Fabrizio Frasca

Creative and dedicated; communicative and adaptive, keen to co-work with people of various cultural and educational backgrounds. Experienced in scientific research in both academic and industrial settings.

Education

Sept 2018 - Nov 2023
PhD Computing, *Imperial College London*, Advisor: Prof. M. Bronstein.
Dissertation title: *Expressive and Efficient Graph Neural Networks*.
Geometric Deep Learning on graph-structured data. The thesis centres around the design and study of Graph Neural Network architectures attaining provable expressive power whilst retaining an advantageous computational complexity. Additionally, assisted the teaching of the BSc course of Linear Algebra. The PhD programme originally started at Università della Svizzera Italiana (Switzerland) and was then moved to Imperial College London to follow my advisor.
Examination passed *without corrections.*

Sept 2015 - Apr 2018
MSc Computer Science and Engineering, *Politecnico di Milano*.
Dissertation title: *Data-driven Modeling of Epigenetic Transcriptional Regulation*.
Gained comprehensive theoretical understanding in the related fields of data analysis, machine learning, artificial intelligence, complex systems and networks. Learnt about advanced and parallel algorithmic techniques.
Grade: ***110 cum laude / 110***

Sept 2012 - Sept 2015
BSc Computer Science and Engineering, *Politecnico di Milano*.
Comprehensively learnt about engineering and computer science fundamentals.
Grade: ***110 cum laude / 110***

Work Experience

May 2019 - Feb 2023
Machine Learning Researcher, *Twitter UK*.
Member of the Cortex Graph Learning Research team. Focus: theoretical underpinnings of graph neural models and their efficient application in industrial settings.

July 2018 - May 2019
Data Scientist, *Fabula AI*.
Researched and developed machine learning techniques and pipelines for (fake) news classification. Fabula AI has been acquired by Twitter in May 2019.

Apr 2016 - June 2017
Course Tutor, *Politecnico di Milano*.
Tutored BSc and MSc students over the courses of Software Engineering and Computer Architecture and Operative Systems. Held theoretical lectures and exercise sessions.

Publications (* indicates equal contribution)

[1] **Understanding and extending Subgraph GNNs by rethinking their symmetries**, *Frasca* F, Bevilacqua* B, Bronstein MM, Maron H*, NeurIPS 2022, Oral presentation (1.7% acceptance rate).

[2] **Equivariant subgraph aggregation networks**, *Bevilacqua* B, Frasca* F, Lim* D, Srinivasan B, Cai C, Balamurugan G, Bronstein MM, Maron H*, ICLR 2022, Spotlight presentation (5% acceptance rate).

[3] **Accurate and highly interpretable prediction of gene expression from histone modifications**, *Frasca F, Matteucci M, Leone M, Morelli MJ, Masseroli M*, BMC Bioinformatics, 2022.

[4] **Weisfeiler and Lehman go cellular: CW networks**, *Bodnar* C, Frasca* F, Otter N, Wang Y, Liò P, Montúfar GF, Bronstein MM*, NeurIPS 2021.

[5] **Weisfeiler and Lehman go topological: Message Passing Simplicial Networks**, *Bodnar* C, Frasca* F, Wang* Y, Otter N, Montúfar* GF, Liò P, Bronstein MM*, ICML 2021.

[6] **Exposing and characterizing subpopulations of distinctly regulated genes by K-plane regression**, *Frasca F, Matteucci M, Morelli MJ, Masseroli M*, CIBB 2018, extended in Lecture Notes in Bioinformatics (LNBI), 2020.

[7] **Modeling gene transcriptional regulation by means of hyperplanes genetic clustering**, *Frasca F, Matteucci M, Masseroli MJ, Morelli M* , IJCNN 2018.

[8] **Graph Neural Networks for link prediction with subgraph sketching**, *Chamberlain* BP, Shirobokov* S, Rossi E, Frasca F, Markovich T, Hammerla N, Bronstein MM, Hansmire M*, ICLR 2023, Notable top 5% paper.

[9] **Improving Graph Neural Network expressivity via subgraph isomorphism counting**, *Bouritsas G, Frasca F, Zafeiriou SP, Bronstein MM*, IEEE TPAMI, 2022.

[10] **Graph Positional Encoding via Random Feature Propagation**, *Eliasof M, Frasca F, Bevilacqua B, Treister E, Chechik G, Maron H*, ICML 2023.

