CURRICULUM VITAE

Last name : Chhaibi
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Birth: 16th of October 1985
Position: Assistant professor at the Institute of Mathematics of Toulouse

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Academic positions and training

- **Université Paul Sabatier - UPS**, Toulouse, France **from September 2015**
Institut de Mathématiques de Toulouse - IMT

  Assistant Professor (Maître de conférences section 26).
  HDR expected for fall 2023.

- **Universität Zürich - UZH**, Zürich, Switzerland **September 2012 - August 2015**
Institüt für Mathematik - iMATH

  Postdoc with Ashkan Nikeghbali and Paul-Olivier Dehaye.

- **Université de Paris VI**, France **September 2009 - August 2012**
LPMA - Laboratoire de Probabilité et Modèles Aléatoires

  PhD thesis (Thèse de Mathématiques).
  - Advisor: Philippe Bougerol.
  - Topic: Littelmann path model for geometric crystals, Whittaker functions for complex semi-simple groups and Brownian motion.
  - Referees: Alexei Borodin and Peter Littelmann.
  - Jury: Philippe Biane, Philippe Bougerol, Alexei Borodin, Emmanuel Breuillard, Yves Lejan, Peter Littelmann, Marc Yor.

- **Université de Paris VI et Ecole Polytechnique**, France **2008 - 2009**
Master "Probabilités et applications"
- **Ecole Polytechnique**, Palaiseau, France **September 2005 - August 2009**

Paris VI University and Ecole Polytechnique, France **September, 2008 - August, 2009**

- MSc, Probability and Finance, directed by El Karoui-Pagès-Yor. Coursework: diffusion processes, numerical methods, risk measures, derivatives products, econometrics and time series, introduction to Lévy processes, exponential functionals of Lévy processes, introduction to optimal control.
- Complementary coursework from the MSc program, Probability and Applications, directed by J. Jacod: stochastic calculus, large deviations and limit theorems, introduction to random matrices, local time and excursions.

Ecole Polytechnique, Palaiseau, France **September, 2005 - August, 2009**

- Mathematics: measure theory, distribution theory, Fourier analysis, Galois theory, differential topology and De Rham cohomology, introduction to elliptic curves and modular forms.

- Applied mathematics and physics: stochastic models in finance, time series, probability (Markov chains and martingales), PDE methods, statistics, quantum mechanics, mechanics.

Industry Experience

- **Natixis, EDA Team (Equity Derivatives and Arbitrage)**, Paris, France
Quantitative Analyst under Adil Reghai (Equities) **April, 2009 - September, 2009**

- **Credit Suisse, RQA Team (Research and Quantitative Analysis)**, London, UK
Quantitative Analyst under Guillaume Gimonet (Credit) **May 2008 - September, 2008**

Publications

(20) "To spike or not to spike: the whims of the Wonham filter in the strong noise regime" with Bernardin Cédric, Najnudel Joseph and Pellegrini Clément. Submitted to PTRF (Probability Theory and Related Fields).
https://arxiv.org/abs/2211.02032

(19) "A unified approach to informed trading via Monge-Kantorovich duality." with Ibrahim Ekren, Eunjung Noh and Lu Vy. Submitted to MOR (Mathematics of Operations Research).
https://arxiv.org/abs/2210.17384

(18) "Free Probability for predicting the performance of feed-forward fully connected neural networks" with Tariq Daouda and Ezechiel Kahn. NeurIPS 2022.
https://arxiv.org/abs/2111.00841
https://openreview.net/forum?id=Ri3T9dwZ_rG

(17) "Emergence of jumps in quantum trajectories via homogeneization" with T. Benoist, C. Bernardin, R. Chetrite, J. Najnudel and C. Pellegrini. Commun. Math. Phys. 387, 1821–1867 (2021).
https://arxiv.org/abs/2103.01916
https://doi.org/10.1007/s00220-021-04179-8

