Complexity of Solving Promise Systems of Equations Over Algebras

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Larrauri and Živný (2024) started the investigation of the computational complexity of the following promise system of equations problem for two semigroups $\mathbf{A}$ and $\mathbf{B}$ such that $\mathbf{A}$ maps homomorphically into $\mathbf{B}$: Is a given system of equations solvable in $\mathbf{A}$ or is it not even solvable in $\mathbf{B}$? The solvability of a system of equations over an algebra $\mathbf{A}$ is known to be either in $\mathbf{P}$ or $\mathbf{NP}$-complete by the famous CSP dichotomy theorem of Bulatov and Zhuk (2017). The complexity of promise systems of equations is still open. I will give a brief introduction to promise systems of equations and state complexity results generalizing the results of Larrauri and Živný.