

# Francesco Caruso

ASSISTANT PROFESSOR (RTDB)

MATHEMATICAL METHODS FOR ECONOMICS, FINANCE AND ACTUARIAL SCIENCES (STAT-04/A)

Department of Economics and Statistics (DiSES), University of Naples Federico II, Via Cintia 26, Napoli, Italy

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## Education

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### PHD ECONOMICS

Napoli, IT

University of Naples Federico II

Feb. 2019

- ADVISOR: PROF. JACQUELINE MORGAN
- Dissertation: Selection methods for subgame perfect Nash equilibrium in a continuous setting
- Committee: Prof. Georges Zaccour (Chair in Game Theory and Management GERAD, HEC Montréal, Canada)  
Prof. Agnieszka Rusinowska (CNRS – Paris School of Economics, Centre d’Economie de la Sorbonne, France)  
Prof. Salvatore Capasso (University of Naples Parthenope and CSEF, Italy)
- Grade: Excellent

### MASTER IN ECONOMICS AND FINANCE (attending all courses)

Napoli, IT

University of Naples Federico II

Jun. 2016

### MS MATHEMATICS

Napoli, IT

University of Naples Federico II

Dec. 2014

- Degree thesis: Convergences of functions and set-valued maps: theory and applications in optimization and in game theory
- Grade: 110/110 cum laude

### BS MATHEMATICS

Napoli, IT

University of Naples Federico II

Jul. 2011

- Degree thesis: Classical results on Fourier series
- Grade: 110/110 cum laude

## Past Positions

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05/2020-02/2024 **Research Fellow**, DiSES – University of Naples Federico II

05-11/2019 **Postdoctoral Researcher**, DiSES – University of Naples Federico II

Topic: Models in non-cooperative game theory

SUPERVISOR: PROF. MARIA CARMELA CEPARANO

## Research Interests

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**GAME THEORY, MATHEMATICAL ECONOMICS, OPTIMIZATION.** More precisely:

- existence and uniqueness of Nash equilibria in simultaneous-move games;
- selection of subgame perfect Nash equilibria for one-leader multi-follower games and Stackelberg games;
- theoretical and numerical iterative schemes for the approximation of equilibria.

## Publications

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### PUBLISHED

- [ 1 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2025. “Lower Stackelberg equilibria: from bilevel optimization to Stackelberg games”. *Optimization*, vol. 74, pp. 2857–2883.
- [ 2 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2024. “On construction of subgame perfect Nash equilibria in Stackelberg games”. *International Game Theory Review*, vol. 26, 2440005.
- [ 3 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2024. “Bilevel Nash equilibrium problems: numerical approximation via direct-search methods”. *Dynamic Games and Applications*, vol. 14, pp. 305–332.

- [ 4 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2024. “Asymptotic behavior of subgame perfect Nash Equilibria in Stackelberg games”. *Annals of Operations Research*, vol. 336, pp. 1573–1590.
- [ 5 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2023. “Affine relaxations of the best response algorithm: global convergence in ratio-bounded games”. *SIAM Journal on Optimization*, vol. 33, pp. 1914–1942.
- [ 6 ] **F. Caruso**, M.B. Lignola, and J. Morgan. 2020. “Approximation and regularization methods in Stackelberg games and bilevel optimization”. In S. Dempe and A. Zemkoho (eds.) *Bilevel Optimization: Advances and Next Challenges*, Springer Optimization and Its Applications, vol. 161, pp. 77–138. Springer, Cham.
- [ 7 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2020. “An inverse-adjusted best response algorithm for Nash equilibria”. *SIAM Journal on Optimization*, vol. 30, pp. 1638–1663.
- [ 8 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2019. “Subgame perfect Nash equilibrium: a learning approach via costs to move”. *Dynamic Games and Applications*, vol. 9, pp. 416–432.
- [ 9 ] **F. Caruso**, M.C. Ceparano, and J. Morgan. 2018. “Uniqueness of Nash equilibrium in continuous two-player weighted potential games”. *Journal of Mathematical Analysis and Applications*, vol. 459 pp. 1208–1221.

#### WORKING PAPERS

- [ 1 ] **F. Caruso**, M.C. Ceparano, and F. Quartieri. “Vessel sharing agreements under non-linear costs”. CSEF WP No. 760, 2025. <https://www.csef.it/WP/wp760.pdf>.

### Fellowships and Grants

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#### Research Fellowship

05/2019-11/2019 *DiSES – University of Naples Federico II*  
Topic: Models in non-cooperative game theory.

#### Registration, Accommodation and Travel Grant

08/2019 *Weierstrass Institute for Applied Analysis and Stochastics*  
For presentation at “International Conference on Continuous Optimization”, Berlin.

