Antonio Longa — Ph.D.

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My research focuses on **Graph Neural Networks**, **Network Science**, and **Complex Systems**, with emphasis on **Temporal Networks**, **Relational Deep Learning**, and **Explainability**.

Current Position

Assistant professor (RTD-A) in Information & Communication Technology — **Aug. 2023 – Present**
University of Trento — *Trento, Italy*

Advisor: Andrea Passerini
Research: Relational Deep Learning, GNN Explainability, Temporal Networks
Teaching: Scientific Programming, Advanced Topics in Machine Learning

Education

Ph.D. in Information & Communication Technology *magna cum laude* — **Nov. 2019 – Jul. 2023**
Bruno Kessler Foundation (FBK) and University of Trento — *Trento, Italy*

Dissertation: Understanding Social Interactions via Temporal Network Analysis
Supervisors: Andrea Passerini, Bruno Lepri

M.Sc. Computer Science, 110/110 *cum laude* — **Oct. 2017 – Oct. 2019**
University of Trento — *Trento, Italy*

Dissertation: Graph embedding in 2D
Supervisors: Fabrizio Costa, Andrea Passerini

B.Sc. Computer Science, 103/110 — **Sep. 2014 – Oct. 2017**
University of Milano-Bicocca — *Milan, Italy*

Thesis: Analysis of Smali code for obfuscation detection in Android applications
Supervisors: Alberto Leporati, Claudio Ferretti

Experience

Research Visitor — **Jun. 2024 – Aug. 2024**
Aix-Marseille University (Centre de physique théorique) — *Marseille, France*
– Topic: Temporal Network Generation (with Giulia Cencetti & Alain Barrat)

Research Visitor — **Feb. 2024 – Mar. 2024**
University of Cambridge — *Cambridge, UK*
– Topic: GNN regularization via explainability (with Pietro Liò)

Research Visitor — **Apr. 2022 – Aug. 2022**
University of Cambridge — *Cambridge, UK*
– Topic: GNN explainability (with Pietro Liò)

Research Trainee — **Mar. 2019 – Sep. 2019**
University of Exeter — *Exeter, UK*
– Graph embedding in low-dimensional space (with Fabrizio Costa)

Teaching Assistant — **Sep. 2018 – Dec. 2018**
Aalto University — *Helsinki, Finland*
– MSc course: Algorithmic Methods of Data Mining (with Aristides Gionis)

Machine Learning Consultant — **Sep. 2021 – Present**
Pulsetech (Remote) — *London, UK*
– GNNs for social media analytics.

Teaching & Supervision

Scientific Programming (22–25): MSc Data Science, Univ. of Trento, co-teaching, 24h
Responsibilities: delivering lab lectures, designing/marking exams, course website with interactive materials. Topics: Python, data structures, functions, Pandas/NumPy.

Advanced Topics in ML (23–25): MSc Computer Science, Univ. of Trento (project supervision)
Responsibilities: design and supervision of tailored research projects in ML/AI. Projects aligned with students' interests, promoting engagement with state-of-the-art methods.

Machine Learning (21–22): MSc Computer Science, Univ. of Trento, co-teaching, 60h
Design/implementation of ML systems and hands-on practice (PyTorch, Scikit-learn). Responsibilities: exam design and grading, practical labs.

Computer Science (20–21): BSc Biology, Univ. of Trento, co-teaching, 36h
Introductory Python programming for biology students. Responsibilities: lab lectures, exam design and grading.

Algorithmic Methods of Data Mining (18–19): MSc Computer Science, Aalto Univ., TA, 36h
Responsibilities: grading exams and assignments.

Teaching Philosophy: Active learning (peer learning, flipped classroom), inclusivity (materials adapted to diverse backgrounds, lecture notes + tutorials), and bridging research with teaching (exposure to state-of-the-art ML, interpretability, ethical AI).
Evidence of Teaching Effectiveness: Scientific Programming (23–24) received excellent student evaluations (avg. overall satisfaction: 94/100; motivation 100/100; clarity 90/100).
Supervision: 8 MSc students (4 with accepted publications incl. ICLR, ICML workshops, LOG 2024 and Applied Network Science; 1 papers under review). Assisted in supervising 1 PhD. Projects covered GNN explainability, temporal graph generation, nonlinear sheaf diffusion, SAT solver prediction, etc. Several students pursued PhDs or positions in industry (e.g., IBM Italy).

Awards & Funding

Awards:

Covid19 PhD extension: Three paid months
NetSci2020 sponsorship: Economic support for online conference
Ph.D. scholarship: Fully funded, ranked 4th/120+
Research support UK: Seven paid months in UK
Erasmus Plus: Five paid months at Aalto University, Finland

Funding:

AIAAA – Artificial Intelligence and Advanced Analysis Applications (2021–2022)
Funded by *Legge 6 – Province of Trento*
Funding: €350,000.
Partner: Dedagroup Business Solutions. FBK groups: DKM, MobS, Smart Communities Lab.
Role: PhD researcher (contributor to project activities).