[11] **Edge Directionality Improves Learning on Heterophilic Graphs**, *Rossi E, Charpentier B, Di Giovanni F, Frasca F, Günnemann S, Bronstein MM*, preprint.

[12] **SIGN: Scalable Inception Graph Neural Networks**, *Frasca* F, Rossi* E, Eynard D, Chamberlain B, Bronstein MM, Monti F*, GRL+ ICML Workshop 2020.

[13] **Learning interpretable disease self-representations for drug repositioning**, *Frasca* F, Galeano* D, Gonzalez G, Laponogov I, Veselkov K, Paccanaro A, Bronstein MM*, GRL NeurIPS Workshop 2019.

[14] **Fake news detection on social media using geometric deep learning**, *Monti F, Frasca F, Eynard D, Mannion D, Bronstein MM*, RLGM ICLR Workshop 2019.

[15] **Temporal graph networks for deep learning on dynamic graphs**, *Rossi E, Chamberlain B, Frasca F, Eynard D, Monti F, Bronstein MM*, GRL+ ICML Workshop 2020.

Talks

Expressiveness of Graph Neural Networks

- "Exploring the practical and theoretical landscape of expressive Graph Neural Networks", Learning on Graph Conference 2022, Tutorial

- "The expressive power of GNNs by the WL test", London Geometry and Machine Learning Summer School 2021

Subgraphs for expressive Graph Neural Networks [1,2]

- Seminar at Imperial College London, UK (Host: Prof. Yves-Alexandre de Montjoye), Mar 2023

- Geometric Deep Learning Course, Oxford University, Lecture, Mar 2023

- Learning on Graphs and Geometry Reading Group, Nov 2022

- Seminar at Università Sapienza, Rome, Italy (Host: Prof. Simone Scardapane), Nov 2022

- Meta AI orgs Reading Meeting, Nov 2022

- Seminar at École Polytechnique, France (Host: Prof. Maks Ovsjanikov), July 2022

- African Masters of Machine Intelligence, 2nd Geometric Deep Learning Course, July 2022

- Learning on Graphs and Geometry Reading Group, Dec 2021

- 3$^{\mathrm{rd}}$ NAAMI Nepal Winter School in AI, Dec 2021

Simplicial and Cellular Complexes for Graph Representation Learning [4,5]

- Dagstuhl Seminars – Graph Embeddings: Theory meets Practice, Mar 2022
- Learning on Graphs and Geometry Reading Group, Sept 2021
- African Masters of Machine Intelligence, 1$^{\mathrm{st}}$ Geometric Deep Learning Course, July 2021
- TopoNets 2021 – Networks Beyond Pairwise Interactions, June 2021
- Seminar at Cambridge University, UK (Host: Prof. Mateja Jamnik), May 2021
- Math Machine Learning seminar MPI MIS + UCLA, Apr 2021

About peer-reviewing

- "Reviewing at LOG 2022, my experience and unsolicited thoughts", Learning on Graph Conference 2022

Other Experiences

London Geometry and Machine Learning Summer School 2022.
Selected to take part in the summer school as contributor in the project: "Equivariant poset representations".

London Geometry and Machine Learning Summer School 2021.
Selected to take part in the summer school as main contributor in the project: "Improved expressive power for message-passing networks via subgraph aggregation", which led to a the ICLR publication [2].

Postgraduate Research Visit, *Imperial College London*, Oct 2018 - Jan 2019.
Visited Dr. Kirill Veselkov to explore applications of Geometric Deep Learning to Drug Repurposing. The collaboration led to [13].

Distributed and Outsourced Software Engineering (DOSE) 2015, *Politecnico di Milano*.
Led a distributed team in software design, development and inspection at the 2015 Distributed and Outsourced Software Engineering (DOSE) Project by ETH Zurich.

Awards

Best reviewer, *Selected amongst the top 20 reviewers*, Learning on Graph Conference, 2022.

Third placement, *Bug-finding competition*, DOSE Project, 2015.

Reviewing Activity

- International Conference on Machine Learning (ICML)
- Neural Information Processing Systems (NeurIPS)
- Learning On Graph Conference (LOG)
- Graph Representation Learning and Beyond Workshop @ ICML 2020 (GRL+)

Skills

Python (PyTorch, PyTorch Geometric, TensorFlow, Keras, Sci-kit Learn, PySpark) · Java · C · MATLAB · SQL · Eiffel

Languages

Italian · English · German *(A1)* · French *(middle school)*