

Pierre Bertrand

Associate Professor at AMSE & Data Scientist

Professional Experience at University

Teaching

- 2024 – 2026 **L1 Mathematics 1**, *Faculty of Economics and Management, AMU, Aix-en-Provence*, 24h lectures, ~200 students in amphitheater
Introductory mathematics course at the entry of the Faculty
- L2 Inferential Statistics**, *Faculty of Economics and Management, AMU, Aix-en-Provence*, 30h lectures, ~200 students in amphitheater
Statistical tests, Mean estimation
- M1 Applied Mathematics**, *Faculty of Economics and Management, AMU, Aix-en-Provence*, 60h tutorials, groups of ~25 students
KKT conditions, Phase portraits
- 2017 – 2024 **Lecturer in the Data Science for Actuarial Studies program**, *Institut des Actuaire*, Paris, 10h, groups of ~15 students
Introduction to machine learning, deep learning and Transformer applications, practice with text mining, sentiment analysis, image generation and classification
- 2013 – 2015 **Oral examiner in MP (Mathematics and Physics preparatory class)**, *Lycée Hoche*, Versailles

Research

- Papers
- Bertrand P., Stummer W.: Some smooth divergences for ℓ_1 -approximations, *Proceedings of Geometric Science of Information* (2025)
 - Bertrand P., Broniatowski M. and Marcotorchino J.F.: Independence versus Indetermination: basis of two canonical clustering criteria, *Advances in Data Analysis and Classification* (2022)
 - Bertrand P., Broniatowski M. and Marcotorchino J.F.: Minimization with respect to divergences and applications, *Geometric Science of Information* (2021)
 - Delavallade T., Bertrand P. and Thouvenot V. : Extracting future crime indicators from Social Media, *Factors Driving Future Crime*, Springer (2016)
 - Bertrand P. and Lenzen C. : Brief Announcement: The 1-2-3 Toolkit for Building your own Balls-into-Bins Algorithm, *28th Symposium on Distributed Computing (DISC)* (2014)
- Conferences
- Bertrand P., Stummer W.: Some smooth divergences for ℓ_1 -approximations, *Proceedings of Geometric Science of Information* (October 2025)
 - Bertrand P.: Une méthode constructive pour minimiser les correspondances de couples, *Journées de Probabilités* (July 2025)
 - Bertrand P. and Mabilia Y. : Deep Recurrent Neural Network for Sequence Learning in Spark, *Spark Summit East* (2016)
 - Bertrand P. and Lenzen C. : The 1-2-3-Toolkit for Building Your Own Balls-into-Bins Algorithm, *Algorithm Engineering & Experiments (ALENEX)* p.44-54 (2015)
- Patents
- Fingerprint recognition acceleration process using Deep Learning (2017)
 - Monitoring system for an industrial installation; associated configuration and monitoring methods (2016)

- Under review ○ Submitted in June 2025, Journal of Machine Learning Research: Bertrand P., Broniatowski M., and Stummer W.: Hybrid Random Concentrated Optimization Without Convexity Assumption, *preprint hal-05010725*
- Ongoing Research ○ General form of indeterminacy: The indeterminacy π^+ is a particular coupling of two marginals μ and ν which has the property of spreading the distribution as much as possible: the sum of squares is minimized under π^+ among the distributions respecting the marginals. Its form is only known under an additional assumption on the marginals. Generalizing it is the aim of this work.
- Referee Geometric Science of Information (2025) • Advances in Data Analysis and Classification (2021)

Professional Experience in the Private Sector

BNPP CIB

- Apr. 2023 – Sept. 2024 **Product Owner at BNP Paribas CIB, Analytics Consulting**, Internal consulting team in Artificial Intelligence (AI) and Business Intelligence (BI)
Development of the ESG API providing ESG data from 20 external providers to the entire BNP Paribas group: collecting and prioritizing user requests across the group; designing technical solutions to maintain and improve the API in collaboration with multiple developers. • Development of the GHG API disseminating BNP Paribas' reference on greenhouse gas (GHG) emissions for each company, based on external providers and an internal model • Deployment of an internal Carbon Footprint Model (CFM): methods to monitor CFM and enhance its robustness.
- Jan. 2018 – Apr. 2023 **Data Scientist at BNP Paribas CIB, Analytics Consulting**
AI: Development in Python of a Speech-to-Text tool; Search solution across multiple data sources used throughout BNP Paribas; Translation solution used across BNP Paribas; Job offer creation assistance tool available to all HR teams; Sentiment analysis; Supervision of interns conducting research to improve the in-house translation tool developed in PyTorch, the sentiment analysis tool in Python, and the audio transcription tool in Kaldi. • BI: Predictive tool for matching future needs with current resources used by HR directors of 20 entities (combination of BI in Alteryx for data preparation, an assignment algorithm in Python, and visualization via a Tableau dashboard); Monitoring of building occupancy for IMEX France. • Other: Development of a Python-based pricer for solar panel financing projects; PySpark-based reconciliation tool to enrich the client database using information from an external database.

