Conference in honor of Alain Valette's 60th birthday

Abstract

- **Alain CONNES**
  - **Title :** Entropy and the spectral action
  - **Abstract :** This is joint work with A. Chamseddine and W. van Suijlekom. We compute the information theoretic von Neumann entropy of the state associated to the fermionic second quantization of a spectral triple. We show that this entropy is given by the spectral action of the spectral triple for a specific universal function. The main result is the surprising relation between this function and the Riemann zeta function.

- **Pierre-Emmanuel CAPRACE**
  - **Title :** Groups with irreducibly unfaithful subsets for unitary representations
  - **Abstract :** A subset F of a group G is called irreducibly faithful if G has an irreducible unitary representation whose kernel does not contain any non-trivial element of F. We say that G has property $P(n)$ if every subset of size at most n is irreducibly faithful. By a classical result of Gelfand and Raikov, every group has $P(1)$. Walter proved that every group has $P(2)$. The goal of this talk, based on a joint work with Pierre de la Harpe, is to provide, for each positive integer n, a purely group theoretic characterization of the countable groups satisfying $P(n)$.

- **Ana KHUKHRO**
  - **Title :** Geometric rigidity of finite quotients of groups
  - **Abstract :** The set of finite quotients of a group can provide a lot of information about the group if this set is sufficiently rich. This is the case for a residually finite group, and studying its finite quotients geometrically has many implications for algebraic and analytic aspects of the group. One can also use this framework to create interesting examples of metric spaces. Rigidity results for finite quotients allow us to better understand the variety of examples obtained in this way. This talk will be based on joint work with Alain Valette, and with Thiebout Delabie.

- **Karen VOGTMANN**
  - **Title :** On the cohomological dimension of automorphism groups of RAAGs
  - **Abstract :** The class of right-angled Artin groups (RAAGs) includes free groups and free abelian groups, Both of these have extremely interesting automorphism groups, which share some properties and not others. We are interested in automorphism groups of general RAAGs, and in particular the aspects shared with automorphism groups of free groups. These aspects are captured by the subgroup of untwisted automorphisms. For free groups, the virtual cohomological dimension of the automorphism group is equal to the rank of a maximal free abelian subgroup. We conjecture that the same is true for the untwisted subgroup for general RAAGs, and prove this in many cases. The idea is to construct abelian subgroups that closely mirror the structure of a space with a proper cocompact action. This talk is based on joint work with Ruth Charney and with Ben Millard.

- **Bachir BEKKA**
  - **Title :** On characters of infinite groups
  - **Abstract :** Let G be a countable infinite group. Unless G is virtually abelian, a description of the unitary dual of G (that is, the equivalence classes of irreducible unitary representations of G) is hopeless, as a consequence of theorems of Glimm and Thoma. A sensible substitute for the unitary dual is the set $\mathrm{Char}(G)$ of characters of traceable factorial representations of G. The set $\mathrm{Char}(G)$ contains in general both finite and infinite characters. The finite characters are given by central positive definite functions on G and have been determined for some classes of discrete groups. In contrast, the set of infinite characters of G is much more mysterious. We will give an overview of recent results about the description of finite as well as of infinite characters for some examples of groups, including the special linear groups $\mathrm{SL}(n, \mathbf{Z})$ over the integers.

- **Stefaan VAES**
  - **Title :** Classification of regular subalgebras of the hyperfinite II_1 factor
  - **Abstract :** I present a joint work with Sorin Popa and Dimitri Shlyakhtenko. We prove that under a natural condition, the regular von Neumann subalgebras B of the hyperfinite II_1 factor R are completely classified (up to conjugacy by an automorphism of R) by the associated discrete measured groupoid. We obtain a similar result for triple inclusions of A in B in R, where A is a Cartan subalgebra in R and the intermediate von Neumann algebra B is regular in R. The two key steps in proving these results are the vanishing of the 2-cohomology for cocycle actions of amenable discrete measured groupoids and the approximate vanishing of the 1-cohomology.

- **Goulnara ARZHANTSEVA**
  - **Title :** Large girth graphs with bounded diameter-by-girth ratio
  - **Abstract :** We provide an explicit construction of an infinite sequence of finite 4-regular Cayley graphs as in the title. For each dimension $n \geqslant 2$, our graphs are suitable Cayley graphs of $SL_n(\mathbb{F}_p)$ as prime $p \to \infty$. These are the first explicit examples in all dimensions $n \geqslant 2$ (all prior examples were in $n = 2$). Moreover, they happen to be expanders. Together with Margulis' and Lubotzky-Phillips-Sarnak's classical constructions, these new graphs are the only known explicit large girth Cayley graph expanders with bounded diameter-by-girth ratio. This is a joint work with Arindam Biswas.

- **Georges SKANDALIS**
  - **Title :** K-théorie à coefficients réels et une conjecture de Baum-Connes localisée à l'élément neutre
  - **Abstract :** Une difficulté de la conjecture de Baum-Connes, déjà remarquée par Alain Valette, est que, alors que la K-théorie topologique $K_*^{top}(\Gamma)$ d'un groupe – le 'membre de gauche' de cette conjecture, est naturellement fonctoriel en le groupe Γ, ce n'est pas du tout clair s'il en va de même pour $K(C_r^*(\Gamma))$ – le 'membre de droite'. Nous construisons une K-théorie à coefficients réels de $C_r^*(\Gamma)$ et une 'conjecture de Baum-Connes localisée en l'élément neutre' qui est plus faible que la conjecture de Baum-Connes, mais implique la conjecture de Novikov et est fonctorielle en Γ. Nous discuterons quelques forces et faiblesses de la conjecture modifiée. C'est un travail en commun avec Paolo Antonini et Sara Azzali.