# Performance Evolution of Swarm Intelligence Algorithms

**Levente Filep**

Department of Economic Sciences, Sapientia University

fileplevente@uni.sapientia.ro

Global optimization is a branch of applied mathematics that focuses on creating methods to find the global optimum of a problem, usually represented in a form of a mathematical function. This field has applications in various areas, including engineering, finance, and machine learning, and continues to be a central focus of research that is constantly evolving.

As real-world optimization problems become more complex [1], extensive evaluation of the objective function often becomes computationally impractical. In many instances, even a single function evaluation can take an excessive amount of time. In such situations, metaheuristic algorithms are often employed. While these methods do not guarantee finding the global optimum, they typically produce sufficiently good solutions within reasonable computational limits.

Swarm Intelligence (SI) algorithms [1, 3] are a well-known category of metaheuristics inspired by the collective behavior of biological swarms, such as flocks of birds, schools of fish, and colonies of insects, as well as by physical systems. These algorithms operate through the interactions of simple agents that follow basic rules, leading to the emergence of effective problem-solving capabilities [2].

Since the introduction of the Particle Swarm Optimization (PSO) algorithm [4], nearly 400 swarm intelligence (SI) algorithms have been proposed in the literature. This study reviews a selection of widely recognized and publicly accessible SI algorithms, comparing their performance across well-known benchmark problems.

## References

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