Thales

- Sept. 2015 – Dec. 2017 **Data Scientist at Thales, Position at the Information Processing and Analysis Center attached to the Technical Directorate of Thales Communications and Security**, Research-oriented team
Development in Scala/Spark of a failure prediction algorithm for an industrial system monitored by hundreds of sensors using recurrent neural networks • Development in Python of a Siamese neural network to search for a fingerprint in a database • Development in Python of a convolutional neural network to recognize voice in radio transmissions • Patent filings on these algorithms and their applications (see the patent section below) • Management and evaluation of collaborative projects (European research project TENSOR)

Education

University Recruitment Results

- 2024 **Aix-Marseille Position 1352 (2024) - Ranked 1st**, Faculty of Economics and Management - Aix Marseille School of Economics, Keywords: econometrics, statistical learning, finance, market finance
- 2023 **Paris-Cité Position 379 (2023) - Ranked 3rd**, Laboratory of Biostatistics, Data Processing, and Modeling of Biological Data, Faculty of Pharmacy, Paris Cité, Keywords: artificial intelligence, modeling, data science

- 2023 **Aix-Marseille Position 1223 (2023) - Ranked 1st - Declined for personal reasons**, *Laboratory of Economic and Social Sciences of Health & Medical Information Processing*, Aix-Marseille University, Keywords: applied statistics, modeling, medical data, biostatistics, public health

PhD 2017–2021 in parallel of the full-time employment

Monge's Conditions, Optimal Transport and Mathematical Relational Analysis : properties, applications and extension of the indeterminacy coupling. Under supervision of Michel Broniatowski and Jean-François Marcotorchino, in department LPSM of Sorbonne Universités. *Study of a poorly known coupling function called indeterminacy. Main results: application to the so-called spy problem & to task partitioning - extension in continuous case and analysis of the attached copula - discovery of a property of couple matching minimization - interpretation through a new decomposition • One paper accepted, one conference.*

ENS Cachan & Mines de Paris 2011–2015

- 2011–2015 **École normale supérieure de Cachan, Normalien**
Normalien is a temporary civil servant status obtained after a highly competitive examination. Students are paid to study a specific field, here mathematics. They are trained by and for research.
- 2014–2015 **Université d'Orsay, Ms in Probability and Statistics, Highest distinction**
- 2013–2014 **Mines de Paris, 'Diplôme d'ingénieur': MENG in civil engineering, Highest distinction**
L'École des Mines is one of the best engineering French school.
- 2011–2013 **École normale supérieure de Cachan, Ms of Mathematics, Highest distinction**
- 2011–2013 **École normale supérieure de Cachan, Ms of Computer Science, Highest distinction**

Prépa 2009–2011

- 2009–2011 **Lycée Thiers, CPGE MPSI/MP***
An intensive curriculum in mathematics, physics, computing for competitive entry into French engineering schools. Admitted to École normale supérieure de Cachan as a normalien, on competitive examination, rank: 108/5000+.

Internships

- 2014 **Banque de France, 7 months**, Credit risk service
Stress test solution • Optimization of allocation on several currencies bonds • Comparison of Bloomberg government indices with internal ones.
- 2013 **CSAIL (MIT computer science laboratory), 3 months**
Balls-into-bins problem: control of existing algorithms run - invention of algorithms with priority - one conference and one paper (see below).
- 2012 **CMLA (ENS Cachan mathematical laboratory), 6 mois**
Convergence of finite volume schema: proof of convergence in case of a triangle discretisation - exhibition of a counter-example convergence in dimension 3 - generalization of a published result in Springer, 2011.

Others

Licenses Car, Motorbike, Boat