Nicolò Defenu – Curriculum Vitae

Address	Wolfgang-Pauli-Str. 27, 8093 Zürich, Switzerland.	**Home Phone**	+41 43 229 65 35
		Office Phone	+41 44 633 78 75
Date of Birth	19th May 1988	**Institute Email**	ndefenu@phys.ethz.ch
Nationality	Italian	**Personal Email**	nicolo.defenu@gmail.com
Website	www.ndefenu.me	**ORCID**	0000-0002-3401-3665

Education

11/2010 BSc with honors - Sapienza University of Rome, Roma

110/110 cum laude - 28/30 Average
Third Year Project - Second Quantization with application to phonon propagation.
Advisor: M. Testa

10/2012 MSc with honors - Sapienza University of Rome, Roma

110/110 cum laude - 29/30 Average
Final Year Project -Overhauser method for pair correlation function calculation applied to density functional theory.
Advisor: J. Lorenzana

01/2017 PhD with honors - International School for Advanced Studies (SISSA), Trieste

PhD cum laude (Maximum degree in the Italian System)
PhD Thesis -Application of Functional Renormalization Group Approach to spin systems and long range models.
Advisors: S. Ruffo, A. Trombettoni and A. Codello

01/2022 National Scientific Habilitation- Italy

Associate Professor Level.
02/B2 - Theoretical physics of condensed matter

01/2022 National Scientific Habilitation- Italy

Associate Professor Level.
02/A2 - Theoretical physics of fundamental interactions

11/2023 National Scientific Habilitation- Italy

Full Professor Level.
02/B2 - Theoretical physics of condensed matter

Past Positions

Dec 2016 Institute for Theoretical Physics (ITP), Philosophenweg, 19 - 69120 Heidelberg, Germany
Four years Post-Doc position in the group of Dr. Tilman Enss and member of the ISOQUANT collaboration

March 2020 Institute for Theoretical Physics, ETH Zürich, Wolfgang-Pauli-Str. 27, 8093, Zürich, Switzerland
Four years Post-Doc position in the group of Prof. Dr. Gian Michele Graf

Present Position

Sep 2023 Institute for Theoretical Physics, ETH Zürich, Wolfgang-Pauli-Str. 27, 8093, Zürich, Switzerland
Assistant Professor of Quantum Physics

Awards, Fellowships

- **Percorsi di eccellenza**

  2010-Awarded of the merit-based fellowship *Percorsi di eccellenza*.

- **Percorso Imprenditoriale Re-Seed**

  2014-Awarded of a project-based fellowship to fund a one year business management course.

- **Fellowship for EU collaborations**

  2015-Awarded of the merit-based *Job Placement* fellowship to fund a two months visit at the Ruprecht-Karls-Universität in Heidelberg.

- **Seal Of Excellence**

  2017-Marie Skłodowska-Curie actions call H2020-MSCA-IF-2017.

Organization of conferences

- **1st Workshop on Low Dimensional Quantum Many Body Systems**

  Internationales Wissenschaftsforum Heidelberg (IWH), Germany.

- **Out-of-equilibrium and collective dynamics of quantum many-body systems**

  Pauli Center for Theoretical Studies, Switzerland.

- **Out-of-equilibrium Dynamics and Quantum Information of Many-body Systems with Long-range Interactions**

  Kavli Institute for Theoretical Physics – UC Santa Barbara, USA

- **12th International Conference on the Exact Renormalization Group 2024 (ERG2024)**

  SwissMAP Research Station, Les Diablerets, Switzerland

Memberships

- **Member of the SwissMAP collaboration.**
- **External Member of the Structures Excellence Cluster at the University of Heidelberg.**
- **External Member of the CNR Istituto officina dei materiali (Trieste).**
- **External Member of SISSA (Trieste).**

Memberships in boards

- **Member of the Young Researchers Board in the Structures Excellence Cluster Feb. 2019**

  The young researchers board proposes and organises scientific activities financed by the special fund for young researchers of the Structures Excellence Cluster. The board assigns travel stipends and internships, organises colloquia and invites scientific guests.

