NJIT

ACM Fellow Distinguished Lecture

Building a brain

Christos H. Papadimitriou

Columbia University

Hosts: Shantanu Sharma and Vincent Oria

Date: Monday, September 30, 2024
Coffee: 2:15 PM – 2:30 PM
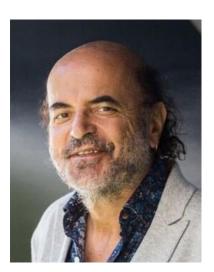**Time:**   2:30 PM – 3:30 PM
Location: GITC 1100 (1st Floor Seminar Lecture Hall)
Zoom Link: https://njit-edu.zoom.us/j/95121797818?pwd=Z6sxi73Awp1LDfjXxbbYg3QMU8aiSj.1

Abstract:
There is no doubt that cognition and intelligence are the results of neural activity - but how, exactly? How do molecules, neurons, and synapses give rise to reasoning, language, plans, stories, art, math? Despite dazzling progress in experimental neuroscience, as well as in cognitive science, we do not seem to be making progress on the overarching question. As Richard Axel recently put it in an interview: "We don't have a logic for the transformation of neuronal activity to thought and action. I view discerning [this] logic as the most important future direction of neuroscience". What kind of formal system would qualify as this "logic"?

I will introduce NEMO, a computational system based on very few basic elements and principles of Neuroscience: excitatory neurons, brain areas, random synaptic connectivity, local inhibition, plasticity, long-range inhibition. Through mathematical proofs and simulations at the scale of tens of millions of neurons we show that several advanced aspects of cognition can be implemented in this model, and of these I will focus on a language acquisition system.

Bio:
Christos H. Papadimitriou is the Donovan Family Professor of Computer Science at Columbia University. Before joining Columbia in 2017, he was a professor at UC Berkeley for the previous 22 years, and before that he taught at Harvard, MIT, NTU Athens, Stanford, and UCSD. He has written five textbooks and many articles on algorithms and complexity, and their applications to optimization, databases, control, AI, robotics, economics and game theory, the Internet, evolution, and the brain. He holds a PhD from Princeton (1976), and nine honorary doctorates, including from ETH, University of Athens, EPFL, and Univ. de Paris Dauphine. He is a member of the National Academy of Sciences of the US, the American Academy of Arts and Sciences, and the National Academy of Engineering, and he has received the Knuth prize, the Goedel prize, the Babbage award, the von Neumann medal, the von Neumann Theory Prize, as well as the 2018 Harvey Prize by Technion. In 2015 the president of the Hellenic republic named him commander of the order of the Phoenix. He has also written fiction, including a NYT bestseller.