

# Machine Learning in Finance

Friday December 9, 2005

Amir Atiya, *Cairo University*

Neil Burgess, *Morgan Stanley, New York*

Ramo Gencay, *Simon Fraser University*

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<http://www.icsi.berkeley.edu/~moody/MLFinance2005.htm>

Machine learning (ML) and related methods have produced some of the financial industry's most consistently profitable proprietary trading strategies during the past 20 years. With markets, trade execution and financial decision making becoming more automated and competitive, practitioners increasingly recognize the need for ML. This workshop brings together researchers from machine learning, academic finance and the financial industry to discuss problems in finance where ML may provide an edge.

ML themes include reinforcement learning, optimization methods, recurrent and state space models, on-line algorithms, evolutionary computing, kernel methods, bayesian estimation, wavelets, neural nets, SVMs, boosting, and multi-agent simulation. Financial topics include high frequency data, trading strategies, execution models, forecasting, volatility, extreme events, credit risk, portfolio management, yield curve estimation, option pricing, and selection of indicators, models, and equilibria.

**WORKSHOP SCHEDULE:** See next page.

## **POSTER PRESENTATIONS:**

**An Algorithm for Pricing the American Put**, Amir Atiya, Cairo University

**Feature Selection and Function Approximation for Mutual Funds**, Rita Biswas, SUNY Albany

**Improving Consistency of Density Forecasting Models in Finance**, Michael Carney, Trinity College Dublin

**The K-Shortest-Paths Approach to Approximate Dynamic Programming**, Nicholas Chapados, U Montreal

**Limit Order Market for Predicting Trade Execution Performance (Demo)**, Richard Coggins, U Sydney

**Learning to Trade with Insider Information**, Sanmay Das, MIT

**From Default Probabilities to Credit Spread Through Scaling Laws**, Stefan Denzler, Converium Ltd.

**Cost-Risk Frontiers for Settlement Systems and Efficient Haircuts for Collateral**, Alejandro Garcia, BoC

**FX Trading with RRL: Comparison of Simulation Methods and Technical Indicators**, Carl Gold, Caltech

**Evolutionary Computation Methods in Trading Systems**, Rami Habib, Kyte Group

**Competitive Algorithms for VWAP and Limit Order Trading**, Michael Kearns, U Penn

**The Penn-Lehman Automated Trading Project**, Michael Kearns, U Penn

**Learning Martingale Measures to Price Options**, Malik Magdon-Ismail, RPI

**Online Algorithms and Option Pricing**, Yishay Mansour, Tel-Aviv University

**Estimating Interest Rate Curves by Support Vector Regression**, André Monteiro, Gavea Investments

**Dirichlet Prior for Bayesian GARCH**, Fernando Perez-Cruz, UCL

**A Multiple-Model Approach to the Design of Autonomous Trading Agents**, S. Ramamoorthy, U Texas

**Neural Networks for Option Pricing Formula Approximation**, Giulia Rotundo, U Tuscia

**Credit Rating Systems by Combining Logistic Regressions and SVMs**, Kristiaan Pelckmans, KU Leuven

**A Bounded State Space Representation of Conditional Covariance with Block Dynamics**, J. Williams, U Bath

**Macroeconomics Modulated Independent State-Space Model for Generalized APT Analysis**, Lei Xu, CUHK

**Financial Market Modeling with Large Recurrent Neural Networks**, Hans-Georg Zimmermann, Siemens

**The Dynamics of Price Discovery**, Eric Zivot, U Washington

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Organizers: Amir Atiya, Neil Burgess, Ramo Gencay & John Moody

## Morning Session: 7:30am–12:00pm

- 7:30am **Opening Remarks**
- 7:35am **Plenary I: Predictability & Technical Indicators: An Overview**,  
Ramo Gencay, Department of Economics, Simon Fraser University, Vancouver
- 8:05am **Kernel Portfolio Management**, Yoshua Bengio, University of Montreal  
**Direct Reinforcement for Trading and Portfolios**, John Moody, ICSI  
**Poster Spotlights I:** Sanmay Das (MIT), Carl Gold (Caltech), Hans-Georg Zimmermann (Siemens),  
Michael Kearns (U Penn), S. Ramamoorthy (U Texas), Nicholas Chapados (U Montreal)
- 9:05am **Coffee Break & Poster Pin-Up**
- 9:20am **Plenary II: Lessons Learned from Studying High Frequency Data in Finance**,  
Michel Dacorogna, Financial Analysis and Risk Modeling, Converium Ltd., Zurich
- 9:50am **Too Good to be True: A Real World Investment Application of Evolutionary Computing**,  
David Leinweber, Leinweber and Co.  
**Poster Spotlights II:** Rami Habib (Kyte Group), Lei Xu (CUHK), Alejandro Garcia (Bank of Canada),  
Malik Magdon-Ismail (RPI), Yishay Mansour (Tel-Aviv University). Announcements.
- 10:30am **Poster Session I:** Authors present. See previous page for presentation list.

## Afternoon Session: 1:30pm–6:30pm

- 1:30pm **Poster Session II:** Viewing and Demos
- 2:30pm **Industry Panel: Trading Models in the Real World**,  
Peter Bolland (Morgan Stanley), David Leinweber (Leinweber and Co.) & Xiru Zhang (PHZ Partners)
- 3:15pm **Break**
- 3:30pm **Plenary III: Simulation-Based Estimation of Stochastic Volatility Models**,  
Eric Zivot, Department of Economics, University of Washington, Seattle
- 4:00pm **Wavelet Based Kernel Learning for Financial Time Series**, Alejandro Cañete, FSMU  
**Using Adaboost for Equity Investment Scorecards**, German Creamer, Columbia University  
**Optimal Investment for All Ages**, Sham Kakade, University of Pennsylvania
- 5:00pm **Coffee Break & Poster Viewing**
- 5:15pm **Plenary IV: Bayesian Orderflow Models, Market Impact and Algorithmic Trade Execution**,  
Richard Coggins, Faculty of Economics and Business, University of Sydney
- 5:45pm **Reinforcement Learning for Optimized Trade Execution**, Michael Kearns, U. of Pennsylvania  
**What Exactly Should we be Optimising?**, Neil Burgess, Morgan Stanley
- 6:25pm **Closing Remarks**