UNIVERSITÉ CÔTE D'AZUR

GRADUATE SCHOOL
FORMAL, PHYSICAL AND ENGINEERING SCIENCES

1) Field of study : Group theory

2) Internship topic : Kazhdan's (T) property

3) Description :

The group of matrices with determinant 1 and with integer coefficients, $SL(n, \mathbb{Z})$, is generated by a finite number of elements (the elementary matrices): this is what is hidden behind Gauss' pivot method when calculating the inverse of an invertible matrix with integer coefficients. The group $SL(n, \mathbb{Z})$ is a network in $SL(n, \mathbb{R})$, a subgroup of the group whose quotient admits a finite measure. There is many other networks in $SL(n, \mathbb{R})$, for which it is more difficult to say if they are of finite type. In order to deal with the general case, Kazhdan [Kaz] introduced the (T) property and showed that all discrete and quotient subgroups of finite measure of $SL(n, \mathbb{R})$ can be generated by a finite number of elements. Since then, the (T) property has proven to have many consequences in various subjects, notably in ex- panding graph theory. A characterization of the (T) property is the following: A topological group G has the property (T) if all unitary representation with almost invariant vectors, has non-zero invariant vectors.

A large class of groups with the property (T) is given by $SL(n, \mathbb{R})$ for all $n \geq 3$ and its networks. In this work, we will study a local combinatorial criterion [Zuk] sufficient to ensure the property (T) for a group acting on a simplicial complex, according to [Oll], and as a corollary we will understand why $SL(n, \mathbb{Q}_p)$ has the property (T) as soon as $n \geq 3$.

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4) Internship level :	Master 2
5) Requirements :	Basic background in group theory
6) Duration :	3 to 6 months
7) Period :	February to July 2024
8) Laboratory :	LJAD
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