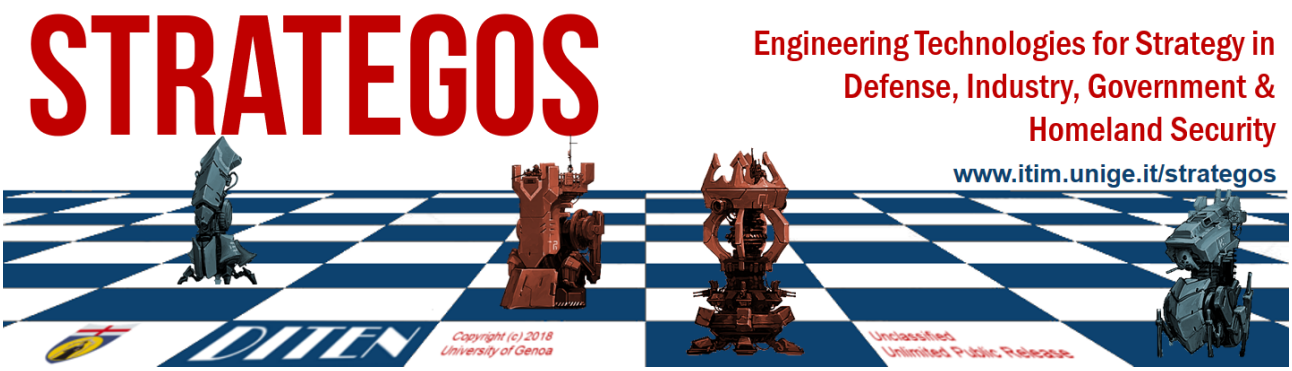


STRATEGOS

Master of Science on Engineering Technology for Strategy and Security,

Modelling, Simulation, Data Analysis, AI/IA for Strategies on Operations and Systems

Technical: **Game Theory Workshop**

Workshop *MAT09*

Credits: ***1***

Schedule & Timetable: ***1st Year, 2nd Semester***

Teachers, Email, URL:

Prof. Lucia Pusillo, *pusillo@dima.unige.it*

http://cpc-prod.csita.unige.it/output_cv/UURDWVk%253D/cv_it.pdf

Offices & Labs in *Room 835, DIMA, Via Dodecaneso, 35, 16146 Genova – ITALY*

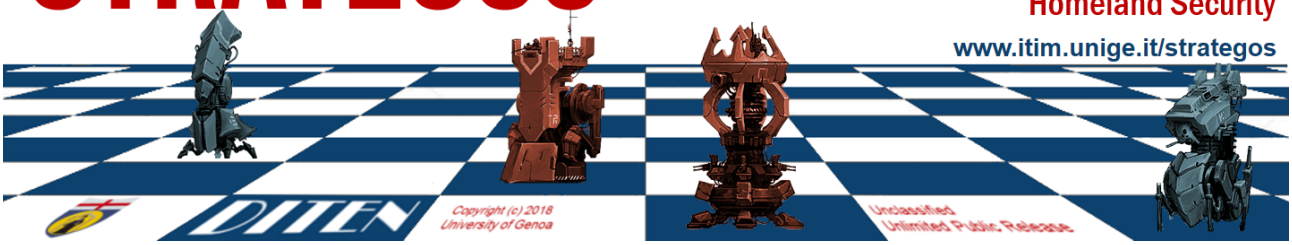
Education Objectives:

Game Theory studies strategic interactions between two or more decision makers, and situations in which two or more rational individuals take decisions to optimize their goals. One of the purposes of this course is to give students the mathematical knowledge to deal with a problem of Strategic Interaction.

This theory, using mathematical techniques, has applications in the economic field, political, military, biological, engineering, industrial and medical; for these reasons a deepening of this subject constitutes a stimulus to carry out a multidisciplinary work and start a fruitful dialogue between mathematics and other sciences, providing elements to understand the complex dynamics present in these phenomena.

Course Program & Elements:

- *Classification of games:cooperative-non-cooperative (static-dynamic); from the finite case to the infinite one.*
- *Nash equilibrium concept for non-cooperative games.*
- *Games in strategic form, in extended form, of complete information, of perfect information*



The rationality of Nash equilibria: dominance, stability, perfection in sub-games, iterate elimination of dominated strategies.

