

## Session 2.5 TAEA: Theory and Applications of Evolutionary Algorithms

Time & Location: 16:00-17:30, Dec. 1, L011

Chair: Hsing-Chung Chen (陳興忠)

### (1) A Multiple Objective PSO-based Approach for Data Sanitization

*Jerry Chun-Wei Lin (Western Norway University of Applied Sciences), Yuyu Zhang (Harbin Institute of Technology, Shenzhen), Chun-Hao Chen (Tamkang University), Jimmy Ming-Tai Wu (Shandong University of Technology), Chien-Ming Chen (Harbin Institute of Technology, Shenzhen), and Tzung-Pei Hong (National University of Kaohsiung)*

Privacy-preserving data mining (PPDM) has become an emerging topic in recent years since it considers to find the trade-off relationship between the side effects of data sanitization, which is concerned as a NP-hard problem and it is a non-trivial task. In this paper, a multi-objective particle swarm optimization (MOPSO)-based framework is presented to find the multiple solutions rather than a single one. The presented grid-based algorithm is used to assign the probability of the non-dominated solution for next iteration. Based on the designed algorithm, it is unnecessary to pre-defined the weights of the side effects for evaluation but the non-dominated solutions can be discovered as an alternative way for data sanitization. Extensive experiments are carried on two datasets to show that the designed grid-based algorithm achieves good performance than the traditional single-objective evolution algorithms.

### (2) A Whale Crow Search Algorithm for Data Clustering

*Ze-Xue Wu (National Kaohsiung University of Science and Technology), Ko-Wei Huang (National Kaohsiung University of Science and Technology), and Abba Suganda Girsang (Bina Nusantara University)*

Data clustering is a well-known data mining approach generally employed to minimize the intra-distance and maximize the inter-distance of each data center. A cluster problem is an NP-hard problem. In this study, a hybrid algorithm termed the hybrid whale crow algorithm (HWCA) based on whale optimization algorithm (WOA) and crow search algorithm (CSA) is proposed. The HWCA integrates the advantages of the WOA and CSA search strategies. Moreover, three operators are used to improve the quality of the solution: a center operator, a hybrid individual operator, and a diversity enhancement operator. The center operator generates the probable Nth solution after N-1 solutions. The hybrid individual operator is used to exchange individuals between the WOA and CSA systems by using a roulette wheel approach. The diversity enhancement operator improves the diversity of each system. The performance of the proposed HWCA was compared with that of the WOA and CSA in terms of the four recognized UCI benchmarks. The proposed algorithm exhibited a higher accuracy rate than did the other algorithms

### (3) Ant Colony Optimization with Negative Feedback for Solving Constraint Satisfaction Problems

*Takuya Masukane (Takushoku University), Kazunori Mizuno (Takushoku University), and Hiroto Shinohara (Takushoku University)*

As meta-heuristics to solve large-scale constraint satisfaction problems (CSPs), ant colony optimization (ACO) has recently been drawing attentions. In most of algorithms based on ACO, candidate assignments are constructed by taking account of data called pheromone graph. The pheromone graph is updated getting positive feedbacks from candidate assignments with the least number of constraint violations. However, it might be easy to get stuck in locally optimal solutions considering only a single perspective. In this paper, we propose a method that adopting new pheromone graph in addition to the original pheromone graph. This new pheromone graph is updated getting negative feedback from candidate assignments with the greatest number of constraint violations. This new pheromone graph, called a negative pheromone graph, is updated getting negative feedback from candidate assignments with the largest number of constraint violations.

Also, the standard pheromone graph is updated by considering negative pheromones as well. By using pheromones updated from two perspectives, more effective search can be conducted. Moreover, in this paper, we conducted experiments on graph coloring problems. Graph coloring problem is one of CSPs. We demonstrated that our model, which is applied to the cunning ant system, can be effective than other ACO-based methods for large-scale and hard graph coloring problems whose instance appears in the phase transition region.

### (4) Development of a Cebuano Parse Tree for a Grammar Correction Tool using Deep Parsing

*Jan Mikhail Gaid (University of San Carlos), Robert Michael Lim (University of San Carlos), and Christian Maderazo (University of San Carlos)*

Many technologies had surfaced to help people understand and learn a language. Learning major languages like English, Spanish, etc., was easier because a lot of people were speaking it and actually knew the structural integrity of its grammar, but what about the minor ones? How would you learn a language easily if you did not know its grammatical structure, especially if the language was not that known? The researchers would present a grammatical tool using deep parsing for Cebuano, a language that was mainly spoken in Central Visayas in the Philippines and was considered as one of the main languages in the whole Visayan region. This grammar tool would be useful mainly to people who wanted to learn the language; students, teachers, people from other regions of the country, and even foreigners. In this study, the researchers would relay the grammar through deep parsing, a method used to give a complete syntactic structure for a group of words. It also showed that the tool, with reliability marks higher than the expected 55%, would actually help the ones who needed it the most, and look forward for them into using it more.