CURRICULUM VITAE

Guionnet Alice

professionnal address	:	MIT Mathematics department, 77 Massachusetts Av, Cambridge MA 02139-4307, USA .
e.mail	:	guionnet@math.mit.edu

French, married, three children.

Cursus :

12	:	Simons investigator.
12	:	Professor position at MIT.
12	:	Chevalière de la légion d'honneur.
10	:	CNRS Silver medal (Médaille d'argent du CNRS).
09	:	Loeve prize.
06	:	Miller Institute Fellowship, Berkeley, USA.
06	:	Doisteau-Blutet Prize from the French Academy of Science.
05	:	Promoted CNRS research director.
03	:	Rollo Davidson prize.
03	:	Habilitation à diriger des recherches.
00	:	Move to Ecole Normale supérieure (Lyon).
99	:	Oberwolfach's prize.
99	:	Move to Ecole Normale supérieure (Paris).
95-96	:	Post Doc position at Courant Institute, NYU, USA
95	:	Defense of my PhD thesis, directed by G. Ben Arous.
1993	:	Permanent position as a chargée de recherche, CNRS.
1989	:	Admission to Ecole Normale Supérieure (Paris)

Research :

I started my Ph-D thesis in 1991-92 under the direction of Gerard Ben Arous. We studied Langevin dynamics for Sherrington-Kirkpatrick model of spin glasses. This subject, related with the aging phenomenon, was the central topic of [8], [9], [10], [36], [54], [55], [6], [2]. The main

results were the convergence of the Langevin dynamics for Sherrington-Kirkpatrick model, as well as a study of the long time behaviour at large temperature.

After my PhD thesis, I was interested by completely different problems with P. Del Moral related with non linear filtering problems and more specifically by particle approximation to non linear filtering equations [29, 30, 31].

I did also a short post Doc with B. Zegarlinski. It was a great opportunity to learn about coercive inequalities and in particular log-Sobolev inequality [11]. We studied the latter for short range interaction models of particles in random environment [54, 55] and proved stretched exponential decay.

At the end of my PhD thesis, I started to be interested in large random matrices with Gaussian entries because of their occurence in Sherrington-Kirkpatrick model. I obtained with G. Ben Arous large deviations estimates for the empirical measure of the eigenvalues of these matrices [11]. On a technical point of view related, due to a logarithmically singular potential, I studied with Thierry Bodineau the static of vortex systems introduced by Onsager and proved large deviation for the law of their empirical measure [19].

However, [11] was the beginning of many of the projects I worked on since then and which concern large random matrices, with applications to free probability and large deviations questions. Indeed, the study of large deviations in the more general multi-matrix framework proposed by Voiculescu could be attacked [25, 26, 38, 18] via hydrodynamics ideas that I learned at Courant institute where I had the chance to do a one year Post Doc in 1995-1996. The central result was a comparison between the two entropies introduced by Voiculescu.

Coming back to the more classical study of the spectrum of one large random matrix, I obtained with O. Zeitouni concentration of the spectral measure in [56] for diverse models of large random matrices. We also proved a full large deviation principle for the spectral measure of generalized Gaussian sample matrices by studying the asymptotics of Itzykson-Zuber integrals (see [57, 58]). In the same direction, we studied with A. Dembo and O. Zeitouni the moderate deviations for the spectral measure of a non centered Gaussian Wigner matrix [33].Later, I studied with G. Ben Arous [13] and S. Belinschi and A. Dembo [5] the convergence of the spectral measure of random matrices with heavy tailed entries, hence putting on a firm mathematical ground an article by Cizeau and Bouchaud. More recently, I studied the localization/delocalization properties of the eigenvectors of such matrices with C. Bordenave [20] and the central limit theorem for their linear statistics [17].

