

# Vittorio Cipriani - Curriculum Vitae

ADDRESS: Institut für Diskrete Mathematik und Geometrie, Technische Universität Wien (TU Wien)

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NATIONALITY: Italian

## Education

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05/23 *PhD in Computer Science, Mathematics and Physics, University of Udine, Italy*

Dissertation title: "Many problems, different frameworks: classification of problems from computable analysis to algorithmic learning theory". Supervised by Alberto Marcone and Luca San Mauro

09/19 *MSc in Computer Science, University of Camerino, Italy (last year at TU Wien)*

Dissertation title: "Algorithmic Learning of Computable Structures". Supervised by Ekaterina Fokina, Luca San Mauro and Carlo Toffalori. Grade: 110 with distinction out of 110

07/17 *BSc in Computer Science, University of Camerino, Italy*

Dissertation title: "Towards a Workbench for Topological Data Analysis". Supervised by Emanuela Merelli. Grade: 110 with distinction out of 110

## Positions

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09/23- Technische Universität Wien, Institut für Diskrete Mathematik und Geometrie  
Postdoctoral fellow

## Net Research Experience

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Total: 5 years and 1 month.

- Before PhD 3 years and 1 month of research

PhD program duration: 6 semester and 1 trimester full-time, with 2 months dedicated to teaching duties and training.

- After PhD 2 years of research

## Research Interests

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KEYWORDS: Computable analysis, Weihrauch reducibility, computability theory, algorithmic learning theory, computable structure theory, descriptive set theory.

MAIN RESULTS:

- Studied connections between reverse mathematics and Weihrauch reducibility, leading to the first systematic study of theorems at the level of  $\text{II}_1^1$ -CA<sub>0</sub> (see [3] below).
- Investigated various graph theoretic problems through the lenses of Weihrauch reducibility and (effective) descriptive set theory (see [4,5] below).
- Introduced and developed the novel framework of *E*-learnability allowing to calibrate the complexity of (non) learnable families of structures and revealing unexpected connections among algorithmic learning theory and descriptive set theory (see [1,2,6,7] below).

## Publications and ongoing research

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- [1] Calculating the Mind Change Complexity of Learning Algebraic Structures (with Bazhenov and San Mauro). In: Berger, U., Franklin, J.N.Y., Manea, F., Pauly, A. (eds) Revolutions and Revelations in Computability. CiE 2022. Lecture Notes in Computer Science, vol 13359, [https://doi.org/10.1007/978-3-031-08740-0\\_1](https://doi.org/10.1007/978-3-031-08740-0_1);
- [2] Learning algebraic structures with the help of Borel equivalence relations (with Bazhenov and San Mauro). In Theoretical Computer Science, 2023, <https://doi.org/10.1016/j.tcs.2023.113762>. Available at <https://arxiv.org/abs/2110.14512>;
- [3] The Weihrauch lattice at the level of  $\mathbf{\Pi}_1^1 - \text{CA}_0$ : the Cantor-Bendixson theorem (with Marcone and Valenti). In *The Journal of Symbolic Logic*, 2025, doi:10.1017/jsl.2024.72. Available at <https://arxiv.org/abs/2210.15556>;
- [4] The complexity of finding supergraphs (with Pauly), In: Della Vedova, G., Dundua, B., Lempp, S., Manea, F. (eds) Unity of Logic and Computation. CiE 2023. Lecture Notes in Computer Science, vol 13967. Springer, Cham., [https://doi.org/10.1007/978-3-031-36978-0\\_15](https://doi.org/10.1007/978-3-031-36978-0_15).
- [5] Embeddability of graphs and Weihrauch degrees (with Pauly), In *Journal of Mathematical Logic* 2025, <https://doi.org/10.1016/j.tcs.2023.113762>. Available at <https://arxiv.org/abs/2305.00935>;
- [6] Classifying different criteria for learning algebraic structures (with Bazhenov, Jain, San Mauro and Stephan), In *Annals of Pure and Applied Logic*, <https://doi.org/10.1016/j.apal.2025.103648>. Available at <https://arxiv.org/abs/2410.22933>;
- [7] On the learning power of Friedman-Stanley jumps (with Marcone and San Mauro), *submitted for publication*. Available at <https://www.arxiv.org/pdf/2501.12846>;
- [8] On statistical learning of graphs (with Delle rose, San Mauro and Soldà), *submitted for publication*;
- [9] Hyperarithmetic Aspects of Unfriendly Partitions of Recursive Graphs (with Belanger, Goh, Richter, Stephan, and Tang) *in preparation*.
- [10] Dichotomy results for classes of countable graphs (with Fokina, Harrison-Trainor, Ko and Rossegger) *in preparation*.

## Selected Talks

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### INVITED TALKS

- 07/24 “On the computational complexity of unfriendly partitions”  
*Computability and Complexity in Analysis* Swansea University (UK)
- 07/24 “Characterizing learnability for families of structures”  
*AMS-UMI International Joint Meeting (Computability Theory special session)*, University of Palermo (Italy)
- 03/24 “Classifying isomorphism problems and learning of algebraic structures”  
*UW Logic Seminar (online)*, University of Wisconsin-Madison (USA)
- 10/21 “Cantor-Bendixson Theorem in the Weihrauch lattice”  
*Midwest Computability Seminars (online)*, University of Wisconsin-Madison (USA)

### CONTRIBUTED TALKS

20 contributed talks given at international meetings, including several editions of Logic Colloquium, Computability in Europe, Computability and Complexity in Analysis, Computability, Complexity and Randomness and Continuity, Com-

putability and Constructivity.

#### INVITED PARTICIPATIONS

- 03/25      "Weihrauch Complexity: Structuring the Realm of Non-Computability"  
03/22      "New directions in computability theory" at CIRM, Luminy (France)

## Research Visits

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- 05/25      University of Bari (3 weeks)  
05/24      National University of Singapore (3 weeks)  
04/24      University of Bari (3 weeks)  
12/22      Swansea University (3 months)

## Events

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- 07/24      (Co-organizer) "Computable structure theory and interactions" (TU Wien)  
01/23      (Staff member) "UNESCO World Logic Day" (University of Udine)  
07/21      (Co-organizer) "Equivalences, Numberings, Reducibilities", a satellite event of the 8th  
european congress of mathematics, University of Udine (online)

## Teaching Experience

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- 21-22      Teaching assistant for Linear Algebra (BSc in Computer Science, University of Udine)

## Awards and Grants

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- 22-24      Association for Symbolic Logic Travel Grant for: Logic Colloquium 2022, 2024  
and Computability, Complexity and Randomness 2023  
04/18      Merit Prize from the association "Pozzo di Miele" for MSc students

## Services to the field

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#### CURRENT MEMBERSHIPS

*Associazione Italiana di Logica e sue Applicazioni (AILA), Computability in Europe and American Mathematical Society.*

#### REVIEWER

Journals: Theoretical Computer Science, Journal of Symbolic Logic.

SCIENTIFIC DISSEMINATION Member of "AILA x MaddMaths" (<https://maddmaths.simai.eu/aila/>) for the dissemination and communication of logic.

## Languages

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ITALIAN (mother tongue), ENGLISH (fluent spoken and written) GERMAN (basic).