

# Antonio Michele Miti

*Ricercatore in Matematica, specializzato in geometria differenziale (con focus sulla geometria multisimplessica) e sulle sue applicazioni alla fisica matematica.*



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## Esperienze di Ricerca

**CIVIS-3i postdoctoral fellow** 02/2024 – Oggi  
Sapienza Università di Roma;

Progetto di ricerca (MSCA-H2020 cofund) sulle applicazioni della geometria multisimplessica agli osservabili di campo classico.

**Assegno di ricerca** 10/2022 – 01/2024

Università Cattolica del Sacro Cuore, Brescia;

Progetto di ricerca incentrato sulla geometria (multi)-simplettica sulle sue applicazioni.

**MPIM postdoctoral fellow** 10/2021 – 09/2022

Max Planck Institute for Mathematics, Bonn;

Progetto di ricerca che intreccia strutture superiori con applicazioni alla geometria multisimplessica.

## Formazione

**Dottorato di ricerca in Science: Mathematics** 04/2021

Università Cattolica del Sacro Cuore, KU Leuven;

Borsa di studio quadriennale nell'ambito del *Joint International Doctoral Program in Science* con il progetto *Multi-symplectic geometry and applications to modern physics*. Ho trascorso i primi 21 mesi della borsa presso UCSC e i successivi 30 mesi presso KU Leuven.

Supervisor: Mauro Spera, Marco Zambon.

Tesi: Homotopy comomentum maps in multisymplectic geometry.

**Laurea Magistrale in Fisica** 11/2015

Università degli Studi di Milano;

Curriculum in Fisica Teorica con enfasi in: Fondamenti e Metodi Matematici in Fisica, Meccanica Geometrica, Teoria Algebrica dei Campi, Metodi Computazionali.

Supervisor: Claudio Dappiaggi, Livio Pizzocchero.

Tesi: Quantizzazione algebrica dei campi di Jacobi e approccio geometrico alle parentesi di Peierls.

## Esperienze Professionali

**Stage programmazione Java** 03/2016 – 07/2016

CST s.r.l, Milano;

Formazione nel linguaggio di programmazione Java e negli strumenti professionali per lo sviluppo software.

**Collaboratore SysAdmin** 05/2014 – 02/2015

LCM - Laboratorio di Calcolo e Multimedia, UniMI;

Manutenzione dei cluster di computer LCM. Tutoraggio: installazione e configurazione del sistema operativo Linux, corsi di fisica computazionale.

## Abilitazioni

**Maître de conférences (section 25)** 02/2022  
nr. 22225373453.

## Lingue

**Italiano** Nativo

**Inglese** Toefl-IBT : 102/120 (apr-18)

**Francese** Principiante

## Competenze Informatiche

C/C++	<div><div></div></div>
Python	<div><div></div></div>
Haskell	<div><div></div></div>
Cuda	<div><div></div></div>
Java	<div><div></div></div>
Mathematica	<div><div></div></div>
LaTeX	<div><div></div></div>
Linux (Sysadmin)	<div><div></div></div>
Windows (Sysadmin)	<div><div></div></div>
Elettronica embedded	<div><div></div></div>
Assemblaggio PC	<div><div></div></div>
Infrastrutture rete	<div><div></div></div>

## Affiliazioni

**Ricercatore MSCA (assegnista)** 02/2024

Università di Roma la Sapienza, Dipartimento di Matematica;

**Membro di Project émergent: Higher structures in differential geometry** 01/2023

Labex MiLyon, Lyon, France;

**Membro GNSAGA - Geometria differenziale** 01/2017  
INDAM;

## Premi & Finanziamenti

**Mensilità Estero** 03/2023  
INDAM;

Borsa di ricerca (3000 euro) a supporto di un periodo di ricerca in Francia.

**Research Fellowships** 05/2021  
Polish academy of Sciences, EIMI Saint Petersburg;

Rifiutate a causa di incompatibilità.

**Borse di Dottorato** 10/2016  
Università degli studi di Udine, University of Minho (Map-PDMA);  
Rifiutate a causa di incompatibilità.

