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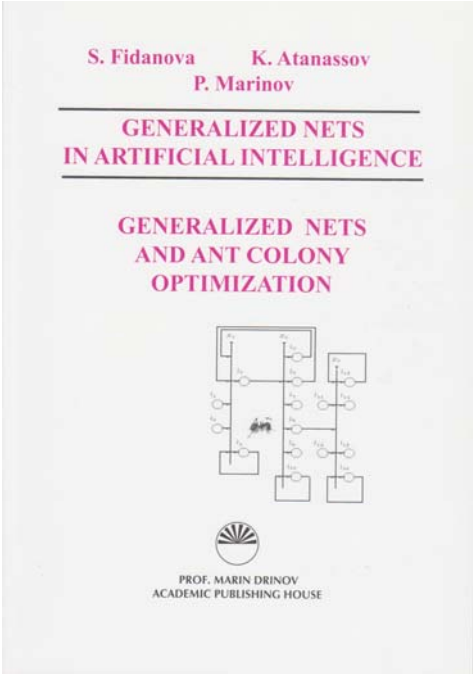
GENERALIZED NETS IN ARTIFICIAL INTELLIGENCE VOLUME 5: GENERALIZED NETS AND ANT COLONY OPTIMIZATION



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Generalized Nets and Intuitionistic Fuzzy Logic provide the tools in this series of books for a mathematical framework which combines various aspects of Operations Research and Combinatorial Optimization, including a Multiple Knapsack Problem. In this particular book in the series some basic interpretations of Ant Colony Optimization (ACO) are introduced.

Combinatorial optimization in general aims to find an optimal object from a finite set of objects. The set of feasible solutions is, or can be put, in a discrete form. The ACO algorithm, in particular, utilizes the model of a colony of artificial ants that behave as cooperative agents in a mathematical space where they are allowed to search and reinforce pathways (solutions) in order to find the optimal pathways. That is, the problem can be represented by a graph on which the ants walk in order to construct solutions which, in turn, are represented by paths in the graph.

Real ants foraging for food lay down quantities of pheromone (chemical cues) that mark the path which they follow. An isolated ant moves essentially at random, but an ant encountering a previously laid pheromone will detect it and decide to follow it with high probability and thereby reinforce it with a further quantity of pheromone. After the initialization of the pheromone trails, the ants construct feasible solutions, starting from random nodes, and then the pheromone trails are updated. At each step the ants compute a set of feasible moves and select the best one (according to some probabilistic rules) to continue the rest of the tour.

The ideas in this book are introduced clearly and in a logical order. They have important applications in several mathematical fields, including artificial intelligence, machine learning, and software engineering. The book is an excellent introduction suitable for graduate students and any others who wish to get to grips with emerging fields as expounded by authors with impressive track records of research findings in these fields.

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