

# Matteo D'Achille

## CURRICULUM VITÆ



### Address and contacts

Institut de Mathématiques d'Orsay - LMO (UMR 8628 CNRS)  
Bâtiment 307, rue Michel Magat, Faculté des Sciences d'Orsay, Université Paris-Saclay  
F-91405 Orsay Cedex  
(+33) 01 69 15 68 38

Email: [matteo.dachille@universite-paris-saclay.fr](mailto:matteo.dachille@universite-paris-saclay.fr)

Website: <https://www.imo.universite-paris-saclay.fr/~matteo.dachille/>

### Research interests

Probability, Random Geometry, Statistical Mechanics, Random assignment problems

### Employement

- 01/11/2023 ↑ Member of the ERC Consolidator Grant “SuPerGRandMa”  
with Prof. Nicolas Curien (PI) and Prof. Jean-François Le Gall (Senior Researcher)
- 01/09/2022 ↑ Postdoctoral Research Fellow, Institut de Mathématiques d'Orsay (LMO, UMR 8628 CNRS),  
université Paris-Saclay. Founding (09/2022-10/2023): ANR “RanTanPlan”, PI Prof. Nicolas Curien

### Past appointment

- 01/10/2020  
→ 31/08/2022 Research and Teaching Assistant (ATER temps plein), Laboratoire d'Analyse et de Mathéma-  
tiques Appliquées, UMR 8050 CNRS, Université Paris-Est Créteil. Host: Prof. Arnaud Le Ny

### Education

- 2020 **Ph.D. Paris–Saclay University**  
Thesis title: *Statistical Properties of the Euclidean Random Assignment Problem*  
Supervisors: William Jalby, Olivier Rivoire and Andrea Sportiello  
Thesis Defended on October 16, 2020 before the Committee composed by: Michel Ledoux  
(president), Charles Bordenave (referee), Massimiliano Gubinelli (referee), Guilhem Semerjian  
(examiner), Lenka Zdeborová (examiner), Sergio Caracciolo (invited member)
- 12/2019-12/2020: Associated Member, Laboratoire d'Informatique de Paris Nord (LIPN), UMR 7030  
CNRS, Université Sorbonne Paris Nord. Working with Andrea Sportiello

2016 **M.Sc. University of Milan**, final grade 110/110 summa cum laude  
 Thesis title: *On two linear assignment problems: random assignment and Euclidean bipartite matching*  
 Supervisor: Prof. Sergio Caracciolo, Assistant Supervisor: Prof. Gabriele Sicuro

2012 **B.Sc. University of Milan**, final grade 110/110  
 Supervisor: Prof. Luca Guido Molinari

## Publications and preprints

### *Preprints*

- 2024 10. Local limit of massive spanning forests on the complete graph, with N. Enriquez and P. Melotti.  
 arXiv: [2403.11740 \[math.PR\]](#) .
- 2023 9. Ideal Poisson-Voronoi tessellations on hyperbolic spaces, with N. Curien, N. Enriquez, R. Lyons and M. Ünel. arXiv: [2303.16831 \[math.PR\]](#) . Submitted to the *Annals of Probability*

### *Published in peer-reviewed journals*

- 2022 ↓ 8. Decimations for Two Dimensional Ising and Rotator Models II: Continuous versus Discrete Symmetries, with A. van Enter and A. Le Ny, *Journal of Mathematical Physics* **63** 63, 123506, . doi: [10.1063/5.0103163](#)
7. Decimations for Two-dimensional Ising and Rotator Models, with A. van Enter and A. Le Ny, *Journal of Mathematical Physics* **63** 63, 033506. doi: [10.1063/5.0057174](#)
6. Almost Gibbsian Measures on a Cayley Tree, with A. Le Ny, *Markov Processes and Related Fields* **28**, pp. 245–273. arXiv: [2105.05767 \[math-ph\]](#)
- 2021 5. Random Assignment Problems on  $2d$  Manifolds, with D. Benedetto, E. Caglioti, S. Caracciolo, G. Sicuro and A. Sportiello, *Journal of Statistical Physics* **183**, art. 34, doi: [10.1007/s10955-021-02768-4](#)
- 2020 4. The Dyck bound in the concave  $r$ -dimensional random assignment model, with S. Caracciolo, V. Erba and A. Sportiello, *Journal of Physics A: Mathematical and Theoretical* **53** (6), 064001 doi: [10.1088/1751-8121/ab4a34](#)
- 2018 3. Anomalous scaling of the optimal cost in the one-dimensional random assignment problem, with S. Caracciolo and G. Sicuro, *Journal of Statistical Physics* **174** (4), 846–864, doi: [10.1007/s10955-018-2212-9](#)
- 2017 ↓ 2. Random Euclidean matching problems in one dimension, with S. Caracciolo and G. Sicuro, *Physical Review E* **96** (4), 42102, doi: [10.1103/PhysRevE.96.042102](#)
1. Finite-size corrections in the random assignment problem, with S. Caracciolo, E.M. Malatesta and G. Sicuro, *Physical Review E* **95** (5), 52129, doi: [10.1103/PhysRevE.95.052129](#)

