# Introduction to the World of Constraint Satisfaction Problems

**Bertalan Bodor**
University of Szeged, Szeged, Hungary

A Constraint Satisfaction Problem, or CSP for short, is a computation problem where we are given a set of variables and a set of constraints on these variables, and we need to decide whether we can assign values to the variables so that all given constaints are satisfied. More formally, for a relational structure $\mathfrak{B}$, called the template structure, the CSP over $\mathfrak{B}$ is defined to be the following decision problem: given a finite structure $\mathfrak{A}$ with the same signature as $\mathfrak{B}$ we need to decide whether there exists a homomorphism from $\mathfrak{A}$ to $\mathfrak{B}$. Many well-known computation problems can be described as CSPs in a natural way. Examples are linear equations over finite fields, $n$-colorability for undirected graphs, and SAT problems.

Using concepts and techniques from universal algebra, Bulatov and Zhuk recently proved independently that CSPs with finite template satisfy a complexity dichotomy: they are in **P** or **NP**-complete. In my talk I will give an introduction to some of these techniques. I will also talk about some generalizations and variations of CSPs. Some of these also touch on some other areas of mathematics such as model theory, mathematical logic, computer science and optimization theory.