Non-Convex Optimization for Signal Processing and Machine Learning

Special Issue for IEEE Signal Processing Magazine
Call for Papers

Motivation

Optimization is now widely reckoned as an indispensable tool in signal processing and machine learning. Although convex optimization remains a powerful, and is by far the most extensively used, paradigm for tackling signal processing and machine learning applications, we have witnessed a shift in interest to non-convex optimization techniques over the last few years. On one hand, many signal processing and machine learning applications—such as dictionary recovery, low-rank matrix recovery, phase retrieval, and source localization—give rise to well-structured non-convex formulations that exhibit properties akin to those of convex optimization problems and can be solved to optimality more efficiently than their convex reformulations or approximations. On the other hand, for some contemporary signal processing and machine learning applications—such as deep learning and sparse regression—the use of convex optimization techniques may not be adequate or even desirable. Given the rapidly-growing yet scattered literature on the subject, there is a clear need for a special issue that introduces the essential elements of non-convex optimization to the broader signal processing and machine learning communities, provides insights into how structures of the non-convex formulations of various practical problems can be exploited in algorithm design, showcases some notable successes in this line of study, and identifies important research issues that are motivated by existing or emerging applications. This special issue aims to address the aforementioned needs by soliciting tutorial-style articles with pointers to available software whenever possible. Topics of interest include, but are not limited to

- optimization fundamentals, including algorithm design and analysis techniques for generic and structured problems (e.g., difference-of-convex optimization, mixed-integer optimization, non-convex non-Lipschitz optimization, non-convex non-smooth optimization), parallel and distributed non-convex methods, and software toolboxes
- big data analytics
- blind demixing and deconvolution
- computer vision and image processing applications
- deep learning
- localization
- massive MIMO
- phase retrieval
- statistical estimation
- structured matrix/tensor decomposition, such as low-rank matrix recovery and non-negative matrix/tensor factorization, with applications

To enhance readability and appeal for a broad audience, prospective authors are encouraged to use an intuitive approach in their presentation; e.g., by using simple instructive examples, considering special cases that show insights into the ideas, and using illustrations as far as practicable.

Submission Procedure

Prospective authors should submit their white papers through the ScholarOne Manuscripts^{TM} system at `https://mc.manuscriptcentral.com/spmag-ieee`. Further guidelines and information on paper submission can be found at `https://signalprocessingsociety.org/publications-resources/submit-manuscript`.

Schedule

- White paper due: ~~August 1, 2019~~ August 8, 2019
- Invitation notification: September 1, 2019
- Manuscript due: November 1, 2019
- First review to authors: January 1, 2020
- Revision due: March 1, 2020
- Acceptance notification: May 1, 2020
- Final manuscript due: June 1, 2020
- Publication date: September 1, 2020

Guest Editors

Anthony Man-Cho So, The Chinese University of Hong Kong, `manchoso@se.cuhk.edu.hk`
Prateek Jain, Microsoft Research India, `prajain@microsoft.com`
Wing-Kin Ma, The Chinese University of Hong Kong, `wkma@ee.cuhk.edu.hk`
Gesualdo Scutari, Purdue University, `gscutari@purdue.edu`