Ion Nechita

Personal Data

Address:	Laboratoire de Physique Théorique, IRSAMC, Université Paul Sabatier, Bat. 3R1B4, 118 route de Narbonne, 31062 Toulouse Cedex 04, France
Citizenship:	Romanian
Date of Birth:	September 17th, 1982
Place of Birth:	Slatina, Romania
Phone:	+33 (0)5 61 55 65 73
E–mail:	ion.nechita@univ-tlse3.fr
Web:	http://ion.nechita.net/about/

Work Experience

Present	CNRS, Chargé de recherche 1ère classe
October 2010	Laboratoire de Physique Théorique, Toulouse. Research-only, permanent position, working in the team *Quantware*, focusing on random matrices and quantum theory.
September 2017	von Humboldt fellow (Experienced Researcher)
May 2014	Research on Quantum Information Theory at TU München.
July 2010	Postdoctoral Researcher at University of Ottawa
July 2009	Advisor: Benoît Collins – Research focused on Random Matrix Theory, free probability and interactions with Quantum Information Theory.
August 2009	PhD Student at Institut Camille Jordan, Université Lyon 1
September 2006	Courses taught include: Introduction to calculus, Linaer algebra, Introduction to probability theory, Multivariate calculus.

Education

2006 - 2009	**PhD in Probability theory** at the University of Lyon Thesis: *Random states, quantum information theory and free probability* – Defended in March 2009 Advisor: Stéphane Attal – Examination board: Philippe Biane, Benoît Collins, Alice Guionnet, Christophe Sabot, Karol Zyczkowski
2005 - 2006	**Master2 de Mathématiques** (MSc) at ENS Lyon Thesis: *Random density matrices* – Advisor: Stéphane Attal
2004 - 2005	**Maîtrise de Mathématiques** (BSc) at ENS Lyon Thesis: *An introduction to quantum information theory* – Advisor: Stéphane Attal
2003 - 2004	**Licence de Mathématiques** at ENS Lyon Thesis: *Zeros of a Gaussian random series: a determinantal process* – Advisor: André Goldman
2003 - 2006	Student at the **Ecole Normale Supérieure de Lyon**, France
2001 - 2003	Preparatory classes at **Intitut National des Sciences Appliquées**, Lyon, France
2001	Romanian **baccalaureate** with high honors

Publication list (5 most significant first)

1. *Joint measurability of quantum effects and the matrix diamond* (with Andreas Bluhm) - Journal of Mathematical Physics 59, 112202 (2018)
2. *Asymptotically well-behaved input states do not violate additivity for conjugate pairs of random quantum channels* (with Motohisa Fukuda) - Comm. Math. Phys. Vol. 328, No. 3, 995-1021 (2014)
3. *Eigenvectors and eigenvalues in a random subspace of a tensor product* (with Benoit Collins and Serban Belinschi) - Inventiones mathematicae, vol. 190, no. 3, pp. 647-697 (2012)
4. *Random quantum channels II: Entanglement of random subspaces, Rényi entropy estimates and additivity problems* (with Benoit Collins) - Advances in Mathematics 226, 1181-1201 (2011)
5. *Asymptotics of random density matrices* - Ann. Henri Poincaré 8, no. 8, 1521-1538 (2007)

