

# mattia**bongini**

Ph.D. in Mathematics

## contact

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MattiaBongini

## languages

italian mother tongue  
english business fluent  
german intermediate  
spanish basic

## programming

C++, Java, Matlab  
STATA, SQL, HTML5

## education

- 2016–Now **Master** of Finance Barcelona Graduate School of Economics  
Emphasys on Systemic Risk in the Banking sector.
- 2013–2016 **Ph.D.** in Mathematics Technische Universität München  
Grade: Summa cum laude  
*Sparse Optimal Control of Multiagent Systems*  
This thesis collects several results in the field of Sparse Optimal Control, ranging from sparse control of dynamical systems, dimensionality reduction techniques for optimal control problems, and learning interaction rules from the observation of the dynamics.
- 2010–2012 **M. Sc.** in Mathematics Università degli Studi di Siena  
Grade: 110/110 Summa cum laude (Average Exams' Grade: 30/30 cum laude)  
*Sequents-of-Relations Calculi: Proof Theory for Semiprojective Logics*  
In this work we explore a proof theoretic approach to Semiprojective Logics and introduced for the first time the concept of *Hyperprojective Logic*.
- 2007–2010 **B. Sc.** in Mathematics Università degli Studi di Siena  
Grade: 110/110 Summa cum laude (Average Exams' Grade: 30/30)  
*Sull'Omissione di Reticoli da parte di Varietà*  
This thesis describes a new approach to prove a conjecture made in the 70's by W. Taylor and O.C. Garcia in Universal Algebra.
- 2007 **Diploma** di Maturità Scientifica Liceo Scientifico Tecnologico "Tito Sarracchi", Siena  
Grade: 100/100 cum laude (Last Year Average Grade: 9.27/10)  
Emphasys on Mathematics, Physics and Philosophy.

## interests

**professional:** multi-agents dynamical systems, pattern formation, optimal control, mean-field games, social and economic networks, mathematical data analysis, sparse recovery, machine learning, artificial intelligence, proof theory, substructural logics, equivalent algebraic semantics

**personal:** reading, football, tennis, history, strategic games, economics

## awards

- Jun. 2016 **Unicredit Mastership 2016 & Marco Fanno Alumni Membership** Unicredit  
One-year scholarship to attend the Master of Finance at Barcelona GSE, Spain
- Dec. 2015 **HIM Scholarship** Universität Bonn  
One-month scholarship to attend the Hausdorff Trimester Program "Mathematics of Signal Processing" in Bonn, Germany
- Dec. 2013 **Associate Graduate Student of the International Research Training Group 1754 & IGDK Alumni Membership** Technische Universität München  
Admitted as Associate Member of the IGDK "Optimization and Numerical Analysis for Partial Differential Equations with Nonsmooth Structure" project between TU München, Universität des Bundeswehr and TU Graz.
- Jun. 2013 **Best Student of Mathematics' Master's Degree** Università degli Studi di Siena  
Awarded to the top student in his final year of the Master's degree.

- 2012 **Ph.D. Scholarships**  
 Mathematics, Technische Universität München: Accepted.  
 Mathematics, Università degli Studi di Pisa: Declined.  
 Computer Science, Università degli Studi di Pisa: Declined.
- 2008-2012 **Merit Scholarships** Monte dei Paschi di Siena  
 Awarded to students who every year show an outstanding profile.

## selection of schools attended

- Jan. 2016 **Mathematics of Signal Processing** Bonn, Germany  
 Harmonic Analysis, Graphs and Learning.
- Sep. 2015 **Summer School of Mathematics for Economics and Social Sciences** San Miniato, Italy  
 Bubbles, instability and speculation.
- Jul. 2015 **Variational Inequalities and Optimization** Munich, Germany  
 Optimization in Mass Transport Theory and Nonlinear Optimization.
- May 2015 **Complex networks: theory, methods, and applications** Como, Italy  
 Interconnectedness and Systemic Risk in Banking.
- Sep. 2014 **Summer School of Mathematics for Economics and Social Sciences** San Miniato, Italy  
 Network Games in Economics.
- Jun. 2014 **Partial Differential Equations and Geometric Measure Theory** Cetraro, Italy  
 Reaction-diffusion equations and equations related to growth models.
- Apr. 2014 **First Joint ENS Lyon-Scuola Normale Superiore School of Mathematics** Pisa, Italy  
 Optimal Transport and stability of shock fronts.
- Sep. 2012 **Summer School of Mathematics for Economics and Social Sciences.** San Miniato, Italy  
 Bifurcation Theory in Economics.