**Premio di Studio e Laurea** 12/2015  
BCC di Carugate e Inzago;  
Premio di 1200 euro per laureati con il massimo dei voti dell'anno accademico 15-16.

## Interessi di ricerca

Sono un geometra differenziale che lavora principalmente con metodi algebrici applicati alla geometria (multi)simplessica. Mi interesso di meccanica geometrica, teorie classiche dei campi, quantizzazione e algebra omotopica. In particolare, sono interessato alle strutture geometriche e omotopiche ispirate dalla fisica teorica.

**Parole chiave:** *Geometria differenziale, Geometria multisimplessica,  $L_\infty$ -algebre, Strutture superiori, Fondamenti assiomatici della fisica, Meccanica geometrica dei sistemi di campi, Quantizzazione geometrica e algebrica, Metodi categoriali e coomologici in geometria e fisica teorica.*

## Pubblicazioni & Preprints

1. Miti, A. M. & Zambon, M. Observables on multisymplectic manifolds and higher Courant algebroids. *Communications in Contemporary Mathematics*, 1–48. ISSN: 0219-1997. arXiv: 2209.05836. <http://arxiv.org/abs/2209.05836><https://www.worldscientific.com/doi/10.1142/S0219199725500063> (2024).
2. Blacker, C., Miti, A. M. & Ryvkin, L. Reduction of  $L_\infty$ -algebras of observables on multisymplectic manifolds. *Symmetry, Integrability and Geometry: Methods and Applications*. ISSN: 18150659. arXiv: 2206.03137. <https://www.emis.de/journals/SIGMA/2024/061/> (2024).
3. Miti, A. M. & Spera, M. A Hydrodynamical Homotopy Co-momentum Map And A Multisymplectic Interpretation Of Higher-order Linking Numbers. *Journal of the Australian Mathematical Society*, 1–20. ISSN: 1446-7887. arXiv: 1805.01696. <https://www.cambridge.org/core/product/identifier/S1446788720000518/type/journal%5Farticle> (2021).
4. Miti, A. M. & Ryvkin, L. Multisymplectic actions of compact Lie groups on spheres. *Journal of Symplectic Geometry* **18**, 1751–1785. ISSN: 15275256. arXiv: 1906.08790. <https://www.intlpress.com/site/pub/pages/journals/items/jsg/content/vols/0018/0006/a006/> (2020).
5. Miti, A. M. & Spera, M. Derivation of the HOMFLYPT knot polynomial via helicity and geometric quantization. *Bollettino dell'Unione Matematica Italiana*. ISSN: 1972-6724. arXiv: 1910.13400. <http://link.springer.com/10.1007/s40574-020-00254-5> (2020).
6. Luongo, A., Miti, A. M., Narasimhachar, V. & Sireesh, A. Measurement-based uncomputation of quantum circuits for modular arithmetic. arXiv:2407.20167. arXiv: 2407.20167. <https://arxiv.org/abs/2407.20167> (July 2024).
7. Miti, A. M. *Homotopy comomentum maps in multisymplectic geometry* Doctoral thesis (Università Cattolica del Sacro Cuore & KU Leuven, 2021). <https://arxiv.org/abs/2105.05645>.

## Insegnamento

### Reduction of (multi)-symplectic observables

AA: 23–24

Università degli Studi di Salerno;

Mini-corso per una conferenza con Leonid Ryvkin.

### Elementi di Geometria Superiore

AA: 17–18, 22–23, 23–24

Università Cattolica del Sacro Cuore, Brescia;

Esercitatore (15 ore). Prof: Mauro Spera.

### Geometrie e topologia differenziale

AA: 17–18

Università Cattolica del Sacro Cuore, Brescia, Italy;

Esercitatore (10 ore). Prof: Mauro Spera.