With O. Zeitouni and M. Khrishnapur, we considered the spectral measure of non-normal matrices with law invariant by unitary conjugation and proved that it converges to a deterministic measure whose support is a single ring [41]. In [59] we study the convergence of the support of such matrices. With P. Wood [60], we analyze the convergence of the empirical measure of non-normal matrices towards the associated Brown measure and in particular the effect of adding a polynomially small GUE matrix.

An important line of my research concerns matrix models. [57, 58] can also be used to study some matrix models. In [39], I characterized the limiting spectral measures of two matrices distributed according to the Gibbs measure of Ising model on random graphs, hence putting on a firm mathematical ground some work of Matytsin. I improved this study of matrix models with M. Maida in two papers [42] and [43]; the first article [42] considers the problem of generalizing these results to more complicated interaction by using characters expansions. The second article [43] tackles easier asymptotics but answer harder questions such as second order corrections, analyticity etc This work could also be used by M. Maida to obtain large deviations for the largest

eigenvalue of perturbed Gaussian matrices. We recently generalized this result by completely different techniques with F. Benaych-Georges [14, 15]. With E. Maurel-Segala, we gave general criteria to prove a perturbative expansion of general Gaussian matrix integrals [45, 44] and show that this expansion can be seen as generating functions for the enumeration of interesting graphs sorted by their genera; this allowed to put on a firm mathematical ground that the topological expansion obtained formally by Brézin-Itzykson-Paris and Zuber are also asymptotic in the context of several matrices. We generalize these results to matrices over the unitary and the orthogonal groups with B. Collins [28, 50]. With G. Borot, I combined these ideas with complex analysis to obtain topological expensions for non-perturbative (one-cut [21] and then several cuts [22]) regime of one-matrix β-models [21], hence generalizing results by Ercolani and Mc Laughlin who used Riemann Hilbert techniques. With K. Kozlowski, we generalize these type of results to more general potentials [23] and more general interactions [24]. Similar in spirit, with F. Bekerman and A.Figalli, we could develop approximate transport maps from a β model to another β-model: this was successfully used to on prove uniqueness, hence providing a new proof of a result by Bourgade, Erdos and Yau. This could be extended with A. Figalli to perturbative several matrix models [40], hence providing the first universality results for such models. Another approach to β ensembles was proposed in [1] and [2]; the idea is that β-Dyson Brownian motions can be obtained for $\beta \leq 2$ as the limit of discrete processes where one flips a coin every unit of time to decide whether a matrix will evolve according to the Hermitian Brownian motion or by keeping its eigenvectors fixed but its eigenvalues following independent Brownian motions.

Another line of my research is the study of the asymptotics of several matrix models and their asymptotic non-commutative law. I extended the first order asymptotics of several matrix models to non perturbative but convex situations with D. Shlyakhtenko [52]. The idea was to build non-commutative laws related with a strictly convex interaction as functions of free Brownian motions, hence embedding its von Neumann algebra into the von Neumann algebra generated by an infinite number of free semi-circle laws. In the case of a small interaction, we succeeded recently to show that indeed we can build a map so that indeed it is a function of finitely many free semi-circle law; that is we build a non-commutative free monotone transport [53]. This in particular allows to show that the Von Neumann algebra of q-deformed semicircular elements is isomorphic to the Von Neumann algebra of semicircular elements provided q is small enough.

With V. Jones and D. Shlyakhtenko, applying the connections between random matrices and combinatorics, we built matrix models for general loop models, in fact traces on planar algebras, and constructed a tower of free group factors in [46]. We more recently studied the associated von Neumann algebras [47] and the extension to Gibbs measures [48](with an application to the counting of configurations of Potts model on a random graph); this puts on a firm mathematical ground the uses of random matrices to compute the partition function of loop models on random graphs.

In the few last years, I wrote two lecture notes on random matrices [8, 9] and a book with G. Anderson and O. Zeitouni [1] published by Cambridge University Press.