6. *Sinkhorn algorithm for quantum permutation groups* (with Simon Schmidt and Moritz Weber) – to appear in Experimental Mathematics
7. *A graphical calculus for integration over random diagonal unitary matrices* (with Satvik Singh) – Linear Algebra and its Applications 613, 46-86 (2021)
8. *Random positive operator valued measures* (with Teiko Heinosaari and Maria Jivulescu) - Journal of Mathematical Physics 61, 042202 (2020)
9. *Compatibility of quantum measurements and inclusion constants for the matrix jewel* (with Andreas Bluhm) - SIAM J. Appl. Algebra Geometry, 4(2), 255–296 (2020)
10. *RTNI - A symbolic integrator for Haar-random tensor networks* (with Motohisa Fukuda and Robert König) - J. Phys. A: Math. Theor. 52 425303 (2019)
11. *On the joint distribution of the marginals of multipartite random quantum state*s (with Stephane Dartois and Luca Lionni) - to appear in Random Matrices: Theory and Applications
12. *Operator Schmidt ranks of bipartite unitary matrices* (with Alexander Müller-Hermes) - Lin. Alg. and its Appl. 557, 174-187 (2018)
13. *On the separability of unitarily invariant random quantum states - the unbalanced regime* - Adv. Math. Phys., vol. 2018, Article ID 7105074, 13 pages (2018)
14. *Almost all quantum channels are equidistant* (with Zbigniew Puchała, Łukasz Pawela, Karol Życzkowski) - Journal of Mathematical Physics 59, 052201 (2018)
15. *On the minimum output entropy of random orthogonal quantum channels* (with Motohisa Fukuda) - IEEE Trans. Inf. Th. 64, no. 2, 1374 - 1384 (2018)
16. *Enumerating meandric systems with large number of components* (with Moto Fukuda) - to appear in Ann. Inst. Henri Poincaré D
17. *Almost Hadamard matrices with complex entries* (with Teodor Banica) - Adv. Oper. Theory 3, no. 1, 149–189 (2018)
18. *On symmetric decompositions of positive operators* (with Maria Jivulescu and Pasc Gavruta) - J. Phys. A: Math. Theor. 50 165303 (2017)
19. *On bipartite unitary matrices generating subalgebra-preserving quantum operations* (with Tristan Benoist) - Linear Algebra and its Applications 521, 70-103 (2017)
20. *Flat matrix models for quantum permutation groups* (with Teodor Banica) - Adv. Appl. Math. 83, 24-46 (2017)
21. *On some classes of bipartite unitary operators* (with Julien Deschamps and Clément Pellegrini) - J. Phys. A: Math. Theor. 49 335301 (2016)
22. *Random and free positive maps with applications to entanglement detection* (with Benoit Collins and Patrick Hayden) - International Mathematics Research Notices, rnw054 (2016)

23. *On the asymptotic distribution of block-modified random matrices* (with Octavio Arizmendi and Carlos Vargas) - Journal of Mathematical Physics 57, 015216 (2016)

24. *Random matrix techniques in quantum information theory* (with Benoit Collins) - Journal of Mathematical Physics 57, 015215 (2016)

25. *Almost one bit violation for the additivity of the minimum output entropy* (with Benoit Collins and Serban Belinschi) - Comm. Math. Phys. 341(3), 885-909 (2016)

26. *Thresholds for reduction-related entanglement criteria in quantum information theory* (with Maria Anastasia Jivulescu and Nicolae Lupa) - Quantum Information and Computation, Vol. 15, No. 13-14 (2015) 1165–118

27. *Additivity rates and PPT property for random quantum channels* (with Motohisa Fukuda) - Ann. Math. Blaise Pascal 22, 1-72 (2015)

28. *On the convergence of output sets of quantum channels* (with Benoit Collins and Motohisa Fukuda) - J. Operator Theory, 73:2(2015), 333-360

29. *Quantum channels with polytopic images and image additivity* (with Motohisa Fukuda and Michael M. Wolf) - IEEE Transactions on Information Theory, vol.61, no.4, pp. 1851-1859 (2015)

30. *Positive reduction from spectra* (with Maria Anastasia Jivulescu, Nicolae Lupa, and David Reeb) - Linear Algebra and its Applications 469 (2015) 276-304

31. *On the reduction criterion for random quantum states* (with Maria Anastasia Jivulescu and Nicolae Lupa) - J. Math. Phys. 55, 112203 (2014)

32. *Analytic aspects of the circulant Hadamard conjecture* (with Teodor Banica and Jean-Marc Schlenker) - Ann. Math. Blaise Pascal 21 (2014), 25-59

33. *A universal set of qubit quantum channels* (with Daniel Braun, Olivier Giraud, Clement Pellegrini and Marko Znidaric) - J. Phys. A: Math. Theor. 47 (2014) 135302

34. *Submatrices of Hadamard matrices: complementation results* (with Teodor Banica and Jean-Marc Schlenker) - Electron. J. Linear Algebra 27 (2014), 197-212

35. *Area law for random graph states* (with Benoit Collins and Karol Zyczkowski) - J. Phys. A: Math. Theor. 46 305302 (2013)