## Seminari

### Invited Talk: Symmetries and reduction of multisymplectic manifolds

09/2024

Université Claude-Bernard Lyon 1, Lyon, France;

### Invited Talk: Multisymplectic approach to LFT and the Stress-Energy tensor

05/2024

Università di Torino, Turin, Italy;

### Invited Talk: Multisymplectic observables and higher Courant algebroids

05/2024

Università di Napoli Federico II, Napoli, Italy;

### Invited Talk: Multisymplectic observables and higher Courant algebroids

03/2024

INFN, Caprarola, Italy;

### Invited Talk: Multisymplectic observables and higher Courant algebroids

09/2023

University of Würzburg, Würzburg, Germany;

### Invited Talk: Multisymplectic observables and higher Courant algebroids

07/2023

University of Göttingen, Göttingen, Germany;

<b>Contributed Talk: The multisymplectic structure of Lagrangian field theories</b> <i>University of Göttingen, Göttingen, Germany;</i>	07/2023
<b>Invited Talk: Symmetries and reduction of multisymplectic manifolds</b> <i>University of Pavia, Pavia, Italy;</i>	04/2023
<b>Contributed Talk: Symmetries and reduction of multisymplectic manifolds</b> <i>KU Leuven, Leuven, Belgium;</i>	03/2023
<b>Contributed Talk: On the Lie infinity algebra associated to higher Courant algebroids</b> <i>Université Claude-Bernard Lyon 1, Lyon, France;</i>	02/2023
<b>Contributed Talk: First steps in geometric quantum mechanics</b> <i>Università Cattolica del Sacro Cuore, Brescia, Italy;</i>	01/2023
<b>Invited Talk: Multisymplectic observables and higher Courant algebroids</b> <i>Université Claude-Bernard Lyon 1, Lyon, France;</i>	12/2022
<b>Invited Talk: Symmetries and reduction of multisymplectic manifolds</b> <i>ESI, Wien, Austria;</i>	08/2022
<b>Invited Talk: Symmetries and reduction of multisymplectic manifolds</b> <i>University of Brescia, Brescia, Italy;</i>	06/2022
<b>Contributed Talk: Lie infinity structures via the Nijenhuis-Richardson algebra</b> <i>University of Göttingen, Online, -;</i>	06/2022
<b>Contributed Talk: Symmetries and reduction of multisymplectic manifolds</b> <i>MPIM, Bonn, Germany;</i>	04/2022
<b>Contributed Talk: Morphisms and Yoneda lemma for stacks</b> <i>MPIM, Bonn, Germany;</i>	03/2022
<b>Contributed Talk: Gauge transformations of multisymplectic manifolds and L-infinity observables</b> <i>MPIM, Bonn, Germany;</i>	12/2021
<b>Contributed Talk: Gauge transformations of multisymplectic manifolds and L-infinity observables</b> <i>EIMI, Online, -;</i>	07/2021
<b>Contributed Talk: What is... Geometric Mechanics?</b> <i>KU Leuven, Leuven, Belgium;</i>	04/2021
<b>Contributed Talk: Homotopy co-moment maps for compact actions on spheres</b> <i>KU Leuven, Leuven, Belgium;</i>	09/2020
<b>Contributed Talk: Gauge transformations of multisymplectic manifolds and <math>L_\infty</math> observables</b> <i>KU Leuven, Leuven, Belgium;</i>	05/2020
<b>Poster: MultiSymplectic manifolds and homotopy co-momentum maps</b> <i>University of Luxembourg, Luxembourg, Luxembourg;</i>	12/2019
<b>Invited Talk: Multisymplectic Geometry and Knots</b> <i>Università degli Studi di Salerno, Fisciano, Italy;</i>	03/2019
<b>Contributed Talk: (An introduction to )MultiSymplectic Geometry and Classical Field systems</b> <i>KU Leuven, Leuven, Belgium;</i>	02/2019
<b>Contributed Talk: A Homotopy co-momentum Map in Hydrodynamics</b> <i>University of Coimbra, Coimbra, Portugal;</i>	12/2018
<b>Invited Talk: On some (multi)symplectic aspects of link invariants</b> <i>KU Leuven, Leuven, Belgium;</i>	05/2018
<b>Contributed Talk: On the Convenient Category of Diffeological Spaces</b> <i>Università Cattolica del Sacro Cuore, Brescia, Italy;</i>	01/2018
<b>Contributed Talk: An Invitation to Geometric Mechanics</b> <i>Università Cattolica del Sacro Cuore, Brescia, Italy;</i>	11/2017
<b>Poster: Multi-symplectic Geometry and Covariant Phase Space</b> <i>ICMAT, Madrid, Spain;</i>	06/2017

