

About me

My current work focuses on exploring and improving the reasoning capabilities of neural networks. More specifically, I am interested in the ability of neural networks to simulate algorithms and how such simulations can emerge through training. Understanding these characteristics is crucial for designing models that exhibit a more consistent behavior. Prior to this, I spent more than two years applying machine learning to real-world applications.

Education

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| Ph.D. in Computer Science University of Waterloo. Supervised by Kimon Fountoulakis | 2022 – Present GPA: 92/100 |
| M.Sc in Artificial Intelligence and Robotics Sapienza University of Rome | 2019 – 2022 GPA: 98/100 (108/110) |
| B.Sc in Mechanical Engineering Federal University of Santa Catarina | 2013 – 2019 Overall course ranking: 92 nd percentile |
| Exchange Program RWTH Aachen University | 2017 – 2018 |

Research Experience

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| Huawei <i>Research Intern</i> Hosted by Guojun Zhang and Yingxue Zhang | Feb 2022 – Jan 2023 <i>Toronto, Canada</i> |
| Micromed/CERTI Foundation <i>Research Consultant</i> | Feb 2021 – Jan 2022 <i>Florianopolis, Brazil</i> |

Publications

- [ICML 2024] **Back de Luca, A.** & Fountoulakis, K. “Simulation of Graph Algorithms with Looped Transformers”
<https://arxiv.org/abs/2402.01107>
- [ICLR 2024] **Back de Luca, A.**, Fountoulakis, K. & Yang, S. “Local Graph Clustering with Noisy Labels”
<https://openreview.net/forum?id=8gA5c6enfc>
- [Preprint 2022] **Back de Luca, A.**, Zhang G., Chen, X. & Yu, Y. “Mitigating Data Heterogeneity in Federated Learning with Data Augmentation” <https://arxiv.org/abs/2206.09979>

Awards

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| DGSA Mathematics Domestic Graduate Student Award | 2023 |
| M-IMAE Mathematics International Master’s Award of Excellence Scholarship | 2022 |

Languages

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| Programming | Python, JavaScript, SQL/NoSQL, Matlab |
| Spoken & Written | Portuguese, English [Native or Fluent], Italian, German [Intermediate]. |

Projects

- Landscapeviz:** Python package to visualize the loss landscape of neural networks using TensorFlow
- PSOpt:** Python package for combinatorial optimization using particle swarms
- EEG Sonify:** Python project converting EEG data into sound for artifact detection or auditory feedback in Brain-Computer Interfaces.

Teaching

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| University of Waterloo | |
| Teaching Assistant, CS 338 – Computer Applications in Business: Databases | 2024 |
| Teaching Assistant, CS 245 – Logic and Computation | 2022–2023 |

Other Professional Experience

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| NEO Empresarial <i>Engineering Intern</i> | May 2015 – Aug 2018 |
| CERTI Foundation <i>Data Analytics Intern</i> | Summers 2017 and 2018 |
| Fraunhofer Institute for Production Technology <i>Research Intern</i> | Apr 2017 – Jan 2018 |
| Whirlpool – Embraco <i>Procurement Intern</i> | Summer 2016 |
| Numerical Simulation Lab. in Fluid Mechanics and Heat Transfer <i>Research Intern</i> | Feb 2015 – May 2015 |