

# Curriculum Vitae Chiara Boccato

UNIVERSITÀ DEGLI STUDI DI MILANO

selezione pubblica per n. 1 posto di Ricercatore a tempo determinato in tenure-track (RTT) per il gruppo scientifico-disciplinare 01/MATH-04 - Fisica matematica, settore scientifico-disciplinare MATH-04/A - Fisica matematica presso il Dipartimento di Matematica, (avviso bando pubblicato sulla G.U. n. 92 del 19/11/2024) Codice concorso 5647

## Personal Information

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Born: 20th April 1986 in Milan, Italy  
Citizenship: Italian  
Languages: Italian (native speaker), English (fluent), German (good)  
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## Academic Positions

since 05/2024 *Ricercatore a tempo determinato di tipo B*, University of Pisa  
05/2021-04/2024 *Ricercatore a tempo determinato di tipo A*, University of Milan  
11/2017-03/2021 *Postdoc*, Institute of Science and Technology Austria (ISTA), Klosterneuburg (Vienna), with Prof. Robert Seiringer

## Education and Degrees

30/08/2017 *Ph.D. in Mathematics*, University of Zurich  
Thesis title: “Dynamical and spectral properties of Bose gases with singular interactions”  
Advisor: Prof. Benjamin Schlein  
04/2013-09/2017 Graduate studies  
Topic: Mathematical aspects of many-body quantum mechanics  
University of Zurich (02/2014-09/2017)  
Hausdorff Center for Mathematics, University of Bonn (04/2013-01/2014)  
Advisor: Prof. Benjamin Schlein

- 27/11/2012      *M.Sc. Degree in Physics*  
University of Milano–Bicocca  
Grade: 110/110 cum laude  
Thesis title: “Hartree dynamics as the limit of the evolution of a quantum many–body system”  
Advisors: Prof. Riccardo Adami, Prof. Alessandro Tomasiello
- 24/04/2009      *B.Sc. Degree in Physics*  
University of Milano–Bicocca  
Grade: 109/110  
Thesis title: “Solitons and instantons in scalar field theories”  
Advisor: Prof. Silvia Penati

## Research Interests

Mathematically rigorous analysis of emergent phenomena in complex quantum systems:

- derivation of nonlinear models from quantum many-body theories
- statistical mechanics of the interacting Bose gas at zero temperature and near criticality
- renormalization group and phase transitions for Ising models with disorder
- effective evolution equations for fractional quantum Hall systems

## Bibliographic Indicators

Citations    292 (Scopus)

h-index    6 (Scopus)

## Publications in Peer-Reviewed Journals

1.    (with J. Kerner, M. Pechmann) *On Bose-Einstein condensation in interacting Bose gases in the Kac-Luttinger model.*  
Journal de Mathématiques Pures et Appliquées (2024)  
doi:10.1016/j.matpur.2024.06.009
2.    (with A. Deuchert, D. Stocker) *Upper bound for the grand canonical free energy of the Bose gas in the Gross-Pitaevskii limit.*  
SIAM Journal on Mathematical Analysis **56**, 2611–2660 (2024),  
doi:10.1137/23M1580930
3.    (with R. Seiringer) *The Bose gas in a box with Neumann boundary conditions.*  
Annales Henri Poincaré **24**, 1505–1560 (2023),  
doi:10.1007/s00023-022-01252-3
4.    (with N. Benedikter) *Correlation corrections as a perturbation to the quasi-free approximation in many-body quantum systems.*  
Encyclopedia of Complexity and Systems Science, Robert A. Meyers (Ed), Springer (2022), doi:10.1007/978-3-642-27737-5-768-1