#### Registration, Accommodation and Travel Grant

09/2016 *Fondazione Alessandro Volta*  
For participation to the “School on Game Theory and Dynamic Games”, Campione d’Italia.

#### Ph.D. Scholarship

11/2015-10/2018 *Italian Ministry of Education, University and Research*

#### Registration, Accommodation and Travel Grant

09/2015 *ISCH COST ACTION IS1104 project*  
For participation to the “Training School on Qualitative Theory of Dynamical Systems, Tools and Applications”, Urbino.

### Participation to Research Projects

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#### Project PRIN 2022 “Externalities and fairness in allocations and contracts”

2024-present

PRINCIPAL INVESTIGATOR: PROF. MARIA GABRIELLA GRAZIANO  
Financed by: Italian Ministry of University and Research

#### Project STAR PLUS 2020 “Exchange of indivisible goods with externalities and groups”

2023-2024

PRINCIPAL INVESTIGATOR: PROF. MARIA GABRIELLA GRAZIANO  
Financed by: Compagnia di San Paolo and University of Naples Federico II

### Invited Talks and Conference Presentations

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#### 2025

- 16th Viennese Conference on Optimal Control and Dynamic Games (**VC2025**). Vienna, July 15th–18th.

- 24th Annual Conference of the Society for the Advancement of Economic Theory (**SAET2025**). Ischia, June 29th–July 5th.

## 2024

- XLVIII Annual Conference of the Association for Mathematics Applied to Social and Economic Sciences (**AMASES**). Ischia, September 5th–7th.
- Variational Inequalities, Nash Equilibrium Problems and Applications (**VINEPA**). Catania, July 11th–12th.

## 2023

- International Conference on Bilevel Optimization (**ICBO**). Southampton, August 8th–12th.
- 13th Workshop of the International Society of Dynamic Games (**13th ISDG Workshop**). Naples, June 7th–9th.

## 2022

- Chair in Game Theory and Management, HEC Montréal – November 17th. *Invited seminar.*
- XLVI Annual Conference of the Italian Association for Mathematics applied to Social and Economic Sciences (**AMASES XLVI**). Palermo, September 22nd–24th.
- 13th International Symposium on Generalized Convexity and Monotonicity (**GCM XIII**). Virtual Event, September 13th–16th.

## 2021

- 31st European Conference on Operational Research (**EURO2021**). Virtual event, July 11th–14th.
- 16th European Meeting on Game Theory (**SING16**). Virtual Event, June 30th–July 2nd.

## 2019

- 16th International Conference on Continuous Optimization (**ICCOPT2019**). Berlin, August 5th–8th.
- 19th Annual Conference of the Society for the Advancement of Economic Theory (**SAET2019**). Ischia, June 30th–July 6th. *Invited.*
- 30th European Conference on Operational Research (**EURO2019**). Dublin, June 23rd–26th. *Invited.*

## 2018

- Workshop Multi-agent optimization (**DIAG Mini-Workshop**). Rome, December 3rd. *Invited.*
- XLII Annual Conference of the Italian Association for Mathematics Applied to Social and Economic Sciences (**AMASES**). Naples, September 13th–15th. *Invited.*
- 23rd International Symposium on Mathematical Programming (**ISMP2018**). Bordeaux, July 1st–6th.
- 18th International Symposium on Dynamic Games and Applications (**ISDG2018**). Grenoble, July 9th–12th.
- VI Workshop on Equilibrium Analysis (**WEA2018**). Naples, January 26th–27th. *Invited.*

## 2017

- 11th International Conference on Parametric Optimization and Related Topics (**ParaoptXI**). Prague, September 19th–22nd.
- International Conference on Optimization and Decision Science (**ODS2017**). Sorrento, September 4th–7th.
- 13th European Meeting on Game Theory (**SING13**). Paris, July 5th–7th.

## Teaching Experience

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ACADEMIC YEAR 2025/2026

### Mathematics 1: Real Analysis and Vector Spaces

*Ph.D. in Economics, DiSES - University of Naples Federico II*

### Mathematics for Economics and Finance: Mathematics Module (with V. Platino)

*Master's Degree in Economics and Finance, DiSES - University of Naples Federico II*

### Basi di Matematica e Statistica per l'Economia: Modulo Matematica

*Master's Degree in Economia e Commercio, DiSES - University of Naples Federico II*

### Metodi Quantitativi

*Bachelor's Degree in Hospitality Management, DEMI - University of Naples Federico II*

### Teaching Assistant for Metodi Matematici

Bachelor's Degree in Economia e Commercio, DiSES - University of Naples Federico II

