DANNY RORABAUGH, Queen’s University

Logical Axioms and Computational Complexity: A Correspondence

Relational structure $A$ is compact provided for any structure $B$ of the same signature, if every finite substructure of $B$ has a homomorphism to $A$ then so does $B$. The Constraint Satisfaction Problem (CSP) for $A$ is the computational problem of determining whether finite structures have homomorphisms into $A$. We explore a connection between the hierarchy of logical axioms and the complexity hierarchy of CSPs. It appears that the complexity of CSP for $A$ corresponds to the strength of the axiom "$A$ is compact". At the top, the statement "$K_3$ is compacts" is logically equivalent to the compactness theorem. Thus the compactness of $K_3$ implies the compactness of all finite relational structures. Moreover, the CSP for $K_3$ is NP-complete. At the bottom are width-one structures; these are provably complete from ZF and their corresponding CPSs are polynomial-time solvable.

This is joint work with Claude Tardif and David Wehlau, arXiv:1609.05221 [math.LO].