

# Giorgia Franchini

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## Research Interests

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Machine learning, deep learning, stochastic gradient methods, variance-reduced stochastic gradient methods, automatic hyperparameter tuning, NAS Neural Architecture Search, image processing, anomaly detection, binary and multi-class classification.

## Education

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- 2017 – 2020 **University of Modena and Reggio Emilia** – Modena, Italy  
PhD in Mathematics  
Advisors: Professors Luca Zanni, Valeria Ruggiero. *Title: Hyperparameters setting in Stochastic Optimization Methods.*
- 2015 – 2017 **University of Modena and Reggio Emilia** – Modena, Italy  
Master's Degree in Mathematics  
Advisor: Professor Luca Zanni. *Title: Stochastic optimization methods in machine learning.*
- 2015 **University of Modena and Reggio Emilia** – Modena, Italy  
Bachelor's Degree in Mathematics  
Advisor: Professor Luca Zanni. *Title: Acceleration of the gradient methods for linear inverse problems.*

## Courses and Conferences Participation

- *Imaging and machine learning*: Institut Henri Poincaré, Paris, April 1-5, 2019
- *Variational methods and optimization in imaging*: Institut Henri Poincaré, Paris, February 4-8, 2019
- *RegML Regularization Methods for Machine Learning*: PhD program in Computer Science, University of Genoa, June 18-22, 2018
- *ACACES International Summer School on Advanced Computer Architecture and Compilation for High-Performance and Embedded Systems*: Hipeac, Fiuggi, July 9-13, 2018
- *SIAM Conference on Imaging Science*: University of Bologna, June 5-8, 2018

## Selection of publications

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- 2023 **Learning rate selection in stochastic gradient methods based on line search strategies**  
G. Franchini, F. Porta, V. Ruggiero, I. Trombini, L. Zanni.  
*Applied Mathematics in Science and Engineering.*
- 2023 **DCT-Former: Efficient Self-Attention with Discrete Cosine Transform**  
C. Scribano, G. Franchini, M. Prato, M. Bertogna.  
*Journal of Scientific Computing.*
- 2023 **A line search based proximal stochastic gradient algorithm with dynamical variance reduction**  
G. Franchini, F. Porta, V. Ruggiero, I. Trombini.  
*Journal of Scientific Computing.*
- 2023 **Neural Architecture Search via classical Machine Learning methods**  
G. Franchini, F. Porta, V. Ruggiero, L. Zanni.  
*Mathematics in Engineering.*
- 2022 **On the First-Order Optimization Methods in Deep Image Prior**  
P. Cascarano, G. Franchini, F. Porta, A. Sebastiani.  
*Journal of Verification, Validation and Uncertainty Quantification.*
- 2022-in press **Chapter: Machine learning for mental health. Focus on affective and non-affective psychosis.**  
M. Ferrara, G. Franchini, M. Funaro, M. Belvederi Murri, T. Toffanin, L. Zerbinati, B. Valier, D. Ambrosio, F. Marconi, M. Cutroni, M. Basaldella, S. Seno, L. Grassi.  
*Book: Advancements in Artificial Intelligence in the Service Sector, Taylor and Francis Group.*

## Research Experience

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- January 2022 – present **Full-time Researcher on a Fixed-Term Contract (Type A)**  
Supervisor: Marco Prato (UNIMORE)
- November 2020 – October 2021 **Research Grant: Development of Stochastic Optimization Methods for Innovative Machine Learning Applications**  
Supervisor: Valeria Ruggiero (UNIFE).
- May 2020 **Contract for Collaboration: Edge and Cloud Computation: A Highly Distributed Software Architecture for Big Data Analytics’ – ‘CLASS’ (‘action’)**  
Supervisor: Marko Bertogna (UNIMORE).

May 2019 – November 2019 **Research Grant: Stochastic Optimization Methods for Large Problems in Machine Learning**  
Supervisor: Valeria Ruggiero (UNIFE).

April 2018 – April 2019 **Research Grant: Acceleration Techniques for Optimization Methods in Large-Scale Machine Learning Applications. Activity as part of the EU Research Project CLASS: "Edge and Cloud Computation: A Highly Distributed Software Architecture for Big Data Analytics". Grant agreement no: 780622.**  
Supervisor: Marko Bertogna (UNIMORE).

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### Selection of teaching Experience

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- 2023 **10 hours of teaching: Optimization methods for machine learning**  
PhD School in Mathematics: UNIMORE, UNIFE, UNIPR.
- 2022 **36 hours course holder: Computational and Statistical Learning**  
Master's Degree in Mathematics, Data Science curriculum, UNIMORE, FIM.
- 2022 **28 hours course holder: Fundamentals of Machine Learning**  
Master's Degree in Computer Science, UNIMORE, FIM.

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### Selection of theses Supervised

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- January 2023 **Thesis Title: A comprehensive analysis of vision deep learning methods for object detection and 6D pose estimation: Real-time applications.**  
Co-supervisor - PhD thesis in Mathematics.
- December 2022 **Thesis Title: Deep reinforcement learning applied in an Industry 4.0 context: completion of a task by the Traffic Manager (internship company: E80).**  
Supervisor - Master's thesis in Computer Science.

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### Industry Experience

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- 2022–2023 **Bioretics Srl (Project related to RTDA PON) – Cesena, Italy**  
Hyperparameter setting in CNN for segmentation.
- 2023 **Bonfiglioli Consulting (Teaching Data Science course) – Bologna, Italy**  
Machine and Deep learning.

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### Conferences with Contributions: Talks or Posters

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August 2023      Quality measure score predictor for imaging via SVR  
*SIMAI23, Invited session Data driven methods for inverse problems in imaging, University of Basilicata*

November 2022      A line search based proximal stochastic gradient algorithm with dynamical variance reduction  
*Mathematics for Artificial Intelligence and Machine Learning: Young Researchers, PoliTO*

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### **Project Participation**

2023      Data-driven optimization methods: new theoretical and practical perspectives  
*Coordinator of GNCS 2023 research project, INdAM*

2022      Hyperparameter search techniques for large-scale problems  
*Young researchers' projects, INdAM*

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### **Technical Skills**

#### **Programming Languages**

MATLAB, Python (Tensorflow, Keras, Pytorch, Optuna), C++ (OpenMP, MPI, and CUDA)

#### **Software**

LaTeX, Git, Office

#### **Foreign Languages**

English (B2), French (A2)

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### **Awards**

2022      Meta-learning From Learning Curves Challenge @ WCCI 2022  
Third place.

I authorize the processing of my personal data contained in my curriculum vitae in accordance with Art. 13 of Legislative Decree No. 196/2003.

CV updated as of September 9, 2024.