FANGHUI LIU

LIONS Lab, École Polytechnique Fédérale de Lausanne (EPFL)

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Education Experience

Shanghai Jiao Tong University (SJTU) *Sept. 2014 - Jun. 2019*
Department of Automation *Shanghai, China*

- Ph.D. in Pattern Recognition and Intelligent Systems — Supervisor: Prof. Jie Yang

Harbin Institute of Technology (HIT) *Sept. 2010- Jun. 2014*
Department of Automation *Harbin, China*

- B.Eng. in Automation

Work Experience

EPFL *Oct. 2021- present*
Laboratory for Information and Inference Systems (LIONS Lab) *Lausanne, Switzerland*

- Postdoctoral researcher — Hosted by Prof. Volkan Cevher

KU Leuven *Oct. 2019- Sep. 2021*
Department of Electrical Engineering (ESAT-STADIUS) *Leuven, Belgium*

- Postdoctoral researcher — Hosted by Prof. Johan A.K. Suykens
  - involved in Project: ERC Advanced Grant E-DUALITY

Research Interest

I'm generally interested in statistical machine learning, mainly on **kernel methods** including kernel learning, random features for large scale kernel approximation, and indefinite kernels (real, symmetric, but not positive definite); and **learning theory** in an approximation theory view to understand the generalization properties of kernel methods and over-parameterized models in high dimensions.

My main attention focuses on theoretically understanding generalization properties of machine learning based algorithms, especially on over-parameterized models (motivated by neural networks); and reinforcement learning theory in the perspective of function approximation.

Selected Publications

[xxx* indicates equal contribution; xxx indicates corresponding author(s)]

Published or accepted papers

(More publications can be found in my Google Scholar)

1. **Fanghui Liu**, Johan A.K. Suykens, Volkan Cevher. *On the double descent of random features models trained with SGD*, The 36th Conference on Neural Information Processing Systems (NeurIPS), 2022. arXiv:2110.06910.

2. **Fanghui Liu**, Luca Viano, Volkan Cevher. *Understanding deep neural function approximation in reinforcement learning via ϵ-greedy exploration*, The 36th Conference on Neural Information Processing Systems (NeurIPS), 2022. arXiv:2209.07376.

3. Zhenyu Zhu, **Fanghui Liu**, Grigorios Chrysos, Volkan Cevher. *Robustness in deep learning: The good (width), the bad (depth), and the ugly (initialization)*, The 36th Conference on Neural Information Processing Systems (NeurIPS), 2022. arXiv:2209.07263.

4. Zhenyu Zhu, **Fanghui Liu**, Grigorios Chrysos, Volkan Cevher. *Generalization properties of NAS under activation and skip connection search*, The 36th Conference on Neural Information Processing Systems (NeurIPS), 2022. arXiv:2209.07238.

5. Yongtao Wu, Zhenyu Zhu, **Fanghui Liu**, Grigorios Chrysos, Volkan Cevher. *Extrapolation and spectral bias of neural nets with Hadamard product: a polynomial net study*, The 36th Conference on Neural Information Processing Systems (NeurIPS), 2022.

6. Elias Abad Rocamora, Mehmet Fatih Sahin, **Fanghui Liu**, Grigorios Chrysos, Volkan Cevher. *Sound and complete verification of polynomial networks*, The 36th Conference on Neural Information Processing Systems (NeurIPS), 2022. arXiv:2209.07235.

7. **Fanghui Liu**, Xiaolin Huang, Yudong Chen, and Johan A.K. Suykens. *Random features for kernel approximation: A survey on algorithms, theory, and beyond*, IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2021. arXiv:2004.11154.

8. **Fanghui Liu***, Lei Shi*, Xiaolin Huang, Jie Yang, and Johan A.K. Suykens. *Generalization properties of hyper-RKHS and its applications*, Journal of Machine Learning Research (JMLR), 2021. arXiv:1809.09910.

9. **Fanghui Liu**, Xiaolin Huang, Yudong Chen, and Johan A.K. Suykens. *Towards a unified quadrature framework for large scale kernel methods*, IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2021. arXiv:2011.01668.

10. **Fanghui Liu***, Lei Shi*, Xiaolin Huang, Jie Yang, and Johan A.K. Suykens. *Analysis of regularized least squares in reproducing kernel Kreĭn spaces*, Machine Learning, 2021. arXiv:2006.01073.

11. **Fanghui Liu**, Zhenyu Liao, and Johan A.K. Suykens. *Kernel regression in high dimensions: Refined analysis beyond double descent*, The 24th International Conference on Artificial Intelligence and Statistics (AISTATS), 2021. arXiv:2010.02681

12. **Fanghui Liu**, Xiaolin Huang, Yingyi Chen, and Johan A.K. Suykens. *Fast learning in reproducing kernel Kreĭn spaces via generalized measures*, The 24th International Conference on Artificial Intelligence and Statistics (AISTATS), 2021. arXiv:2006.00247

13. **Fanghui Liu**, Xiaolin Huang, Chen Gong, Jie Yang, and Li Li: *Learning data-adaptive nonparametric kernels*, Journal of Machine Learning Research (JMLR), 2020. arXiv:1808.10724

Academic services

- Program Committee/Conference Reviewers
  - ◇ NeurIPS, ICML, ICLR, AISTATS, UAI, AAAI.
- Journal Reviewers
  - ◇ JMLR, TPAMI, AIJ, TNNLS, TIP, etc.

Selected Honors, Awards and Fellowships

Excellent Doctoral Dissertation Award *2019*

awarded by China Society of Image and Graphics (CSIG) (only ten graduates in China)

Excellent Doctoral Dissertation Award Finalist of Shanghai Jiao Tong University *2019*

China National Scholarship for Doctoral Students *2016,2017,2018*

awarded by Ministry of Education of China for research performance