**Dr. Lei Zhang** (zhangl@math.pku.edu.cn)

Peking University

China

Lei Zhang is Boya Distinguished Professor at Beijing International Center for Mathematical Research, Peking University. He is also a Principle Investigator at Center for Quantitative Biology, Center for Machine Learning Research. He obtained his Ph.D in Mathematics at Penn State University in 2009. His research is in the area of computational and applied mathematics and interdisciplinary science in biology, materials, and machine learning. He was awarded/funded by NSFC Innovation Research Group, NSFC Outstanding Youth Award, WangXuan Outstanding Youth Award, Royal Society Newton Advanced Fellowship, etc. He serves as vice Editor-in-Chief of Mathematica Numerica Sinica, and an Associate Editor for SIAM J. Appl. Math, Science China Mathematics, CSIAM Trans. Appl. Math, DCDS-B, The Innovation.

Title: Construction of Solution Landscape for Complex Systems

Abstract:
Energy landscape has been widely applied to many physical and biological systems. A long standing problem in computational mathematics and physics is how to search for the entire family tree of possible stationary states on the energy landscape without unwanted random guesses? Here we introduce a novel concept Solution Landscape, which is a pathway map consisting of all stationary points and their connections. We develop a generic and efficient saddle dynamics method to construct the solution landscape, which not only identifies all possible minima, but also advances our understanding of how a complex system moves on the energy landscape. We then apply the solution landscape approach to target several problems, including the defect landscapes of nematic liquid crystals, the transition pathways connecting crystalline and quasicrystalline phases, and the excited states of rotational Bose-Einstein condensates.