



Mathematisches  
Forschungsinstitut  
Oberwolfach

Member of



# Oberwolfach Seminar

## Statistical Inference for Complex Data: Random Matrices, Random Functions and Geometry and Topology

Organizers: Alexander Aue, Davis  
Wolfgang Polonik, Davis  
Date (ID): 20 - 26 May 2018 (1821a)  
Deadline: 19 March 2018

Program: An introduction to statistical inference for modern complex data structures with a special focus on: (1) Random matrix theory applications in statistics, in particular the asymptotic characterization of the eigenvalues of sample covariance matrices in the highdimensional regime and their practical use. (2) Functional data analytic methods, in particular the use of Hilbert space and linear operator theory and their application to functional time series prediction and estimation. (3) Topological data analysis, in particular how feature extraction can be performed with the persistent homology and how topological features can be used to build methods for statistical inference. (4) Emphasizing the connection between topological data analysis and geometric approaches to statistical analysis, using Morse theory.

Introductory reading: (1) Chazal, F., Fasy, B.T., Lecci, F., Rinaldo, A., Singh, A. & Wasserman, L. (2013). On the bootstrap for persistence diagrams and landscapes. *Modeling and Analysis of Information Systems* 20, 96-105. (2) Chazal, F. & Michel, B. (2017). An introduction to topological data analysis: fundamental and practical aspects for data scientists. arXiv:1719.04019. (3) Paul, D. & Aue, A. (2014). Random matrix

theory in statistics: a review. *Journal of Statistical Planning and Inference* 150, 1-29. (4) Ramsay, J. & B. Silverman (2005). *Functional data analysis* (2nd edition). Springer, New York.

The seminar takes place at the Mathematisches Forschungsinstitut Oberwolfach. The Institute covers board and lodging. By the support of the Carl Friedrich von Siemens Foundation travel expenses can be reimbursed up to 150 EUR in average per person (against copies of travel receipts). The number of participants is restricted to 25.

### Applications including

- full name and address, incl. e-mail address
- short CV and publication list
- present position, university
- name of supervisor of Ph.D. thesis
- a short summary of previous work and interest
- title, ID and date of the intended seminar

should be sent preferably by e-mail (with attachments in pdf format) via [seminars@mfo.de](mailto:seminars@mfo.de) until 19 March 2018 to:

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