

Collegio Carlo Alberto

UNIVERSITÀ DEGLI STUDI DI TORINO

MADAS

Master in Data Science for Complex Economic Systems

AGENT-BASED MODELS

2018-19



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Learning Objectives

The goal is both (i) to introduce the *making of* agent-based simulation models, comparing NetLogo and SLAPP and (ii) to explore network analysis via the agent-based model lens.

Course Contents

1st lecture, Nov. 7th h.14:00pm-16:00pm - Introductory notes. Preliminary steps with NetLogo and Python. Initial exercises in NetLogo, with a parallel look at the content of the folders 1, 2 and 3 of SLAPP.

Homework.

2nd lecture, Nov. 8th h.11:00am-1:00pm - Exercises in NetLogo, also considering the content of the folders 4 and 5 of SLAPP.

3rd lecture, Nov. 9th h.11:00am-1:00pm - SLAPP, folders 6 (as an agent-based shell). Agents and Emergencies for Simulating Organizations in Python and the perspectives of SLAPP-AESOP, with applications.

Homework.

4th lecture Nov. 12th h.11:00am-1:00pm - Preliminary steps with: (i) NetLogo and the NW extension and (ii) with Python and the NetworkX library.

Homework.

5th lecture Nov. 13th h.11:00am-1:00pm - Putting agents into the networks: from agent-based simulation to network analysis (and return).

Pizza.

Course Methodology

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Fondatori:



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Frontal teaching with computer exercises (suggestion: have the laptop with you).

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 (3.7.x) from <https://www.python.org> and (optionally) IPython with Jupyter, from <http://ipython.org> (and <https://jupyter.org>); familiarize with the IDLE programming environment, specific for Python and installed with Python;
4. if you prefer to use Jupyter/ipython, have a look to <https://github.com/jerry-git/learn-python3>
5. download SLAPP (Swarm-Like Agent Protocol in Python), from <https://github.com/terna/SLAPP3> (use the "Clone or download" button);
6. install NetLogo, from <http://ccl.northwestern.edu/netlogo/>, version 6.0.4 or newer;
7. have a look to the Tutorial contained into the installed NetLogo program;
8. compare the contents of:
 - i) https://en.wikipedia.org/wiki/Social_network;
 - ii) https://en.wikipedia.org/wiki/Social_network_analysis;
 - iii) http://en.wikipedia.org/wiki/Complex_network;
9. familiarize with the NetLogo NW extension, at <https://github.com/NetLogo/NW-Extension>;
10. familiarize with NetworkX library: <http://networkx.github.io>.

Slides: available during the course, with the video films 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 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), 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>.