Workshop on machine learning & AI in portfolio management and financial analytics

This will be an introduction into the use of machine learning and AI techniques in predictive analytics for portfolio management and capital markets. We will talk about modern computational finance and demonstrate the use of various machine learning and AI algorithms in analysis of financial markets.
We will learn some useful machine learning techniques, about problems in computational finance and what are the needs of portfolio managers. The goal is to either improve the existing system or to adapt it to a different domain (set of problems).
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goals:
- develop a better predictive analytics for finance data
- use it in portfolio management & optimization

tools/approach:
- genetic algorithms, SVM, (ANN)...

demonstration:
- implementation in Matlab
- open source implementation in python (pandas):
    1. QuantSoftware ToolKit
    2. zipline by quantopian

Definitions (mostly Wikipedia):

An **exchange-traded fund** (**ETF**) is an investment fund traded on stock exchanges, much like stocks. An ETF holds assets such as stocks, commodities, or bonds, and trades close to its net asset value over the course of the trading day. Most ETFs track an index, such as a stock index or bond index. ETFs may be attractive as investments because of their low costs, tax efficiency, and stock-like features. ETFs are the most popular type of exchange-traded product.

The **capital stock** (or **stock**) of an incorporated business constitutes the equity stake of its owners. It represents the residual assets of the company that would be due to stockholders after discharge of all senior claims such as secured and unsecured debt. Stockholders' equity cannot be withdrawn from the company in a way that is intended to be detrimental to the company's creditors.

Alpha is a risk-adjusted measure of the so-called active return on an investment. It is the return in excess of the compensation for the risk borne, and thus commonly used to assess active managers' performances. Often, the return of a benchmark is subtracted in order to consider relative performance, which yields Jensen's alpha.

Capital markets are financial markets for the buying and selling of long-term debt- or equity-backed securities. These markets channel the wealth of savers to those who can put it to long-term productive use, such as companies or governments making long term investments. Financial regulators, such as the UK's

Financial Services Authority (FSA) or the U.S. Securities and Exchange Commission (SEC), oversee the capital markets in their jurisdiction to protect investors against fraud, among other duties.

A **hedge** is an investment position intended to offset potential losses/gains that may be incurred by a companion investment. In simple language, a hedge is used to reduce any substantial losses/gains suffered by an individual or an organization.

Volatility is a measure for variation of price of a financial instrument over time. Historic volatility is derived from time series of past market prices. An implied volatility is derived from the market price of a market traded derivative (in particular an option). The symbol σ is used for volatility, and corresponds to standard deviation.

Portfolio management is the art and science of making decisions about investment mix and policy, matching investments to objectives, asset allocation for individuals and institutions, and balancing risk against performance.
Portfolio management is all about strengths, weaknesses, opportunities and threats in the choice of debt vs. equity, domestic vs. international, growth vs. safety, and many other tradeoffs encountered in the attempt to maximize return at a given appetite for risk.

The Process of portfolio management
1. Find Assets
2. Train (Machine learning) Models
3. Find the Optimal Portfolio Allocation

tools in python (with pandas):
- https://github.com/quantopian/zipline
- https://github.com/tucker777/QSTK
  (http://wiki.quantsoftware.org/index.php?title=QuantSoftware_ToolKit)

relevant MOOC's
- https://www.coursera.org/course/compinvesting1
- https://www.coursera.org/course/compfinance
- (https://www.coursera.org/course/fe)

some disruptive companies:
- https://www.wealthfront.com/
- https://addepar.com/
- http://www.wealthlift.com/
- https://lucenaresearch.com/
- http://www.palantir.com/solutions/capital-markets/
- https://www.quantopian.com/

references:

1. Russell, Norvig - Artificial Intelligence. A Modern Approach (2010)
2. Paul Wilmott Introduces Quantitative Finance (2007)
3. McNelis - Neural Networks in Finance, Gaining Predictive Edge in the Market (2005)
4. Wes McKinney - Python for Data Analysis (2012)

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http://www.bdatafest.computationalreporting.com/