## Talks

**24** talks, including **4** at international conferences and **6** at national conferences or workshops, see details below. Legenda: in presence (P) or in visioconference (V), invited (I) or contributed (C).

2024 ↓	14/08 - Bernoulli-ims 11th World Congress in Probability and Statistics, Bochum, Germany ( <a href="#">website</a> ) C, P	
	19/06 - Stat-Mech in Créteil 2024-II : Random Systems, Université Paris-Est Créteil, 45 min ( <a href="#">website</a> ) I, P	
	30/04 - Séminaire CALIN, LIPN, Université Sorbonne Paris Nord, France ( <a href="#">website</a> )	I, P
	19/02 - Séminaire de Probabilités, LAREMA, université d'Angers, France ( <a href="#">website</a> )	I, P
	30/01 - Séminaire de Probabilités, Institut Fourier, université Grenoble-Alpes ( <a href="#">website</a> )	I, P
2023 ↓	21/11 - Séminaire Analyse-Probabilités, CEREMADE, université Paris-Dauphine ( <a href="#">website</a> )	I, P
	21/09 - Rencontres de Probabilités 2023, LMRS, université de Rouen, France ( <a href="#">website</a> )	I, P
	20/09 - Seminário de Probabilidade e Mecânica Estatística, IMPA, Brazil ( <a href="#">recording</a> )	I, V
	28/06 - Journée Cartes, IRIF, université Paris-Cité ( <a href="#">website</a> )	I, P
	13/06 - Franco-Dutch Workshop : Stat-Mech in Créteil 2023, université Paris-Est ( <a href="#">website</a> )	I, P
	24/01 - PizzaMa Seminar, LMO, université Paris-Saclay	C,P
	17/01 - Random Geometry - Géométrie Aléatoire, CIRM Marseilles Luminy ( <a href="#">website</a> )	I, P
2022 ↓	06/12 - Probability and Statistics Seminar, LAGA, Sorbonne Paris Nord ( <a href="#">site web</a> )	I,P
	22/09 - Back-to-school day of probastat team of LMO, université Paris-Saclay ( <a href="#">website</a> )	I,P
	06/09 - Optimal Transport & Uncertainty - 2 <sup>nd</sup> Edition, University of Naples, IT ( <a href="#">site web</a> )	I, P
	20/06 - DYOGENE Seminar, INRIA and École Normale Supérieure, Paris ( <a href="#">website</a> )	I, P
	08/03 - Séminaire de probabilité de Créteil, université Paris-Est Créteil, FR ( <a href="#">website</a> )	I, P
	18/02 - Les probas du vendredi, Sorbonne Université, Paris, FR ( <a href="#">website</a> )	I, P
2021 ↓	26/11 - Optimal Transport & Uncertainty, Pisa University, IT ( <a href="#">website</a> )	I, P
	14/09 - SPOR Seminar, EURANDOM, TU/E, Eindhoven, NL ( <a href="#">website</a> )	I, P
	07/07 - Franco-Dutch meeting, CNRS IRP, Institut Henri Poincaré, Paris, FR ( <a href="#">website</a> )	I, P
	23/06 - 1 <sup>st</sup> Italian Society of Statistical Physics (SIFS) conference, Parma, IT ( <a href="#">recording</a> )	C,V

