TS15: Thematic Session: New models of formal language recognition

Monday 30 June, 11:00–12:30 • Room 106

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Time: 11:00–12:30

New models of formal language recognition

The syntactic approach to the classification of regular languages is a well-known success story. The general key ingredients are Eilenberg's correspondence, providing an algebraic translation of problems on regular languages through their (ordered) syntactic semigroups, and Birkhoff-type theorems, describing pseudovarieties of such structures. The theory carries over to other combinatorial algebraic contexts, with ample motivation from computer science in the case of tree languages.

Mainly with the aim of separating various classes of languages, several attempts have been made to extend this theory beyond regular languages. Fixing the alphabet, most often we are interested in Boolean algebras, or at least lattices of languages, which leads to the consideration of their dual (Stone, respectively Priestley) spaces. In the case of regular word languages, this leads to profinite semigroups, which have been instrumental in the solution of many problems.

The session will consist of the following two talks:

1. Stone recognition of languages

The purpose of this talk is to present the general framework for the recognition of Boolean algebras and lattices of subsets of topological algebras (typically, a discrete relatively free algebra) by Stone topological algebras by characterizing those classes of languages that can be so recognized. The results can be simply formulated as an equivalence of categories.

2. How to use Stone recognition for arbitrary word languages

We first provide an Eilenberg-type correspondence for Stone recognition. We then show how the minimal automaton of an arbitrary word language can be naturally completed into a Stone topological unary algebra. We also deduce a general criterion for separation of suitable language classes and exemplify how it applies for certain classes of context-free languages.

(Both based on joint work with O. Klíma)

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