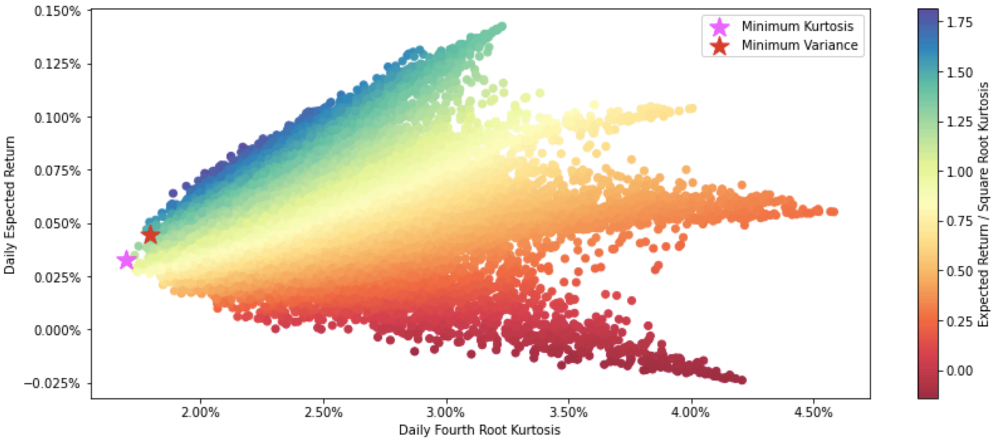
Portfolio Optimization with Python

$$
\begin{aligned}
\min_{x, X, z, g} \quad & g \\
& \begin{bmatrix} X & x \\ x' & 1 \end{bmatrix} \succeq 0 \\
& z = L_2 \text{vec}(X) \\
& \left\| \left[S_2 \Sigma_4 S_2' \right]^{1/2} z \right\|_2 \leq g \\
& \sum_{i=1}^{n} x_i = 1 \\
& x \geq 0 \\
& X \succeq 0
\end{aligned}
$$



Objective

The objective of the course is to provide the student with the computational tools that allow them to design asset allocation strategies using the most modern portfolio optimization techniques that would be very complicated using a spreadsheet or a traditional programming language.

Student Profile

Professionals in the areas of finance, investments, risk management; who wish to improve their skills in portfolio optimization. It is recommended that the students have basic to intermediate knowledge of portfolio theory, optimization, calculus, linear algebra and statistics; and intermediate to advance knowledge of one programming language (Python, R, Julia, Rust, C, C++, VBA, VB.net, Matlab or similar)

Course Content

Topics
Main Libraries (Numpy, Pandas)
Convex Optimization for Portfolio Optimization
Integer Programming for Portfolio Optimization
Machine Learning for Portfolio Optimization
Graph Theory for Portfolio Optimization
Backtesting of Portfolio Optimization Strategies

The detailed content on the last page.

Teacher:

Dany Cajas, author of the book **"Advanced Portfolio Optimization: a Cutting-edge Quantitative Approach"** published by Springer and creator and sole maintainer of **Riskfolio-Lib**, a portfolio optimization Python library with **3,300 Github Stars** ⭐ and more than **738K downloads**.

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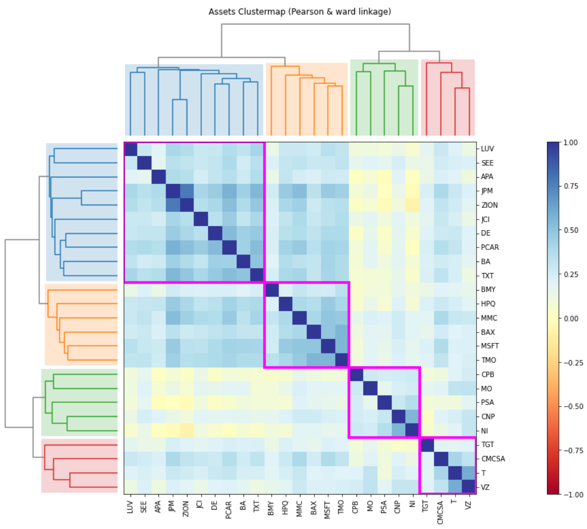

