Thematical Seminar - Analysis on metric spaces

Analysis on metric spaces is a fairly new field whose goal is to find ways to do first-order calculus on very general and a priori not smooth metric measure spaces. In this seminar we will see how various concepts of Euclidean analysis (e.g., gradients, Sobolev spaces, Poincaré inequalities, quasiconformal mappings, etc.) can be extended to more general metric spaces. The content of the seminar is mostly based on the beautifully written book [2]. Other useful references are [4], [1] and [3].

Prerequisites for the seminar are the courses Analysis I - IV; familiarity with measure theory is helpful but not a strict prerequisite.

The seminar takes place on Fridays from 10:15 - 12:00 in PER 23, Room 0.05. We will have an organizational meeting on Friday 23.09.2022 where all talks will be distributed. If you are interested in giving one of the first few talks, please contact Stefan Wenger (stefan.wenger@unifr.ch) or Damaris Meier (damaris.meier@unifr.ch).

Schedule and topics

23.09.2022	Overview and organizational meeting
30.09.2022	Outer measures and Hausdorff measure
07.10.2022	Covering theorems
14.10.2022	Maximal functions and Riesz potential
21.10.2022	Sobolev spaces
28.10.2022	Poincaré inequalites
04.11.2022	Sobolev spaces on metric spaces
11.11.2022	Lipschitz functions
18.11.2022	Conformal modulus
25.11.2022	Upper gradients, capacity and Poincaré inequalites in metric spaces
02.12.2022	Loewner spaces
09.12.2022	Quasisymmetries part 1
16.12.2022	Quasisymmetries part 2

References

[1] Dmitri Burago, Yuri Burago, and Sergei Ivanov. *A course in metric geometry*, volume 33 of *Graduate Studies in Mathematics*. American Mathematical Society, Providence, RI, 2001.

[2] Juha Heinonen. *Lectures on analysis on metric spaces*. Universitext. Springer-Verlag, New York, 2001.

[3] Juha Heinonen, Pekka Koskela, Nageswari Shanmugalingam, and Jeremy T. Tyson. *Sobolev spaces on metric measure spaces*, volume 27 of *New Mathematical Monographs*. Cambridge University Press, Cambridge, 2015. An approach based on upper gradients.

[4] Pertti Mattila. *Geometry of sets and measures in Euclidean spaces*, volume 44 of *Cambridge Studies in Advanced Mathematics*. Cambridge University Press, Cambridge, 1995. Fractals and rectifiability.