Research interests

- **Statistical Physics**
- **Cold Atoms Physics**
- **Mathematical Physics**

Supervision of graduate students and post-doctoral fellows

- **2019-2022: 1 Master Student and 1 postdoc**
  Heidelberg University, Germany.
- **2020-2022: 3 Master Students**
  ETH Zürich, Switzerland.
- **2018-2022: 3 PhD Students**
  Scuola Internazionale Superiore Studi Avanzati (SISSA), Italy.
- **2018-2022: 3 PhD Students**
  Institute for theoretical physics, ETH Zürich.

Teaching experience

- **2017-2020: Co-Instructor of multiple seminar courses for Master students,**
  Heidelberg University, Germany.
- **2018: Co-lecturer of the course on functional renormalization group,**
  UMass, Boston, USA.
- **2017-2020: Teaching Assistant for undergraduate and master courses**
  Heidelberg University, Germany.
- **2020: Lecturer of the course on functional renormalization group**
  SISSA, Italy.
- **2020-2021: Co-Instructor seminar courses for Master students**
  ETH Zürich, Switzerland.
- **2021:Lecturer of the course on long-range interacting systems**
  Mainz University, Germany.

Referee experience

- **2018-2023, Invited Referee for multiple journals:**
  Phys. Rev. Lett., *Phys. Rev.* A, *Phys. Rev.* B, *Phys. Rev.* E, *J. Stat. Mech*, *Comm. Phys.*, *Sci-Post*, *Nature*.

Third-party funding

- **Exploratory Project within the STRUCTURES excellence cluster.**
  Universality on Network Structures from Quantum Dynamics to Big Data,
  Amount: 150'000€.
  Role: Principal Investigator.
  The project focuses on the study of quantum critical behaviour on complex networks with finite spectral dimension. These, studies are intended to clarify the role of non-homogeneity in the out-of-equilibrium scaling observed in Rydberg atom experiments.
- **Exploratory Project within the STRUCTURES excellence cluster.**
  Critical behavior of epidemic models on distinct network topologies and applications to the study of brain disease,
  Amount: 150'000€.
  Role: Co-Principal Investigator.
  The project focuses on the characterisation of the phases and observables of classical epidemic models on complex networks with finite spectral dimension. These numerical analysis will then be used to model seizure propagation in real data coming from epilepsy patients.

- **Swiss National Science Foundation Grant.**

  Out-of-equilibrium criticality of long-range interacting quantum systems
  Amount: 480'000€.
  Role: Principal Investigator.
  Our ambition is to uncover and investigate the common aspects induced by long-range interactions in quantum systems, predicting the necessary conditions to observe universal behaviour and giving quantitative estimations of the universal quantities. The comprehensive framework of the theory of critical phenomena will deliver general predictions which could be easily tested in various physical contexts, while part of the focus is on the description of actual existing experiments.

- **European Research Council: Starting Grant.**

  Quantum Long-Range Networks (QLR-Net)
  Amount: 1'500'000€.
  Role: Principal Investigator.
  QLR-Net hinges on the construction of a unified tool, exemplified in terms of a prototypical many-body theory model, which reproduces the spectral properties of long-range interactions in a modular structure amenable to extensive numerical investigations. Then, the project will focus on the spreading of quantum correlations and entanglement, anomalous dynamics and ergodicity breaking, universal quasistatic dynamics, dynamical phase transitions, pre-thermal phases and universal defect formation. The QLR- Net approach is organized in such a way to provide both basic intuition and formal understanding, while making quantitative predictions for scaling phenomena that can be realised in experiments.

Career Breaks

07/2022 1 Month Parental Leave, my son was born on 14/05/2022.
08/2022 Partial career break due to familiar reason:
My partner is affected by spontaneous coronary artery dissection (SCAD). During the several months necessary for her recovery, I will be the principal caregiver of our 4 month old child, resulting in a disruption of my research activity. Medical documents will be provided upon request.

Publications in peer-reviewed scientific journals

- **A. Codello, N. Defenu, and G. D'Odorico**

  Critical exponents of O (N) models in fractional dimensions,
  Phys. Rev. D **91**,105003 (2015).
  arXiv:1410.3308
  Author Contributions: Authors are listed in alphabetical order. N. Defenu conceived the study, devised the approach to calculate the correlation length exponent ν, derived the numerical results and conceptualised the manuscript.