Exact potential games and congestion games with and applications .

Some ideas about vector games or multicriteria games

- *Cooperative games and various types of solutions (nucleus, Shapley value, Banzaf value, tau-value and comparisons).*
- *Partially cooperative games and applications to environmental issues.*
- *Applications of Game Theory to problems in Health Care.*

Teaching Approach:

Frontal Lecturing on Game Theory. Individual and Team Work Exercises in addressing problems such as:

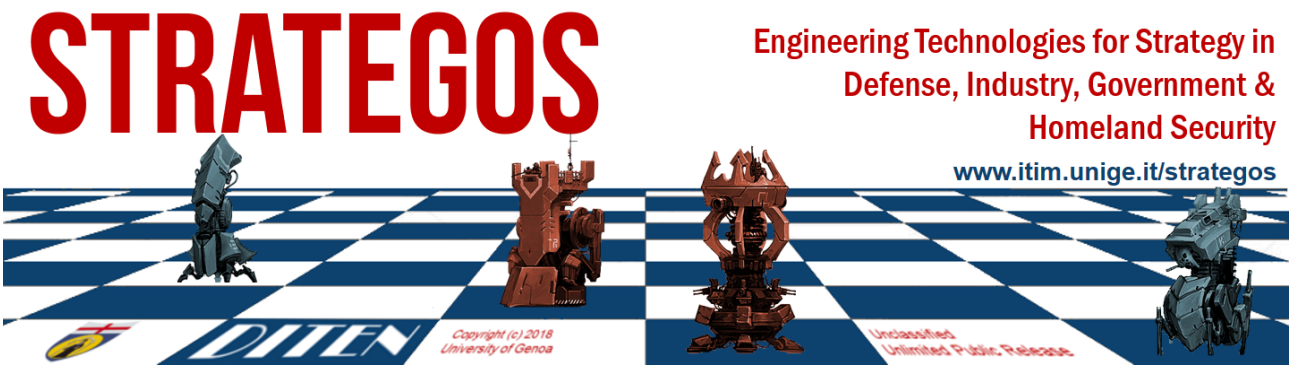
- *Non cooperative games:*
  - *Strategic games and extended-form games*
  - *Incomplete-information games*
  - *Nash equilibrium and mixed strategies*
  - *Potential games and telecommunication models*
- *Cooperative TU-games*
  - *Introduction to Cooperative Games*
  - *Solutions for cooperative games: Core, Shapley value, Banzhaf, value, tau value etc*

Demonstration of multicriteria (or vector) games (cooperative and non cooperative cases).

Applications on:

- *Partial cooperative games and applications to environment models*
- *Medicine problems via Game Theory and generalizations to strategic engineering problems.*

Assessment: *Evaluation during Game Theory Exercises*



Time Zone: *Genoa, Italy (CET), GMT+1*

Prerequisites:

The Course does not require specific prerequisites, being accessible to University students and including all the elements and references necessary for the Candidates; therefore basics know-how in engineering, mathematics, statistics and computer use could be useful to improve the Candidate learning curve and performance.

References

- *Levaggi L., Pusillo L., "Classes of Multi-Objective games possessing Pareto equilibria", Operation Research Perspectives, 4, 142--148 (2017).*

- *Patrone F., Pusillo L., Tijs S., Multi-Criteria Games and Potentials, TOP, 15, 138-145, (2007).*
- *Peters H., "Game Theory- A Multileveled Approach". Springer (2008).*
- *Pusillo L., Vector Games with potential function}, Games , 8, 1--11 (2017).*
- *Pusillo L., Tijs S.," Multicriteria Potentials Games", preprint DIMA n.524- (2005)*
- *Pusillo L., "Interactive Decisions and Potential Games", Journal of Global Optimization, 40, 339-352, (2008).*
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- *Tijs S., "Introduction to Game Theory"" Hindustan Book Agency, (2003).*
- *Voorneveld M., Potential Games and Interactive Decisions with Multiple Criteria, Dissertation series n.61, CentER of Economic Research-Tilburg University, The Netherlands, (1999).*