



# Financial Signal Processing and Machine Learning (Wiley - IEEE)

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**Financial Signal Processing and Machine Learning (Wiley - IEEE)** From Wiley-IEEE Press

The modern financial industry has been required to deal with large and diverse portfolios in a variety of asset classes often with limited market data available. *Financial Signal Processing and Machine Learning* unifies a number of recent advances made in signal processing and machine learning for the design and management of investment portfolios and financial engineering. This book bridges the gap between these disciplines, offering the latest information on key topics including characterizing statistical dependence and correlation in high dimensions, constructing effective and robust risk measures, and their use in portfolio optimization and rebalancing. The book focuses on signal processing approaches to model return, momentum, and mean reversion, addressing theoretical and implementation aspects. It highlights the connections between portfolio theory, sparse learning and compressed sensing, sparse eigen-portfolios, robust optimization, non-Gaussian data-driven risk measures, graphical models, causal analysis through temporal-causal modeling, and large-scale copula-based approaches.

Key features:

- Highlights signal processing and machine learning as key approaches to quantitative finance.
- Offers advanced mathematical tools for high-dimensional portfolio construction, monitoring, and post-trade analysis problems.
- Presents portfolio theory, sparse learning and compressed sensing, sparsity methods for investment portfolios. including eigen-portfolios, model return, momentum, mean reversion and non-Gaussian data-driven risk measures with real-world applications of these techniques.
- Includes contributions from leading researchers and practitioners in both the signal and information processing communities, and the quantitative finance community.

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## **Editorial Review**

From the Back Cover

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About the Author

**Ali N. Akansu, Electrical and Computer Engineering Department, New Jersey Institute of Technology (NJIT), USA**

Dr. Akansu is a Professor of Electrical and Computer Engineering at NJIT, USA. Prof. Akansu was VP R&D at IDT Corporation and the founding President and CEO of PixWave, Inc. He has sat on the board of an investment fund and has been an academic visitor at David Sarnoff Research Center, IBM T.J. Watson Research Center, and GEC-Marconi Electronic Systems. Prof. Akansu was a Visiting Professor at Courant Institute of Mathematical Sciences of New York University performing research on Quantitative Finance. He is a Fellow of the IEEE and was the Lead Guest Editor of the recent special issue of IEEE Journal of Selected Topics in Signal Processing on Signal Processing Methods in Finance and Electronic Trading.

**Sanjeev R. Kulkarni, Department of Electrical Engineering, Princeton University, USA**

Dr. Kulkarni is currently Professor of Electrical Engineering at Princeton University, and Director of Princeton's Keller Center. He is an affiliated faculty member of the Department of Operations Research and Financial Engineering and the Department of Philosophy, and has taught a broad range of courses across a number of departments (Electrical Engineering, Computer Science, Philosophy, and Operations Research & Financial Engineering). He has received 7 E-Council Excellence in Teaching Awards. He spent 1998 with Susquehanna International Group and was a regular consultant there from 1997 to 2001, working on statistical arbitrage and analysis of firm-wide stock trading. Prof. Kulkarni is a Fellow of the IEEE.

## **Dmitry Malioutev, IBM Research, USA**

Dr. Dmitry Malioutov is a research staff member in the machine learning group of the Cognitive Algorithms department at IBM Research. Dmitry received the Ph.D. and the S.M. degrees in Electrical Engineering and Computer Science from MIT where he was part of the Laboratory for Information and Decision Systems. Prior to joining IBM, Dmitry had spent several years as an applied researcher in high-frequency trading in DRW Trading, Chicago, and as a postdoctoral researcher in Microsoft Research, Cambridge, UK. His research interests include interpretable machine learning; sparse signal representation; inference and learning in graphical models, message passing algorithms; Statistical risk modeling, robust covariance estimation; portfolio optimization. Dr. Malioutov received the 2010 IEEE Signal Processing Society best 5-year paper award, and a 2006 IEEE ICASSP student paper award, and the MIT Presidential fellowship. Dr. Malioutov serves on the IEEE-SPS machine learning for signal processing technical committee, and is an associate editor of the IEEE Transactions on Signal Processing, and a guest editor of the IEEE Journal on Selected Topics in Signal Processing.

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