- **N. Defenu, A. Trombettoni, and A. Codello**

  Fixed Points Structure & Effective Fractional Dimension for O (N) Models with Long-Range Interactions,
  Phys. Rev. E **92**, 052113 (2015).
  arXiv:1409.8322
  Author Contribution: N. Defenu pursued the derivation of the non-perturbative flow equations in the long-range case, derived the numerical results and wrote the manuscript.

- **N. Defenu, P. Mati, I.G. Marian, I. Nandori, and A. Trombettoni**

  Truncation effects in the functional renormalization group study of spontaneous symmetry breaking,
  JHEP **1505** (2015) 141.
  arXiv:1410.7024
  Author Contribution: N. Defenu carried on the mathematical proof that the lower order functional RG equations for $O(N)$ field theories are consistent with the Mermin-Wagner theorem.

- **V. Bacso, N. Defenu, A. Trombettoni, and I. Nandori**

  c-function and central charge of the sine-Gordon model from the non-perturbative renormalization group flow,
  Nucl. Phys. B, **901**, 444-460 (2015).
  arXiv:1507.04920
  Author Contribution: N. Defenu derived the mathematical expression of the c-function for the sine-Gordon model in the functional RG scheme.

- **N. Defenu, A. Trombettoni and S. Ruffo**

  Anisotropic long range spin systems,
  Phys. Rev. B **94**, 224411 (2016).
  arXiv:1606.07756.
  Author Contribution: N. Defenu conceived the study, derived the RG equations for the study of anisotropic long-range $O(N)$ models, performed the numerical calculations and wrote the manuscript.

- **G. Gori, M. Michelangeli, N. Defenu, and A. Trombettoni**

  Numerical study of one-dimensional long-range percolation,
  Phys. Rev. **E 96**, 012108 (2017).
  arXiv:1610.00200
  Author Contribution: N. Defenu contributed to the interpretation of the numerical simulations by mapping the mathematical expressions for critical exponents in the local interaction case to the long-range case under study, using the effective dimension approach.

- **N. Defenu, A. Trombettoni, I. Nandori, T. Enss**

  Nonperturbative RG treatment of amplitude fluctuations for $|\varphi|^4$ topological phase transitions,
  Phys. Rev. B **96**, 174505 (2017).
  arXiv:1706.00618
  Author Contribution: N. Defenu initiated the project, revised the previous literature accurately, derived the RG equations for the study of the two dimensional $O(2)$ model in the amplitude and phase representation. The, he performed the numerical calculations and conceptualised the manuscript.

- **N. Defenu, A. Trombettoni and S. Ruffo**

  Criticality and Phase Diagram of Quantum Long-Range O(N) models,
  Phys. Rev. **B 96**, 104432 (2017).
  arXiv:1704.00528
  Author Contribution: N. Defenu conceived the study, derived the RG equations for the study of quantum long-range $O(N)$ models, performed the numerical calculations and conceptualised the manuscript, deriving the connections with previous investigations.

- **N. Defenu, and A. Codello**

  Scaling solutions in the derivative expansion,
  Phys. Rev. **D 98**, 016013 (2018).
  arXiv:1704.00528
  Author Contribution: N. Defenu derived the mathematical expressions for the flow equations, pursued the numerical calculations, analysed the results and wrote the manuscript.

- **N. Defenu, T. Enss, M. Kastner and G. Morigi**

  Dynamical Critical Scaling of Long-Range Interacting Quantum Magnets,
  Phys. Rev. Lett. **121**, 240403 (2018).
  arXiv:1805.00008
  Author Contribution: N. Defenu initiated the study by mapping the slow drive universal behaviour of the fully connected quantum Ising model to the driven quantum harmonic oscillator case. Then, he pursued both the numerical and analytical calculations, analysed the results in the light of previous investigations and substantially contributed to the draft.