(16) "Geodesics in fibered latent spaces: A geometric approach to learning correspondences between conditions" with T. Daouda, P. Tossou and A. Villani. Submitted to SIAGA (SIAM Journal on Applied Algebra and Geometry).
https://arxiv.org/abs/2005.07852

(15) "Quantum SL_2, Infinite curvature and Pitman's 2M-X theorem" with F. Chapon. Probability Theory and Related Fields.
https://arxiv.org/abs/1904.00894
https://doi.org/10.1007/s00440-020-01002-8

(14) "On the circle, $GMC^\gamma = \varprojlim C\beta E_n$ for $\gamma = \sqrt{\frac{2}{\beta}}$, $(\gamma \leq 1)$" with J. Najnudel. Positive reports. In revisions at JEMS (Journal of the European Mathematical Society).
https://arxiv.org/abs/1904.00578

(13) "Rigidity of the Sineβ process" with Joseph Najnudel. Electron. Commun. Probab., Volume 23 (2018), paper no. 94, 8 pp.
http://arxiv.org/abs/1804.01216
https://doi.org/10.1214/18-ECP195

(12) "Spiking and collapsing in large noise limits of SDE's" with C. Bernardin, R. Chetrite, J. Najnudel and C. Pellegrini. Ann. Appl. Probab. 33 (1) 417 - 446, February 2023.
https://arxiv.org/abs/1810.05629
https://doi.org/10.1214/22-AAP1819

(11) "A limiting characteristic polynomial of some random matrix ensembles" with Emma Hovhannisyan, Joseph Najnudel, Ashkan Nikeghbali, Brad Rodgers. Ann. Henri Poincaré (2019).
http://arxiv.org/abs/1707.09956

https://doi.org/10.1007/s00023-019-00769-4

(10) "The Hörmander condition for delayed stochastic differential equations" with Ibrahim Ekren. Annales Henri Lebesgue, Volume 3 (2020) , pp. 1023-1048.
http://arxiv.org/abs/1610.05229
https://doi.org/10.5802/ahl.53

(9) "On the maximum of the CβE field" with Thomas Madaule and Joseph Najnudel. Duke Math. J. 167 (2018), no. 12.
http://arxiv.org/abs/1607.00243
https://doi.org/10.1215/00127094-2018-0016

(8) "Mod-φ convergence: Approximation of discrete measures and harmonic analysis on the torus", with Freddy Delbaen, Pierre-Loïc Méliot, Ashkan Nikeghbali. Annales de l'Institut Fourier, Volume 70 (2020) no. 3, pp. 1115-1197.
http://arxiv.org/abs/1511.03922
https://doi.org/10.5802/aif.3332

(7) "Whittaker processes and Landau-Ginzburg potentials for flag manifolds". Preprint.
http://arxiv.org/abs/1504.07321

(6) "The Circular Unitary Ensemble and the Riemann zeta function: the microscopic landscape", with J. Najnudel and A. Nikeghbali. Invent. math. (2017) 207: 23.
http://arxiv.org/abs/1410.1440
https://doi.org/10.1007/s00222-016-0669-1

(5) "Non-Archimedean Whittaker functions as characters: a probabilistic approach to the Shintani-Casselman-Shalika formula". Int Math Res Notices (2016).
http://arxiv.org/abs/1409.4615
https://doi.org/10.1093/imrn/rnw091

(4) "A note on a Poissonian functional and a q-deformed Dufresne identity". Electron. Commun. Probab. Volume 21 (2016), paper no. 35, 13 pp.
http://arxiv.org/abs/1406.5695
https://doi.org/10.1214/16-ECP4055

(3) "Littelmann path model for geometric crystals". Preprint.
http://arxiv.org/abs/1405.6437

(2) "Beta-gamma algebra identities and Lie-theoretic exponential functionals of Brownian motion". Electron. J. Probab. 20 (2015), no. 108, pages 1-20.
http://arxiv.org/abs/1404.7029
https://doi.org/10.1214/EJP.v20-3666

(1) "Littelmann path model for geometric crystals, Whittaker functions on Lie groups and Brownian motion". PhD thesis. 226 pages. University of Paris VI. Publicly defended on the 24th of January 2013.
http://arxiv.org/abs/1302.0902.