Digitalization of the Energy System (2025–2027)
Funded by *Italian National Research Program.*
Funding: € 63,000.
Partner: Univ. of Trento & RSE.
Role: Co-PI.

Scientific Metrics

Scopus: 232 citations (h=9)
Google Scholar: 629 citations (h=11) [as of Aug 2025]

Publications

1. Simple Path Structural Encoding for Graph Transformers
   ICML 2025
   *Louis Airale, **Antonio Longa**, Mattia Rigon, Andrea Passerini, Roberto Passerone*

2. Reconsidering faithfulness in regular, self-explainable and domain invariant GNNs
   ICLR 2025
   *Steve Azzolin, **Antonio Longa**, Stefano Teso, Andrea Passerini*

3. Community Aware Temporal Network Generation
   Applied Network Science (2025)
   *Nicolò Alessandro Girardini, **Antonio Longa**, Gaia Trebucchi, Giulia Cencetti, Andrea Passerini, Bruno Lepri*

4. xAI-Drop: Don't Use What You Cannot Explain
   Learning on Graphs (LOG 2024)
   *Vincenzo Marco De Luca, **Antonio Longa**, Pietro Liò, Andrea Passerini*

5. A Simple and Expressive Graph Neural Network Based Method for Structural Link Representation
   GRAM Workshop @ ICML 2024
   *Veronica Lachi, Francesco Ferrini, **Antonio Longa**, Bruno Lepri, Andrea Passerini*

6. Sheaf Diffusion Goes Nonlinear: Enhancing GNNs with Adaptive Sheaf Laplacians
   GRAM Workshop @ ICML 2024
   *Olga Zaghen, **Antonio Longa**, Steve Azzolin, Lev Telyatnikov, Andrea Passerini, Pietro Liò*

7. Putting Context in Context: the Impact of Discussion Structure on Text Classification
   EACL 2024
   *Nicolò Penzo, **Antonio Longa**, Bruno Lepri, Sara Tonelli, Marco Guerini*

8. Explaining the Explainers in Graph Neural Networks: a Comparative Study
   ACM Computing Survey (2024)
   ***Antonio Longa**, Steve Azzolin, Gabriele Santin, Giulia Cencetti, Pietro Liò, Bruno Lepri, Andrea Passerini*

9. Generating fine-grained surrogate temporal networks
   Communications Physics (2024)
   ***Antonio Longa**, Giulia Cencetti, Sune Lehmann, Andrea Passerini, Bruno Lepri*

10. A Unified Active Learning Framework for Annotating Graph Data with Application to Software Source Code Performance Prediction
    Engineering Applications of Artificial Intelligence (2024)
    *Peter Samoaa, Linus Aronsson, **Antonio Longa**, Philipp Leitner, Morteza Haghir Chehreghani*

11. Patterns in Temporal Networks with Higher-Order Egocentric Structures
    Entropy (2023)
    *Beatriz Arregui-García, **Antonio Longa**, Quintino Francesco Lotito, Sandro Meloni, Giulia Cencetti*

12. Graph Neural Networks for Temporal Graphs: State of the Art, Open Challenges, and Opportunities
    Transactions on Machine Learning Research (2023)
    ***Antonio Longa**, Veronica Lachi, Gabriele Santin, Monica Bianchini, Bruno Lepri, Pietro Liò, Franco Scarselli, Andrea Passerini*

13. A Simple Latent Variable Model for Graph Learning and Inference
    Learning on Graphs (LOG 2023)
    *Manfred Jaeger, **Antonio Longa**, Steve Azzolin, Oliver Schulte, Andrea Passerini*

14. Meta-Path Learning for Multi-relational Graph Neural Networks
    Learning on Graphs (LOG 2023)
    *Francesco Ferrini, **Antonio Longa**, Manfred Jaeger, Andrea Passerini*

15. Global Explainability of GNNs via Logic Combination of Learned Concepts
    ICLR 2023
    *Steve Azzolin, **Antonio Longa**, Pietro Barbiero, Pietro Liò, Andrea Passerini*

16. An Efficient Procedure for Mining Egocentric Temporal Motifs
    Data Mining and Knowledge Discovery (2022)
    ***Antonio Longa**, Giulia Cencetti, Bruno Lepri, Andrea Passerini*

17. Generating Synthetic Mobility Networks with Generative Adversarial Networks
    EPJ Data Science (2022)
    *Giovanni Mauro, **Antonio Longa**, Massimiliano Luca, Bruno Lepri, Luca Pappalardo*

18. TEP-GNN: Accurate Execution Time Prediction of Functional Tests using Graph Neural Networks
    PROFES 2022
    *Hazem Peter Samoaa, **Antonio Longa**, Mazen Mohamad, Morteza Haghir Chehreghani, Philipp Leitner*

19. Emotion Analysis using Multi-Layered Networks for Graphical Representation of Tweets
    IEEE Access (2022)
    *Anna Nguyen, **Antonio Longa**, Massimiliano Luca, Joe Kaul, Gabriel Lopez*

