Journées de l’ ANR 3DMAPS
(Wed. 03 – Fri. 05)

Time table

Time	Wed. 03.07	Thurs. 04.07	Friday 05.07
	(IHP, Paris) Room Olga Ladyjenskaïa (RdC ex-salle 01)	(LIPN, Villetaneuse) Room B107	(IHP, Paris) Room Olga Ladyjenskaïa (RdC ex-salle 01)
9h30 – 10h20		E. Fusy	E. Archer
10h20 – 11h10		A. Carrance	L. Lionni
11h10 – 11h40		Coffee break	Coffee break
11h40 – 12h30		V. Bonzom	A. Castro
12h30 – 14h00	Free morning	Lunch break	
13h55 – 14h00	Opening session		
14h00 – 14h50	V. Nador	J. Thürigen (online)	
14h50 – 15h40	T. Müller	C. Porrier	
15h40 – 16h10	Coffee Break	Coffee break	
16h10 – 17h00	L. Castelli Aleardi	A. Solente	Free afternoon

Slot = 40 min talk + 10 min questions

Title and abstract booklet

V. Nador (IMPAN, Warsaw)
Title: ***Tensor models and double scaling limit***

Abstract: Tensor models are a generalization of matrix models in dimension \$D \geq 3\$. Via their large size expansion, they can be used to study the generating series of some families of PL-manifold of dimension D. After recalling some key results of the two dimensional matrix case, I will present the main features of tensor model, and how to study their large size expansion via their expansion in colored graphs. In particular, I will present the scheme decomposition: a method that allows to extract the critical points for the generating series of tensor models. In particular, it allows to access the double scaling limit. While this method has to be implemented on a case-by-case basis, I will present some ideas that can (hopefully) be used to facilitate its use.

T. Müller (LaBRI, Bordeaux)
Title: ***Higher dimensional floorplans and baxter d-permutations***

Abstract: A \$2-\$dimensional mosaic floorplan is a partition of a rectangle by other rectangles with no empty rooms. These partitions (considered up to some deformations) are known to be in bijection with Baxter permutations. A \$d\$-floorplan is the generalisation of mosaic floorplans in higher dimensions, and a \$d\$-permutation is a \$(d-1)\$-tuple of permutations. Recently, in *[N. Bonichon and P.-J. Morel, Integer Sequences 25 (2002)]*, Baxter \$d\$-permutations generalising the usual Baxter permutations were introduced.

In this paper, we give a bijection between the 2^{d-1}-floorplans and d-permutations characterized by forbidden vincular patterns. Surprisingly, this set of d-permutations is strictly contained within the set of Baxter d-permutations. Moreover, we contruct a generating tree for d-floorplans, which generalises the known generating tree structure for 2-floorplans. The corresponding labels and rewriting rules appear to be significantly more sophisticated in higher dimensions.

L. Castelli (L'X, Palaiseau)
Title: ***Adaptive encoding and regularity sensitive compact data structures for triangulations***

Abstract: We consider the design of efficient compact encodings and data structures for representing the connectivity information of triangle meshes. We propose new encodings and compact representations based on Schnyder woods that are sensitive to the regularity of the graph while still having proable worst case guarantees. Our experimental results, both in terms runtime and memory performance, show the practical interest of compact encodings involving Schnyder woods.

E. Fusy (LIGM, Champ-sur-Marne)
Title: ***Enumeration of corner polyhedra and 3-connected Schnyder labelings***

Abstract: I will present results on the exact and asymptotic enumeration of corner polyhedra, a special class of simple orthogonal polyhedra introduced by Eppstein and Mumford. The enumeration proceeds by a reduction to certain plane bipolar orientations, and an encoding of these orientations by quadrant walks thanks to a bijection by Kenyon, Miller, Sheffield and Wilson. Similar results can be obtained for rigid orthogonal surfaces, which also correspond to 3-connected Schnyder labelings.

A. Carrance (CMAP, Palaiseau)
Title: ***Some advances towards scaling limits of non-uniform models of colored trisps***

Abstract: I will talk about a work in progress with Fabien Vignes-Tourneret, where we obtain results that strongly hint at (tree-like) scaling limits for some random models of colored trisps/colored tensors introduced by Valentin Bonzom in 2016. I will start by defining all the necessary notions, before stating our results, and some related conjectures.

V. Bonzom (LIGM, Champ-sur-Marne)
Title: ***b-deformed maps and constellations***

Abstract: Les cartes combinatoires sont des collages de polygones formant des surfaces de genre arbitraire et orientables ou non. On s'intéressera ici à des modèles de cartes, orientables ou non, introduits par Chapuy and Dolega et qui généralisent combinatoirement les ensembles de matrices beta. Les cartes y sont pondérées par des b-poids, qui sont des polynômes en une variable b=2/beta - 1, déterminés récursivement par élimination des arêtes à partir de la racine. Ces modèles sont motivés par le lien avec la combinatoire algébrique, au sens où leurs séries génératrices se développent naturellement sur les polynômes de Jack. Néanmoins, la définition des b-poids les rend délicats à manipuler. Nous prouverons des propriétés d'invariance de la moyenne des b-poids qui sont bien connues pour les cartes orientables mais non-triviales ici. Ce sont des résultats obtenus avec Victor Nador (Impan).

