

# MODIFIED AND ENSEMBLE INTELLIGENT WATER DROP ALGORITHMS AND THEIR APPLICATIONS

The Intelligent Water Drop (IWD) algorithm is a swarm-based model that is useful for undertaking optimization problems. The main aim of this research is to enhance the IWD algorithm and overcome its limitations pertaining to population diversity, as well as balanced exploration and exploitation in handling optimization problems. Firstly, a modified IWD algorithm is introduced. Two ranking-based selection methods, i.e. linear ranking and exponential ranking, are proposed to replace the fitness proportionate selection method. Secondly, the Master River Multiple Creeks Intelligent Water Drops (MRMC-IWD) algorithm is proposed in an attempt to exploit the exploration capability of the modified IWD algorithm. In addition, the hybrid MRMC-IWD model is proposed. It combines MRMC-IWD with the iterated improvement local search method, to empower MRMC-IWD with the exploitation capability. The usefulness of the proposed models is evaluated systematically and comprehensively using three combinatorial optimization problems, i.e., rough set feature subset selection, multiple knapsack problem, and travelling salesman problem. The applicability of the hybrid MRMC-IWD model is investigated to solving real-world optimization problems related to feature selection and classification tasks. A number of publicly available benchmark data sets and two real-world problems, namely human motion detection and motor fault detection, are studied. The results ascertain the effectiveness of the proposed models in improving the performance of the original IWD algorithm as well as undertaking real-world optimization problems.