Supervision (PhD students)

- September 2022 - September 2025: Damien REMOT (50%). Co-supervised with Clément PELLEGRINI (50%). Industrial grant. Collaboration with NXP Semiconductors.
  Topic: Global sensitivity analysis and Gaussian processes for circuit design.
- September 2022 - September 2025: Anirban BOSE (33%). Co-supervised with Serge GRATTON (33%) and Sixin ZHANG (33%). Academic grant.
  Topic: Computational aspects of optimal transport.
- November 2020 - November 2023: Virgile FOY (50%). Co-supervised with Fabrice GAMBOA (50%). Industrial grant. Collaboration with Safran Tech.
  Topic: Geometry of latent spaces for the AI generation of 3D shapes.

Supervision (Master students)

- Louis CARLIER. M1 internship. “Machine learning for time series using rough path signatures”. Université Paul Sabatier. Summer 2023.
- Damien REMOT. M2 internship. “Estimators of the Sobol and Cramér-Von-Mises indices for Global Sensitivity Analysis”. Université Paul Sabatier. Summer 2022.
- Virgile FOY. M2 internship. “Machine learning for sound recognition”. Université Paul Sabatier. Summer 2020.
- Tom GIPOULOUX. M2 internship. “Last passage percolation”. Université Paul Sabatier. 2018.
- Sandro CALORE. “Numerical methods in finance: Pricing options with MATLAB”. Universitat Zurich. Defended on fall 2013.
- Kevin Konrad MEYER. “On Infinitely Divisible Laws, Brownian motion and Analytic Number theory”. Universitat Zurich. Defended on fall 2013.

Selected talks

- 22/09/2020: Seminar Talk. Laboratoire Jean Dieudonné. Nice. France.
- 03-05/06/2020: Workshop ANR MESA "Quantitative methods in Random Matrices". Toulouse, France. RESCHEDULED BECAUSE OF COVID-19.
- 25-29/05/2020: Congrès de la SMF. Nancy, France. Invité mais évènement annulé à cause de la COVID-19.
- 19/05/2020: Oxford Random Matrix Theory Seminars. Online.
- 13/03/2020: Séminaire MeGA. Paris, France.
- 02-06/12/2019: XV Latin American Congress of Probability and Mathematical Statistics (CLAPEM 2019). Speaker at a thematic session. Mérida-Yucatán, México.
- 17-28/11/2019: Guest at FSU. Seminar and Coloquium talks. Thallahassee, Florida, USA.
- 01-15/11/2019: Guest at the Hausdorff Institute. Seminar talk. Bonn, Germany.
- 27-31/10/2019: Workshop. Bristol, UK.
- 22/10/2019: Seminar talk. Geneva, Switzerland.
- 14-18/10/2019: Interactions between PDEs and Probability: Particle Systems, Hyperbolic Conservation Laws.. No talk. CIRM, Marseille, France.
- 09/09/2019: Workshop on quantum measurements. Talk: "Spiking and collapsing in 1d diffusions with large noise". Laboratoire Jean Dieudonné, Nice, France.
- 17-21//2019: Conference "Extremes in number theory and probability". Invited speaker. IHP, Paris, France.
- 10-21/06/2019: Conference "Probability and quantum field theory: discrete models, CFT, SLE and constructive aspects". Invited speaker. Porquerolles, France.
- 18/04/2019: Seminar talk. Cornell, USA.
- 10/04/2019: Seminar talk. Queen’s University, Kingston, Ontario, Canada.
- 01/04/2019: Workshop "Processus stochastiques, géométrie et structures algébriques". Invited speaker. Mahdia, Tunisia.
- 02/2019: Aachen-Bochum-Cologne-Darstellungstheorie Seminar. Invited speaker. Aachen, Germany.
- 2018-06-14: Exposé invité “A conjecture relating the Gaussian Multiplicative Chaos and Random matrices, on the circle” à la conférence “Log-correlated fields”. Bonn. Allemagne.
- 2018-05-29: Séminaire de probabilités. “Log-correlation: Gaussian Multiplicative Chaos, Random Matrices and some Number theory”. Versailles. France.
- 2018-03-21: Séminaire de physique mathématique. Angers. France.
- 2017-07-24: Exposé invité “On the maximum of the CβE field”. SPA Moscou.
- 2017-06-19:“Functional equations in number theory and André’s reflection principle”. Conférences en l’honneur de Yves Guivar’ch. Rennes.