20. Digital Proximity Tracing on Empirical Contact Networks for Pandemic Control
Nature Communications (2021)
*Giulia Cencetti, Gabriele Santin, **Antonio Longa**, Emanuele Pigani, Alain Barrat, Ciro Cattuto, Sune Lehmann, Marcel Salathé, Bruno Lepri*

Under review:

1. Boosting Relational Deep Learning with Pretrained Tabular Models
KDD 2026 (under review)
*Veronica Lachi, **Antonio Longa**, Beatrice Bevilacqua, Bruno Lepri, Andrea Passerini, Bruno Ribeiro*
2. Bridging Theory and Practice in Link Representation with Graph Neural Networks
NeurIPS 2025 (under review)
*Veronica Lachi, Francesco Ferrini, **Antonio Longa**, Bruno Lepri, Andrea Passerini, Manfred Jaeger*
3. GNNs Meet Sequence Models Along the Shortest-Path: An Expressive Method for Link Prediction
NeurIPS 2025 (under review)
*Francesco Ferrini, Veronica Lachi, **Antonio Longa**, Bruno Lepri, Andrea Passerini*
4. A Benchmark Dataset for Graph Regression with Homogeneous and Multi-Relational Variants
DMLR (2025, under review)
*Hazem Peter Samoaa, Marcus Vukojevic, Morteza Haghir Chehreghani, **Antonio Longa***
5. Generating Higher-Order Fine-Grained Temporal Networks via Egocentric Sub-Structures
Communications Physics (2025, under review)
*Beatriz Arregui-García, **Antonio Longa**, Marco Mancastroppa, Quintino Francesco Lotito, Sandro Meloni, Giulia Cencetti*
6. FAIR-MOFs: A Comprehensive Database for Accelerating the Discovery and Synthesis of Metal-Organic Frameworks
Nature Materials (2025, under review)
*Dinga Wonanke, **Antonio Longa**, Lauri Himanen, Alvin N. Ladine, Jose Marquez, Matthew A. Addicoat, Deborah Crittenden, Markus Scheidgen, Pietro Liò, Christof Woll, Thomas Heine*

Talks

Invited:

1. Modeling Time with Egocentric Temporal Structures in Networks
Aalborg University Seminar (2025)
2. The role of Egocentric Perspective in Temporal Networks
Temporal Graph Reading Group (2024)
3. Generating Temporal Networks & Journals vs. Conferences
NetPlace (2024)
4. Privacy-aware Temporal Network Generation: Methods and Applications
The MIT Club of Norway - AISD (2024)
5. Hands-on Tutorial on Graph Deep Learning
MLDS Seminar, Alan Turing Institute (2023)
6. Explaining the Explainers in Graph Neural Networks: a Comparative Study
CENTAI Seminar (2022)
7. Temporal network generation: a fast algorithm and some open problems
AIxIA Workshop on Machine Learning and Data Mining (2022)
8. Explaining the explainers in GNNs: a comparative study
GAIN Workshop: Hot topics in Graph Neural Networks (2022)
9. Neighbourhood matching creates realistic surrogate temporal networks
Cambridge Talk (2022)

Contributed:

1. Patterns in Temporal Networks with Higher-Order Egocentric Structures
NetSci (2025)
2. Constructing a Temporal Multipartite Network from News Articles
Complex Networks (2024)

3. Community aware temporal network generation
   NetSciX (2024)
4. Understanding how explainers work in graph neural networks & Global Explainability of GNNs via Logic Combination of Learned Concepts
   Mining and Learning with Graphs (2023)
5. Graph Neural Networks for Temporal Graphs: State of the Art, Open Challenges, and Opportunities
   NetSci (2023)
6. Hands-on Tutorial on Graph Deep Learning
   SIAM Conference on Computational Science and Engineering (CSE23) (2023)
7. An efficient procedure for mining egocentric temporal motifs
   ECML PKDD (2022)
8. ETN-Gen: Generating Temporal Networks through Egocentric Temporal Neighbours
   NetSciX (2021)
9. ETMM: Egocentric Temporal Motifs Miner
   Complex Networks (2021)
10. Digital Proximity Tracing in the COVID-19 Pandemic on Empirical Contact Networks: Controlling Re-emerging Outbreaks
    CCS – Complex Systems for the Most Vulnerable (2020)
11. How the Ego Perspective Shapes the Temporal Motifs in Human Face-to-Face Interactions
    NetSci (2020)

Academic Service

Organizer: LOG-meetup (2023), HONS@NetSci (2025), TENET@CCS (2025)

Reviewer: NeurIPS, KDD (top reviewer), ICML, ICLR, WWW, ECML, TMLR, Neural Networks, Artificial Intelligence, ACM Computing Survey, Physics A, Machine Learning, MLG

Dissemination

PyTorch Geometric Tutorial: YouTube channel with 320k+ views (2019–2025)

Organizer, Pint of Science Trento (2024)

Presenter, “Networks and the Shape of Big Data”, Notte dei Ricercatori (MUSE, 2021)