- **P. M. Preiss, J. H. Becher, R. Klemt, V. Klinkhamer, A. Bergschneider, N. Defenu, and S. Jochim**

High-Contrast Interference of Ultracold Fermions,
Phys. Rev. Lett. **122**, 143602 (2019).
arXiv:1811.12939
Author Contribution: N. Defenu supported the experimental investigations with theoretical insight, deriving the exact mathematical expressions for the correlation functions of the few particle system.

- **I. G. Marian, N. Defenu, U. D. Jentschura, A. Trombettoni, I. Nándori**

  Pseudo-Periodic Natural Higgs Inflation,
  Nucl. Phys. B, **945**, 114642 (2019).
  arXiv:1705.10276
  Author Contribution: N. Defenu supported the mathematical analysis with technical knowledge on the RG approach.

- **N. Defenu, T. Enss and J. C. Halimeh**

  Criticality and Phase Dynamical criticality and domain-wall coupling in long-range Hamiltonians,
  Phys. Rev. **B 100**, 014434 (2019).
  arXiv:1902.08621
  Author Contribution: N. Defenu together with Jad C. Halimeh realised the connection between the absence of anomalous dynamical phase and absence of domain wall couplings in the Kitaev chain representation of the long-range Ising model. He performed the numerical calculations to prove the conjecture and substantially contributed to the draft.

- **V. Karle, N. Defenu, T. Enss**

  Coupled superfluidity of binary Bose mixtures in two dimensions,
  Phys. Rev. **A 99**, 063627 (2019).
  arXiv:1903.06759
  Author Contribution: N. Defenu supported the analysis with technical knowledge on the RG calculations and on the physics of topological phase transitions.

- **N. Defenu, V. Bacsó, I. G. Márián, I. Nándori, and A. Trombettoni**

  Berezinskii-Kosterlitz-Thouless transition and criticality of an elliptic deformation of the sine-Gordon model,
  J. Phys. A: Math. Theor. **52**, 345002 (2019).
  arXiv:1706.01444
  Author Contribution: N. Defenu initiated the project and supported the investigations with insight on topological phase transitions.

- **G. Bighin*, N. Defenu*, T. Enss, I. Nandori, L. Salasnich, A. Trombettoni**

  BKT-paired phase in coupled XY models,
  Phys. Rev. Lett. **123**, 100601 (2019).
  arXiv:1907.06253
  Author Contribution: N. Defenu devised the mean-field+RG approach suited to study topological phase transitions in coupled bilayer models, pursued the numerical calculations for the phase boundaries and analysed the results in comparison with exact numerical simulations. N. Defenu and G. Bighin contributed equally to the work.

- **P. A. Murthy†,*, N. Defenu†,*, L. Bayha, M. Holten, P. M. Preiss, T. Enss, and S. Jochim**

  Quantum scale anomaly and spatial coherence in a 2D Fermi superfluid,
  Science **365**, 268-272 (2019).
  arXiv:1805.04734
  † corresponding authors.
  Author Contribution: N. Defenu proposed the comparison between real-space and momentum-space profiles at different stages of the breathing motion to assess the presence of quantum anomaly corrections, contributed to the analysis of the experimental data and substantially contributed to the manuscript. N. Defenu and P. A. Murthy contributed equally to the work.

- **N. Defenu, G. Morigi, L. Dell'Anna, and T. Enss**

  Universal dynamical scaling of long-range topological superconductors,
  Phys. Rev. **B 100**, 184306 (2019).
  arXiv:1906.09425
  Author Contribution: N. Defenu conceived the study, derived the analytical expressions for the universal scaling exponent in the slow drive limit, by solving the Landau-Zener problem. He performed the numerical calculations and conceptualised the manuscript.

- **N Defenu, A. Codello, S. Ruffo, and A. Trombettoni.**

  Criticality of Spin Systems with Weak Long-Range Interactions,
  J. Phys. A: Math. Th. **53**, 143001 (2020).
  arXiv:1908.05158
  Special issue of J. Phys. A on 'Long-range Interactions and Synchronization'
  Author Contribution: N. Defenu wrote the manuscript, which summarises his previous investigations.

- **I. G. Marian, N. Defenu, U. D. Jentschura, A. Trombettoni, and I. Nandori.**

  Renormalization-Group Running Induced Cosmic Inflation,
  J. Cosmol. Astropart. Phys. **06**, 028 (2020).
  arXiv:1909.00580
  Author Contribution: N. Defenu supported the analysis with technical knowledge on the functional RG approach.

