

Collaborative Neurodynamic Optimization Approaches to Combinatorial Optimization

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Abstract

The past three decades witnessed the birth and growth of neurodynamic optimization which has emerged as a potentially powerful problem-solving tool for constrained optimization due to its inherent nature of biological plausibility and parallel and distributed information processing. Despite the success, almost all existing neurodynamic approaches work well only for optimization problems with continuous variables. Effective neurodynamic approach to combinatorial optimization with discrete variables is rarely available. In this talk, based on a reformulation of combinatorial optimization problems as constrained global optimization problems, collaborative neurodynamic approaches to combinatorial optimization will be presented. By using multiple neurodynamic optimization models with diversified initial states to search local minima in parallel and a meta-heuristic method (such as PSO) to update neuronal initial states iteratively to escape local minima toward global optimal solutions, it will be shown that combinatorial optimization problems can be solved effectively. The efficacy of the proposed approaches will be substantiated with experimental results for sparse nonnegative matrix factorization and cardinality-constrained portfolio selection.

Biosketch

Jun Wang is the Chair Professor Computational Intelligence in the Department of Computer Science and School of Data Science at City University of Hong Kong. Prior to this position, he held various academic positions at Dalian University of Technology, Case Western Reserve University, University of North Dakota, and the Chinese University of Hong Kong. He also held various short-term visiting positions at USAF Armstrong Laboratory, RIKEN Brain Science Institute, Dalian University of Technology, Huazhong University of Science and Technology, and Shanghai Jiao Tong University (Changjiang Chair Professor). He received a B.S. degree in electrical engineering and an M.S. degree from Dalian University of Technology and his Ph.D. degree from Case Western Reserve University. His current research interests include neural networks and their applications. He published over 230 journal papers, 15 book chapters, 11 edited books, and numerous conference papers in these areas. He is the Editor-in-Chief of the *IEEE Transactions on Cybernetics* (2014-2019). He served as an Associate Editor of the *IEEE Transactions on Neural Networks* (1999-2009), *IEEE Transactions on Cybernetics* and its predecessor (2003-2013), and *IEEE Transactions on Systems, Man, and Cybernetics: Part C* (2002–2005), as a member of the editorial board of *Neural Networks*

(2012-2014), editorial advisory board of *International Journal of Neural Systems* (2006-2013). He was an organizer of many international conferences such as the General Chair of the 13th/25th International Conference on Neural Information Processing (2006/2018), the 2008 IEEE World Congress on Computational Intelligence, and a Program Chair of the IEEE International Conference on Systems, Man, and Cybernetics (2012). He is an IEEE Fellow, IAPR Fellow, CAAI Fellow. He was a Distinguished Lecturer of the IEEE Computational Intelligence Society - CIS (2010-2012, 2014-2016) and the IEEE Systems, Man and Cybernetics Society - SMCS (2017-2019). In addition, he served in many professional organizations such as Asia Pacific Neural Network Assembly (APNNA) as President (2006) and IEEE Fellow Committee; IEEE CIS Awards Committee; IEEE SMCS Board of Governors. He is a recipient of the APNNA Outstanding Achievement Award in 2011, IEEE CIS Neural Networks Pioneer Award in 2014, CAAI Wu Wenjun AI Science and Technology Achievement Award in 2016, and IEEE SMCS Norbert Wiener Award and Outstanding Contribution Award in 2019, among other distinctions.