

Masterseminar-Functional data analysis (interested Bachelor students welcome)

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Depending on your interests and background, this seminar offers the opportunity to learn the basics of functional data analysis or to learn more about neural operator networks. Neural operator networks are constructed to learn maps between function spaces and use many techniques from functional data analysis. The seminar will start in the second half of the semester and there will be weekly meetings.

Feel free to reach out if you have any questions or interest in a Master- or Bachelorthesis on this topic.

Introductory on functional data analysis

1. Chapter in [Horváth and Kokoszka \(2012\)](#) can be chosen as topic.
2. On the prediction of stationary functional time series: [Aue, Norinho, and Hörmann \(2015\)](#)
3. Kernel Autocovariance Operators of Stationary Processes: Estimation and Convergence: [Mollenhauer, Klus, Schütte, and Koltai \(2022\)](#)
4. Convolutional autoregressive models for functional time series [Liu, Xiao, and Chen \(2016\)](#)

Neural operator network literature

1. Neural Operator: Learning Maps Between Function Spaces With Applications to PDEs: [Kovachki, Li, Liu, Azizzadenesheli, Bhattacharya, Stuart, and Anandkumar \(2023\)](#)
2. Neural Operator: Graph Kernel Network for Partial Differential Equations: [Anandkumar, Azizzadenesheli, Bhattacharya, Kovachki, Li, Liu, and Stuart \(2020\)](#)
3. Fourier Neural Operator with Learned Deformations for PDEs on General Geometries: [Li, Huang, Liu, and Anandkumar \(2023\)](#)
4. Learning Operators with Stochastic Gradient Descent in General Hilbert Spaces: [Shi and Yang \(2024\)](#)

References

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- Alexander Aue, Diogo Dubart Norinho, and Siegfried Hörmann. On the prediction of stationary functional time series. *Journal of the American Statistical Association*, 110(509):378–392, 2015.
- Lajos Horváth and Piotr Kokoszka. *Inference for functional data with applications*, volume 200. Springer Science & Business Media, 2012.

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- Xialu Liu, Han Xiao, and Rong Chen. Convolutional autoregressive models for functional time series. *Journal of econometrics*, 194(2):263–282, 2016.
- Mattes Mollenhauer, Stefan Klus, Christof Schütte, and Peter Koltai. Kernel autocovariance operators of stationary processes: Estimation and convergence. *Journal of Machine Learning Research*, 23(327):1–34, 2022.
- Lei Shi and Jia-Qi Yang. Learning operators with stochastic gradient descent in general hilbert spaces. *arXiv preprint arXiv:2402.04691*, 2024.