PHYSICAL MATHEMATICS SEMINAR

APPLICATIONS OF CONFORMAL MAPS AND IMPLICIT FEATURE MAPS

PETER BADDOO
Massachusetts Institute of Technology

ABSTRACT:

The correct coordinate mapping can transform a challenging problem into a trivial one. In this talk, I will present recent progress on two specific types of coordinate maps: conformal maps and implicit feature maps. In particular, I will survey new results on the theory, computation and applications of these maps.

Conformal maps find relevance in many physical problems. Recent work has clarified the mathematical structure of conformal maps between multiply connected domains via a new transcendental function. Additionally, new connections with rational function approximation have enabled fast computations of conformal maps. I will present generalisations of these results to infinitely connected (periodic) domains and use the new maps to solve fluid mechanics problems such as biological propulsion, schooling and ground effect.

Implicit feature maps arise in the context of kernel learning methods. I will present a new data-driven kernel method that extracts structure from high-dimensional nonlinear systems. The associated implicit maps enable a robust modal decomposition that disambiguates the roles of linearity and nonlinearity. I will demonstrate the method on a range of partial differential equations and dynamical systems.

TUESDAY, MAY 11, 2021
2:30 PM – 3:30 PM

https://math.mit.edu/sites/pms/

https://mit.zoom.us/j/95597721876

Meeting ID: 955 9772 1876

Massachusetts Institute of Technology