Alessandro Camilletti

Nationality: Italian **Date of birth:** 26/08/1992 **Phone number:** (+39) 3406533563

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ABOUT ME

I am a researcher at Fondazione Bruno Kessler, working on AI-methods for seasonal weather forecasting.

During my PhD in Physics, I focused on the setup and analysis of numerical relativity simulations of binary neutron star mergers under the supervision of Albino Perego. My work included an in-depth analysis of the binary neutron star merger observed by the LIGO-Virgo collaboration on April 25, 2019, aiming to address some open questions surrounding this peculiar event. In another study, I investigated the properties of the accretion disks formed during neutron star mergers under different conditions.

I am part of the CoRe collaboration, a collaborative research effort among scientists from the University of Jena (Germany), the Federal University of ABC (Brazil), The Pennsylvania State University (USA), Florida Atlantic University (USA), the University of Trento, and INFN (Italy). The collaboration focuses on performing 3+1 numerical relativity simulations of compact binary spacetimes, supporting the advancing fields of gravitational wave and multi-messenger astronomy.

CURRENT POSITION

[01/02/2024 – Current]

Researcher at Fondazione Bruno Kessler

Researcher (ricercatore terzo livello) working on AI-methods for seasonal weather forecasting.

Experience:

- Data science and machine learning
- Climate science

EDUCATION AND TRAINING

PhD in Physics

University of Trento [01/11/2019 – 19/06/2024]

City: Trento | **Country:** Italy | **Field(s) of study:** Natural sciences, mathematics and statistics: • Physics

Numerical relativity simulations of binary neutron star mergers in the context of multimessenger astrophysics.

Thesis Title: Neutron Star Mergers at the Dawn of Multimessenger Astrophysics: massive binaries, accretion disks and phase transitions

Supervisor: Albino Perego

Master Degree in Theoretical Physics with honors

University of Rome "La Sapienza" [10/2018 – 12/2019]

City: Roma | **Country:** Italy | **Level in EQF:** EQF level 7

Thesis Title: Constraint algebra for a black hole in Quantum-Reduced Loop Gravity

Supervisors: Daniele Pranzetti (Perimeter Institute), Giovanni Montani (Enea / Sapienza)

Co-Examiner: Guido Martinelli (Sapienza)

Selected Courses:

- Quantum Field Theory
- General Relativity
- Riemmanian and Differential Geometry
- Canonical Quantum Gravity
- Quantum Information and Computation

Visiting student

Perimeter Institute [05/2019 – 06/2019]

City: Waterloo | **Country:** Canada

- Master Thesis
- Talks and Conferences

Bachelor Degree

University of Rome "La Sapienza" [2012 – 2017]

City: Rome | **Country:** Italy | **Field(s) of study:** Physical sciences | **Level in EQF:** EQF level 6

Thesis Title: Extension of Hamilton principle and Noether theorem to non-conservative field theory
Thesis Advisor: Paolo Pani (La Sapienza)

PUBLICATIONS

[2024]

Geometric and Thermodynamic Characterization of Binary Neutron Star Accretion Discs
A. Camilletti, F. M. Guercilena, A. Perego, S. Bernuzzi; D. Radice

[2022]

Numerical Relativity Simulations of The Neutron Star Merger GW190425: Microphysics and Mass Ratio Effects
A. Camilletti, L. Chiesa, G. Ricigliano, A. Perego, L. C. Lippold, S. Padamata, S. Bernuzzi, D. Radice, D. Logoteta, F. M. Guercilena

[2024]

Kilohertz Gravitational Waves From Binary Neutron Star Mergers: Numerical-relativity Informed Postmerger Model
M. Breschi, S. Bernuzzi, K. Chakravarti, A. Camilletti, A. Prakash, A. Perego

[2023]

Second Release of the CoRe Database of Binary Neutron Star Merger Waveforms
A. Gonzalez, F. Zappa, M. Breschi, S. Bernuzzi, D. Radice, A. Adhikari, A. Camilletti, S. Vivekanandji Chaurasia, G. Doulis, S. Padamata, A. Rashti, M. Ujevic, B. Brügmann, W. Cook, T. Dietrich, A. Perego, A. Poudel, W. Tichy

CONFERENCES AND SEMINARS

[28/08/2024 – 31/08/2024] Trento, Italy

AIWCAST24: Artificial Intelligence for Weather and Climate Autumn School 2024
Assistant during the lectures and hands-on sessions.
School Topics:

- AI models for Weather Forecasts
- Foundation Model
- Precipitation nowcasting models

Link: https://dsip.fbk.eu/aiwcas2024/

[19/12/2023 – 21/12/2023] Naples

Speaker at TEONGRAV INFN meeting

Talk title: Dynamics and thermodynamics of accretion discs from numerical relativity simulations of neutron star mergers

Conference Topics:

- Model of black holes
- Neutron stars, pulsars and kilonovae
- Model beyond general relativity and exotic compact objects
- Tests of gravity, numerical simulations and observable measurements

Link: https://sites.google.com/physics.cz/2023-teongrav-meeting-napoli/program

[24/10/2023 – 27/10/2023] Pisa, Italy

Poster Presentation at GraSP23: Gravity Shape Pisa 2023:

Poster title: Characterization of accretion discs from binary neutron star mergers.

