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GOOSE algorithm: a powerful optimization tool for real-world engineering challenges and beyond

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Abstract
This study proposes the GOOSE algorithm as a novel metaheuristic algorithm based on the goose's behavior during rest and foraging. The goose stands on one leg and keeps his balance to guard and protect other individuals in the flock. The GOOSE algorithm is benchmarked on 19 well-known benchmark test functions, and the results are verified by a comparative study with genetic algorithm (GA), particle swarm optimization (PSO), dragonfly algorithm (DA), and fitness dependent optimizer (FDO). In addition, the proposed algorithm is tested on 10 modern benchmark functions, and the gained results are compared with three recent algorithms, such as the dragonfly algorithm, whale optimization algorithm (WOA), and salp swarm algorithm (SSA). Moreover, the GOOSE algorithm is tested on 5 classical benchmark functions, and the obtained results are evaluated with six algorithms, such as fitness dependent optimizer (FDO), FOX optimizer, butterfly optimization algorithm (BOA), whale optimization algorithm, dragonfly algorithm, and chimp optimization algorithm (ChOA). The achieved findings attest to the proposed algorithm's superior performance compared to the other algorithms that were utilized in the current study. The technique is then used to optimize Welded beam design and Economic Load Dispatch Problems, Pressure vessel Design Problems, and the Pathological IgG Fraction in the Nervous System, four renowned real-world challenges. The outcomes of the engineering case studies illustrate how well the suggested approach can optimize issues that arise in the real-world.

Keywords GOOSE algorithm · Metaheuristic optimization algorithms · Evaluation study · Benchmark test functions · Real-World engineering challenges · Pathological IgG fraction in the nervous system

1 Introduction

Since computers came along, the main goal has been to find the best solution. At the government's wartime communications center, Alan Turing spent the majority of his time between 1939 and 1945 perfecting the German enciphering machine Enigma and conducting other cryptological research. Turing became the leading scientist with specific responsibility for deciphering the U-boat transmissions after making a distinctive logical breakthrough in the decoding of the Enigma. As a result, he rose to prominence in Anglo-American relations and was exposed to the most cutting-edge electrical technologies of the time. From time to date thousands of algorithms have been designed for different kinds of goals, notably optimization problems. The optimization Problems are solved using a metaheuristic technique. Numerous facets of everyday living might suffer from optimization issues. In general, there are two types of optimisation algorithms: classical and evolutionary. Quadratic programming and gradient-based algorithms are examples of conventional algorithms. Heuristic or metaheuristic algorithms and several hybrid methods are examples of evolutionary algorithms. In recent years, the employment of metaheuristic algorithms has become common practice to resolve modern-day real-world optimization problems, which cannot be resolved by conventional mathematical methods.

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