Gradient flows in metric spaces: overview and recent advances

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General Prerequisites:
Good knowledge of Functional Analysis, metric spaces, and basic concepts of random variables, laws, and expectations are needed. It is recommended to take the course C4.9 Optimal Transport & Partial Differential Equations, as this is a natural continuation.

Course Term:
Hilary (weeks 9 and 10)

Course Lecture Information:
2 lectures (4h) plus reading group (4h)

Course Overview:
The course will serve as an introduction to the theory of gradient flows with emphasis on the recent advances in metric spaces.

Learning Outcomes:
Becoming acquainted with the use of optimal transport and variational methods to the study of certain type of PDEs, showing a gradient flow structure with respect to an associated energy functional.

Course Synopsis:
Lectures
Overview of gradient flows from the Euclidean theory to its generalisation to metric spaces, in particular Wasserstein spaces. Short introduction to the Optimal Transport theory, with focus on specific concepts and tools useful subsequently. Time-discretisation scheme à la Jordan–Kinderlehrer-Otto (JKO), or minimising movements.
Reading group
Lambda-convex gradient flows: stability, uniqueness, and long-time behaviour. Recent advances, e.g., in the study of PDEs on graphs and/or particle approximation of diffusion equations.