- **P. Uhrich, N. Defenu, R. Jafari, J. C. Halimeh.**

  Out-of-equilibrium phase diagram of long-range superconductors,
  Phys. Rev. **B 101**, 245148 (2020)
  arXiv:1910.10715
  Author Contribution: N. Defenu suggested the analysis, performed the calculation on the return rates of the Loschmidt echo and supported the work with knowledge on the physics of long-range interacting quantum systems.

- **W. Rzadkowski, N. Defenu, S. Chiacchiera, A. Trombettoni, G. Bighin.**

  Detecting hidden and composite orders in layered models via machine learning,
  New J. Phys. **22**, 093026 (2020)
  arXiv:1907.05417
  Author Contribution: N. Defenu supported the analysis with knowledge on critical phenomena in coupled systems.

- **I. Maccari, N. Defenu, L. Benfatto, C. Castellani, and T. Enss**

  Interplay of spin waves and vortices in the two-dimensional XY model at small vortex-core energy
  Phys. Rev. **B 102**, 104505 (2020)
  arXiv:2007.01526
  Author Contribution: N. Defenu conceived the idea and performed the RG calculations.

- **A. Colcelli, N. Defenu, G. Mussardo, A. Trombettoni**

  Finite Temperature Off-Diagonal Long-Range Order for Interacting Bosons
  Phys. Rev. **B 102**, 184510 (2020)
  arXiv:2007.01403
  Author Contribution: N. Defenu supervised the study of Off-Diagonal Long-Range Order in 2D systems.

- **N. Defenu, A. Trombettoni, D. Zappalà**

  Topological phase transitions in four dimensions
  Nucl. Phys. B **964** 115295 (2021)
  arXiv:2003.04909
  Author Contribution: N. Defenu conceived the study and performed the functional RG calculation.

- **M. Syed, T. Enss, N. Defenu**

  Dynamical quantum phase transition in a bosonic system with long-range interactions
  Phys. Rev. B **103**, 064306 (2021)
  arXiv:2007.01526
  Author Contribution: N. Defenu conceived the idea and supervised the execution of the study.

- **A. P. Millán, G. Gori, F. Battiston, T. Enss, N. Defenu**

  Complex networks with tuneable dimensions as a universality playground
  Phys. Rev. Research **3**, 023015 (2021)
  arXiv:2006.10421
  Author Contribution: N. Defenu conceived the study and supervised the entire investigation.

- **G. Giachetti, N. Defenu, S. Ruffo, A. Trombettoni**

  Self-consistent harmonic approximation with non-local couplings
  EPL, **133**, 57004 (2021).
  arXiv:2005.10827
  Author Contribution: N. Defenu first realised the discrepancy between odd and even multicritical behaviour in the large N limit and performed the functional RG calculation.

- **T. Botzung, D. Hagenmüller, G. Masella, J. Dubail, N. Defenu, A. Trombettoni, G. Pupillo**

  Effects of energy extensivity on the quantum phases of long-range interacting systems
  Phys. Rev. B **103**, 155139 (2021).
  arXiv:1909.12105
  Author Contribution: N. Defenu suggested the implementation of the Kac's rescaling and helped with the interpretation of numerical simulations.

- **N. Defenu**

  Quantum adiabatic cycles and their breakdown: an analytic solution
  Comm. Phys. **4**, 150 (2021)
  arXiv:2011.14846
  Author Contribution: single author.

- **N. Defenu**

  Metastability and discrete spectrum of long-range systems
  Proc. Nat. Acad. Sci. **118**, e210178511 (2021)
  arXiv:2012.15808
  Author Contribution: single author.

- **G. Giachetti, N. Defenu, S. Ruffo, A. Trombettoni**

  Berezinskii-Kosterlitz-Thouless phase transitions with long-range couplings
  arXiv:2104.13217
  Phys. Rev. Lett. **127**, 156801 (2021).
  Author Contribution: N. Defenu supervised the derivation and interpretation of the flow equations for long-range deformations of the BKT theory. N. Defenu substantially contributed to the writing of the manuscript.

