

**Game Theory Module
for STRATEGOS, International MSc in Strategic Engineering
Prof. Lucia Pusillo**

Phone: +39 (010) 353 68 35

Email: lucia.pusillo@unige.it

URL: <http://tdg.dima.unige.it/>

OBJECTIVES: Game Theory studies strategic interactions between two or more decision makers, that is, and situations in which two or more rational individuals take decisions to optimize their goals.

Therefore 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

PROGRAM:

- 1) Classification of games (cooperative-non-cooperative-static-dynamic); from the finite games to the infinite games
- 2) Nash equilibrium concept, Pareto Efficiency, etc.
- 3) Games in strategic form, in extended form, to complete information, a perfect information.
- 4) Game theory and Mathematical Analysis: concepts of "good position"
- 5) in Scalar and Game Theory optimization, approximated solutions and various types of convergence.
- 6) Game theory and Economics: oligopoly problems, from the static case (Cournot, Bertrand) to the dynamic case (Stackelberg)
- 7) Problem of the ration of Nash equilibria: dominance, stability, perfection in sub-games, iterate elimination of strategies tightly dominated
- 8) Games with potential (exact, ordinal, generalized)
- 9) Congestion games and applications
- 10) Evolutionarily stable equilibria
- 11) From vector optimization to multicriteria games
- 12) Cooperative games and various types of solutions (nucleus, nucleolus, Shapley value, Alexia value, tau-value and comparisons).
- 13) Partially cooperative games and applications to environmental issues.
- 14) Applications of Game Theory to problems in Health Care

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