### PAST COURSE LECTURER

#### Mathematics 2: Static and Dynamic Optimization (with M.C. Ceparano)

a.yrs 2019/2020-2024/2025

Ph.D. in Economics, DiSES - University of Naples Federico II

#### Mathematics for Economic Analysis (with C. Meo)

a.y. 2024/2025

Bachelor's Degree in Economia e Commercio, DiSES - University of Naples Federico II

#### Metodi Matematici (with M. G. Graziano)

a.y. 2024/2025

Bachelor's Degree in Economia delle Imprese Finanziarie, DiSES - University of Naples Federico II

#### Metodi Quantitativi

a.yrs 2020/2021-2023/2024

Bachelor's Degree in Hospitality Management, DEMI - University of Naples Federico II

### PAST TEACHING ASSISTANT

#### Metodi Matematici

a.yrs 2018/2019-2023/2024

Bachelor's Degree in Economia e Commercio, DiSES - University of Naples Federico II

#### Finanza Matematica

a.y. 2017/2018

Master's Degree in Economia e Commercio, DiSES - University of Naples Federico II

## Professional Activities

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### DEPARTMENT SERVICE

- 09/2025-present **Member of "Gruppo di Lavoro Opinioni Studenti"** DiSES – University of Naples Federico II  
◇ Activities: Organization of the student opinion survey on courses and instructors
- 01/2024-present **Coordinator of the Project "Pronti, partenza, via!"** DiSES  
◇ Activities: Mentoring for students enrolled in the first year courses
- 03/2024-present **Member of the "Cultural Committee"** DiSES  
◇ Activities: Monitoring of actions connected to gender balance, inclusion, religious and cultural diversities
- 2021-present **Curricular Internship Tutor** DEMI – University of Naples Federico II  
◇ Activities: Tutoring for internship programs of students enrolled in bachelor's degree of Hospitality Management
- 2019-2022 **Member of the Project "Piano di orientamento e tutorato per l'area economica"** DiSES  
◇ Activities: analysis of mathematical skills from the admission test to taking the mathematics exam, development of DiSES Virtual Assistant "Sofia"
- 2021 **Member of the "Commissione per la valutazione dello stress da lavoro correlato"** DiSES  
◇ Activities: analysis of the physical, psychological or social discomforts of fixed-term department workers

### ORGANIZATION

**Member of the Local Organizing Committee** of the **24th Annual Conference of the Society for the Advancement of Economic Theory** (SAET2025), Ischia, June 29th–July 7th, 2025.

**Co-organizer**, together with Alba Roviello, of the session *"Topics in Non-Cooperative Game Theory"* at the **24th Annual Conference of the Society for the Advancement of Economic Theory**, Ischia, June 29th–July 7th, 2025.

**Member of the Local Organizing Committee** of the **48th Annual Conference of the Association for Mathematics Applied to Social and Economic Sciences** (AMASES2024), Naples, September 5th–7th, 2024.

**Co-organizer**, together with Maria Carmela Ceparano, of the session “*Nash equilibria in Stackelberg games*” at the **International Conference on Bilevel Optimization**, Southampton, August 8th–11th, 2023.

**Member of the Local Organizing Committee** of the **XXXI European Workshop on Economic Theory (EWET2023)**, Naples, July 2nd–4th, 2023.

**Member of the Local Organizing Committee** of the **13th Workshop of the International Society of Dynamic Games (ISDG2023)**, Naples, June 7th–9th, 2023.

**Co-organizer**, together with Jacqueline Morgan, of the session “*Nash equilibria in Stackelberg models*” at the **31st European Conference on Operational Research**, Athens (virtual event), July 11th–14th, 2021.

**Member of the Local Organizing Committee** of the workshop **Advances in Mathematical Economics**, Naples (virtual event), May 17th–18th, 2021.

## REVIEW

**Peer review:** Economics Bulletin, Operations Research Letters, Optimization Methods and Software, European Journal of Operational Research, SIAM Journal on Optimization, INFORMS Journal on Computing, Optimization, Fuzzy Sets and Systems, Annals of Operations Research, EURO Journal on Computational Optimization.

**PhD Thesis review:** PhD program in *Economia, statistica e sostenibilità* (XXXIII cycle), University of Naples Parthenope.

## AFFILIATIONS

**Member of the AMASES** *2018-present*  
*Associazione per la Matematica Applicata alle Scienze Economiche e Sociali*

**Member of the GNAMPA** *2017-present*  
*Gruppo Nazionale per l'Analisi Matematica, la Probabilità e le loro Applicazioni*

**Member of the WGGC** *2022-present*  
*Working Group on Generalized Convexity*