Into the Forest - Abstracts

Indira Chatterji (Université de Nice) – Median Spaces

I will introduce median spaces, give examples, and show how they naturally have a structure of measured wall spaces. I will also discuss the medianization of a real hyperbolic space, and explain why it is locally compact and at finite Hausdorff distance from the space itself.

Bruno Duchesne (Université de Lorraine) – Dendrites

Dendrites are topological objects that can be thought as compact trees. In this mini-course, we will be interested in actions by homeomorphisms on dendrites. We will prove some results that are similar to groups acting on trees (no knowledge about this is required) and explore some new properties of homeomorphism groups of some universal dendrites. In particular, we will introduce kaleidoscopic groups (some analogs of Burger-Mozes universal groups) and study the homeomorphism groups as Polish groups.

Gil Goffer (Weizmann) – The Neretin Group

The Neretin group is a generalization of the group of automorphisms of a tree, Aut(T). It provides the main source of examples for locally compact totally disconnected groups which are NOT linear and do NOT act on a tree. Further, it is simple in a very strong sense: it admits no non-trivial Invariant Random Subgroups, due to Zheng. We will introduce the Neretin group, understand some of its properties, and discuss similarities and differences with Aut(T). Finally, we discuss a solution to the conjugacy problem, which is joint work in progress with Waltraud Lederle.

Radhika Gupta (Bristol University) – Trees from Outer Space

Free groups are one of the simplest groups that occur in nature. In order to understand them, it is equally important to understand their group of symmetries, called the group of outer automorphisms of a free group $\mathrm{Out}(F_n)$. In this talk, we will look at a space of simplicial trees, called Outer space, on which this group acts. A 'fully irreducible' element of $\mathrm{Out}(F_n)$ acts with north-south dynamics on Outer space. We will also look at another space of simplicial trees, called relative Outer space, which helps in better understanding certain 'reducible' elements of $\mathrm{Out}(F_n)$.

Mark Hagen (Bristol University) – CAT(0) Cube Complexes

I will introduce CAT(0) cube complexes, emphasising hyperplanes and convex subcomplexes. I will discuss wallspaces and the duality between wallspaces and CAT(0) cube complexes. Finally, I will discuss group-theoretic applications: how does one cubulate a group, and what is gained by doing it? I will mention various examples and open questions.

Arnaud Hilion (Aix Marseille Université) – $\mathbb{R}$-Trees

Real trees are metric spaces, and in this course we will consider them (almost) always with isometric action (by a free group most of the time).

These real trees are objects that appear naturally in two contexts (among others), a priori different: on the one hand as the spaces of leaves of measured foliations, and on the other hand as degenerations of hyperbolic metric spaces.

Rips' brilliant idea was to explain that these two points of view are in fact related, even if this link is not at all obvious to reveal: for this, we have to use what is now called "Rips machinery", which acts on systems of partial isometries. The most emblematic examples of systems of partial isometries are given by interval exchange transformations.

In this course, I will present the objects mentioned above, mainly following the point of view developed by Coulbois-Hilion-Lustig.

Alex Margolis (Technion) – Splittings of Groups and Quasi-Isometries

A theorem of Stallings says that a finitely generated group has more than one end if and only if it splits over a finite subgroup. Consequently, splitting over a finite subgroup is a quasi-isometry invariant. In this talk, I will survey analogues of Stallings' theorem due to Papasoglu, Mosher-Sageev-Whyte and myself, which state that admitting a splitting over certain infinite groups is also a quasi- isometry invariant. I will sketch the key ideas used to prove these results and give applications to quasi-isometric rigidity.

Michah Sageev (Technion) – Bass-Serre Theory

We will discuss Bass-Serre Theory, which relates actions of groups on trees to decompositions of groups as graphs of groups. Time permitting, we will also discuss some central graph of groups decomposition results, such as Grushko?s theorem, Dunwoody?s theorem on decompositions of groups as graphs of groups over finite groups, and JSJ decompositions.

Daniel Woodhouse (Technion) – Leighton's Graph Covering Theorem

Given two finite graphs with isomorphic universal covers, there exists a common finite cover. I will discuss how such a theorem can be proven, how you might determine if two graphs have isomorphic universal covers, and potential applications and generalizations.