Nathan **Buskulic**

Ph.D. · Optimization and Machine Learning for inverse problems

Genova, Italy

Machine Learning Genoa Center · MaLGa

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Positions

Genova, Italy
January 2025-Today

Post-Doc, Machine Learning Genoa Center (MaLGa), Università degli studi di Genova
Supervisor: Luca Calatroni

Education

Caen, France
September 2021 - November 2024

PhD in Computer Science
Supervised by Jalal Fadili and Yvain Quéau at Université de Caen
Convergence and reconstruction guarantees of self-supervised deep learning methods applied to inverse problems. Theoretical results for various optimization schemes (continuous/discrete, first/second order) with generic loss functions, and a variety of empirical results on image problems that validate the different developed theoretical insights.

Paris, France
2019-2020

MSc Data Science and Machine Learning
Sorbonne Université, *graduated with honors*

Delft, The Netherlands
2018-2019

MSc Data Science and Machine Learning
TU Delft (Technische Universiteit Delft) - One year Erasmus exchange in the Netherlands

Paris, France
2017-2018

BSc Computer Science
Sorbonne Université (Previously UPMC)

Research interests

Inverse problems · Self-supervised learning · Optimization · Physics-informed learning

Publications

JOURNAL ARTICLES:

Implicit Regularization of the Deep Inverse Prior Trained with Inertia
Nathan Buskulic, Jalal Fadili, Yvain Quéau
Handbook of Numerical analysis, 2025

Convergence and recovery guarantees of unsupervised neural networks for inverse problems
Nathan Buskulic, Jalal Fadili, Yvain Quéau
Journal of Mathematical Imaging and Vision, 2023

CONFERENCE ARTICLES:

Recovery Guarantees of Unsupervised Neural Networks for Inverse Problems trained with Gradient Descent
Nathan Buskulic, Jalal Fadili, Yvain Quéau
European Signal Processing Conference, **Best paper award Finalist**, 2024

Convergence Guarantees of Overparametrized Wide Deep Inverse Prior
Nathan Buskulic, Yvain Quéau, Jalal Fadili
SSVM, **Best paper award**, 2023

Labelling sulcal graphs across indiviuals using multigraph matching
Nathan Buskulic, François-Xavier Dupé, Sylvain Takerkart, Guillaume Auzias
International Symposium on Biomedical Imaging, 2021

Maximizing drift is not optimal for solving OneMax
Nathan Buskulic, Carola Doerr
Genetic and Evolutionary Computation Conference, 2019

Presentations

October 2025 — ***Seminar of "Signal and Communication" team at IRIT***
Oral presentation

October 2025 — ***(Blind) inverse problems in imaging: from foundations to applications*** **(Workshop)**
Oral presentation

September 2025 — ***Seminar "Machine Learning and Signal Processing" at ENS de Lyon***
Oral presentation

September 2025 — ***Mathematical Aspects of Data Science*** **(Summer School)**
Poster presentation

July 2025 — ***Maths4DL Conference on Inverse Problems and Deep Learning*** **(Conference)**
Oral presentation (Invited)

May 2025 — ***Unrolling and un/self/*/supervised learning for inverse problems*** **(Workshop)**
Oral presentation

January 2025 — ***Mathematical Image Analysis*** **2025 (Conference)**
Oral presentation

August 2024 — ***EUSIPCO*** **2024 (Conference)**
Oral presentation and poster presentation for best paper award

October 2023 — ***Fondements mathématiques de l'IA*** **(Workshop)**
Oral presentation

May 2023 — ***Scale Space and Variational Methods*** **2023 (Conference)**
Poster presentation

March 2023 — ***Imaging inverse problems - regularization, low dimensional models and applications*** **(Workshop)**
Oral presentation

Research experience

Marseille, France
February 2020 - August 2020

INT (Institut de Neurosciences de la Timone) - CNRS
Supervisor: Guillaume Auzias and Sylvain Takerkart
Worked on developing multi-graph matching algorithms with a subsequent soft labeling of graph nodes in order to create a prototype on sulcal pits graphs

Paris, France
June. 2018 - August 2018

LIP6 (Computer Science Laboratory of Paris 6) - CNRS
Supervisor: Carola Doerr
Found optimal values for evolutionary algorithms applied to the OneMax problem

Teachings

Université de Caen:

2021 and 2022
Image and Sound Processing - Teaching assistant
Fundamentals of variational methods for inverse problems, Master Level

2022 and 2023
Image Synthesis - Teaching Assistant
Ray-tracing methods and creation of a ray-tracer, Master Level