Gastvortrag

Donnerstag, 13. März 2025
Uhrzeit: 12:00 Uhr
Seminarraum 2

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Differential geometry meets infinite dimensional calculus:
A Riemannian metric on the space of embeddings $\mathbb{S}^1 \to \mathbb{R}^m$

Abstract:

Arnold introduced a new perspective in the field of geometric analysis and geometric mechanics: infinite-dimensional differential geometry. Ebin and Marsden expanded on their ideas and developed a more general framework. This gave rise to a new branch in mathematics.

In my talk, I motivate their new perspective through an example. After that, I am going to introduce the geometry of mapping spaces. This will lead to the setting of embeddings and the encountered difficulties. Since the field of infinite-dimensional geometry is quite broad and still under heavy research, I will restrict myself to "strong Riemannian metrics".
My colleagues and I designed a Riemannian metric on the space of embeddings of the circle.
Inspired by the tangent-point energies, we were able to incorporate self-repulsion into a metric on the mentioned manifold. I will elaborate on how we were able to overcome the topological difficulties of the manifold and some basic concepts of the theory.
In the second half of the talk, I will explain the result we were able to achieve and give short proofs for some theorems. This will clarify the analytical difficulties of this theory, for example, the role of regularity. In addition, I am going to explain some differences between finite- and infinite-dimensional geometry.

Finally, we will finish by elaborating on how our geometrical statements affect the dynamics of the deformations and give an outlook onto future work and other directions open for exploration.

Eingeladen von Simon Blatt