5. *The excitation spectrum of the Bose gas in the Gross–Pitaevskii regime.*  
Reviews in Mathematical Physics **32**, 2060006, 11 pages (2020),  
doi:10.1142/S0129055X20600065
6. (with C. Brennecke, S. Cenatiempo, B. Schlein) *Optimal rate for Bose–Einstein condensation in the Gross–Pitaevskii regime.*  
Communications in Mathematical Physics **376**, 1311–1395 (2020),  
doi:10.1007/s00220-019-03555-9
7. (with C. Brennecke, S. Cenatiempo, B. Schlein) *The excitation spectrum of Bose gases interacting through singular potentials.*  
Journal of the European Mathematical Society **22**, no. 7, 2331–2403 (2020).  
doi:10.4171/JEMS/966
8. (with C. Brennecke, S. Cenatiempo, B. Schlein) *Bogoliubov theory in the Gross–Pitaevskii limit.*  
Acta Mathematica **222**, no. 2, 219–335 (2019),  
doi:10.4310/ACTA.2019.v222.n2.a1
9. (with C. Brennecke, S. Cenatiempo, B. Schlein) *Complete Bose–Einstein condensation in the Gross–Pitaevskii regime.*  
Communications in Mathematical Physics **359**, 975–1026 (2018),  
doi:10.1007/s00220-017-3016-5
10. (with S. Cenatiempo, B. Schlein) *Quantum many-body fluctuations around nonlinear Schrödinger dynamics.*  
Annales Henri Poincaré **18**, 113–191 (2017), doi:10.1007/s00023-016-0513-6

## Conference Proceedings

1. *The Bose gas in a box with Neumann boundary conditions.*  
Contribution to the Oberwolfach report “A Geometric Fairytale full of Spectral Gaps and Random Fruit”. Report No. 53/2022, doi:10.4171/OWR/2022/53
2. *The excitation spectrum of the Bose gas in the Gross–Pitaevskii regime.*  
Contribution to the Oberwolfach report “Many–Body Quantum Systems”, Report No. 41/2019.  
Oberwolfach Reports **16**, no. 3, 2541, 3 pages (2019), doi:10.4171/OWR/2019/41

## PhD Thesis

1. *Dynamical and spectral properties of Bose gases with singular interactions.*  
Dissertation, Universität Zürich (2017),  
[https://www.recherche-portal.ch/primo-explore/fulldisplay?docid=ebi01\\_prod011160724&context=L&vid=ZAD&search\\_scope=default\\_scope&tab=default\\_tab&lang=de\\_DE](https://www.recherche-portal.ch/primo-explore/fulldisplay?docid=ebi01_prod011160724&context=L&vid=ZAD&search_scope=default_scope&tab=default_tab&lang=de_DE)

## Invited Mini-course

30/08-01/09/2023 Mini-course at the workshop “Recent advances in Bose–Einstein condensation”, Technical University of Munich

## Invited Talks in Conferences

24-28/11/2025 Workshop ”Quantum Many-body Systems and Bose-Einstein Condensation: A Mathematical Physics Perspective”  
Erwin-Schrödinger Institute, Vienna

12-14/05/2025 Spring School and Workshop “Spectral Theory, Fourier Analysis and PDE”  
Bizkaia Aretoa, Bilbao

05-09/05/2025 Workshop “Spring Time in Mathematical Quantum Physics”  
Pacific Institute for Mathematical Studies, Vancouver

31/03-02/04/2025 Workshop “Algebra meets probability in interacting particle systems”  
EURANDOM, Eindhoven

13/09/2024 Workshop “Interacting particles in the continuum”,  
EURANDOM, Eindhoven

01-06/09/2024 Workshop “Quantum Optimal Transport and Applications”,  
Palazzone di Cortona

19/08/2024 Conference “Venice 2024 - Quantissima in the Serenissima V”  
Venezia, *Invited participation to panel discussion*

26/07/2024 Special Session “Functional Analytic Methods in Quantum Many-Body Theory”,  
Joint Meeting AMS-UMI, University of Palermo

23/07/2024 Special Session “Mathematics for Quantum and Statistical Physics”,  
Joint Meeting AMS-UMI, University of Palermo

04-09/09/2023 XXII Congress of the Italian Mathematical Union,  
University of Pisa and Scuola Normale Superiore

11/01/2023 Workshop “Mathematical Quantum Matter”,  
University of Milan

30/11/2022 “A Geometric Fairytale full of Spectral Gaps and Random Fruit”,  
Mathematisches Forschungsinstitut Oberwolfach