- 2017-04-07:"On the maximum of the CβE field". Conférence MiLyon organisée par A. Guionnet et J. Dabrowski. Lyon.
- 2017-04-14:"Autour du maximum du champs CβE et chaos gaussien". Séminaire du GdR Matrices Et Graphes Aléatoires, Paris.
- 2017-02-23: Semestre IHP - Asymptotic representation theory. "André's reflection principle and functional equations in number theory", Paris, France.
- 2017-01: Mini-cours "From random dynamics to combinatorial and geometric crystals". Les Diablerets. Suisse.
- 2016-07-25: BIRS Workshop 16w5039: Whittaker Functions: Number Theory, Geometry and Physics, Exposé "André's reflection principle and functional equations in number theory" disponible sur http://www.birs.ca/events/2016/5-day-workshops/16w5039/videos. Banff, Canada.
- 2016-06-28: Exposé de séminaire. "On the maximum of the circular beta field". Grenoble, France.
- 2016-06-23: MADACA Conference, "André's reflection principle and functional equations in number theory", Tours, France.
- 2016-05-26: Séminaire d'algèbre à Poitiers. "Bases cristallines de groupes quantiques et propriété de Markov de marches aléatoires".
- 2014-06-22/29: Visiteur à l'University of Warwick (invité de Nikolas Zygouras). Talk: "Whittaker functions as characters: A combinatorial tour".
- 2014-01: Séminaire de probabilités à Paris V. "The geometric Robinson-Schensted correspondence and the Whittaker process".
- 2013-10-13/18: BIRS Workshop 13w5154, Whittaker Functions: Number Theory, Geometry and Physics. Exposé "Archimedean Whittaker functions and geometric crystals" disponible sur http://www.birs.ca/events/2013/5-day-workshops/13w5154/videos
- VII-th summer school in probability and stochastic processes, Mexico. Lecturer of "Random matrices in number theory: a probabilistic approach." with Nicolas Robles. http://paginas.matem.unam.mx/VII-EscuelaDeProbabilidad/
- 2013-06-18: Number theory seminar - Stanford, Palo Alto, California, USA. "On probabilistic aspects of the Archimedean Whittaker functions".
- 2013-05-22: Seminar for stochastic processes - ETH/UZH Zurich. "An Integrable Markov processes: the Whittaker process".
- 2013-03-11: The MIT Probability seminar - MIT, Boston, USA. "The geometric Robinson-Schensted correspondence and the Whittaker process".
- 2013-03-06: The MIT Lie group seminar - MIT, Boston, USA. "Littelmann path model for geometric crystals and Archimedean Whittaker functions as geometric characters".
- Deux semaines 11-15 February 2013 et 4-8 March 2013. ICERM Semester Program on "Automorphic Forms, Combinatorial Representation Theory and Multiple Dirichlet Series". Informal talks given.
- Du 24 Février au 2 Mars 2013. The Kardar-Parisi-Zhang Equation. "The Whittaker process for arbitrary root systems".
- 2012-12-10/14: Bielefeld University. Infinite Dimensional Analysis and Representation Theory.
- 2012-11-28: Swiss probability seminar. "Poisson Approximations and the Wiener Algebra".
- 2012-03: Warwick, UK. Worshop "Interacting particle systems, growth models and random matrices". Talk title: "Robinson-Schensted-Knuth correspondance for geometric crystals".
- 2012-02: Zurich, Switzerland. "Markov processes in probability and path models in combinatorial representation theory".

