# Al@Bicocca seminar

You are all welcome to the next bite of the series

### "Al@Bicocca"

which is meant to give you a small taste of the Algebra at Bicocca and beyond



Università di Milano-Bicocca

## A groupoid $C^*$ -algebraic Bass-Serre theorem

**Abstract:** The concept of a group action on a space was generalized to a groupoid action and it has applications to dynamical systems, representation theory and operator algebras. If groups can roughly be described as the set of symmetries of certain objects, then groupoids can be thought as the set of symmetries of fibered objects.

Thanks to the knowledge of Bass-Serre theory for groups, we were able to establish a Bass-Serre theory for groupoids. A graph of groupoids  $\mathcal{G}(\Gamma)$  is given by a connected graph  $\Gamma$  together with a groupoid for each vertex and edge of  $\Gamma$ , and monomorphisms from each edge groupoid to the adjacent vertex groupoid. To prove a groupoid C\*-algebraic Bass-Serre theorem we associate to a graph of groupoids  $\mathcal{G}(\Gamma)$  a groupoid, called the *universal fundamental groupoid* and denoted by  $\Pi_1(\mathcal{G}(\Gamma))$ , and a forest, called the *universal forest* and denoted by  $Y_{\mathcal{G}(\Gamma)}$ , on which the universal fundamental groupoid acts. Such an action induces an action of  $\Pi_1(\mathcal{G}(\Gamma))$  on the boundary  $\partial Y_{\mathcal{G}(\Gamma)}$  of the universal forest  $Y_{\mathcal{G}(\Gamma)}$ . Given a locally-finite nonsingular graph of groupoids  $\mathcal{G}(\Gamma)$ , we work with two C\*-algebras: the graph of groupoids C\*-algebra  $C^*(\mathcal{G})$ , which is universal for generators and relations encoding an underlying combinatorial object, and the *action groupoid*  $C^*$ -algebra  $C^*(\Pi_1(\mathcal{G}(\Gamma)) \ltimes \partial Y_{\mathcal{G}(\Gamma)})$ induced by the action of  $\Pi_1(\mathcal{G}(\Gamma))$  on  $\partial Y_{\mathcal{G}(\Gamma)}$ . We prove that the two algebras are related by isomorphism.



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### Online venue: WebEx

University of Milano-Bicocca Via R. Cozzi 55 Milano (IT)

#### Organizers:

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Website 🌘