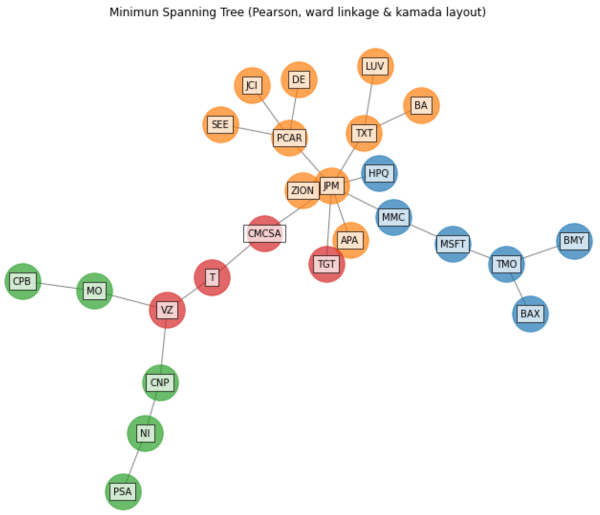

Program Fee

The fee is $800 USD (United States Dollars) per student. For registration of groups of 4 or more students there is a 10% discount.

Additional Information

Start Date: June 14th, 2025

Classes: Online through Google Meets (all classes will be recorded and uploaded to the google classroom)

Duration: 42 hours

Schedule: Saturday and Sunday from 10a.m. to. 1p.m. (UTC-5)

Capacity: Minimum 5 - Maximum 20 students per section.

Materials: All class recordings (class videos), Python scripts, whiteboards and documents will be shared to students through our google classroom.

Other: The student must have a personal computer (administrator user enabled) and an email account with an explicit “@gmail.com" domain (work or university emails that are gmail are not valid for google classroom). Python installation instructions and other requirements will be shared through google classroom.

Payments:

- You can send us an email with your full name, city and country of residence to orenji.eirl@gmail.com in order to send you a customized PayPal invoice.
- Use the following payment link https://www.paypal.com/ncp/payment/CNGYDJU3SAJH4 and then send us your information to complete the registration.

orenji.eirl@gmail.com
https://www.linkedin.com/company/orenj-i/

Topics	Hours
Main Libraries	
Numpy: Linear algebra	2
Pandas: Dataframes	1
Scipy: Statistical Functions and Linear Algebra	1
Montecarlo and Quasimontecarlo Simulation for Portfolio Optimization	2
Convex Programming for Portfolio Optimization	
CVXPY: Disciplined Convex Programming (DCP) Optimization	
Linear Programming (CVaR, CDaR, Minimax)	3
Quadratic Programming (Variance)	1.5
Second Order Cone Programming (Standard Deviation)	1.5
Semidefinite Programming (Variance, Kurtosis and Approximate Kurtosis)	3
Exponential Cone Programming (Entropic Value at Risk)	1
Power Cone Programming (Relativistic Value at Risk)	1
Convex Fractional Programming (Risk Adjusted Return Ratio Optimization)	1
Mean Risk Optimization	2
Risk Parity Optimization (Least Squares and Risk Budgeting approaches)	2
Worst Case Optimization (Box and Elliptical Uncertainty Sets)	2
Integer Programming for Portfolio Optimization	
Value at Risk Optimization	1
Integer Constraints (Cardinality on Assets and Classes, and Buy in threshold constraints)	3
Convex Fractional Programming with Integer Variables	2
Risk Parity Optimization for Long Short Portfolios	1
Machine Learning for Portfolio Optimization	
Hierarchical Risk Parity	2
Hierarchical Equal Risk Contribution	1
Nested Clustered Optimization	1
Graph Theory for Portfolio Optimization	
Centrality Measures Constraints (Average Connectivity of Graphs)	1
Network Constraints (Relative Positions on Graphs)	1
Clusters Constraints (Clusters based on Dendrogram)	1
Backtesting of Portfolio Optimization Strategies	
The Walk Forward Method (Rolling and Expanding Window)	2
The Cross-Validation Method	1
The Combinatorial Purged Cross-Validation Method	1
Total	**42**