22/08/2022 Conference Venice 2022 - Quantissima in the Serenissima IV

30/03-01/04/2022 Session “Mathematical perspectives in quantum mechanics and quantum chemistry” at “The 12th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena”,  
University of Georgia, Athens, USA (Invitation declined)

03/09/2021	Minisymposium “Trends in nonlinear PDEs and applications” at “Biannual Congress of the Italian Society of Applied and Industrial Mathematics” (SIMAI), University of Parma
15/08/2019	“QMath 14: Mathematical Results in Quantum Physics”, Aarhus University
19/03/2019	“Many-Body Theory, Effective Equations and PDEs”, Mittag-Leffler Institute, The Royal Swedish Academy of Sciences, Stockholm
27/09/2018	“Trails in Quantum Mechanics and Surroundings 2018”, Polytechnic of Turin
29/11/2016	“Workshop in Mathematical Physics”, ETH Zurich

### **Invited Talks in Seminars**

03/10/2024	Analysis Seminar University of Pisa
30/11/2023	Analysis and PDE Seminar Peking University, online
02/11/2023	Mathematical Physics seminar, University of Rome La Sapienza
26/10/2023	Barcelona Analysis seminar, Jointly organized between Autonomous University of Barcelona, University of Barcelona, and Technical University of Catalonia
20/09/2023	Seminar of Analysis and Mathematical Physics, University of Basel
24/04/2023	Munich-Aarhus-Santiago Seminar in Mathematical Physics, (online)
09/03/2023	Seminar “Mathematics of Many-Body Systems”, Scuola Internazionale Superiore di Studi Avanzati (SISSA), Trieste
21/04/2022	Invited online lecture for PhD students and early career researchers for the series of lectures “Mathematical Challenges in Quantum Mechanics” (MCQM) Online seminar jointly organized by Politecnico di Milano, University of Insubria in Como, Gran Sasso Science Institute, Sapienza University of Rome and Federico II University of Naples
13/04/2022	Condensed matter theory seminar, KTH Royal Institute of Technology (online)
12/11/2019	Mathematical Physics seminar, University of Roma Tre
06/03/2019	GSSI PDEs group seminar, Gran Sasso Science Institute, L’Aquila

23/11/2017	Physical Sciences Seminar, IST Austria, Klosterneuburg (Vienna)
16/08/2017	Quantum Lunch, University of Copenhagen
23/01/2017	Analysis Seminar, Polytechnic of Turin
16/03/2016	Quantum Lunch, University of Copenhagen

### **Contributed Talks in Conferences**

27/07/2018	“XIX International Congress on Mathematical Physics” (ICMP 2018), Montréal
11/02/2016	“Mathematical Challenges in Quantum Mechanics”, Bressanone

### **Poster Sessions, Outreach Activities**

20-22/01/2025	Presentation at “Math PhD days at the University of Pisa”, an event for potential PhD applicants to the PhD program of University of Pisa
21/02/2024	Presentation at “Math PhD at UniMi”, an event for potential PhD applicants to the PhD program of University of Milan
30/11/2018	Introductory talk for undergraduate students at the “Student Open Day”, IST Austria
02/06/2016	Poster presentation at SwissMAP meeting, ETH Zurich
04-05/07/2013	Bonn International Graduate Schools (BIGS) Poster Exhibition, University of Bonn

### **Third-Party Funding**

09/2023–09/2025	Local coordinator of the <i>PRIN 2022</i> grant from the Italian Ministry of University and Research for the project “ <i>Interacting Quantum Systems: Topological Phenomena and Effective Theories</i> ”, in collaboration with the University of Rome La Sapienza (PI: Dr. Domenico Monaco), 165 k€
12–25/05/2024	Oberwolfach Research Fellows (OWRF) project “ <i>Bose-Einstein condensation in interacting Bose gases in the Kac-Luttinger model</i> ” in collaboration with Dr. Joachim Kerner (University of Hagen), Dr. Maximilian Pechmann (University of Tennessee), Prof. Wolfgang Spitzer (University of Hagen)

