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Research on Heuristic Optimization and Operations in IoT

J.UCS Special Issue

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Nowadays, many Internet of Things solutions require heuristic optimization and operations techniques. Nonetheless, there are still many challenges to overcome. In particular, the majority of practical applications of optimization methods should be investigated with the emphasis on artificial intelligence methods and techniques, machine learning elements and image processing, as well as their applications in the broadly understood IoT. The main problems are related to decision making under conditions of uncertainty and with incomplete data. This often requires the design, implementation and solution/execution of models that represent the system subject to tests.

Therefore, in this Special Issue, we covered recent solutions to the abovementioned problems, novel methods and algorithms, advances, challenges, as well as practical applications of optimization and operations techniques for IoT systems.

All submissions were peer-reviewed by top experts in the domain. After revision and re-review, based on the reviews and the opinion of the guest editors, 8 articles were selected for publication in this special issue to represent the breadth of the field.

Sathishkumar Natesan and Rajakumar Krishnan present Energy Efficient Composite Metric Routing (EECMR) protocol for Low Power and Lossy Networks used by IoT systems.

Izabela Rojek, Dariusz Mikołajewski, Piotr Kotlarz and Alžbeta Sapietová show the evolution of databases from classical relational databases to distributed databases

and data warehouses to fuzzy databases used in a production enterprise, which could be used also by IoT systems.

Tibor Vince, Matej Bereš, Irena Kováčová, Ján Molnár, Branislav Fecko, Jozef Dziak, Iveta Tomčíková and Milan Guzan present analyses of the implementation of IoT in the patent technology of the remote measuring laboratory (VMLab). The technology allows to create a new electrical connection between different devices, where the connection diagram has not been defined before.

Vibekanaanda Dutta, Michał Choraś, Marek Pawlicki and Rafał Kozik cover the security problems of IoT systems by testing modern machine learning approaches on a novel cybersecurity benchmark IoT dataset.

Łukasz Apiecionek and Mateusz Biedziak also cover the security problems of IoT systems by presenting the fuzzy adaptive algorithm using Ordered Fuzzy Numbers for predicting amount of packets which could be passed over the network boarder gateway to minimize the DDoS attacks.

Lelio Campanile, Mauro Iacono, Fiammetta Marulli, Michele Mastroianni and Nicola Mazzocca present a fuzzy logic based power management strategy for IoT subsystem that aims at maximizing the duration of the network by locally migrating part of the computing tasks between nodes.

Dawid Ewald, Hubert Zarzycki, Łukasz Apiecionek and Jacek M. Czerniak show an innovative OFNBee optimization method based on combining the swarm intelligence with the use of ordered fuzzy numbers OFN.

Ján Molnár, Simona Kirešová, Tibor Vince, Dobroslav Kováč, Patrik Jacko, Matej Bereš and Peter Hrabovský describe IoT issues and communication protocols used in IoT, and the design and implementation of an educational model of IoT system – the Weather station with the ThingSpeak cloud support.

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