Syllabus of the Seasonal School

AGENT-BASED MODELS IN ECONOMICS: THEORY, TOOLKIT AND POLICY LABORATORIES

11-15 July, 2022

Scuola Superiore Sant'Anna, Pisa, Italy

Lecture

Introduction to agent based models and complexity theory (Monday, 11.00-13.00)

Instructor

Giorgio Fagiolo (Scuola Superiore Sant'Anna)

Description

This lecture is intended to serve as a broad introduction to the huge literature using agent-based computational approaches to the study of economic dynamics. It is organized in three parts. The first one ("Why?") analyzes critiques to the mainstream paradigm and suggests instead that bounded rationality, non-trivial interactions, non-equilibrium dynamics, and heterogeneity are irreducible features of modern complex economies. In the second part ("What?") we discuss, using simple examples, what agent-based models are. Finally, in the third part ("How?"), we study how agent-based models can be statistically analyzed, empirically validated, and employed to perform policy-based experiments

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Keynote lecture

COVID-19 Across Nations: One Pandemic, Many Trajectories, (online) (Monday, 14.00-16.00)

Speaker

Hazhir Rahmandad, MIT Sloan School of Management

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Lecture

Evolutionary agent-based models of technical change (Monday, 16.30-19.30)

Instructor

Giovanni Dosi (Scuola Superiore Sant'Anna)

Description

The lecture will, first, address the nature of technological knowledge, its structure and patterns of change. Second, it will critically discuss the ways in which technology and technical change are formalized, both in models focusing on learning processes and in models of industrial and macroeconomic dynamics.

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Lecture

Macroeconomic agent-based models I and II (Tuesday, 10.00-13.00 / 17.30-19.30)

Instructor

Andrea Roventini (Scuola Superiore Sant'Anna)

Description

The lecture will present the medium-scale Keynes meeting Schumpeter agent-based model (Dosi et al, 2010). It will show the capability of the model to endogenously generate growth and business cycles punctuated by major crises, as well to reproduce a rich ensemble of macro and micro empirical regularities. Finally, the model will be employed to test the short- and long-run impacts of different combinations of innovation, fiscal and monetary policies.

Lecture

Macroeconomic agent-based models_Labour Markets (Wednesday, 10.00-13.00)

Instructor

Maria Enrica Virgillito (Scuola Superiore Sant'Anna)

Description

The lecture develops the labour-augmented version of the K+S model, presenting two institutional archetypes, a Fordist and a Competitive set-up, according to the Regulation Theory. The institutional set-ups of the labour markets are confronted in terms of the macroeconomic properties of the model (hysteresis, path-dependency, remanance) and of the resulting aggregate performances in terms of income distribution and innovative activities. A series of policy experiments, such as active versus passive labour market policies, will be analysed.

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Lecture

Macroeconomic agent-based models_Sectoral Dynamics (Wednesday, 17.30-18.30)

Instructor

Maria Enrica Virgillito (Scuola Superiore Sant'Anna)

Description

The lecture will present the multi-sector version of the K+S model, accounting for the arrival of new technological paradigms, the emergence of new industries and a consumption structure following hierarchical needs satisfaction and class-based consumption schemes.

The model will be employed to perform scenario analyses on the future of work, studying conditions of labour creation vs labour destruction.

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Lecture

Macroeconomic agent-based models_Climate Change (Thursday, 10.00-13.00)

Instructor

Francesco Lamperti (Scuola Superiore Sant'Anna)

Description

This lecture will introduce and discuss the recently blossoming literature on macroeconomic agent-based modeling and climate change. It is organized in two parts. The first one analyzes the impacts of cimate change on economic and financial dynamics, especially focusing on how climate impacts give rise to endogenous and emergent regime shifts in the dynamics of both growth and business cycles. The second part, instead, focuses on the analysis of policies to fight climate change using agent-based models as simulation laboratories for ex-ante assessment of a broad range of interventions. The lecture will heavily draw on the applications of the Dystopian Schumpeter Meeting Keynes (DSK) model

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Lecture

Macroeconomic agent-based models: Monetary and Macroprudential policies (Thursday, 17.30-19.30)

Instructor

Lilit Popoyan (Università di Napoli Parthenope)

Description: The lecture features a family of macroeconomic models taking a detailed look at the interaction mechanism of monetary and macroprudential policies. It evolves from the base model, gradually adding complexity allowing it to evaluate the efficiency of different financial regulatory policies in pre, post-crisis setup and offer an optimal policy setup able to assure both macroeconomics and final stability of the economy. Models incorporate such essential features of credit networks as the interbank market, systemically important banks, and the housing market.

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Lecture

Empirical validation of agent-based models (Friday, 10.00-13.00)

Instructors

Alessio Moneta and Mario Martinoli (Scuola Superiore Sant'Anna)

Description

The lecture introduces the main tools to empirically calibrate and validate and agent-based model such as indirect inference, method of simulated moments, simulated minimum distance, simulated maximum likelihood, and the method based on causal inference, with a special focus on the latter.

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ABM Laboratory (From Tuesday to Friday, 14.00-17.00)[1]

Instructor

Marcelo Pereira (University of Campinas)

Description

The laboratory explores computational economics from an applied perspective. The agent-based methodology (ABM) is presented, focusing on applications in economic analysis and policy-making. Models are presented "hands-on", closely following the theoretical lectures, providing a practical overview on the implementation, configuration and validation of ABM models. Advanced topics like meta-modelling and sensitivity analysis, particularly useful for working with large-scale models, are also briefly covered.

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1   On Friday the 15 of July, the laboratory will last two hours.