

Syllabus

Foundations of Complex Systems

Introduction to Complex Systems – Kondor
Stochastic processes and statistical inference
Dynamical systems theory – Wuensche, Crutchfield
Discrete dynamics software - Wuensche
Statistical mechanics – Moore
Measures of complexity – Moore
Information theory – Crutchfield
Theory of computation - Moore
Darwinian selection dynamics - Pepper

Collective Behavior and Self-organization

Jean-Louis Deneubourg – self-organization in social insects
Dirk Helbing - traffic jams, pedestrian flows, and escape panics
Tamas Vicsek - statistical physics of collective behaviour
Wim van Saarloos - nonequilibrium pattern formation
Adaptation in Natural and Artificial Systems:
Chris Adami – evolution in digital and biological organisms
Jonathan Shapiro - evolutionary computation
Eörs Szathmáry – origin of life, molecular evolution

Network Structure and Dynamics

Albert-László Barabási – self-organized networks
Béla Novák – DNA regulatory networks
Gábor Vattay – internet traffic

Scaling Laws in Biology

Geoffrey West