobaben, Marcus Klasson, Rui Li, Arno Solin, Antti Honkela. Differentially Private Continual Learning using Pre-Trained Models. *NeurIPS workshop on Scalable Continual Learning for Lifelong Foundation Models* 2024.
- Rui Li, ST John, Arno Solin. Improving Hyperparameter Learning under Approximate Inference in Gaussian Process Models. *International Conference on Machine Learning (ICML),* 2023.
- Rui Li, ST John, Arno Solin. Towards Improved Learning in Gaussian Processes: The Best of Two Worlds. *NeurIPS Workshop on Gaussian Processes, Spatiotemporal Modeling, and Decision-making Systems,* 2022.
- Arno Solin, Rui Li, Andrea Pilzer. A Look at Improving Robustness in Visual-inertial SLAM by Moment Matching. *International Conference on Information Fusion (FUSION),* 2022.
- Chuan Chen, Rui Li, Lin Shu, Zhiyu He, Jining Wang, Chengming Zhang, Huanfei Ma, Kazuyuki Aihara, Luonan Chen. Predicting Future Dynamics From Short-term Time Series Using an Anticipated Learning Machine. *National Science Review,* 2020.
- Rui Li, Fanghua Ye, Shaoan Xie, Chuan Chen and Zibin Zheng. Digging into It: Community Detection via Hidden Attributes Analysis. *Neurocomputing,* 2019.
- Rui Li, Zhengyun You and Yumei Zhang. Deep Learning for Signal and Background Discrimination in Liquid based Neutrino Experiment. *International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT),* 2018.

Courses Completed for M.Sc.

- Probabilistic and Unsupervised Learning
- Approximate Inference and Learning in Probabilistic Models
- Machine Learning Seminar
- Supervised Learning
- Introduction to Deep Learning
- Statistical Natural Language Processing
- Reinforcement Learning
- Numerical Optimisation