## periods abroad

- 2015-2016 **Università di Pisa with G. Buttazzo, M. Novaga, and M. S. Gelli** Pisa, Italy  
 6 weeks stay
- 2015-2016 **Università di Siena with M. Gori** Siena, Italy  
 2 weeks stay
- 2014 **Duke University with M. Maggioni** Durham, NC, USA  
 2 weeks stay
- 2014 **Aix-Marseille Université with F. Rossi** Marseille, France  
 3 weeks stay
- 2014 **Università La Sapienza with E. Cristiani** Rome, Italy  
 1 week stay
- 2013-2014 **RICAM with D. Kalise** Linz, Austria  
 3 weeks stay

## teaching activities

WS 2015	<b>Case Studies of Mathematical Modelling</b> Tutorial sessions for the course.	Technische Universität München
SS 2015	<b>Mathematische Behandlung der Natur- und Wirtschaftswissenschaften 2</b> Technische Universität München Exercise sessions for the course.	Technische Universität München
WS 2015	<b>Case Studies of Mathematical Modelling</b> Tutorial sessions for the course.	Technische Universität München
SS 2014	<b>Numerical Programming II</b> Exercise sessions for the course.	Technische Universität München
WS 2014	<b>Case Studies of Mathematical Modelling</b> Tutorial sessions for the course.	Technische Universität München
	<b>Learning Theory</b> Supervisor and tutor of the course.	Technische Universität München
SS 2013	<b>Numerics for Ordinary Differential Equation</b> Exercise sessions for the course.	Technische Universität München

## presentations in international conferences

### Sparse stabilization of dynamical systems driven by attraction and avoidance forces

Oct. 2014	<b>Invited Talk</b> International Conference in Network, Games and Optimization	Trento, Italy
Jul. 2014	<b>Invited Talk</b> 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications	Madrid, Spain
Mar. 2014	<b>Invited Talk</b> Workshop on Numerical Methods for Optimal Control and Inverse Problems	Munich, Germany
Dec. 2013	<b>Contributed Talk</b> Mathematical Control in Trieste 2013	Trieste, Italy

### (Un)conditional consensus emergence under perturbed and decentralized feedback control

Jun. 2014	<b>Invited Talk</b> Conference on New Trends in Optimal Control	Tours, France
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### Sparse control of alignment models in high dimension

Jun. 2015	<b>Invited Talk</b> 26th Biennial Numerical Analysis Conference	Glasgow, Scotland
Dec. 2014	<b>Poster Session</b> Annual Colloquium of IGDK 1754	Munich, Germany

### Invisible control of self-organizing agents leaving unknown environments

Jun. 2016	<b>Contributed Talk</b> Optimal Control for Evolutionary PDEs and Related Topics	Cortona, Italy
Sep. 2015	<b>Poster Session</b> IGDK 1754 Hearing	Vienna, Austria
Mar. 2015	<b>Invited Talk</b> Workshop on Numerical Methods for Optimal Control and Inverse Problems	Munich, Germany

### Mean-field Pontryagin maximum principle

- Sep. 2015 **Contributed Talk** Siena, Italy  
XX Congresso dell'Unione Matematica Italiana
- May 2015 **Invited Talk** Vienna, Austria  
13th Viennese Workshop on Optimal Control and Dynamic Games
- Apr. 2015 **Invited Talk** Graz, Austria  
IGDK Compact Course "From Sparse Optimization to Sparse Optimal Control"
- Mar. 2015 **Contributed Talk** Trieste, Italy  
Intensive Period on Variational Methods for Plasticity and Dislocations

### **Inferring Interaction Rules from Observations of Evolutive System I: The Variational Approach**

- Dec. 2015 **Invited Talk** Cambridge, UK  
Data Rich Phenomena - Modelling, Analysing and Simulation using Partial Differential Equations