J. Thürigen (U. Münster, Münster)
Title: ***Approaching Continuum Geometry Dynamically: The Full Large-N Phase Space of Melonic Interactions***

Abstract: Tensor models provide generating functions for various classes of higher-dimensional triangulations with interesting continuum geometries at (multi)critical points. However, these geometries fall in the same universality classes already known from matrix models. One way to broaden the framework is to consider the tensor indices as dynamical, propagating degrees of freedom in a field theory. This allows to find new critical behaviour at fixed points of the renormalization group flow. The potential of such tensor theories has not been fully exploited yet since only a symmetry-reduced ``isotropic" part of their phase space has been studied so far. In this talk, I will show how applying the functional renormalization group to tensor fields in the full, anisotropic cyclic-melonic potential approximation unveals a plethora of new non-Gaussian fixed points. These fixed points correspond to continuum limits of distinguished ensembles of triangulations raising hope to find new classes of continuum geometry in this way.
This talk is based on arxiv.org/abs/2406.01368 with Leonardo Juliano.

C. Porrier (LIPN, Villetaneuse)
Title: ***From aperiodic tilings of the Euclidian plane to a Markov partition of the torus.***

Abstract: Golden Octagonal tilings were initially defined as cut-and-project tilings, i.e. some kind of discretization of a 2-dimensional plane in a 4-dimensional space. It was shown that they can equivalently be defined by a finite set of forbidden patterns, i.e. they have local rules. In terms of symbolic dynamical systems, this means that the set of all Golden Octagonal tilings along with a translation action is a subshift of finite type (SFT). Using both these characterizations, a Markov partition of a torus can be defined, along with a rotation action. We then have a topological conjugacy mapping each point of the torus to a tiling of the whole Euclidean plane. Furthermore, this third representation allowed to exhibit the subtitutive structure of Golden Octagonal tiling.

A. Solente (Paris Saclay, Orsay)
Title: Multiple-order Tensor Field Theory: Enumeration of observables/unitary group invariants

Abstract: Tensor Field Theory (TFT) is one approach to quantum gravity that has been developed over the last decade. TFT generalizes random matrix models by generating random discretizations of space-time in higher dimensions, thanks to tensor contractions and quantum field theory rules. The interactions in TFT are tensor contractions that are invariant under Lie groups (orthogonal or unitary, for instance). In this presentation, we first review unitary tensor contractions, the way that we represent them as graphs, and how it is possible to count them if we assume that contractions are performed with tensors of a fixed order. In the second part, we will take a first step towards contractions of tensors of different orders and propose a formula for computing the number of unitary contractions made with vectors, matrices, and tensors of order 3. These contractions will play the role of interactions in new TFTs with multiple order tensors.

E. Archer (Paris Nanterre, Nanterre)
Title: ***Scaling limits of stable quadrangulations.***

Abstract: It is a well-known result of Le Gall and Miermont that sequences of uniform quadrangulations converge under rescaling towards the Brownian sphere. In this talk we will introduce a model of non-uniform random quadrangulations with heavy-tailed vertex degrees and take a first look at their scaling limits. These limits can be viewed as stable analogues of the Brownian sphere, indexed by a parameter alpha in (1,2). In particular we will discuss the Hausdorff dimension of the limits and highlight some important differences with the Brownian case. Based on joint work with Ariane Carrance and Laurent Ménard.

L. Lionni (CNRS, Lyon)
Title: ***Unitarily invariant random matrices and tensors and expansions over discrete geometries.***

Abstract: I will discuss how moment/free-cumulant relations of arbitrary order for unitarily invariant random matrices and tensors generally provide expansions over discrete geometries, without the need for a Gaussian term. Asymptotically, a subclass of geometries is singled out, which is characteristic of the invariance and scaling of connected correlations, but does not depend on the precise distribution. For matrices, planarity is recovered, as expected. For tensors however, the class is larger than for usual random tensor models. This can be seen already from the connected melonic correlations, whose combinatorics is non-trivial.

A. Castro (LaBRI, Bordeaux)
Title: ***3D scale-invariant random geometries from mating of trees***

Abstract: In this talk, I present new results on the search for scale-invariant random geometries in the context of Quantum Gravity. To uncover new universality classes of such geometries, we generalized the mating of trees approach, which encodes Liouville Quantum Gravity on the 2-sphere in terms of a correlated Brownian motion describing a pair of random trees. We extended this approach to higher-dimensional correlated Brownian motions, leading to a family of non-planar random graphs that belong to new universality classes of scale-invariant random geometries. We developed a numerical method to efficiently simulate these random graphs and explore their scaling limits through distance measurements, allowing us to estimate Hausdorff dimensions in the two- and three-dimensional settings.