

# **COURSE: ECONOMIC COMPLEXITY**

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## **COURSE DESCRIPTION**

Understanding the basic issues concerning complex systems and predictability. Network theory network statistical properties. The statistical features of world wide bipartite network.

## **LEARNING OUTCOMES**

- ✓ Features of complex systems: theory and predictability properties
- ✓ Network statistical properties
- ✓ Statistical analysis of world wide exports

## **METHODOLOGY**

Theoretical lessons and practice using Python and C.

## **ASSESSMENT**

Project; weighting: 100%

## **OUTLINE**

- Introduction of complex systems
  1. what is a complex system
  2. predictability of complex systems and Lyapunov numbers
- Network theory
  1. Network fundamentals.
  2. Markov chain and Page rank algorithm
  3. Statistical properties of random networks
  4. Network tolerance to external attack
  5. Scale free network
  6. Network search and Kleinberg theorem
  7. Small world network
- Optimization
  1. Simulating annealing
  2. Genetic Algorithms
- World economy as complex system
  1. Hidalgo Housmann approach
  2. Non linear approach: fitness and product complexity
  3. The product graph and its meaning.
  4. Country development and the product graph
  5. Causal correlation
  6. Country fitness and Gross Domestic Product

## **TEXTBOOKS**

Mark Newman: Network: an introduction. UP Oxford

Steven Strogatz: Nonlinear Dynamics and Chaos, Westview Press