36. *Almost Hadamard matrices: the case of arbitrary exponents* (with Teodor Banica) - Discrete Applied Mathematics, vol. 161, no. 16-17, 2367-2379 (2013)

37. *Random pure quantum states via unitary Brownian motion* (with Clément Pellegrini) - Electron. Commun. Probab. 18 (2013), no. 27, 1-13

38. *Low entropy output states for products of random unitary channels* (with Benoit Collins and Motohisa Fukuda) - Random Matrices: Theory Appl. 02, 1250018 (2013)

39. *Almost Hadamard matrices: general theory and examples* (with Teodor Banica and Karol Zyczkowski) - Open Systems & Information Dynamics, Vol. 19, No. 4, 1250024 (2012)

40. *Realigning random states* (with Guillaume Aubrun) - J. Math. Phys. 53, 102210 (2012)

41. *Block-modified Wishart matrices and free Poisson laws* (with Teodor Banica) - Houston Journal of Mathematics, Volume 41, No. 1 (2015)

42. *The absolute positive partial transpose property for random induced states* (with Benoit Collins and Deping Ye) - Random Matrices: Theory Appl. 01, 1250002 (2012)

43. *Towards a state minimizing the output entropy of a tensor product of random quantum channels* (with Benoit Collins and Motohisa Fukuda) - J. Math. Phys. 53, 032203 (2012)

44. *The multiplicative property characterizes ℓ_p and L_p norms* (with Guillaume Aubrun) - Confluentes Mathematici, Volume 3, Number 4 (2011), pp. 637-647

45. *Asymptotic eigenvalue distributions of block-transposed Wishart matrices* (with Teodor Banica) - J. Theoret. Probab. 26 (2013), 855-869

46. *Generating random density matrices* (with Benoit Collins, Karol Penson and Karol Zyczkowski) - J. Math. Phys. 52, 062201 (2011)

47. *Random repeated quantum interactions and random invariant states* (with Clément Pellegrini) - Probab. Theory Relat. Fields (2012) 152:299-320

48. *Gaussianization and eigenvalue statistics for Random quantum channels (III)* (with Benoit Collins) - Ann. Appl. Probab. Volume 21, Number 3 (2011), 1136-1179

49. *Eigenvalue and Entropy Statistics for Products of Conjugate Random Quantum Channels* (with Benoit Collins) - Entropy (2010), 12(6), 1612-1631

50. *Random graph states, maximal flow and Fuss-Catalan distributions* (with Benoit Collins and Karol Zyczkowski) - J. Phys. A: Math. Theor. 43 (2010), 275303

51. *Discrete approximation of the free Fock space* (with Stéphane Attal) - Séminaire de Probabilités XLIII, LNM, (2011), vol. 2006/2011, 379-394

52. *Random quantum channels I: graphical calculus and the Bell state phenomenon* (with Benoit Collins) - Comm. Math. Phys. 297 (2010), no. 2, 345-370

53. *Quantum Trajectories in Random Environment: the Statistical Model for a Heat Bath* (with Clément Pellegrini) - Confluentes Mathematici, Vol. 1, No. 2 (2009), 249-289

54. *A permutation model for free random variables and its classical analogue* (with Florent Benaych-Georges) - Pacific Journal of Math., Vol. 242 (2009), No. 1, 33-51

55. *Stochastic domination for iterated convolutions and catalytic majorization* (with Guillaume Aubrun) - Ann. Inst. H. Poincaré Probab. Statist. Volume 45, Number 3 (2009), 611-625

56. *Catalytic majorization and ℓ_p norms* (with Guillaume Aubrun) - Comm. Math. Phys. 278 (2008), no. 1, 133-144

Selected list of talks in conferences and seminars

1. *On the (in-)compatibility of generic quantum measurements* - 4th Bangkok Workshop on Discrete Geometry Dynamics and Statistics - January 2020

2. *Compatibility of quantum measurements and inclusion of free spectrahedra* - Noncommutative Analysis, Computational Complexity, and Quantum Information workshop, CMSA Harvard - October 2019

3. *Partial transposition of random matrices: old and new* - CIRM workshop Random Matrices and Random Graphs, Luminy - April 2019

