Abstract

Oberwolfach Workshop:

Nonlinear Data: Theory and Algorithms

Dates:

22 Apr - 28 Apr 2018 (Code: 1817)

Organizers:

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Data with values in a nonlinear manifold plays an increasing role in modern scientific computing. Sources of such data ranges from univariate signals such as airplane headings, to image data from diffusion-tensor imaging, and to sets of unstructured point data, arising for instance in motion capture applications. Likewise the manifolds in question include simple ones like the projective spaces and rotation groups, to more exotic ones like shape spaces of both finite and infinite dimension.

At the same time, there is considerable interest in partial differential differential equations (PDEs) for fields of nonlinear data. Such equations arise in liquid crystal and particle physics, descriptions of micromagnetic systems, and in non-classical theories of solid mechanics. Open problems still abound, both on the analytical and the numerical side, and it will need the joint efforts of geometers, analysts, and numerical analysts to develop a solid mathematical foundation. It is increasingly often recognized that the „right“ geometric setting does not only lead to theoretical insights but is actually valuable for algorithms. As an example we mention the computation of eigenspaces by viewing them as elements of a Grassmann manifold.

The last years have seen a flurry of activity regarding the processing of such nonlinear data, and fundamental theoretical and practical results related to modeling and algorithm design have been achieved. This workshop shall report on some of these activities. It is hoped to bring together the leading groups working in this area, in order to exchange ideas between these groups, create synergies, and identify and discuss directions for future research.