- **A. P. Millán, R. Ghorbanchian, N. Defenu, F. Battiston, G. Bianconi**

  Local topological moves determine global diffusion properties of hyperbolic higher-order networks
  Phys. Rev. E **104**, 054302 (2021).
  arXiv:2102.12885
  Author Contribution: N. Defenu supervised the numerical analysis and contributed to the interpretation of the numerical results and to the manuscript.

- **I. G. Marian, U. D. Jentschura, N. Defenu, A. Trombettoni, I. Nandori**

  Renormalization of Field-Independent Term in the Cosmological Constant Problem
  JCAP **03** (2022) 062.
  arXiv:2107.06069
  Author Contribution: N. Defenu supervised the derivation and analysis of the renormalization group equations.

- **M. Syed, T. Enss, N. Defenu**

  Universal scaling at a pre-thermal dark state
  Phys. Rev. B **105**, 224302 (2022).
  arXiv:2112.14180
  Author Contribution: N. Defenu had the idea and supervised the execution of the analysis. He substantially contributed to the manuscript.

- **J. Alexandre, N. Defenu, G. Grigolia, I. G. Marian, D. Mdinaradze, A. Trombettoni, J. Turoci, I. Nandori**

  Quantization and renormalization of non-differentiable potentials
  JHEP **07** (2022) 012.
  arXiv:2112.14696
  Author Contribution: N. Defenu provided insight on the functional RG investigations.

- **Guido Giachetti, Andrea Trombettoni, Stefano Ruffo, Nicolò Defenu**

  BKT transitions in classical and quantum long-range systems
  Phys. Rev. B **106**, 014106 (2022).
  arXiv:2201.03650
  Author Contribution: N. Defenu supervised the investigation and substantially contributed to the manuscript.

- **N. Defenu, T. Donner, T. Macrì, G. Pagano, S. Ruffo, A. Trombettoni**

  Long-range interacting quantum systems
  Rev. Mod. Phys. **95**, 035002 (2023)
  arXiv:2109.01063
  Author Contribution: N. Defenu lead the team, assigned the tasks and wrote three entire sections of the manuscript.

- **A. Solfanelli, G. Giachetti, M. Campisi, S. Ruffo, N. Defenu**

  Quantum heat engine with long-range advantages
  New J. Phys. 25 (2023) 033030
  arXiv:2208.09492
  Author Contribution: N. Defenu supervised the entire study and substantially contributed to the manuscript.

- **G. Giachetti, N. Defenu, S. Ruffo, A. Trombettoni**

  Villain model with long-range couplings
  J. High. En. Phys. 238 (2023)
  arXiv:2209.11810
  Author Contribution: N. Defenu substantially contributed to the interpretation of the results.

- **H. P. Ojeda Collado, N. Defenu, J. Lorenzana**

  Engineering Higgs dynamics by spectral singularities
  Phys. Rev. Res. **5**, 023011 (2023)
  arXiv:2205.06826
  Author Contribution: N. Defenu suggested the study of critical quenches in the BCS model and contributed to frame the results in the context of recent cold atom experiments.

- **O. K. Diessel, S. Diehl, N. Defenu, A. Rosch, A. Chiocchetta**

  Generalized Higgs mechanism in long-range interacting quantum systems
  Phys. Rev. Res. **5**, 033038 (2023)
  arXiv:2208.10487
  Author Contribution: N. Defenu contributed to the understanding of the strong long-range regime and to the conceptualisation of the message.

- **A. Solfanelli, S. Ruffo, S. Succi, N. Defenu**

  Logarithmic, Fractal and Volume-Law Entanglement in a Kitaev chain with long-range hopping and pairing
  J. High. En. Phys. 66 (2023)
  arXiv:2301.02247
  Author Contribution: N. Defenu conceived the idea, supervised the calculation and substantially contributed to the manuscript.

- **A. Tarantola, N. Defenu**

  Softening of Majorana edge states by long-range couplings
  Phys. Rev. B **107**, 235146 (2023)
  arXiv:2301.02247
  Author Contribution: N. Defenu conceived the idea, supervised the calculation and substantially contributed to the manuscript.