### **Awards**

19/06/2024	Selected for the Ramón y Cajal Grant, funded by the Agencia Estatal de Investigación, Spanish Ministry of Science and Innovation. Second in the ranking. Through this grant I have been offered a research position at BCAM (Basque Center for Applied Mathematics) in Bilbao with tenure-track.
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- 03/2019 Postdoctoral Fellowship, Institut Mittag-Leffler,  
The Royal Swedish Academy of Sciences, 2 k€
- 10/2017 Career Grant from the program “Finding Talents”,  
FFG Austria, covering relocation costs to Austria, 2 k€

### **Workshop Participation by Invitation**

- 11/2022 (1 week) Mathematisches Forschungsinstitut Oberwolfach  
*“A Geometric Fairytale full of Spectral Gaps and Random Fruit”*
- 09/2019 (1 week) Mathematisches Forschungsinstitut Oberwolfach  
*“Many-Body Quantum Systems”*
- 03/2019 (3 weeks) The Royal Swedish Academy of Sciences, Institut Mittag-Leffler  
*“Spectral Methods in Mathematical Physics”*
- 09/2016 (1 week) Mathematisches Forschungsinstitut Oberwolfach  
*“Many-Body Quantum Systems and Effective Theories”*

### **Participation in Research Projects**

- 11/2017-03/2021 Participation in the research project of Prof. Robert Seiringer  
funded by ERC Advanced Grant 694227.
- 04/2017-09/2017 Participation in the research project of Prof. Benjamin Schlein  
“Dynamical and energetic properties of Bose-Einstein condensates” funded by the Swiss National Science Foundation.  
<http://p3.snf.ch/Project-172623>
- 04/2014-03/2017 Participation in the research project of Prof. Benjamin Schlein  
“Effective equations from quantum dynamics” funded by the Swiss National Science Foundation.  
<http://p3.snf.ch/Project-153621>

### **Organization of Seminars, Workshops, Schools**

- 26-30/08/2024 Coorganization of the summer school “*Rigorous Renormalization Group Analysis of Collective Phenomena in Fermionic Quantum Systems*” at Lake Como School of Advanced Studies, together with Prof. Niels Benedikter and Dr. Marco Falconi
- 2021–2024 Coorganization of the seminars “*Itinerant Quantum Math Meetings*”, joint with Politecnico di Milano and Università degli Studi dell’Insubria, <http://quantumseminar.unimi.it/>
- 19–22/12/2023 Coorganization of the workshop “Quantum and Dynamical Christmas”, University of Milan
- 20–22/12/2021 Coorganization of the workshop “Quantum Before Christmas”  
University of Milan

## Teaching Experience

At University of Pisa I am teaching two courses for Bachelors' students. My duties are lecturing, preparation of lecture notes, written and oral examinations. In the Spring of next year I will give a Ph.D. course accessible to Masters' and Ph.D. students in Mathematics and Physics.

Spring 2025	Mathematical Methods of Quantum Mechanics (Ph.D. course)
Fall 2024	Elementi di Matematica e Statistica (Pharmacy Department)
	Matematica (Engineering Department) together with Fabrizio Bianchi

At the Department of Mathematics, University of Milan, I taught mathematical physics courses for the Bachelor degree in mathematics and one course (Laboratory of Hamiltonian Systems 1) for the Master degree in mathematics. My duties included lecturing, preparation of lecture notes, written and oral examinations.

Fall 2023	Laboratory of Hamiltonian Systems 1
	Exercise session of Mathematical Physics 2 (PDEs and Fourier Analysis)
Fall 2022	Laboratory of Methods and Mathematical Models for Applications
	Exercise session of Mathematical Physics 2 (PDEs and Fourier Analysis)
Fall 2021	Laboratory of Methods and Mathematical Models for Applications
	Exercise session of Mathematical Physics 2 (PDEs and Fourier Analysis)

At the Department of Mathematics, University of Zurich, I taught for the Bachelor degree in mathematics, chemistry, physics and natural sciences. My duties included weekly exercise classes, preparation of weekly homeworks and final exams, weekly corrections of the students' homeworks.

