Ion Nechita

Personal Data

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Work Experience

Present October 2010	CNRS, Chargé de recherche 2ème classe Laboratoire de Physique Thorique, Toulouse. Research-only, permanent position, working in the team *Quantware*, focusing on random matrices and quantum theory.
October 2015 May 2014	von Humboldt fellow (Experienced Researcher) Research on Quantum Information Theory at TU München.
July 2010 July 2009	Postdoctoral Researcher at University of Ottawa Advisor: Benoît Collins – Research focused on Random Matrix Theory, free probability and interactions with Quantum Information Theory. Two undergraduate courses taught.
August 2009 September 2006	PhD Student at Institut Camille Jordan, Université Lyon 1 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

Published or accepted papers

1. *Asymptotically well-behaved input states do not violate additivity for conjugate pairs of random quantum channels* (with Motohisa Fukuda) - to appear in Comm. Math. Phys.
2. *A universal set of qubit quantum channels* (with Daniel Braun, Olivier Giraud, Clément Pellegrini and Marko Znidaric) - to appear in J. Phys. A.
3. *Submatrices of Hadamard matrices: complementation results* (with Teodor Banica and Jean-Marc Schlenker) - to appear in Electronic Journal of Linear Algebra.
4. *Area law for random graph states* (with Benoît Collins and Karol Zyczkowski) - J. Phys. A: Math. Theor. 46 305302 (2013).
5. *Almost Hadamard matrices: the case of arbitrary exponents* (with Teodor Banica) - Discrete Applied Mathematics, vol. 161, no. 16-17, 2367-2379 (2013).
6. *Random pure quantum states via unitary Brownian motion* (with Clément Pellegrini) - Electron. Commun. Probab. 18 (2013), no. 27, 1-13.
7. *Low entropy output states for products of random unitary channels* (with Benoit Collins and Motohisa Fukuda) - Random Matrices: Theory Appl. 02, 1250018 (2013).
8. *Almost Hadamard matrices: general theory and examples* (with Teodor Banica and Karol Zyczkowski) - Open Systems & Information Dynamics, Vol. 19, No. 4, 1250024 (2012)
9. *Realigning random states* (with Guillaume Aubrun) - J. Math. Phys. 53, 102210 (2012)
10. *Block-modified Wishart matrices and free Poisson laws* (with Teodor Banica) - to appear in Houston Journal of Mathematics
11. *The absolute positive partial transpose property for random induced states* (with Benoit Collins and Deping Ye) - Random Matrices: Theory Appl. 01, 1250002 (2012)
12. *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)
13. *The multiplicative property characterizes ℓ_p and L_p norms* (with Guillaume Aubrun) - Confluentes Mathematici, Volume 3, Number 4 (2011), pp. 637-647
14. *Asymptotic eigenvalue distributions of block-transposed Wishart matrices* (with Teodor Banica) - J. Theoret. Probab. 26 (2013), 855-869.
15. *Laws of large numbers for eigenvectors and eigenvalues associated to random subspaces in a tensor product* (with Benoit Collins and Serban Belinschi) - Inventiones mathematicae, vol. 190, no. 3, 2012, pp. 647-697
16. *Generating random density matrices* (with Benoit Collins, Karol Penson and Karol Zyczkowski) - J. Math. Phys. 52, 062201 (2011).
17. *Random repeated quantum interactions and random invariant states* (with Clément Pellegrini) - Probab. Theory Relat. Fields (2012) 152:299-320
18. *Gaussianization and eigenvalue statistics for Random quantum channels (III)* (with Benoit Collins) - Ann. Appl. Probab. Volume 21, Number 3 (2011), 1136-1179.
19. *Random quantum channels II: Entanglement of random subspaces, Rényi entropy estimates and additivity problems* (with Benoit Collins) - Advances in Mathematics 226 (2011), 1181-1201.
20. *Eigenvalue and Entropy Statistics for Products of Conjugate Random Quantum Channels* (with Benoit Collins) - Entropy 2010, 12(6), 1612-1631.

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

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

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

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

25. *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.

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

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

28. *Asymptotics of random density matrices* - Ann. Henri Poincaré 8 (2007), no. 8, 1521-1538.

Submitted papers and preprints

1. *Analytic aspects of the circulant Hadamard conjecture* (with Teodor Banica and Jean-Marc Schlenker)

2. *Almost one bit violation for the additivity of the minimum output entropy* (with Benoit Collins and Serban Belinschi)

3. *Small circulant complex Hadamard matrices of Butson type* (with Teodor Banica, Gaurush Hiranandani, and Jean-Marc Schlenker)

4. *On the convergence of output sets of quantum channels* (with Benoit Collins and Motohisa Fukuda)

5. *On the reduction criterion for random quantum states* (with Maria Anastasia Jivulescu and Nicolae Lupa)

Selected list of talks in conferences and seminars

1. *Random matrix theory with a view towards free probability, and connections to quantum information* - New Mathematical Directions for Quantum Information workshop (invited talk), Newton Institute, Cambridge - September 2013

2. *On the additivity of the minimum entropy of certain subspaces of tensor products* - Workshop on Operator Spaces, Harmonic Analysis and Quantum Probability, Madrid - June 2013

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

4. *Random subspaces of a tensor product and the additivity problem* - XI-th Colloque Franco-Roumain de Mathématiques Appliquées, Bucuresti - August 2012

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

6. *Statistical properties of random quantum channels* - Invited lecture, CIRM workshop on the Geometry of Quantum Entanglement - January 2012

7. *Block-modified Wishart matrices and applications to entanglement theory* - 14th Non-commutative harmonic analysis Workshop, Bedlewo - September 2011

8. *Random subspaces of a tensor product and the additivity problem* - Quantum Information Theory Seminar, Madrid - March 2011

9. *Graphical calculus for random quantum channels* - Mittag-Leffler program on QIT, Stockholm - November 2010

10. *Random graph states, maximum flow on networks and the Fuss-Catalan ensembles of density matrices* - IQC Colloquium, Waterloo - March 2010

11. *Random matrix techniques in quantum information theory* - Analysis seminar, Saskatoon - March 2010
12. *Random matrix models in quantum information theory* - invited talk at the Canadian Mathematical Society Winter Meeting, Windsor - December 2009
13. *Random matrix models in quantum information theory* - Free probability seminar, Kingston - September 2009
14. *Majorization, entanglement catalysis, stochastic domination and ℓ_p norms* - invited talk at the Fields Workshop on Operator Structures in Quantum Information, Toronto - July 2009
15. *Random density matrices* - Open Quantum Systems Days, Marseille - November 2006

Awards and Grants

- 2013: von Humboldt Fellowship for Experienced Researchers (research grant, 18 months) at Technische Universität München.
- 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

Academic service

- 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 Stphane Attal and Clment 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 Univeristy 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, Universit Lyon 1, France
- Referee for the following journals
  - *Electronic Journal of Probability*
  - *Comm. in Math. Phys.*
  - *Bernoulli*
  - *Entropy*
  - *Journal of Mathematical Physics*
  - *Phys. Rev. A*
  - *Probability Theory and Related Fields*
  - *Quantum Information & Computation*
- Referee for NSERC Discovery grants
- Report writer for the AMS Reviews (*MathSciNet*)

Languages

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