

# Collegio Carlo Alberto

UNIVERSITÀ DEGLI STUDI DI TORINO

**MADAS**

*Master in Data Science for Complex Economic Systems*

**AGENT-BASED MODELS**



**Pietro Terna**  
pietro.terna@unito.it

## Learning Objectives

The goal is to introduce the *making of* agent-based simulation models, comparing NetLogo and SLAPP.

## Course Contents

1<sup>st</sup> lecture, Oct. 25<sup>th</sup> h.11:00am-1:00pm - Introductory notes. Preliminary steps with NetLogo and Python.

*Homework.*

2<sup>nd</sup> lecture, Oct. 26<sup>th</sup> h.11:00am-1:00pm - initial exercises in NetLogo, with a parallel look at the content of the folders 1, 2 and 3 of SLAPP.

3<sup>rd</sup> lecture, Oct. 27<sup>th</sup> h.9:00am-11:00am - exercises in NetLogo, with a deep parallelism with the content of the folders 4 and 5 of SLAPP.

*Homework.*

4<sup>th</sup> lecture Nov. 9<sup>th</sup> h.11:00am-1:00pm - SLAPP, folders 6 (as an agent-based shell).

*Homework.*

5<sup>th</sup> lecture Nov. 10<sup>th</sup> h.11:00am-1:00pm - from SLAPP to AESOP (Agents and Emergencies for Simulating Organizations in Python), and the perspectives of SLAPP-AESOP, with applications.

*Pizza.*

## Course Methodology

Frontal teaching with computer exercises (suggested: having the laptop with you).

Via Real Collegio, 30 – 10024 Moncalieri (Torino)  
Tel. +39 011 6705001 – Fax +39 011 6705082  
segreteria@carloalberto.org – www.carloalberto.org

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## Readings

Suggested preliminary readings and activities:

1. a general introductory paper: Paul L. Borrill and Leigh S. Tesfatsion (2010), Agent-Based Modeling The Right Mathematics for the Social Sciences?, <http://www.econ.iastate.edu/tesfatsi/ABMRightMath.PBLTWP.pdf>;
2. if you do not know Python, have a look to it (being SLAPP built using that language), also to familiarize with the ideas of object oriented programming; a useful starting point is: Allen Downey (2013), Think Python - How to Think Like a Computer Scientist <http://greenteapress.com/wp/think-python/>; as an alternative, view the interactive version of the book at <http://interactivepython.org/courselib/static/thinkcspy/index.html>;
3. install Python (3.6.x) from [www.python.org](http://www.python.org) and (optionally) IPython with Jupyter, from [ipython.org](http://ipython.org);
4. familiarize with the IDLE programming environment, specific for Python and installed with Python;
5. download SLAPP (Swarm-Like Agent Protocol in Python), from <https://github.com/terna/SLAPP3> (use the "Clone or download" button);
6. start to familiarize with the structure of the SLAPP tutorial reported into the .txt files (included in the main folder and in its subfolders, from 1 to 6);
7. install NetLogo, from <http://ccl.northwestern.edu/netlogo/>, version 6.0.2 or newer;
8. have a look to the Tutorial contained into the installed NetLogo version.

**Slides:** available during the course, also with the full recording of the lessons.

## Course Evaluation

The homeworks will be considered, without a specific evaluation, but as a participation effort. A final essay, of about 2,000 words, will be evaluated.

## About the Instructor

Pietro Terna is a retired professor of the University of Torino (Italy), where he was a full professor of Economics. His research work is in the fields of (i) artificial neural networks for economic applications, (ii) social simulation with agent-based models (where he has been pioneering the use of Swarm, [www.swarm.org](http://www.swarm.org)), and (iii) simulation of enterprises and organizations. He has prepared a new agent-based simulation tool in Python (Swarm-Like Agent Protocol in Python), SLAPP. Publications and projects at <http://terna.to.it>.