4. *Quantum de Finetti theorems and Reznick's Positivstellensatz* - Workshop on Interactions between Operator Space Theory and Quantum Probability with Applications to Quantum Information, Oberwolfach - May 2018

5. *Block-modified random matrices and applications to entanglement theory* - MEGA seminar on random matrices and random graphs, Paris - May 2017

6. *On some applications of Random Matrices in Quantum Information Theory* - QUATR-17 conference, Skoltech Moscow - June 2017

7. *Block-modified random matrices, operator-valued free probability, and applications to entanglement theory* - Mathematical Aspects in Current Quantum Information Theory, Daejeon, Korea - February 2016

8. *Random quantum channels and additivity violations* - invited talk, Quantum Groups and Quantum Information Theory, Herstmonceux - July 2015

9. *Random matrices and their use in Quantum Information Theory* - lecture at the 14ème Annual Canadian Summer School on Quantum Information, Guelph - June 2014

10. *Random matrix theory with a view towards free probability, and connections to quantum information* - lecture given at the workshop New Mathematical Directions for Quantum Information workshop, Newton Institute, Cambridge - September 2013

11. *Random subspaces of a tensor product and the additivity problem* - DMV Annual Meeting 2012, Saarland University - September 2012

12. *Random subspaces of a tensor product and the additivity problem* - Operator Spaces, Quantum Probability and Applications Workshop, Wuhan - June 2012

13. *Statistical properties of random quantum channels* - invited talk, workshop CIRM Geometry of Quantum Entanglement - January 2012
14. *Block-modified Wishart matrices and applications to entanglement theory* - 14th Non-commutative harmonic analysis Workshop, Bedlewo - September 2011
15. *Positivity in Quantum Information Theory* - Positivity Workshop, Fields Institute, Toronto - August 2011
16. *Graphical calculus for random quantum channels* - Mittag-Leffler program on QIT, Stockholm - November 2010
17. *Random graph states, maximum flow on networks and the Fuss-Catalan ensembles of density matrices* - IQC Colloquium, Waterloo - March 2010
18. *Random matrix models in quantum information theory* - Conférencier invité, Canadian Mathematical Society Winter Meeting, Windsor - December 2009
19. *Majorization, entanglement catalysis, stochastic domination and ℓ_p norms* - Conférencier invité, Fields Workshop on Operator Structures in Quantum Information, Toronto - July 2009
20. *Random density matrices* - Open Quantum Systems Days, Marseille - November 2006

Awards and Grants

- 2021: ANR grant ESQuisses - Sotchastic Quantum Evolutions (PI, 4 years)
- 2021: PHC Procope - Entanglement preservation in Quantum Information Theory (PI, 2 years)
- 2021: ANR grant STARS - Space of Traffics and Asymptotics of Random Spectra (member, 4 years)
- 2020: PHC Sakura - Random Matrices and Tensors for Quantum Information and Machine Learning - coordinator France, 2 years
- 2018: Travel grant from the Romanian science granting agency UEFISCDI
- 2017: LaBeX grant COMPMOL - member, 2 years
- 2016: grant for a 3-week research stay at the Mathematisches Forschungsinstitut Oberwolfach. Project title: "Applications of Real Algebraic Geometry in Quantum Information Theory"
- 2016: CNRS grant, Inphyniti call Project title: "MISTEQ" (coordinator, 2 years)
- 2014: von Humboldt Fellowship for Experienced Researchers (research grant, 18 months) at Technische Universität München.
- 2014: ANR grant "STOQ" - Stochastic methods in quantum mechanics (member, 3 years)
- 2013: CNRS grant, Quantum Information and Communication call. Project title: "COGIT" (coordinator, 1 year)
- 2012 : Procope grant for the project *Random matrix theory and free probability* (coordinator, 3 years, joint with Roland Speicher, University of Saarlandes)
- 2012 : ANR Blanc International grant for the project *RMTQIT* - Random matrix techniques in Quantum Information Theory (coordinator, 300kE, 3 years, joint with Politehnica University, Timisoara, Romania)
- 2011 : AO1 research grant from the University of Toulouse (coordinator, joint with a team from IRIT) for the project *Compressed sensing in ultrasound imaging: theory and applications*
- 2011 : ANR project *OSvsQPI* - Interactions between Operator Space Theory and Quantum Probability with Applications to Quantum Information (member, 3 years)
- 2011 : Prime d'excellence scientifique (excellence in science award) from CNRS, 3 years
- 2010 : PEPS grant from CNRS (coordinator) for the project *Random constructions in Quantum Information Theory*
- 2010 : Travel grant from the University of Toulouse for a 3 months stay in Ottawa, Canada

