EDITORIAL

Preface: Special issue on learning and robustness

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The proliferation of huge amounts of datasets brings with it a series of special theoretical and computational challenges. This data avalanche arises in a wide range of scientific and commercial applications. With rapid advances in algorithms, computer and information technologies, many of these challenges are beginning to be addressed. Machine learning, knowledge discovery algorithms and optimization have become central to data analysis.

In this special issue of CMS the authors have considered several issues of machine learning and non-convex optimization algorithms with several applications in finance.

In the paper "Numerical Study of Learning Algorithms on Stiefel Manifold" by Takafumi Kanamori and Akiko Takeda non-convex optimization problems in machine learning are presented. Extensive computational results using different approaches are reported.

The next paper "Calibrating Probability Distributions with Convex-Concave-Convex Functions: Application to CDO Pricing" by Alexander Veremyev, Peter Tsyurmasto, Stan Uryasev, and R. Tyrrell Rockafellar, the authors apply the proposed methodology for the problem of calibrating probabilities of credit environments (market states) in the implied copula Collateralized Debt Obligations (CDO) pricing model.

The third paper "Interaction between Financial Risk Measures and Machine Learning Methods" by Jun-ya Gotoh, Akiko Takeda, and Rei Yamamoto the authors demonstrate how the financial risk measures relate to the machine learning methods, especially to support vector machines. In addition, they introduce the class of coherent risk-based methods and report extensive computational results.

The paper by Theodore B. Trafalis, Indra Adrianto, Michael B. Richman, and S. Lakshmivarahan on "Machine-learning classifiers for imbalanced tornado data" deals with an important application of tornado prediction.

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The paper "Incremental accelerated gradient methods for SVM classification: study of the constrained approach" by Nicolas Couellan and Sophie Jan deals with constrained first order techniques for training support vector machines for online classification tasks. Computational results are presented to support the efficiency of the proposed techniques.

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