Laboratorio ITEM Carlo Savy

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Module Announcement

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Module Title: Games on Graphs

Lecturer: Dr. Sasha Rubin

Auckland, New Zealand

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CV: Sasha Rubin got his PhD in Mathematics and Computer Science in 2004 at the University of Auckland, New Zealand, on Automatic Structures. His current interests are in formal methods and using mathematical logic for describing, reasoning and controlling systems.

From 2012 to 2015 he has been postdoctoral researcher at the IST Austria and TU Vienna, in Austria. Recently he held a two-year Marie Curie Fellowship of the Istituto Nazionale di Alta Matematica to work at the University of Naples Federico II (until March 2017) on formal methods for parameterised light-weight mobile agents.

This year he is co-chair of the Italian Conference on Theoretical Computer Science (ICTCS) 2017, co-chair of the International Workshop on Strategic Reasoning 2017, co-organiser of the First Workshop on Formal Methods in Artificial Intelligence (FMAI) 2017, and a program committee member for the IRISA Master Research Internship 2016-2017.

Dates and Locations (rooms are in ed.1, via Claudio 21, Napoli)

Date	Hours	Room
24 Aprile 2017	**11.00-13.00**	**DIETI - Edificio 1 –Aula I5**
24 Aprile 2017	**15.00-17.00**	**DIETI - Edificio 1 –Aula I5**
26 Aprile 2017	**15.00-17.00**	**DIETI - Edificio 1 –Aula I5**
27 Aprile 2017	**11.00-13.00**	**DIETI - Edificio 1 –Aula I5**

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Content

I Lesson – Where do games come from?: Games on graphs are a useful mathematical model of many phenomena in mathematics and computer science that involve interaction of two or more players. We will define games on graphs and mention a few scenarios where they arise, including automated planning in Artificial Intelligence, automata theory and mathematical logic.
We will illustrate by showing how one can think of evaluating Boolean formulas as a game on the parse tree of the formula.

II Lesson – Games with qualitative objectives: Games with qualitative objectives assign a winner to every play, e.g., reachability games. We will show how to solve reachability games. We will discuss how to compute winning strategies, and raise the issue of determinacy, and show how to solve games with more complex but still qualitative objectives.

III lesson - Games with quantitative objectives: Games with quantitative objectives assign a real number to every play, and one player is trying to maximise this value while the other is trying to minimise it. We will discuss how to solve mean-payoff games.

IV Lesson – Games with multiple players: Games with multiple players require different types of solutions. We will define Nash equilibria on games on graphs, and show how to decide their existence (and compute an equilibrium, if it exists) for certain objectives that we have already encountered.

ECTS Credits: 1.6 (8 hours)

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Info: **Prof. Aniello Murano -** tel. 081 679279 – aniello.murano@unina.it