Training of highly qualified personnel

- Denis Rochette, PhD student (2020 -)
- Faedi Loulidi, PhD student (2019 -)
- Tristan Benoist, postdoctoral fellow, March 2015 - August 2016; now CNRS researcher at IMT Toulouse.

Academic service

- 26th September 2019 : Co-organizer of the annual meeting of the Mathematics and Theoretical Physics departments at the Univeristy of Toulouse.
- 26-27 November 2018 : Co-organizer, with Clement Pellegrini, of the mini-workshop "Random quantum circuits" at the IMT
- 2-6 July 2018 : Co-organizer of the special session Connections to Quantum Information Theory during the 27th edition of the Operator Theory conference in Timisoara, Romania
- September - December 2017 : Co-organizer of the trimester Analysis in Quantum Information Theory at the IHP, Paris
- 23-25 January 2017 : Co-organizer of the workshop Quantum trajectories, parameter and state estimation at the IMT in Toulouse
- 11-22 July 2016 : Co-organizer of the summer school Stochastic Methods in Quantum Mechanics in Autrans, France
- 18-22 January 2016 : Co-organizer of the workshop Linear Matrix Inequalities, Semidefinite Programming and Quantum Information Theory 2016 at the LPT Toulouse
- 5-7 November 2015 : Co-organizer of the workshop Mathematical Methods in Quantum Information Theory at the Politehnica University in Timisoara
- 9-11 September 2015 : Co-organizer of the workshop Quantum Thermodynamics and Quantum Information Theory in Toulouse
- 27-29 August 2014 : Organizer of the "Random Matrices" session within the MAS days in Toulouse
- 13-15 November 2013 : Co-organizer of the second meeting of the "COGIT" CNRS PEPS-ICQ meeting in Toulouse.
- 5-7 June 2013 : Co-organizer of the first meeting of the "COGIT" CNRS PEPS-ICQ meeting in Rouen
- 24th May 2013 : Co-organizer of the annual meeting of the Mathematics and Theoretical Physics departments at the Univeristy of Toulouse
- 24th May 2012 : Co-organizer of the annual meeting of the Mathematics and Theoretical Physics departments at the University of Toulouse
- 14-16 May 2012 : Co-organizer, with Stéphane Attal and Clément Pellegrini of the workshop Probabilistic Methods in Quantum Mechanics at the University of Lyon
- 16-18 November 2011 : Co-organizer, wtih Stéphane Attal and Clément Pellegrini of the Open Quantum Systems and Quantum Information Theory workshop at the Univeristy of Toulouse
- 4th of April 2011 : Co-organizer of the annual meeting of the Mathematics and Theoretical Physics departments at the University of Toulouse
- July 2010: Co-organizer, with Benoit Collins and Patrick Hayden, of an international conference at the Perimeter Institute on random matrices and quantum information theory
- 2009 - 2010: Informal supervision of Muneerah Al-Nuwairan, a graduate student at the University of Ottawa
- 2008 - 2009: Co-organization of the PhD Students' Seminar at Institut Camille Jordan, Université Lyon 1, France
- Referee for CNRS (France), NSERC (Canada) and the National Science Center (Poland)

- Referee for the following journals: Annales Henri Poincaré, Electronic Journal of Probability, IEEE Trans. Inf. Th., Phys. Rev. A, Bernoulli, Comm. in Math. Phys., Probability Theory and Related Fields, Journal of Mathematical Physics, Quantum Information & Computation
- Report writer for the AMS Reviews (*MathSciNet*)

Languages

Romanian:	Mothertongue
English:	Fluent
French:	Fluent
German:	Good knowledge (B1 level)