Most of my research is motivated by the understanding of the global behaviour of systems in high dimensions, often coming from physics, using techniques from large deviations or coercive inequalities. From this theme, deviations to combinatorics, free probability or PDE's occured and were (and hopefully will still be in the future) rather enjoyable.

CHOSEN TALKS AND COURSES :

- Two invited talks at Hypathie seminar, november 1999.
- Invited speaker at the European Statistician conference in Prague, august 2002.
- Invited talk at the ICIAM 2003 conference in Sydney, Australia, july 2003.
- 6 hours course at XXIX Conference on Stochastic Processes and their Applications in Rio, Brazil, august 2003.
- Invited talk at Karslruhe Stochastic-Tage, march 2004.
- Invited talk at SPA meeting, Vancouver may 2004.
- Invited talk at the European mathematical society conference at Stockholm, june 2004.
- Short course on random matrices, Eurandom, march 2006.
- Invited talk at ICM 2006, Madrid.
- Course on random matrices at St Flour summer school, july 2006.
- Course on random matrices at IAS/PCMI, Utah, july 2007.
- Plenary talk at the second Canada-France congress, june 2008.
- Levy Lecture at the 7th world congress in probability, Singapour, july 2008.
- Plenary lecture at ICMP, august 2009.
- IMS medallion lecture at SPA, Oaxaca (Mexico), july 2011.
- Course in St Petersbourg probability summer school, july 2012.
- Course in IMA summer school, Minneapolis, july 2012.
- Gergen lectures at Duke, october 2012.
- Colloquium lectures at AMS meeting, San Diego, January 2013.
- Invited address, AMS meeting, Boston 2013.
- Bellow lectures, Northwestern University, Chicago march 2013.
- Takagi Lectures, Tokyo university, november 2013.

Research management :

I have been editor in chief at the Annales de l'Institut Henri Poincaré from june 2006 to june 2011. I am now an associate editor for e Annals of probability . I was an associate editor at Stochastic processes and applications from 1999 to 2006.

I have been responsible for the probability group at ENS-Lyon from 2000 to 2012.

I was a member of CNRS national committee from 2008-2012. I was member of the Conseil National des Universités from 1998 to 2001 and of the ANR project scientific committee in 2005 and 2006. I was a member of the scientific committee of the French Mathematical Society from 2003 to 2007, a member of the scientific committee of IHP in 2010, and a member of the scientific committee of the CRM (Montreal) from 2007 to 2010. I am actually a member of the scientific committee of IMA (Minneapolis) as well as of the scientific committee of Bernoulli society.

I was in charge of the ANR project GranMa with F. Benaych-Georges and B. Eynard on Random Matrices from 2009 to 2012 http://www.umpa.ens-lyon.fr/ aguionne/ANRGranMa.html. I have organised a few conferences in ENS Lyon (séminaire Hypathie, Rencontres mathématiques, Rencontre de l'ANR GranMa), one in les Houches in 2012, and coorganized a few conferences in the USA (with D. Shlyakhtenko and D. Voiculescu in Berkeley (2007) and UCLA (2010), with L. Saloff Coste in Cornell (2007)) I coorganized a semester at MSRI during fall 2010 and a conference in Oberwolfach 'Stochastic Analysis', June 2011. I coorganized a summer school in Changchun, China, during july 2012, as well as a school in les Houches on integrable systems in march 2012.

I had three PhD students, E. Maurel-Segala, M. Maida (who are now maitres de conférences at Université Paris Sud) and Camille Male who obtained a position at CNRS in 2013. Being at CNRS, I had no teaching duties but tried to teach topics courses regularly (in 2008-2009, I taught Random partitions and random matrices, in 2009-2010 Large deviations and concentration of measures and a course on concentration inequalities in 2010-2011). I gave a topics course on random matrices in 2007 at Berkeley University. At MIT I taught 3 graduate courses (Random matrices, Markov Chains, Stochastic analysis) and one undergrads classes (18-440). .

Research Articles

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