### **Optimal Control Problems in Transport Dynamics**

- Apr. 2016 **Invited Talk** Pisa, Italy  
Seminar of Mathematical Analysis

## **experience**

- Aug.–Oct.'12 **Università degli Studi di Siena** Siena, Italy  
*Technical Support for the Faculty of Science*  
Managed the organization of Faculty's lectures, fixed broken paraphernalia, provided technical assistance to personnel.
- Jan.–Jun.'12 **Università degli Studi di Siena** Siena, Italy  
*Undergraduate Tutor for the Faculty of Science*  
Helped undergraduate students of the Faculty of Science in understanding mathematical concepts, either with plenary lectures or with one-to-one meetings.

## **exposure in the media**

- Nov. 2015 The divulgative journal Airone has published the article "Tutti come pecore" reporting the findings of our paper "Invisible control of self-organizing agents leaving unknown environments".
- Jun. 2015 The divulgative journal Focus has published the article "Folla, seguimi!" reporting the results of our paper "Invisible control of self-organizing agents leaving unknown environments".
- May 2015 The findings of our paper "Invisible control of self-organizing agents leaving unknown environments" are commented at Radio Vaticano, as well as on Galileo, Wired, Le Scienze, Il Tempo and Il Foglio.

## **publications**

### **papers in peer-reviewed journals**

#### **Optimal control problems in transport dynamics**

Mattia Bongini, Giuseppe Buttazzo

To appear in Math. Mod. Meth. Appl. Sci., 2016

### **Sparse control of multiagent systems**

Mattia Bongini, Massimo Fornasier

To appear in Active Particles Volume 1, Theory, Methods, and Applications, 2016

### **Invisible control of self-organizing agents leaving unknown environments**

Giacomo Albi, Mattia Bongini, Emiliano Cristiani, Dante Kalise

SIAM J. Appl. Math. 76-4 (2016), pp. 1683-1710

### **Proof search and Co-NP completeness for many-valued logics**

Mattia Bongini, Agata Ciabattoni, Franco Montagna

Fuzzy Sets and Systems 292 (2016), pp. 130–149

### **Sparse control of alignment models in high dimension**

Mattia Bongini, Massimo Fornasier, Oliver Junge, Benjamin Scharf

Netw. Heterog. Media 10-3 (2015) pp. 647–697.

### **(Un)conditional consensus emergence under perturbed and decentralized feedback control**

Mattia Bongini, Massimo Fornasier, Dante Kalise

Discrete Contin. Dyn. Syst. Ser. A 35-5 (2015), pp. 4071–4094

### **Sparse stabilization of dynamical systems driven by attraction and avoidance forces**

Mattia Bongini, Massimo Fornasier

Netw. Heterog. Media 9-1 (2014), pp. 1–31

## **papers submitted to peer reviewed journals**

### **Inferring interaction rules from observations of evolutive systems I: the variational approach**

Mattia Bongini, Massimo Fornasier, Markus Hanses, Mauro Maggioni

Submitted to Math. Mod. Meth. Appl. Sci. (Apr. 2016) p. 46.

### **Mean-field Pontryagin maximum principle**

Mattia Bongini, Massimo Fornasier, Francesco Rossi, Francesco Solombrino

Submitted to J. Optim. Theory Appl. (Apr. 2016) p. 36.

## **international peer reviewed conferences/proceedings**

### **Sparse control of force field dynamics**

Mattia Bongini, Massimo Fornasier, Fabian Fröhlich, Laleh Haghverdi

International Conference on Network Games, Control and Optimization, 2014, Trento, Italy

## **divulgative papers**

### **Effetto gregge e controllo di folle**

Giacomo Albi, Mattia Bongini

Maddmaths, available at <http://maddmaths.simai.eu/divulgazione/madd-spot-2-2015-effetto-gregge-e-controllo-di-folle/>

## **working papers**

### **Transport dynamics with density constraints**

Mattia Bongini, Maria Stella Gelli, Matteo Novaga

Preprint, 2016

### **Leader formation with mean-field birth and death models**

Giacomo Albi, Mattia Bongini, Francesco Rossi, Francesco Solombrino

Preprint, 2016