EVOLUTIONARY COMPUTATION FOR FEATURE SELECTION, EXTRACTION AND DIMENSIONALITY REDUCTION

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In machine learning and data mining, the quality of the input data determines the quality of the output (e.g. accuracy), known as the GIGO (Garbage In, Garbage Out) principle. For a given problem, the input data of a learning algorithm is almost always expressed by a number of features (attributes or variables). Therefore, the quality of the feature space is a key for success of any machine learning and data algorithm.

Feature selection, feature extraction or construction and dimensionality reduction are important and necessary data pre-processing steps to increase the quality of the feature space, especially with the trend of big data. Feature selection aims to select a small subset of important (relevant) features from the original full feature set. Feature extraction or construction aims to extract or create a set of effective features from the raw data or create a small number of (more effective) high-level features from (a large number of) low-level features. Dimensionality reduction aims to reduce the dimensionality of the data space with the focus of solving "the curse of dimensionality" issue. All of them can potentially improve the performance of a learning algorithm significantly in terms of the accuracy, increase the learning speed, and the complexity and the interpretability of the learnt models. However, they are challenging tasks due to the large search space and feature interaction problems. Recently, there has been increasing interest in using evolutionary computation techniques to solve these tasks due to the fast development of evolutionary computation and capability of stochastic search, constraint handling and dealing with multiple conflict objectives.

The theme of this special session is the use of evolutionary computation for feature reduction, covering ALL different evolutionary computation paradigms. The aim is to investigate both the new theories and methods in different evolutionary computation paradigms to feature selection, feature extraction and construction, dimensionality reduction and related studies on improving quality of the feature space, and their applications. Authors are invited to submit their original and unpublished work to this special session.

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Topics

- Dimensionality reduction
- Feature ranking/weighting
- Feature subset selection
- Multi-objective feature selection
- Filter, wrapper, and embedded methods for feature selection
- Feature extraction or construction
- Single feature or multiple features construction
- Filter, wrapper, and embedded methods for feature extraction
- Multi-objective feature extraction
- Feature selection, extraction, and dimensionality reduction in image analysis, pattern recognition, classification, clustering, regression, and other tasks
- Feature selection, extraction, and dimensionality reduction on high-dimensional and large-scale data
- Analysis on evolutionary feature selection, extraction, and dimensionality reduction algorithms
- Hybridisation of evolutionary computation and neural networks, and fuzzy systems for feature selection and extraction
- Hybridisation of evolutionary computation and machine learning, information theory, statistics, mathematical modelling, etc., for feature selection and extraction
- Real-world applications of evolutionary feature selection and extraction, e.g. images and video sequences/analysis, face recognition, gene analysis, biomarker detection, medical data classification, diagnosis, and analysis, hand written digit recognition, text mining, instrument recognition, power system, financial and business data analysis, etc.