	21/06 - Journées de Probabilités 2021, Guidel Plages, FR ( <a href="#">website</a> )	I,P
	18/03 - ALÉA Days 2021, CIRM Marseilles Luminy, FR ( <a href="#">website</a> )	C,V
	21/02 - Laboratoire Painlevé, Université de Lille, Lille, FR ( <a href="#">website</a> )	I,V
2020 ↓	10/11 - Probability and Statistics Seminar, Université Paris-Est Créteil, Créteil, FR ( <a href="#">website</a> )	I,P
	16/10 - PhD Thesis Defense, Université Paris-Saclay, FR	V
	14/01 - Combinatorics Seminar, Université Sorbonne Paris Nord, Villataneuse, FR ( <a href="#">website</a> )	I,P

### Invited Graduate School

2024	“Probability with / on random graphs: trees, networks, dimers, assignments”, AESIM-CIMPA Summer School, Nesin Mathematics Village, Şirince, İzmir Province, Turkey. 29/07 to 04/08 Course title: <i>An invitation to random assignment problems</i>	
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### Referee activity in peer-reviewed journals

2017 ↑	Referee for <b>11 manuscripts</b> submitted for possible publication to the following journals in probability theory, information theory, statistical mechanics and nonlinear sciences:	
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- Probability Theory and Related Fields
- Electronic Journal of Probability (IMS)
- IEEE Transactions on Information Theory
- Physical Review X (APS)
- Chaos (AIP)

Source: Web of Science ([link](#))

### Grants

2023 ↑	<b>2.25k€</b> from the Fondation Mathématique Jacques Hadamard (FMJH)	
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### Scientific invitations abroad

2021 ↓	One week (22/11-29/11), Mathematics Department, University of Pisa, Italy. Host: Prof. Dario Trevisan.  Two weeks (09/09-24/09), CASA, TU/E, Eindhoven, The Netherlands. Host: Prof. Oliver Tse.	
2018	Two weeks (18/02-04/03), Banach Center; Polish Academy of Sciences, Warsaw, Poland. Host: Prof. Jacek Miękiś.	

## Invited stays in France

- 2024 ↓ 3/06-5/06, Institut Fourier, Grenoble, France.  
Host: Loren Coquille.
- 18/02-19/02, LAREMA, Université d'Angers, France.  
Host: Pr Loïc Chaumont.
- 29/01-30/01, Institut Fourier, Grenoble, France.  
Hosts: Loren Coquille and Hugo Vanneuville.

## (Co-)Organization of seminars and conferences

- 2024 Bernoulli-IMS **11th World Congress in Probability and Statistics**, August 12-16, Bochum, Germany.  
Contributed Paper Session: *Randomness on Trees and Random Trees*  
[bernoulli-ims-worldcongress2024.org/Randomness on Trees and Random Trees](https://bernoulli-ims-worldcongress2024.org/Randomness%20on%20Trees%20and%20Random%20Trees)
- 2023 ↑ Weekly seminar **SuperGRandMa**, Institut de Mathématiques d'Orsay.  
<https://www.imo.universite-paris-saclay.fr/~nicolas.curien/ERC.html>
- 2022 ↑ Recurring conference **Les Probabilités de Demain**, Institut Henri-Poincaré, Paris.  
<https://www.lesprobabilitesdedemain.fr/>
- 2022 Conference **The many facets of Statistical Field Theory**, SISSA, Trieste, Italy.  
In honour of Prof. Sergio Caracciolo's 70th birthday  
<https://sites.google.com/view/the-many-facets-of-sft> - [YouTube channel](#)
- 2021 ↑ Seminar and webinar "**Seed Seminar of Mathematics and Physics**", Institut Henri-Poincaré & online.  
Seed Seminar is an international activity of the INSMI-CNRS: [Indico](#)  
<https://seedseminar.apps.math.cnrs.fr/> - [YouTube channel](#)

## Membership of Scientific Societies

- 2022 ↑ Société de Mathématiques Appliquées et Industrielles (SMAI), voting member
- 2019 ↑ Italian Society of Statistical Physics (SIFS), voting member
- 2017 ↑ European Physical Society (EPS), individual member
- 2013 ↑ Italian Physical Society (SIF), voting member

## Other memberships

- 2019 ↑ Member of the WIMS EDU association ([website](#))

## Students supervision

**12 students** in Mathematics in M2, M1 or L3 in Orsay (LMO, université Paris-Saclay) and Créteil (LAMA, université Paris-Est): **1** M2 research internship (with stipend), **5** M1 TER projects and **5** L3 TER projects.