- Contributed Talk: Covariant Phase Space Via Multisymplectic Geometry** 05/2017  
*Università Cattolica del Sacro Cuore, Brescia, Italy;*
- Invited Talk: Runde Summer 2016: Demystifying the Peierls' Brackets Construction** 07/2016  
*IMPRS, Mathematics in the Sciences, Leipzig, Germany;*

## Soggiorni di Ricerca

- Institut Camille Jordan, Université Lyon 1** 12/2023 – 2/2024  
 Mensalità estero INDAM, collaborazione con il gruppo di fisica matematica.
- Department of Mathematics, University of Göttingen** 07/2023  
 Collaborazione con F. Zanella e seminari di ricerca.
- Department of Mathematics, KU Leuven** 03/2023  
 Collaborazione con G. Sevestre e GMC workshop.
- Institut Camille Jordan, Université Lyon 1** 12/2022 – 02/2023  
 Collaborazione con il gruppo di fisica matematica.
- Erwin Schrödinger International Institute for Mathematics and Physics** 08/2022  
 Programma tematico: Higher Structures and Field Theory.
- Department of Mathematics, Università degli studi di Salerno** 03/2019  
 Collaborazione con il gruppo di geometria e seminari di ricerca.

## Organizzazione Eventi

- Reading course on the diffeological structure of Classical Field Theory** 10/2024 – 12/2024  
*Institut Camille Jordan, Université Claude-Bernard Lyon 1;*
- Workshop on Multisymplectic Structures in Geometry and Physics** 01/2024  
*Institut Camille Jordan, Université Claude-Bernard Lyon 1;*
- Workshop on multisymplectic geometry** 09/2020  
*KU Leuven, Belgium;*

## Formazione Post-laurea

### • Algebra & Geometria

- School: Higher Structures in Geometry and Mathematical Physics** 04/2023  
*CIRM, Marseille, France;*
- School: Bicategories, categorification and quantum theory** 07/2022  
*University of Leeds, Leeds, UK;*
- Reading Course: Reading Seminar on Differentiable Stacks** 03/2022  
*MPIM, Bonn, Germany;*
- Ph.D. Course: Toposes as Bridges - a short course** 02/2022  
*Warwick University, Online, -;*
- School: Summer School in Algebra and Topology** 09/2019  
*UCLouvain, Louvain la Neuve, Belgium;*
- School: XXII Summer Diffiety School** 07/2019  
*Diffiety Institute association and Levi-Civita association, Lizzano in Belvedere, Italy;*
- Ph.D. Course: Introduction to Motivic Homotopy Theory** 02/2019  
*Università di Verona, Verona, Italy;*
- Ph.D. Course: Cartan's theory of local symmetries** 11/2018  
*KU Leuven, Leuven, Belgium;*
- Ph.D. Course: Symplectic and Poisson geometry** 10/2018  
*ULB, Bruxelles, Belgium;*
- School: Summer School on Poisson Geometry** 07/2018  
*Fields Institute for Research in Mathematical Sciences, Toronto, Canada;*
- School: Diffeology, Categories and Toposes and Non-commutative Geometry** 06/2018  
*Nesin Mathematics Village, Sirince, Turkey;*

- Ph.D. Course: Classical and Quantum Knots** 02/2018  
*Università degli Studi di Milano Bicocca, Università degli Studi di Pavia, Milan, Italy;*
- Master Course: Category Theory** 09/2017  
*Università degli Studi di Milano, Milan, Italy;*
- Ph.D. Course: Topics in Symplectic and Multi-symplectic Geometry** 01/2017  
*Università Cattolica del Sacro Cuore, Brescia, Italy;*
- School: Geometric Cauchy problems on Lorentzian manifolds** 07/2016  
*University of Regensburg, Regensburg, Germany;*
- School: XIX Summer Diffiety School** 07/2016  
*Diffiety Institute association and Levi-Civita association, Lizzano in Belvedere, Italy;*

