

SIOC 216A Introduction to the Physics of Complex Systems

Winter Quarter, 2021

Tuesday/Thursday 200-320PM

ONLINE



SYSTEM BOUNDARIES
GENETIC ALGORITHMS
NONLINEARITY
CELLULAR AUTOMATA
COVID-19

OPTIMIZATION

ASSEMBLAGE THEORY

SELF-ORGANIZATION

STABILITY

NEURAL NETWORKS

SIMULATED ANNEALING



AGENT-BASED MODELS

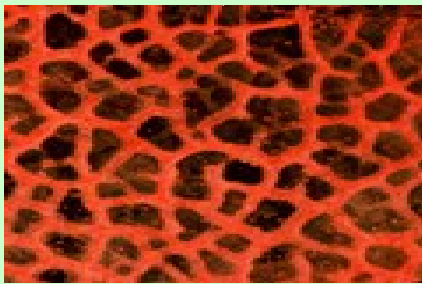
DISSIPATION

CHAOS

TIME SCALE

LINEAR STABILITY ANALYSIS

LEVEL OF DESCRIPTION
COMPLEXITY
FEEDBACK ATTRACTORS
PANDEMIC



PATTERNS



BIPOC STRUGGLES



COMPLEX ADAPTIVE SYSTEMS

BIFURCATIONS

The study of complex systems is centrally focused on deciphering the ways in which the complicated interacts with the simple - the way a sand grain relates to a river, a tree relates to a forest, a worker relates to global capitalism, an indigenous clan relates to millennia of their culture.

In SIOC 216A, we will discuss the philosophical underpinnings of complexity and its implications, the conceptual and mathematical apparatus that has been developed (and continues to be developed) for analyzing complex systems, specific tools for probing different kinds of complex systems, modeling, measurement and data analysis strategies, and a framework for asking questions and answering them for any complex system.

Applications will include physical systems from canyons to climate, biological systems from flagella to forests, human systems from consciousness to culture, economic systems from stock markets to socialism, and political systems from colonialism to collectivism.

You will finish the course with a working knowledge of the concepts and methods used in the study of complex systems and how they have been and can be applied in the natural and social sciences.

In the last two weeks of the course in 2021, we will use the methods of complexity to analyze anti-Blackness and the struggles against it, and the COVID-19 pandemic.

For more information, contact bt werner bwerner@ucsd.edu

or check out <https://courses.complex-systems-laboratory.org/sioc216a>