Alessio **Gravina**

PhD Student in Computer Science

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Education

PhD in Computer Science, University of Pisa, Italy — ***Nov. 2020 - PRESENT***

- Main Theme: *Representation learning for dynamic graphs.*
- Supervisors: Prof. Davide Bacciu and Prof. Claudio Gallicchio.

Oxford Machine Learning Summer School, Virtual — ***Aug. 2021***

- 15-days specialized AI school that covers the topics of Rep. Learning & Statistical ML, ML in Healthcare, NLP, and AI for Good.
- Acceptance rate 15%.

MSc in Computer Science, University of Pisa, Italy — ***Sep. 2018 - Mar. 2020***

- Curriculum: Artificial Intelligence.
- Thesis: *Machine Learning prediction of compounds impact on Schizophrenia treatment* (110/110 Hons., equiv. GPA: 4/4).

ERASMUS+ Student Programme, University College Dublin, Ireland — ***Jan. 2019 - May 2019***

- Student at the Computer Science Department in the framework of the EU Erasmus+ programme.
- Main Theme: *Artificial Intelligence and Cognitive Science*.

BSc in Computer Science, University of Pisa, Italy — ***Sep. 2014 - Mar. 2018***

- Thesis: *Machine Learning for the prediction of Bronchopulmonary dysplasia risk* (103/110, equiv. GPA: 3.75/4).

Experience

Machine Learning Research Intern, Huawei Research Center, Munich, Germany — ***Mar. 2023 - Aug. 2023***

- Supervisors: Claas Grohnfeldt, Giulio Lovisotto and Michele Russo.
- Joined the AI4Sec team to work on Representation Learning for Continuous-Time Dynamic Graphs leveraging ODE-based neural architectures.

Visiting Phd Student, IDSIA USI-SUPSI, Switzerland — ***Apr. 2022 - Jul. 2022***

- Supervisors: Prof. Cesare Alippi and Daniele Zambon
- Designed the first forecasting model (by means of Ordinary Differential Equations) for temporal graphs where the intervals between observations are not regularly spaced, achieving state-of-the-art performance on various synthetic and real-world benchmarks.

Teaching Assistant, University of Pisa, Italy — ***Feb. 2021 - May 2021***

- Course: Introduction to Programming and Algorithms.
- Weekly office hours for homework assistance and reinforcement of learned concepts.

Research scholarship, University of Pisa, Italy — ***Jul. 2020 - Nov. 2020***

- Released a resource that collects all the clinical evidence on COVID-19 and the human genomic and proteomic information to foster COVID-19 research.
- Developed Deep Learning for graphs method in *Python* to repurpose drugs given sets of proteins. The model has been used to propose a list of 27 COVID-19 candidate drugs.

Machine Learning Engineer, Vydiant — ***Jan. 2020 - Jun. 2020***

- Developed an NLP model in *Python* to identify sentences containing relations between entities from a biomedical corpus, improving precision by 3%.

Visiting Student Researcher, Stanford University, USA — ***Sep. 2019 - Dec. 2019***

- Developed a Graph Deep Learning model in *Python* to automatize drug repurposing screenings in the field of Schizophrenia treatment, discovering 64 new candidate drugs.
- Research in collaboration with SPARK research group.

Publications

- A. Gravina*****, G. Lovisotto*****, C. Gallicchio, D. Bacciu, C. Grohnfeldt. ***Effective Non-Dissipative Propagation for Continuous-Time Dynamic Graphs.*** In Temporal Graph Learning Workshop, NeurIPS, December 2023.**(* Equal Contrib.)**
- J. Reha, G. Lovisotto, M. Russo, A. Gravina, and C. Grohnfeldt. ***Continuous-Time Temporal Graph Learning on Provenance Graphs.*** In Temporal Graph Learning Workshop, NeurIPS, December 2023.

- A. Gravina, C. Gallicchio, and D. Bacciu. ***Non-Dissipative Propagation by Randomized Anti-Symmetric Deep Graph Networks.*** In Deep Learning meets Neuromorphic Hardware Workshop, ECML-PKDD 2023.
- F. Errica*****, A. Gravina*****, D. Bacciu., A. Micheli. ***Hidden Markov Models for Temporal Graph Representation Learning.*** In ESANN, 2023. **(* Equal Contrib.)**
- A. Gravina and D. Bacciu. ***Deep learning for dynamic graphs: models and benchmarks.*** July 2023.
- A. Gravina, D. Bacciu, and C. Gallicchio. ***Anti-Symmetric DGN: a stable architecture for Deep Graph Networks.*** In ICLR 2023.
- A. Gravina, D. Bacciu, and C. Gallicchio. ***Non-Dissipative Propagation by Anti-Symmetric Deep Graph Networks.*** In DGL-AAAI'23 workshop, AAAI 2023. **(Best Student Paper Award)**
- D. Bacciu, F. Errica, A. Gravina*****, L. Madeddu, M. Podda, and G. Stilo. ***Deep Graph Networks for Drug Repurposing with Multi-Protein Targets.*** In IEEE Transactions on Emerging Topics in Computing 2023. **(* First Author - Alphabetical Order)**
- A. Gravina, J.L. Wilson, D. Bacciu, K.J. Grimes, and C. Priami. ***Controlling astrocyte-mediated synaptic pruning signals for schizophrenia drug repurposing with Deep Graph Networks.*** In PLOS Computational Biology, 2022.
- A. Gravina*****, F. Rossetto*****, S. Severini*****, and G. Attardi. ***A comparative study of models for answer sentence selection.*** In CLiC-it, 2019. **(* Equal Contrib.)**
- A. Gravina*****, F. Rossetto*****, S. Severini*****, and G. Attardi. ***Cross attention for selection-based question answering.*** In NL4AI@AI*IA, 2018. **(* Equal Contrib.)**

Projects

NumGraph, GROUP PROJECT ***2021***

- Num(py)Graph is a library for synthetic graph generation. The main principle of NumGraph is to be a lightweight library (i.e., *Numpy* is the only dependency) that generates graphs from a broad range of distributions in both the static and temporal domain.

Deep Graph Networks for Drug Repurposing with Multi-Protein Targets ***2021***

- Developed Deep Learning for graphs method in *Python* and *Pytorch* to repurpose drugs given sets of proteins instead of single-protein/single-drug associations (as widespread in literature), increasing the AUROC by 9% with respect to the single-protein repurposing scenario.
- The model was used to discover 27 new potential COVID-19 candidate drugs.

Graph learning for Schizophrenia treatment ***2020***

- Used *Python* and *Pytorch* to develop a ML for graph framework to predict compounds that can reduce glial phagocytic activity in Schizophrenia patients.
- The framework was used by SPARK research group at Stanford to optimize drug phenotypic screens, discovering 64 new potential drug candidates.

Cross-Attentive CNN for QA, GROUP PROJECT ***2018***

- **1st Place, Fujitsu AI-NLP Challenge,** ***Prize $20,000***
- Implemented a Cross-Attentive Convolutional Neural Network (using *Python* and *Keras*) to tackle the task of Answer Sentence Selection. The model was assessed over SelQA and WikiQA datasets with different types of word embeddings: FastText, GloVe, and ELMo.

Skills

Programming	Python, Java, C, C++
Frameworks/Libraries	Pytorch, Sklearn, Numpy, Pandas, Keras
Languages	Italian (*Native*), English (*Fluent*), Spanish (*Elementary*)