- **G. Giachetti, N. Defenu**

  Entanglement propagation and dynamics in non-additive quantum systems
  Sci. Rep. **13**, 12388 (2023)
  arXiv:2112.11488
  Author Contribution: N. Defenu had the idea and supervised the execution of the analysis. He also substantially contributed to the manuscript.

- **G. Giachetti, A. Solfanelli, L. Correale, N. Defenu**

  High-order time crystal phases and their fractal nature
  Phys. Rev. B **108**, L140102 (2023)
  arXiv:2203.16562
  Author Contribution: N. Defenu had the idea and supervised the execution of the analysis. He also wrote the manuscript.

- **B. Liegeois, C. Ramasubramanian, N. Defenu**

  Tunable tachyon mass in the PT-broken massive Thirring model
  Phys. Rev. D **108**, 116014 (2023)
  arXiv:2212.08110
  Author Contribution: N. Defenu supervised the FRG study, the writing of the manuscript and substantially contributed to the presentation of the message.

- **K. Sim, N. Defenu, P. Molignini, R. Chitra**

  Quantum metric unveils defect freezing in non-Hermitian systems
  Phys. Rev. Lett. **131**, 156501 (2023)
  arXiv:2301.02247
  Author Contribution: N. Defenu had the idea to connect the metric dynamics to the Kibble-Zurek mechanism and substantially contributed to the manuscript.

- **S. Chowdhary, N. Defenu, F. Musciotto, F. Battiston**

  Funding bias: nurture European researchers' independence
  Nature **616**, 33 (2023)
  Author Contribution: N. Defenu had the idea, supported the data analysis and substantially contributed to the manuscript.

- **S. Chowdhary, N. Defenu, F. Musciotto, F. Battiston**

  Dependency of ERC-funded research on US collaborations
  Nat. Phys. **19**, 1746 (2023)
  Author Contribution: N. Defenu had the idea, supported the data analysis and substantially contributed to the manuscript.

- **I. Maccari, N. Defenu, C. Castellani, T. Enss**

  Vortex supersolid in the XY model with tunable vortex fugacity
  J. Phys.: Condens. Matter **35**, 334001 (2023)
  arXiv:2302.13712
  Author Contribution: N. Defenu contributed to the data analysis, the interpretation and substantially contributed to the manuscript.

Notes

- The symbol $*$ indicates equal contributions.
- Selecting the title or the arXiv reference shall automatically open the corresponding website.
- Complete publication list: https://orcid.org/0000-0002-3401-3665

Online Preprints on arXiv

- **N. Defenu, A. Codello**

  The fate of O(N) multi-critical universal behaviour
  arXiv:2005.10827
  Submitted to *Phys. Rev. Lett.*
  Author Contribution: N. Defenu first realised the discrepancy between odd and even multi-critical behaviour in the large N limit and performed the functional RG calculation.

- **A. Mendoza-Coto, V. Mattiello, R. Cenci, N. Defenu, L. Nicolao**

  A general theory of two-dimensional melting: the Gaussian-core model explained
  arXiv:2209.02802
  Author Contribution: N. Defenu supervised the RG study of the Gaussian core model and substantially contributed to the manuscript.

- **G. Bighin, T. Enss, N. Defenu**

  Universal scaling in fractional dimension
  arXiv:2211.13302
  Author Contribution: N. Defenu devised and supervised the study. He substantially contributed to the manuscript.

- **G. Bighin, P. A. Murthy, T. Enss, N. Defenu**

  Resonantly enhanced superconductivity mediated by spinor condensates
  arXiv:2212.07419
  Author Contribution: N. Defenu contributed to construct the idea and advised on the details of the calculation.

- **S. Gherardini, L. Buffoni, N. Defenu**

  Universal defects statistics with strong long-range interactions
  arXiv:2305.11771
  Author Contribution: N. Defenu ideated the study, performed the theoretical analysis and substantially contributed to the manuscript.

- **A. Solfanelli, S. Ruffo, S. Succi, N. Defenu**

  Stabilization of Discrete Time-Crystaline Response on a Superconducting Quantum Computer by increasing the Interaction Range
  arXiv:2305.14426
  Author Contribution: N. Defenu contributed to the original idea of the study, supervised the numerical and experimental simulation and contributed to the manuscript.

