Universität Hamburg
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Fakultät für Mathematik, Informatik
und Naturwissenschaften
Fachbereich Mathematik

Donnerstag, den 05. November 2026, um 14:30 Uhr, MIN-F, Hörsaal 3

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(University of Cambridge, Dept. of Applied Mathematics and Theoretical Physics)

Mathematical Imaging in the Era of AI

Zusammenfassung/Abstract:

Mathematical imaging has for decades been a powerful catalyst for new developments across the mathematical sciences. At its core lie fundamental questions about how information can be represented, reconstructed, and interpreted from incomplete, noisy, or indirect data. Addressing these questions has led to deep advances in areas such as functional and harmonic analysis, geometry, variational methods, inverse problems, partial differential equations, probability and statistics, and, more recently, learning theory. The resulting interplay between theory, computation, and applications has made imaging a uniquely fertile meeting point for pure and applied mathematics alike. Applications span an extraordinary range of domains, including biomedical and materials imaging, astronomy, environmental science, cultural heritage, and emerging technologies such as autonomous systems and data-driven diagnostics. The rapid rise of artificial intelligence is now reshaping the landscape of imaging science once again. Data-driven approaches, in particular deep learning, have achieved remarkable empirical success in tasks such as reconstruction, segmentation, and synthesis. At the same time, their opaque nature and heavy reliance on data raise fundamental mathematical questions concerning stability, generalisation, interpretability, uncertainty quantification, and the incorporation of prior knowledge and physical constraints. In this talk, I will present mathematical imaging as a continuing source of new mathematical ideas and challenges in the age of AI. I will highlight how modern approaches seek to blend data-driven models with structure, geometry, and physical principles, giving rise to novel analytical frameworks and computational paradigms. This perspective positions imaging not merely as an application area, but as a driver for the next generation of mathematical theory at the interface of analysis, computation, and learning.

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