Conference topics:

- Compact Objects (Neutron Stars, Black Holes)
- Constraints on Gravity Theories
- Gravity in the Solar System

Link: https://agenda.infn.it/event/35400/overview

[11/09/2023 – 15/09/2023] Trento

Speaker at "MICRA2023: microphysics in computational relativistic astrophysics"

Talk title: Dynamics and thermodynamics of accretion discs from numerical relativity simulations of neutron star mergers

Conference Topic: microphysics needs of relativistic simulations of astrophysical systems, such as core-collapse supernovae, compact object mergers, and gamma-ray bursts.

Link: https://indico.ectstar.eu/event/178/

[28/11/2022 – 01/12/2022] WE-Heraus Seminar, Bad Honnef, Germany

Best Poster Prize winner at WE-Heraus Seminar

Poster title: Numerical relativity simulations of the neutron star merger GW190425

Conference Topic: Kilonova: Multimessenger and Multiphysics

[04/09/2022 – 09/09/2022] Oléron, France

Joliot-Curie School "Nuclear Matter under Pressure"

School Topics:

- From high-energy lepton scattering to nucleon pressure

- Exclusive reactions as a nuclear manometer
- Giant resonance properties and the nuclear equation of state
- From transport properties to the nuclear equation of state: an experimental survey in the Fermi energy range
- Nuclear equation of state from ground and excited state properties of nuclei
- Binary Neutron Star Mergers and Nuclear Physics
- Neutron star observations and extreme matter properties

Lecturers:

- Bruno Giacomazzo: Binary Neutron Star Mergers and Nuclear Physics
- Anna Watts: Neutron star observations and extreme matter properties
- Xavier Roca-Maza: Nuclear equation of state from ground and excited state properties of nuclei
- Nicole d'Hose: From high-energy lepton scattering to nucleon pressure
- Hervé Moutarde: Exclusive reactions as a nuclear manometer
- Julien Gibelin: Giant resonance properties and the nuclear equation of state
- Olivier Lopez: From transport properties to the nuclear equation of state: an experimental survey in the Fermi energy range

Link: https://ejc2022.sciencesconf.org

[25/07/2022 – 29/07/2022] University of Jena, Jena, Germany

Speaker at "Frontiers in Numerical Relativity"

Talk Title: Numerical relativity simulations of the neutron star merger GW190425: microphysics and mass ratio effects

Conference Topics:

- Mathematical foundations
- Numerical methods for the Einstein equations
- High performance computing
- Astrophysics (binary mergers, gravitational waves, counterparts)
- Beyond current astrophysics and general relativity

[20/06/2022 – 24/06/2022] ECT*, Trento, Italy

ECT* Workshop "Neutron stars as multi-messenger laboratories for dense matter"

[06/2019] Penn State University, USA

Loops'19 Conference

Conference Topics:

- Covariant & Canonical LQG
- Quantum Gravity Phenomenology
- Loop Quantum Cosmology
- Quantum Black Holes
- Classical and Quantum Gravity

Link: https://igc.psu.edu/os/events/loops19/

[06/2019] Bard, New York, USA

Bard Summer School on Quantum Gravity

School Topics:

- Quantum Field Theory in Curved Spacetimes
- 3D Gravity and Quantum Groups
- Edge Modes, Soft Modes, & Quantum Gravity

- Covariant Loop Quantum Gravity
- Quantum Cosmology

Lecturers:
- Ivan Agullo
- Maïté Dupuis
- Laurent Freidel
- Carlo Rovelli
- Ed Wilson-Ewing

Link: https://faculty.bard.edu/hhaggard/qgsummer

WORK EXPERIENCE

Assistant lecturer
Università della Tuscia [10/2019 – 12/2019]

City: Viterbo | **Country:** Italy

Delivered lectures on Python for scientific programming as part of the engineering curriculum at the University of Tuscia.

Collaboration Grants
University of Rome "La Sapienza" [10/2017 – 01/2019]

Country: Italy

Electromagnetism and Thermodynamics laboratory assistant for the bachelor in physics.

Programmer and Founder
ByTek Marketing [2015 – 2018]

City: Viterbo | **Country:** Italy

Developed Skills:
- Programming in different languages for data collection and processing
- Team management
- Project management

Programmer and Web Developer
CloudWorks [2013 – 2015]

City: Roma | **Country:** Italy

LANGUAGE SKILLS

Mother tongue(s): Italian

Other language(s):

English

LISTENING B2 **READING** B2 **WRITING** B2

SPOKEN PRODUCTION B2 **SPOKEN INTERACTION** B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user