Ehrenfeucht-Fraïssé Games: Applications and Complexity

Angelo Montanari and Nicola Vitacolonna

University of Udine, Italy

Abstract

The method of Ehrenfeucht-Fraïssé (EF-game for short) provides a characterisation of m-equivalence for first-order logic, which can be easily adapted to other logical languages (second-order logics, fixed-point logics, modal logics, etc...). Besides, it has special relevance to finite model theory, where other model-theoretic techniques, such as the Compactness Theorem or the Löwenhein-Skolem theorem, cannot be applied. In the first part of the talk the main variants of EF-games will be reviewed and the most significant applications to logic will be discussed, such as lower-bounds on logical definability and derivation of normal forms.

Then, we will focus on algorithmic questions related to EF-games. We will discuss the known complexity results about EF-games (how hard is it to compute a winning strategy for a player?), in general and for specific classes, their relationship with other well-known algorithmic problems on graphs, the notions of remoteness of a game and of "optimal" (as opposed to "winning") strategy for a player.