Spring 2017	Stochastics for the Natural Sciences, Dr. Christoph Luchsinger
Fall 2016	Linear Algebra for the Natural Sciences, Prof. Viktor Schroeder
Spring 2016	Analysis II, Prof. Benjamin Schlein
Fall 2015	Analysis I, Prof. Benjamin Schlein
Spring 2015	Mathematics for Chemistry II, Prof. Thomas Kappeler
Fall 2014	Analysis III, Prof. Benjamin Schlein
Spring 2014	Analysis II, Prof. Camillo De Lellis

## Supervision of Students and Postdocs

since 10/2024	Supervision of Dr. Umberto Morellini at University of Pisa, post-doc funded by the project <i>PRIN 2022</i>
since 03/2024	Co-supervision (together with Prof. Niels Benedikter) of the master thesis of Xiangyuan Li (University of Zurich)
10/2023-01/2024	Co-supervision (together with Prof. Niels Benedikter) of the semester project of the master student Xiangyuan Li (University of Zurich). Title of the project: “Hartree-Fock equation - Derivation and comparison with the Schrödinger equation”

## Formative activity: Conferences attended

03-05/10/2024	“Assemblea gruppo nazionale fisica matematica” Montecatini
01-06/07/2024	“International Congress of Mathematical Physics” Strasbourg
18-23/06/2023	“Effective theories in classical and quantum particle systems” SwissMAP Research Station in Les Diablerets
06-08/02/2023	“Universality in Condensed Matter and Statistical Mechanics” Università degli Studi Roma Tre
09-11/01/2023	“Mathematical Quantum Matter” Università degli Studi di Milano
17/11-03/12/2022	“A Geometric Fairytale full of Spectral Gaps and Random Fruit” Mathematisches Forschungsinstitut Oberwolfach
22-26/08/2022	“Conference Venice 2022 - Quantissima in the Serenissima IV”
13-18/06/2022	“Mathematical Challenges in Quantum Mechanics” Como
05-07/05/2022	“Assemblea gruppo nazionale fisica matematica” Montecatini
30/08-03/09/2021	“Biannual Congress of the Italian Society of Applied and Industrial Mathematics” (SIMAI) Università degli Studi di Parma
02-07/08/2021	“International Congress of Mathematical Physics” Geneva
02-07/08/2021	“Young Researchers Symposium of the ICMP 2021” University of Geneva (attended online)
21-25/06/2021	SwissMAP workshop “Emergent theories for wave turbulence and particle dynamics”, SwissMAP Research Station in Les Diablerets

22-25/02/2021	“Mathematics of Condensed Matter and Beyond (MCMB)”, American University of Beirut (attended online)
17-20/12/2019	“From semi-classical to quantum many-body through normal forms”, Università degli Studi di Milano
09-14/09/2019	“Many-Body Quantum Systems”, Mathematisches Forschungsinstitut Oberwolfach
12-16/08/2019	“QMath 14: Mathematical Results in Quantum Physics” Aarhus University
27-29/09/2018	“Trails in Quantum Mechanics and Surroundings 2018” Politecnico di Torino
23-28/07/2018	“XIX International Congress on Mathematical Physics” (ICMP 2018) Montréal
20-21/07/2018	“Young Researchers Symposium of the ICMP 2018” McGill University, Montréal
19-24/02/2018	“Mathematical Challenges in Quantum Mechanics” “Sapienza” Università di Roma
28-30/11/2016	“Workshop in Mathematical Physics” ETH Zurich
8-13/02/2016	“Mathematical Challenges in Quantum Mechanics” Bressanone
22-26/09/2014	“Scaling limits and effective theories in classical and quantum mechanics” Erwin Schrödinger Institute, Vienna
01-05/09/2014	“Selected Problems in Mathematical Physics” Polo Universitario La Spezia
18-20/09/2013	“Dispersive PDEs: Models and Dynamics.” Dipartimento di Matematica, Pisa
17-21/06/2013	“Mathematical Properties of Large Quantum Systems”, part of the Trimester “Variational and Spectral Methods in Quantum Mechanics” Institut Henri Poincare, Paris
27-31/05/2013	“Workshop on Analytical Aspects of Mathematical Physics” ETH Zurich
29-02/02/2013	“Trails in Quantum Mechanics and Surroundings” INFN Frascati National Laboratories