See below for details (names, manuscripts titles, school specialty, defense date in the margin).

### **2024**

- 10.07 Marino Azzola  
*Study of the local limit of massive spanning forests on  $K_n$*   
M1 TER project, Master Jacques Hadamard, Orsay, université Paris-Saclay
- 9.07 Zhuowei Yao  
*Étude de la perturbation diagonale des zéros de Yang-Lee de la matrice  $J_n$*   
M1 TER project, Master Mathématiques fondamentales, Orsay, université Paris-Saclay
- 16.05 Mathys Brugier, Tony Hajjar, Theotime Niault, Simon Objois, Adam R.  
*Répulsion de zéros de Yang-Lee aléatoires*  
L3 TER project, licence Mathématiques MAG, Orsay, université Paris-Saclay

### **2022**

- 2.09 Yuqi Liu  
*Comparison of different Euclidean Random Assignment Problems*  
M2 research internship, Master Mathématiques et Applications, université Paris-Est Créteil. Yuqi's internship has been funded by a 3 months stipend from université Paris-Est Créteil (from 11/04 to 11/07)
- 19.05 Mouad Haï, Yilun Li  
*Équations de Mathieu et ERAPs sur des domaines elliptiques à  $p = 2$*   
M1 TER project, Master Mathématiques et Applications, université Paris-Est Créteil

### **2021**

- 17.05 Moustapha Mouhamadou Ba, Yuqi Liu, Issa Konate Sy  
*Universalité dans le problème d'assignation aléatoire euclidienne en dimension  $d = 1$*   
M1 TER project, Master Mathématiques et Applications, université Paris-Est Créteil

## Regular teaching activities

**429h eqTD**, including **CM** (course) and **TD** (tutorial) in analysis, probability, statistics and dynamical systems for bachelor students (L1, L2 and L3), see details below.

2020 → 2022 Teaching Assistant in Mathematics, Université Paris-Est Créteil (~192 hours for 2<sup>nd</sup>-3<sup>rd</sup> year Bachelor students in Economics)

Spring Term 2022: Tutorials/Course, “**Statistical Inference**” by S. Laruelle.

*Program:* point estimators, confidence interval estimators, statistical tests, least squares.

Fall Term 2021: Tutorials, “**Mathematics for Dynamical Systems**” by A. Deshayes.

*Program:* sequences, 1st and 2nd order recurrent equations, 1st and 2nd order ODEs, higher order ODEs, recurrent systems.

Tutorials/Course, “**Probability**” by S. Laruelle.

*Program:* Introduction to Probability, discrete and continuous random variables, convergence of random variables, limit theorems.

Spring Term 2021: Tutorials/Course, “**Statistical Inference**” by S. Laruelle.

*Program:* point estimators, confidence interval estimators, statistical tests, least squares.

Fall Term 2020: Tutorials, “**Mathematics for Dynamical Systems**” by A. Le Ny.

*Program:* dynamical systems in discrete time dynamical systems in continuous time, applications to models in Economics.

2019 → 2020 *Lecturer in Mathematics*, Paris-Saclay University (Orsay) (15 hours for 1<sup>st</sup> year Bachelor students in Mathematics, Physics and Informatics)

Spring Term 2020: WIMS, “**Remédiation en Mathématiques (OuiSi)**” by G. Moreau.

*Program:* basic operations, Euclidean geometry, trigonometry, functions, complex numbers, mean value theorem, integral calculus.

2018 → 2019 *Tutor in Mathematics*, Paris-Saclay University (Orsay) (65 hours for 1<sup>st</sup> year Bachelor students in Mathematics, Physics and Informatics, and dual Bachelor “Physico-Chimie”)

Spring Term 2019: Tutorials+WIMS, “**Remédiation en Mathématiques (OuiSi)**” by G. Moreau.

*Program:* basic operations, Euclidean geometry, trigonometry, functions, complex numbers, mean value theorem, integral calculus.

Fall Term 2018: Tutorials, “**Calculus Math 151**” by G. David.

*Program:* functions, limits and continuity, Taylor expansion, derivative, parametric curves, behaviors of functions over a closed and bounded interval, Taylor expansion of order  $\geq 2$ , ODEs, primitives and integrals, functions of several variables.

