BERARDINO BARILE

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EDUCATION

Double PhD in Computer Science:
Catholic University of Leuven, Belgium & Université Claude Bernard Lyon 1, France | May 2019 – Oct 2022

- Thesis: "Machine Learning Methods for Multiple Sclerosis Classification and Prediction Using MRI Brain Connectivity"
  Supervisor: Sabine Van Huffel & Dominique-Sappey Marinier

Master Degree in Statistics:
La Sapienza University of Rome, Italy | Nov 2011 – Oct 2013

- Grade: 110/110 with honors
- Thesis: "Short and Long Structural Effects of the International Bank System: A Structural-VAR Approach"
  Supervisor: Bernardo Maggi

Bachelor Degree in Statistics
La Sapienza University of Rome, Italy | Oct 2008 – Nov 2011

- Grade: 110/110 with honors
- Thesis: "Purchase Power Parity (PPP) and Equilibrium Exchange Rate in the Financial Market"

PROFESSIONAL EXPERIENCE

Research Scientist:
McGill: Probabilistic Vision Group and Mila AI Institute, Montréal, Canada | Mar 2023 – Present

- ***Led AI research projects in Computer Vision and Causal ML***: advanced deep learning model for longitudinal trajectory prediction, designing generative models for counterfactual image synthesis and biomarker discovery, and implementing causal inference techniques to predict the efficacy of new drugs.
- ***Leveraging novel generative AI methods (LLMs):*** zero-shot prediction and causal reasoning in the context of longitudinal disease evolution. Exploited the embedding of tabular and image data to simulate counterfactual scenarios, aiding in the management of risks and side effects of new experimental drugs.
- ***Teaching assistant at McGill University:*** taught probability theory, Bayesian inference and deep learning generative model focusing on the mathematical and probabilistic aspect under the supervision of Prof. Tal Arbel. Presenting novel research work at top tier conferences (i.e. MICCAI, ICCV, NeurIPS)
- ***Research Consultant at University La Sapienza:*** provided expert guidance for developing advanced statistical and econometric models for analyzing credit risk and survival of small and medium Italian enterprises. Conducted analysis of balance sheets and financial statements to assess financial health, predict insolvency risks, and identify key economic factors influencing business longevity under the supervision of Prof. Angelo Castaldo.

Senior Data Scientist:
Verti Spa, Milan, Italy | Jul 2022 – Mar 2023

- ***Developed machine learning and statistical models:*** for optimal pricing, churn prediction, and customer retention, utilizing techniques such as regression analysis, gradient boosting, and neural networks. Developped production pipelines, achieving a measurable increase in revenue and reduction in customer churn rates.
- ***Built automated pipelines using AWS SageMaker:*** scalable model training, evaluation, and deployment, enabling seamless integration of machine learning workflows and reducing deployment time for production-ready models.

  Developed constrained optimization models for risk assessment and profitability: Implemented linear programming and metaheuristic algorithms to determine optimal pricing strategies that balanced risk mitigation with profitability targets.

***Big* Data Scientist**:
Isiway Srl, Rome, Italy | Nov 2017 – May 2019

- ***Implemented ML solutions for big data consulting projects****:* implemented deep learning models for predicting human trajectories. Analyzed customer behavior (i.e. mouse tracking) and recommendation systems for enhanced customer experience.
- ***Web Scraping and NLP for Sentiment Analysis:*** Developed deep learning-based NLP methods to predict sentiment (positive or negative) from large-scale textual data extracted from web sources, utilizing techniques such as word embeddings and recurrent neural networks (RNNs, LSTM), for enhanced prediction accuracy.

Data Analyst:

Invitalia SpA, Rome, Italy | Apr 2014 – Nov 2017

- ***Analyzed economic and financial indicators:*** in-depth evaluation of the solidity and solvability of publicly listed companies for investment risk assessment and portfolio management strategies.
- ***Developed advanced econometric models for public policy evaluation:*** Implemented parametric and semi-parametric models for survival analysis of small and medium enterprises. Designed non-parametric methods for clustering and density estimation, and performed probabilistic matching to simulate counterfactual scenarios.

LANGUAGE AND TECHNICAL BACKGROUND

Languages: English: Advanced – **French**: TEF Certificate: C2 Level – **Italian**: Native

Tools: Python - Matlab - Stata - R - SQL - AWS – Docker – PyTorch - Tensorflow – Latex - Bash – Linux – GitHub

SELECTED PUBLICATIONS

- **Data Augmentation Using Generative Adversarial Neural Networks (GANs) on Brain Structural Connectivity in Multiple Sclerosis.**
  Barile B, Marzullo A., Stamile C. et al. 2021, Computer Methods and Programs in Biomedicine, 206:106113
  Link: https://hal.science/hal-03241649/document
- **Tensor Factorization of Brain Structural Graph for Unsupervised Classification in Multiple Sclerosis.**
  Barile B, Marzullo A., Stamile C. et al. *2020 25th International Conference on Pattern Recognition (ICPR)*, 2021, Milan (virtual), Italy. pp.5052-5059
  Link: **https://ieeexplore.ieee.org/document/9412491**
- **Ensemble Learning for Multiple Sclerosis Disability Estimation Using Brain Structural Connectivity.**
  Barile B, Marzullo A., Stamile C. et al. 2021, Brain Connectivity doi: 10.1089/brain.2020.1003 PMID: 34269618
  Link: **https://www.liebertpub.com/doi/10.1089/brain.2020.1003**
- **Causal Impact Evaluation of Occupational Safety Policies on Firms' default using ML Uplift Modelling.**
  Barile B., Forti M., Marrocco A., Castaldo A. 2024, In: Sci Rep 14, 10380
  Link: https://www.nature.com/articles/s41598-024-60348-4
- **New Multiple Sclerosis Lesion Segmentation and Detection Using Pre-activation U-Net.**
  Ashtari P., *Barile B.*, Van Huffel S. et al. 2022, Frontiers in Neuroscience, in press
  Link: **https://www.readcube.com/articles/10.3389/fnins.2022.975862**
- **A Kernel Based Blind Source Separation Approach for Classification of Multiple Sclerosis Clinical Profiles.**
  Barile B., Ashtari P., Durand-Dubief F. et al. 2022, In: Proceedings 30th European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN 2022), Bruges, BE, October 5-7, 2022, in press
  Link: **https://www.esann.org/sites/default/files/proceedings/2022/ES2022-17.pdf**
- **Probabilistic Temporal Prediction of Continuous Disease Trajectories and Treatment Effects Using Neural SDEs**
  Barile B., Durso-Finley, Falet J.P., et al. 2024 In: MICCAI (Oct. 2024 Conference)
  Link: **https://arxiv.org/abs/2406.12807**
- **ADOPT: Adversarial Optimization Strategy for Counterfactual Trajectories of Grey Matter Atrophy.**
  Barile B., Chen E., Sappey-Marinier D. 2024, In: IEEE Transaction in Biomedical Imaging (Under review)

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