

Call-for-Papers

Special Session on Evolutionary Computation for Feature Selection, Extraction and Dimensionality Reduction

The 11th International Conference on Simulated Evolution and Learning

(November 10-13, 2017, Shenzhen, China)

Motivation

This special session continues the previous one in SEAL 2014, focusing mainly on Evolutionary Computation for *Feature selection, feature extraction or construction and dimensionality reduction*, to improve the feature space quality in learning tasks. This is one of the key areas in the SEAL conference.

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.

Scope:

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.

Topics:

Topics of interest include but are not limited to:

- 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, et al.

Organisers:

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Biography of the organisers:

Bing Xue is currently a lecturer and co-leader of the Evolutionary Computation Research Group, School of Engineering and Computer Science at Victoria University of Wellington, and leading the strategic research direction on evolutionary feature selection and construction. Her research focuses mainly on evolutionary computation, pattern recognition, feature selection, feature extraction, feature construction, multi-objective optimisation, data mining and machine learning. She has over 70 papers published in fully referred international journals and conferences and most of them are on evolutionary feature selection and construction. She is currently co-supervising over 10 PhD and Master's students and visiting scholars, and over 10 Honours and summer research projects.

Dr Xue is currently the Chair of the IEEE Task Force on Evolutionary Feature Selection and Construction, consisting of over 20 members for the five continents working in this area. She is the main Chair of IEEE Symposium on Computational Intelligence in Feature Analysis, Selection, and Learning in Image and Pattern Recognition (FASLIP) in IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2016), the main organiser of the special session on Evolutionary Feature Selection and Construction in IEEE Congress on Evolutionary Computation (CEC) 2015 and WCCI/CEC 2016. She is also a program co-chair of the 7th International Conference on Soft Computing and Pattern Recognition (SoCPaR2015), Publicity Chair for the Australian Conference on Artificial Life and Computational Intelligence (ACALCI 2017), Special Session co-Chair for The 20th Asia-Pacific Symposium on Intelligent and Evolutionary Systems (IES2016), Special Session Co-chair on Evolutionary Feature Reduction in the international conference on Simulated Evolution And Learning (SEAL 2014). She is a member of Editorial Board for Applied Soft Computing (journal), International Journal of Computer Information Systems and Industrial Management Applications and International Journal of Swarm Intelligence Research, and also a Guest Editor for the Special Issue on Evolutionary Feature Reduction and Machine Learning for the Springer Journal of Soft Computing. Dr Xue is serving as a reviewer of over 10 international journals including IEEE Transactions on Evolutionary Computation, IEEE Transaction on Cybernetics and Information Sciences. She is a program committee member for many international conferences including Genetic and Evolutionary Computation Conference (GECCO), European Joint Conference on Evolutionary Computation (EvoStar -- EuroGP, EvoCOP and EvoApplications), IEEE Congress on Evolutionary Computation (CEC), International Joint Conference on Artificial Intelligence (IJCAI), Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD), and International Conference on Simulated Evolution and Learning (SEAL). She is also serving as the Director of Women in Engineering for the IEEE New Zealand Central Section and the Secretary of the IEEE Chapter on Computational Intelligence in that Section.

Mengjie Zhang is currently Professor of Computer Science at Victoria University of Wellington, where he heads the interdisciplinary Evolutionary Computation Research Group. He is a member of the University Academic Board, a member of the University Postgraduate Scholarships Committee, a member of the Faculty of Graduate Research Board at the University, Associate Dean (Research and Innovation) in the Faculty of Engineering, and Chair of the Research Committee of the Faculty of Engineering and School of Engineering and Computer Science.

His research is mainly focused on evolutionary computation, particularly genetic programming, particle swarm optimisation and learning classifier systems with application areas of feature selection/construction and dimensionality reduction, computer vision and image processing, job shop scheduling, multi-objective optimisation, and classification with unbalanced and missing data. He is also interested in data mining, machine learning, and web information extraction. Prof Zhang has published over 400 research papers in refereed international journals and conferences in these areas. He has been serving as an associated editor or editorial board member for seven international journals including IEEE Transactions on Evolutionary Computation, the Evolutionary Computation Journal (MIT Press), Genetic Programming and Evolvable Machines (Springer), Applied Soft Computing, IEEE Transactions on Emergent Topics in Computational Intelligence, Natural Computing, and Engineering Applications of Artificial Intelligence, and as a reviewer of over 30 international journals. He has been involving major EC conferences such as GECCO, IEEE CEC, EvoStar, IEEE SSCI and SEAL as a Chair. He has also been serving as a steering committee member and a program committee member for over 100 international conferences including all major conferences in evolutionary computation. Since 2007, he has been listed as one of the top ten world genetic programming researchers by the GP bibliography (<http://www.cs.bham.ac.uk/~wbl/biblio/gp-html/index.html>).

Prof Zhang is the Chair of the IEEE Emergent Technologies Technical Committee, the immediate Past Chair of the IEEE CIS Evolutionary Computation Technical Committee, a vice-chair of the IEEE CIS Task Force on Evolutionary Feature Selection and Construction, a vice-chair of the IEEE CIS Task Force on Evolutionary Computer Vision and Image Processing, and the founding chair of the IEEE Computational Intelligence Chapter in New Zealand.

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