



Fabrizio Frasca

Research Scientist at Twitter / PhD Candidate at Imperial College London

Rational and responsible. Striver and dedicated, creative hard-worker. Communicative and adaptive, open to working-environments made up of people with various cultural and educational backgrounds. Eager for developing new skills and seizing original thoughts. Experienced in designing flexible solutions by applying solid software engineering principles.

Work Experience

- May 2019 - now **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 effective machine learning techniques for (fake) news classification, including the definition of strategies for efficient and scalable data collection, processing and learning. 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. Taught proper application of design patterns, held theoretical lectures and exercise sessions.

Other Experiences and Awards

- July 2022 **African Masters of Machine Intelligence (speaker), African Institute for Mathematical Sciences (AIMS).**
Invited speaker at the 2nd Geometric Deep Learning course within the African Masters of Machine Intelligence (AMMI) programme. Talk: "Subgraphs for more expressive Graph Neural Networks".
- July 2022 **London Geometry and Machine Learning Summer School.**
Selected to take part in the summer school as contributor in the project: "Equivariant poset representations".
- Mar 2022 **Dagstuhl Seminars – Graph Embeddings: Theory meets Practice, Leibniz-Zentrum für Informatik, (<https://www.dagstuhl.de/en/program/calendar/semhp/?semnr=22132>).**
Invited to the seminar "Graph Embeddings: Theory meets Practice" at Schloss Dagstuhl. Talk: "Graph representation learning on Simplicial and Cellular Complexes".
- Dec 2021 **Nepal Winter School in Artificial Intelligence (speaker), NAAMI.**
Invited speaker at the 3rd NAAMI Nepal Winter School in AI (Geometric Deep Learning course). Talk: "Subgraph Networks".
- Aug 2021 **African Masters of Machine Intelligence (speaker), African Institute for Mathematical Sciences (AIMS).**
Invited speaker at the 1st Geometric Deep Learning course within the African Masters of Machine Intelligence (AMMI) programme. Talk: "Weisfeiler and Lehman go topological: Message Passing Simplicial Networks".
- July 2021 **London Geometry and Machine Learning Summer School.**
Invited to animate and moderate the tutorial session "The expressive power of GNNs by the WL test" at the 1st London Geometry and Machine Learning Summer School (LOGML).
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 top-tier conference publication ("Equivariant subgraph aggregation networks", ICLR 2022).
- Oct 2015 – Dec 2015 **Distributed and Outsourced Software Engineering Project, Politecnico di Milano.**
Led a distributed team in software design, development and inspection at the 2015 Distributed and Outsourced Software Engineering (DOSE) Project from ETH Zurich. Awarded the third placement in the bug-finding competition.

Education

- Oct 2020 - Now **PhD Candidate**, *Imperial College London*.
Researching Geometric Deep Learning; main research focus is on the representational power of Graph Neural Network models and their ability to learn meso-scale network structures. Published in top-tier conferences and journals.
- Sept 2018 - May 2019 **PhD Candidate**, *Università della Svizzera italiana (USI)*.
Researched Geometric Deep Learning oriented to Computational Biology, with particular focus on drug repurposing. The PhD program was suspended due to the acquisition of Fabula AI by Twitter.
- 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**

Skills and Capabilities

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

Great communicative skills. Comfortable with co-working with people of different backgrounds. Capability to skillfully learn new technologies. Enthusiastic about mingling different ideas for efficient and flexible solutions.

Languages

Italian · English · German (A1) · French (*middle school*) · Persian (*basic colloquial*)

Publications (* indicates equal contribution)

- 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 (*preprint*)
<https://arxiv.org/pdf/2209.15486.pdf>
- Understanding and extending Subgraph GNNs by rethinking their symmetries**
Frasca* F, Bevilacqua* B, Bronstein MM, Maron H
Advances in Neural Information Processing Systems (NeurIPS), 2022 – Oral presentation (1.7 % acceptance rate)
<https://arxiv.org/pdf/2206.11140.pdf>
- Equivariant subgraph aggregation networks**
Bevilacqua* B, Frasca* F, Lim* D, Srinivasan B, Cai C, Balamurugan G, Bronstein MM, Maron H
International Conference on Learning Representations (ICLR), 2022 – Spotlight presentation (5% acceptance rate)
<https://openreview.net/forum?id=dFbKQaRk15w>
- Improving graph neural network expressivity via subgraph isomorphism counting**
Bouritsas G, Frasca F, Zafeiriou SP, Bronstein MM
IEEE Transactions on Pattern Analysis and Machine Intelligence, 2022
<https://ieeexplore.ieee.org/abstract/document/9721082>
- Accurate and highly interpretable prediction of gene expression from histone modifications**
Frasca F, Matteucci M, Leone M, Morelli MJ, Masseroli M
BMC bioinformatics, 2022
<https://bmcbioinformatics.biomedcentral.com/articles/10.1186/s12859-022-04687-x>
- Weisfeiler and Lehman go cellular: CW networks**
Bodnar* C, Frasca* F, Otter N, Wang Y, Liò P, Montúfar GF, Bronstein MM
Advances in Neural Information Processing Systems (NeurIPS), 2021
<https://proceedings.neurips.cc/paper/2021/file/157792e4abb490f99dbd738483e0d2d4-Paper.pdf>
- Weisfeiler and lehman go topological: Message passing simplicial networks**
Bodnar* C, Frasca* F, Wang* Y, Otter N, Montúfar* GF, Liò P, Bronstein MM

International Conference on Machine Learning (ICML), 2021
<http://proceedings.mlr.press/v139/bodnar21a/bodnar21a.pdf>

8. **Temporal graph networks for deep learning on dynamic graphs**
Rossi E, Chamberlain B, Frasca F, Eynard D, Monti F, Bronstein MM
Graph Representation Learning and Beyond (GRL+) Workshop at ICML, 2020
<https://grlplus.github.io/papers/58.pdf>
9. **SIGN: scalable inception graph neural networks**
Frasca* F, Rossi* E, Eynard D, Chamberlain B, Bronstein MM, Monti F
Graph Representation Learning and Beyond (GRL+) Workshop at ICML, 2020
<https://grlplus.github.io/papers/77.pdf>
10. **Exposing and characterizing subpopulations of distinctly regulated genes by K-plane regression**
Frasca F, Matteucci M, Morelli MJ, Masseroli M
Computational Intelligence Methods for Bioinformatics and Biostatistics (CIBB), 2018
extended in *Lecture Notes in Computer Science (LNBI)*, 2020
https://link.springer.com/chapter/10.1007%2F978-3-030-34585-3_20
11. **Learning interpretable disease self-representations for drug repositioning**
Frasca* F, Galeano* D, Gonzalez G, Laponogov I, Veselkov K, Paccanaro A, Bronstein MM
Graph Representation Learning Workshop at NeurIPS, 2019
<https://grlearning.github.io/papers/79.pdf>
12. **Fake news detection on social media using geometric deep learning**
Monti F, Frasca F, Eynard D, Mannion D, Bronstein MM
Representation Learning on Graphs and Manifolds Workshop at ICLR, 2019
<https://rlgm.github.io/papers/34.pdf>
13. **Modeling gene transcriptional regulation by means of hyperplanes genetic clustering**
Frasca F, Matteucci M, Masseroli MJ, Morelli M
International Joint Conference on Neural Networks (IJCNN), 2018
<https://ieeexplore.ieee.org/document/8489054>