## **Formative activity: Summer- and Winterschools attended**

- 19-23/7/2021 “Current Topics in Mathematical Physics”, University of Zurich  
<https://www.math.uzh.ch/index.php?id=konferenzdetails0&key1=632>
- 22-26/03/2021 “From Equilibrium Phenomena Towards Open Quantum System”,  
Gran Sasso Science Institute (attended online)  
<https://indico.gssi.it/event/103/>
- 16-19/07/2018 “Current Topics in Mathematical Physics”, Fields Institute, Toronto  
<http://www.fields.utoronto.ca/activities/18-19/physics-summer-school>
- 17-21/07/2017 “Current Topics in Mathematical Physics”, University of Zurich  
<https://www.math.uzh.ch/index.php?konferenzdetails0&key1=491>
- 08-13/02/2016 “Mathematical Challenges in Quantum Mechanics”, Bressanone  
<https://www.mcqm.cond-math.it/>
- 10-14/02/2014 “BCS Theory and NLS Equations”, Graduiertenkolleg 1838 ”Spectral Theory and Dynamics of Quantum Systems”, Blaubeuren [http://pnp.mathematik.uni-stuttgart.de/iadm/grk1838/Workshops/workshop2014/Workshop\\_2014..html](http://pnp.mathematik.uni-stuttgart.de/iadm/grk1838/Workshops/workshop2014/Workshop_2014..html)
- 01-07/09/2013 “Current Topics in Mathematical Physics ”, Centre international de rencontres mathématiques (CIRM), Marseille [https://www.cirm-math.fr/Archives/?EX=info\\_rencontre&annee=2013&id\\_renc=904](https://www.cirm-math.fr/Archives/?EX=info_rencontre&annee=2013&id_renc=904)

## **Referee for Scientific Journals**

Analysis & PDE,  
Annales Henri Poincaré,  
Journal of Mathematical Physics,  
Journal of Statistical Physics,  
Springer INdAM Series

## **Cooperation Partners**

Giulia Basti (GSSI), Niels Benedikter (Università degli Studi di Milano), Christian Brennecke (University of Bonn), Serena Cennatiempo (GSSI), Andreas Deuchert (University of Zurich), Matteo Gallone (SISSA, Trieste), Joachim Kerner (University of Hagen), Vieri Mastropietro (Università degli Studi di Milano), Maximilian Pechmann (University of Tennessee), Benjamin Schlein (University of Zurich), Robert Seiringer (IST Austria), David Stocker (University of Zurich)

## Membership in Professional Organizations

AWMP (Association of Women in Mathematical Physics) - Committee member,  
IAMP (International Association of Mathematical Physics),  
GNFM (Gruppo Nazionale di Fisica Matematica),  
UMI (Unione Matematica Italiana)

## Other Activities

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|------------------|---|
| 10/2022, 10/2024 | I have been part of the commission for the final exams of the Bachelor degree in mathematics  |
| 2022–2024        | I participated to four evaluation commissions for the hiring of postdocs at the University of Milano and the Scuola Internazionale Superiore di Studi Avanzati (SISSA) in Trieste.  |
| since 11/2022    | Organizer of the “Diversity reading group”, a monthly reading seminar on scientific literature about the gender gap and participation of minorities in academia and the job market  |
| 04/2022          | Co-author of the article “ <i>Voices of women in mathematical physics. A series of five interviews.</i> ”. Published in the IAMP News Bulletin, April 2022. <a href="http://www.iamp.org/page.php?page=page_bulletin">http://www.iamp.org/page.php?page=page_bulletin</a> |

## References

- Prof. Riccardo Adami   Politecnico di Torino, [riccardo.adami@polito.it](mailto:riccardo.adami@polito.it)  
Prof. Robert Seiringer   IST Austria, [robert.seiringer@ist.ac.at](mailto:robert.seiringer@ist.ac.at)  
Prof. Benjamin Schlein   University of Zurich, [benjamin.schlein@math.uzh.ch](mailto:benjamin.schlein@math.uzh.ch)

Pisa, 19/12/2024