

abstract

WORKSHOP ON TOPOLOGY: IDENTIFYING ORDER IN COMPLEX SYSTEMS

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

Can we use computational algorithms to make accurate predictions of physical phenomena? In this talk, intended for non-experts, I will give examples where complicated space-time phenomena can be exquisitely captured with simple computational algorithms, that not only produce patterns resembling those seen in experiment, but also make accurate predictions about probes of dynamics and spatial organisation, such as correlation functions. I use examples from condensed matter physics, as well as from geophysics.

Because many patterns involve structure on multiple length and time scales, I also discuss how one can develop multiscale methods for real materials processing from the nanoscale on up. I show that a computationally-efficient multiscale approach can be developed systematically by using renormalization group or equivalent techniques to derive appropriate coupled phase and amplitude equations, which can then be solved by adaptive mesh refinement algorithms.