- **Fisica Matematica**

- School: Interactions between Poisson Geometry and Quantisation** 03/2023  
*University of Göttingen, Göttingen, Germany;*
- School: 11th International Summer School on Geometry, Mechanics and Control** 06/2017  
*ICMAT, Madrid, Spain;*
- School: Causal Fermion Systems** 03/2016  
*University of Regensburg, Regensburg, Germany;*

- **Calcolo Scientifico**

- Industry Course: Functional Programming and Domain-Specific Languages** 10/2019  
*KU Leuven, Leuven, Belgium;*
- Ph.D. Course: Scientific computing with Python** 06/2018  
*Università Cattolica del Sacro Cuore, Brescia, Italy;*
- Ph.D. Course: Tools making research easy** 05/2018  
*Università Cattolica del Sacro Cuore, Brescia, Italy;*
- Ph.D. Course: Computational methods for the solution of Differential Equations** 02/2018  
*Università Cattolica del Sacro Cuore, Brescia, Italy;*
- Training Course: Python for computational science** 02/2017  
*CINECA-SCAI, Milan, Italy;*
- Training Course: Introduction to Scientific and Technical Computing in C++** 03/2016  
*CINECA-SCAI, Milan, Italy;*
- Training Course: Introduction to Scientific Programming using GPGPU and CUDA** 03/2014  
*CINECA-SCAI, Milan, Italy;*

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## Conferenze selezionate

- Conference: Focus Program on Poisson Geometry** 07/2024  
*Università di Napoli Federico II, Napoli, Italy;*
- Workshop: Geometric conservation laws in physics** 05/2024  
*Università di Torino, Turin, Italy;*
- Workshop: Higher structures in Caprarola** 02/2024  
*INFN, Caprarola, Italy;*
- Workshop: Poisson Geometry, Higher Structures, and Deformation Theory** 09/2023  
*University of Würzburg, Würzburg, Germany;*
- Workshop: Dg-manifolds in Geometry and Physics** 07/2023  
*IHP, Paris, France;*
- Workshop: Higher structures and field theory** 08/2022  
*ESI, Wien, Austria;*
- Workshop: Workshop on Foundations and Constructive Aspects of Quantum Field Theory** 06/2022  
*FAU-Erlangen-Nurnberg, Erlangen, Germany;*

<b>Conference: Supergeometry, supersymmetry and quantization</b> <i>University of Luxembourg, Luxembourg, Luxembourg;</i>	12/2019
<b>Conference: Souriau 2019</b> <i>Universite' Paris-Diderot, Paris, France;</i>	05/2019
<b>Conference: Higher Homotopy Algebras in Topology</b> <i>MPIM-Bonn, Bonn, Germany;</i>	05/2019
<b>Workshop: Higher Geometric Structures along the Lower Rhine XII</b> <i>Radboud University Nijmegen, Nijmegen, Netherlands;</i>	01/2019
<b>Workshop: The Noether Theorems, a hundred years later</b> <i>Institut Henri Poincare', Paris, France;</i>	01/2019
<b>Workshop: Poisson Geometry and Higher Structures</b> <i>Istituto Nazionale di Alta Matematica, Rome, Italy;</i>	09/2018
<b>Workshop: Workshop on MultiSymplectic Geometry and Applications</b> <i>Institut Elie Cartan Lorraine, Metz, France;</i>	09/2018
<b>Conference: Focus Program on Poisson Geometry and Physics</b> <i>Fields Institute for Research in Mathematical Sciences, Toronto, Canada;</i>	07/2018
<b>Workshop: Formal Theory of PDEs</b> <i>Universita' degli Studi di Salerno, Fisciano, Italy;</i>	11/2017
<b>Conference: PADGE 2017</b> <i>KU Leuven, Leuven, Belgium;</i>	08/2017

LIONE, 28/11/24  
Antonio Miti