Fachseminar *Differentialgeometrie* (Math.)
Seminar *New developments in geometry* (Math.Phys.)

Persistent homology

winter term 2021/22

Tuesday 11:15 – 12:45, Seminargebäude SG 3-13 Start: Tuesday, October, 12

Please enrol in **Moodle**

students:

- mathematics

- mathematical physics (M.Sc.), it is a compulsary elective course in the mathematical physics program (10-MAT-MPHSG).

Topics:
In topological data analysis persistent homology was introduced as a tool to extract robust information from noisy topological patterns. In the reference the concept of persistence modules and barcodes is introduced and applications in metric geometry and the calculus of variations are presented.

Reference:
Leonid Polterovich, Daniel Rosen, Karina Samvelyan and Jun Zhang:
Topological Persistence in Geometry and Analysis, `arXiv:1904.04044`
https://arxiv.org/pdf/1904.04044.pdf

List of talks:

1. Persistence modules, ch. 1, p. 2-12

2. Barcodes, ch. 2, p. 13-23

3. Proof of the isometry theorem, ch. 3, p. 24-34

4. Meaning of barcodes, ch. 4, p. 35-50

5. Application of the Rips complex, ch. 5, 52-64

6. Topological function theory, ch. 6, p. 65-80

7. Introduction to symplectic geometry, ch. 7, p. 82-92

8. Hamiltonian persistence modules, ch. 8, p. 92-104

9. Symplectic persistence modules, ch. 9, p. 105-119