- **N. Defenu, A. Lerose, S. Pappalardi**

  Out-of-equilibrium dynamics of quantum many-body systems with long-range interactions
  arXiv:2307.04802
  Author Contribution: N. Defenu led the collaboration, wrote the second chapter of the review and substantially contributed to introduction, conclusions and chapter 5.

- **G. Giachetti, N. Defenu**

  On the Conditions for a Quantum Violent Relaxation
  arXiv:2312.14768
  Author Contribution: N. Defenu helped conceiving the study, supervised the theoretical analysis and substantially contributed to the manuscript.

- **M. Sarkar, T. Enss, N. Defenu**

  Universality of critical dynamics on a complex network
  arXiv:2401.00092
  Author Contribution: N. Defenu conceived the original idea and supervised the numerical study.

Activities

- **Selected Invited Speakers**
  - *Conference on Long-Range-Interacting Many Body Systems.*, 25th–29th July 2016, ICTP, Trieste.
  - *CQD mini symposium*, April 19th–20th, 2017, Physikalisches Institut, Heidelberg.
  - *Stochastic Dynamics Out of Equilibrium.*, 24th–05th April-May 2017, Inst. Henri Poincare, Paris.
  - *Quantum Many-Body Systems out-of-equilibrium*, 12th–16th Mar. 2018, NITheP, South Africa.
  - *Quantum Paths*, 28th–1st May-June 2018, Erwin Schrödinger Institute, Vienna.
  - *EXPLORING NUCLEAR PHYSICS WITH ULTRACOLD ATOMS*, 8th–12th July 2019, ECT*, Trento.
  - *QUANTUM AND CLASSICAL SYSTEMS WITH LONG-RANGE INTERACTIONS*, 15th–19th July 2019, International Institute of Physics, IIP (Natal).
  - *Functional RG methods-Italian Meeting*, 16th–20th Sept. 2019, ECT*, Trento, Italy.
  - *FRGIM@Trieste*, 26th Sept. 2019, SISSA, Trieste, Italy.
  - *Exact Renormalization Group 2020*, 2th–6th Nov. 2020, Yukawa Inst. Th. Phys., Kyoto University.
  - *Non-Equilibrium Universality: From Classical to Quantum and Back*, 13th-Sep. to 8th-Oct., 2021, KITP, UCSB.

- **Scientific Visits**
  - *MTA Atomki, Hungarian Academy of science*, Debrezen.
    Repeated visits staring from December 2014. Seminar Presentation.
  - *International Institute of Physics*, Natal (Brasil),
    1-7 December 2013, Natal. Seminar Presentation.
  - *Theoretical Quantum Physics Group*, Universitaat des Saarlandes,
    Repeated visits staring from February 2016.
  - *La Sapienza University*, Rome,
    Repeated visits staring from March 2016. Seminar Presentation.
  - *International School for Advanced Studies, SISSA*, Trieste,
    Repeated visits staring from January 2017. Seminar Presentation.
  - *ETH*, Zürich,
    02nd–04th October 2017, Zürich. Seminar Presentation.
  - *University of Colorado, Boulder, JILA*,
    09th–12th October 2017, Boulder. Seminar Presentation.
  - *Los Alamos National Laboratory, LANL*,
    13th–25th October 2017, Los Alamos. Seminar Presentation.
  - *Boston University, BU*,
    3rd–17th May 2018, Boston.
  - *Weizmann Institute of Science*,
    Rehovot, Israel. Repeated visits starting from November 2018. Seminar Presentation.
  - *Massachusetts Institute of Technology, MIT*,
    22th–30th April 2019, Boston, USA.
  - *Simons Center for Geometry and Physics, SCGP*,
    1st–2nd May 2019, Stony Brook, USA. Seminar Presentation.
  - *Georgetown University, GU*,
    3rd–6th May 2019, Washington, USA. Invited Seminar.
  - *Swinburne University of Technology, SUT*,
    20th–24th January 2020, Melbourne, Australia. Seminar Presentation.