## Participation as auditor to research schools, conferences, seminars, workshops

2024	Abel in Paris, IHP, Paris ( <a href="#">website</a> )
2023 ↓	<p>11e séminaire ITZYKSON, IHES, Bures-sur-Yvette (<a href="#">website</a>)</p> <p>Probability and Geometry in, on and of non-Euclidean space, CIRM Luminy. (<a href="#">website</a>)</p> <p>Dimers2023 : DIMERS ANR final conference, Sorbonne Université (<a href="#">website</a>)</p> <p>3 days for Elisabeth Gassiat's 62nd birthday, LMO, Université Paris-Saclay. (<a href="#">website</a>)</p> <p>Branching Processes and Applications, Angers, France (<a href="#">website</a>)</p> <p>ALEA Days - Journées ALEA, CIRM Marseille Luminy. (<a href="#">website</a>)</p> <p>Journée Cartes, Université Gustave-Eiffel, FR (<a href="#">website</a>)</p> <p>Inhomogeneous Random Systems, IHP and Institut Curie, Paris (<a href="#">website</a>)</p>
2022 ↓	<p>Journée cartes, ENS Lyon, FR (<a href="#">website</a>)</p> <p>Journées Postdoc de la Fondation Mathématique Jacques Hadamard, IHES, FR (<a href="#">website</a>)</p> <p>Lille Days in Point Processes and Stochastic Geometry, IMT Nord Europe, Lille, FR (<a href="#">website</a>)</p> <p>Journée Aleatoire 2022, Institut Henri Poincaré, Paris (<a href="#">website</a>)</p> <p>Journées MAS 2022, Rouen, FR (<a href="#">website</a>)</p> <p>Random Point Processes in Statistical Physics, Harnack-Haus, Berlin, DE (<a href="#">site web</a>)</p> <p>10th Anniversary of the Bézout Labex, université Gustave Eiffel, FR (<a href="#">website</a>)</p> <p>100 (102!) Years of the Ising Model, IHES, Bures-sur-Yvette, FR (<a href="#">website</a>)</p> <p>Random matrices meet random permutations, Lille, FR (<a href="#">website</a>)</p> <p>Journées ALEA 2022, CIRM Luminy, FR (<a href="#">website</a>)</p> <p>Quantization, Location, Sampling and Matching, Centre Lagrange, Paris (<a href="#">website</a>)</p> <p>Inhomogeneous Random Systems, IHP and Institut Curie, Paris (<a href="#">website</a>)</p>
2021 ↓	<p>Optimal Transport and Uncertainty, Pisa, IT (<a href="#">website</a>)</p> <p>Stochastic Geometry Days Dunkerque, FR (<a href="#">website</a>)</p> <p>Franco-Dutch meeting Bézout-Eurandom IHP, Paris (<a href="#">website</a>)</p>



Journées Processus de Hawkes, IHP, Paris ([website](#))

Journées de probabilités 2021, Guidel, FR ([website](#))

Theory of Probability and Its Applications: P.L. Chebyshev - 200, Moscow, RU ([website](#))

Journées Aléa 2021, Research School, CIRM Marseilles Luminy, FR, ([website](#))

Inhomogeneous Random Systems, IHP and Institut Curie, Paris ([website](#))

2020 ↓ Integrable Probability Online Summer School, Clay Institute & Heilbronn Institute, ([website](#))

Journées de combinatoire de Bordeaux 2020, LaBRI, Université de Bordeaux, FR ([website](#))

2019 ↓ Combinatorics and Arithmetic for Physics: special days meeting, IHES, FR ([website](#))

Journées MathSTIC 2019 – Probabilités et Combinatoire workshop, Université Paris 13 ([website](#))

2018 ↓ Paths in Statistical Physics, Université Paris Diderot, FR ([website](#))

Information transmission in biological systems, Będlewo, Poland ([website](#))

2016 Optimal Transport and Applications, Scuola Normale Superiore, Pisa, IT ([website](#))

2014 Mathematical Physics, Analysis and Stochastics, Universität Heidelberg, DE ([website](#))

## Languages

Italian (native), French (advanced), English (advanced), Spanish (beginner)

## Programming languages and computer skills of everyday use

C++, Python, Wolfram Language<sup>™</sup>, L<sup>A</sup>T<sub>E</sub>X, HTML, CSS