Organisation of scientific events

- 2023-02-17: “Journée GDR MeGA”, Toulouse, France.
- 2020-11-23: “Journées Doctorants du GDR MeGA”, Toulouse, France.
  https://perso.math.univ-toulouse.fr/journees-gdr-mega/
- 2020-11-04/06: “Conférence du GdR TRAG”, Toulouse, France.
  https://trag2020.sciencesconf.org/
- 2018-11-7/9: “Brown measures and non-normal random matrices”, Toulouse, France.
  https://perso.math.univ-toulouse.fr/workshop-brown/
- 2017-11-6/8: “Brownian motion in cones: algebraic and analytic approaches”, Toulouse, France.
  http://www.lmpt.univ-tours.fr/ToulouseConfBrownianCones/
- CIRM, Marseille, France. Février 27 - Mars 3, 2017. “Random matrices and determinantal point processes”
  http://scientific-events.weebly.com/1715.html
- Les Diablerets, Suisse. Du 7 au 12 Février 2016 . “Integrable random systems, representation theory and geometry of Lie groups”
  http://www.nccr-swissmap.ch/events/integrable-random-systems-representation-theory

Funding in France

- 2020/10-: Holder of a Labex CIMI project, whose members are Mireille CAPITAINE, Guillaume CEBRON and Pascal MAILLARD.
- 2020/10-: Member of ANR project JCJC STARS “Space of Traffics and Asymptotics of Random Spectra” held by Guillaume CEBRON.
- 2018/10-: Member of ANR JCJC MESA “Méthode de Stein et Analyse” held by Max FATHI.
- 2018: Beneficiary of a PEPS with Guillaume Cébron.
- 2017: Beneficiary of PEDR.
- 2017: Beneficiary of a PEPS CNRS project with François Chapon.
- 2015: Beneficiary of a BQR for new staff.

Peer Review Services

For the following journals:

- Journal of the American Mathematical Society (JAMS)
- Annals of Probability (AOP)
- Probability theory and Related Fields (PTRF)
- Bernoulli
- Electronic Communications of Probability (ECP)
- Electronic Journal of Probability (EJP)
- Bulletin of the London Mathematical Society (BLMS)
- Annales de la Faculté des Sciences de Toulouse (AFST)
- Non-linearity (NON)
- Annals of Applied Probability (AAP)

Services to the Department

- 2021-: Organizer of the probability seminar with Guillaume CEBRON and Simona GRUSEA.
- 2018-2022: In charge of the Master 1 in data science. The program name is SID "Sciences et Ingénierie des Données". The responsibility was in collaboration with Riad MOKADEM, colleague from the computer science institute (IRIT). Every year, more than 300 applications.

Languages

- French (Mothertongue)
- English (Professional)
- Spanish, German (Basic level)

Computer skills

- Mathematical packages: Matlab, Scilab, Sage, R, Python, Freefem++.
- Machine learning: PyTorch, Tensorflow.
- Programming: C/C++/C#, Java, Javascript. A certain knowledge of low level languages such as assembly x86 for code optimization.
- Algorithms: Experienced in programming deterministic and stochastic algorithms for finance (Pricing with Monte-Carlo or PDE schemes, Variance reduction). Computational mathematics (Numerical linear algebra, gradient procedures). Computer graphics (3D rendering and shading, raytracing).
- OS: Unix/Linux.

References

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