

# Algorithmic Trading Optimization with DEAP

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## Introduction & Motivation

- 60% of working Americans do not believe Social Security will pay practical benefits when they reach retirement age.
- The S&P 500 averages around +8% return annually, with all past crashes eventually resulting in a strong recovery.
- Long term holding is a reliable option, however, Americans with retirement around the corner do not have the luxury of waiting for a possible crash to recover.
- Steady, consistent growth is less risky than cycles of boom and bust.

Can genetic algorithms optimize trading strategy performance in the market?



S&P 500 (SPY) Market Data History (1993-2022)

## Methodology

### Strategy:

#### Buy:

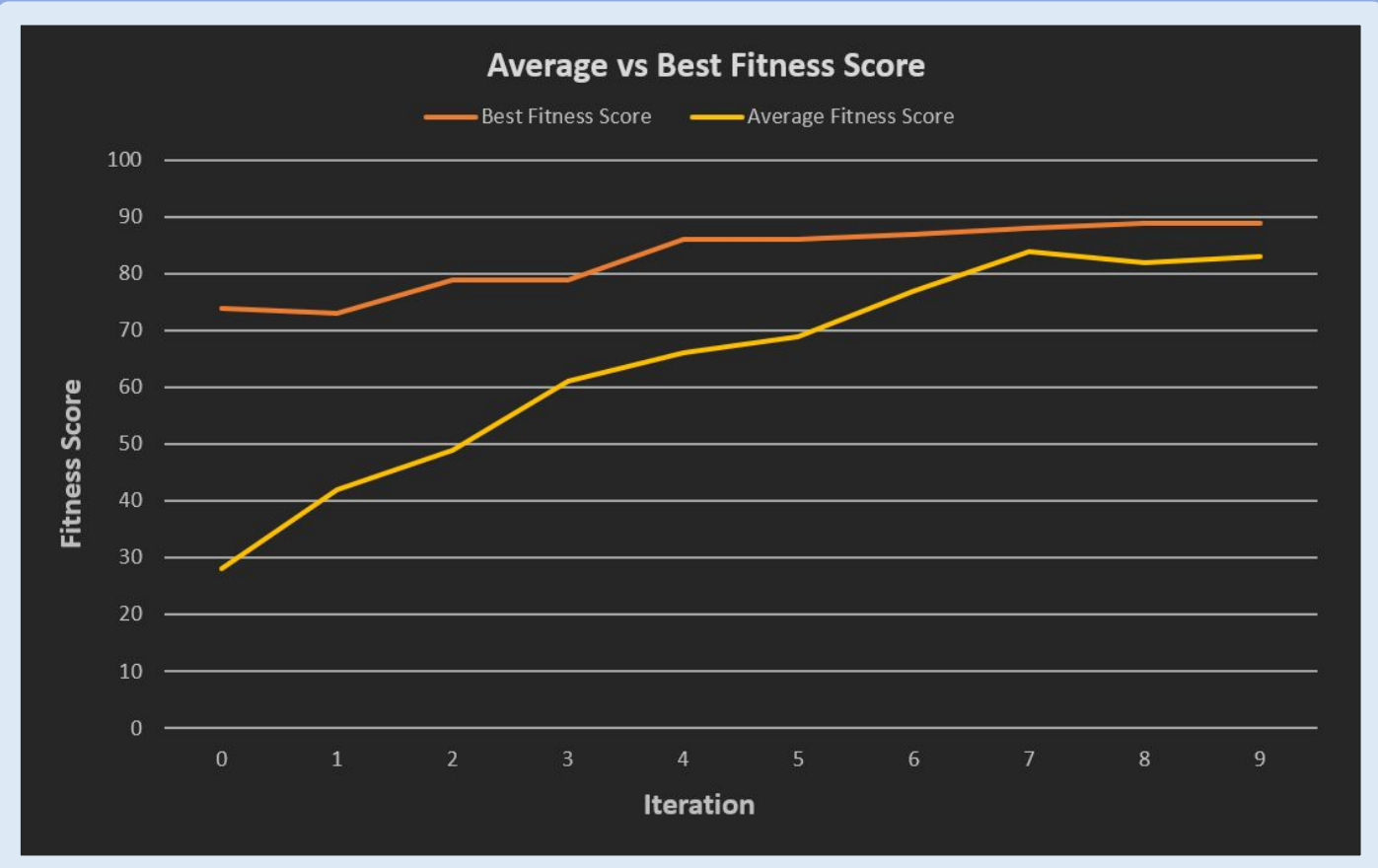
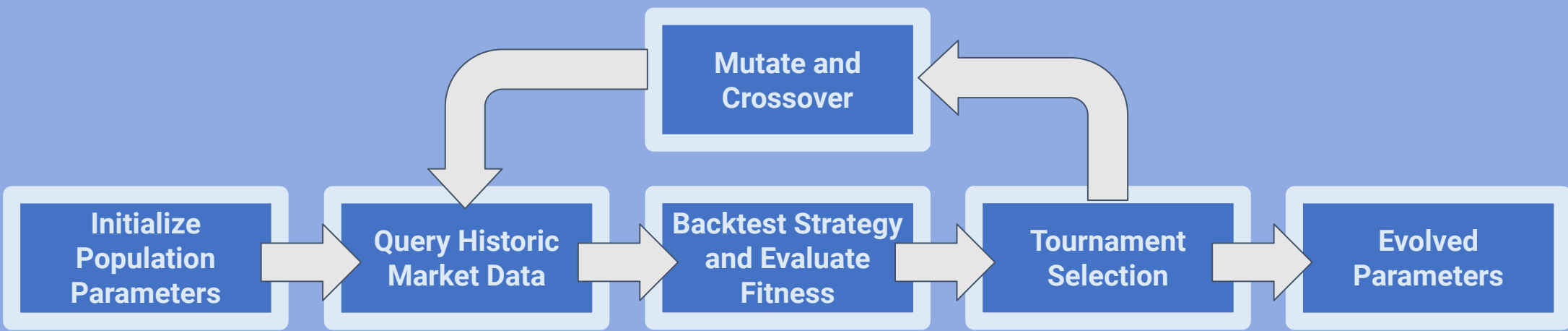
- "Fast" MA (blue line) crosses the "slow" MA (yellow line)

#### Sell:

- "Slow" MA (yellow line) crosses the "fast" MA (blue line)
- RSI falls below the given threshold



2011-2013 SPY Market Data with 10 (Blue) and 50 Day Moving Average and RSI Indicators



Fitness = % Net Return

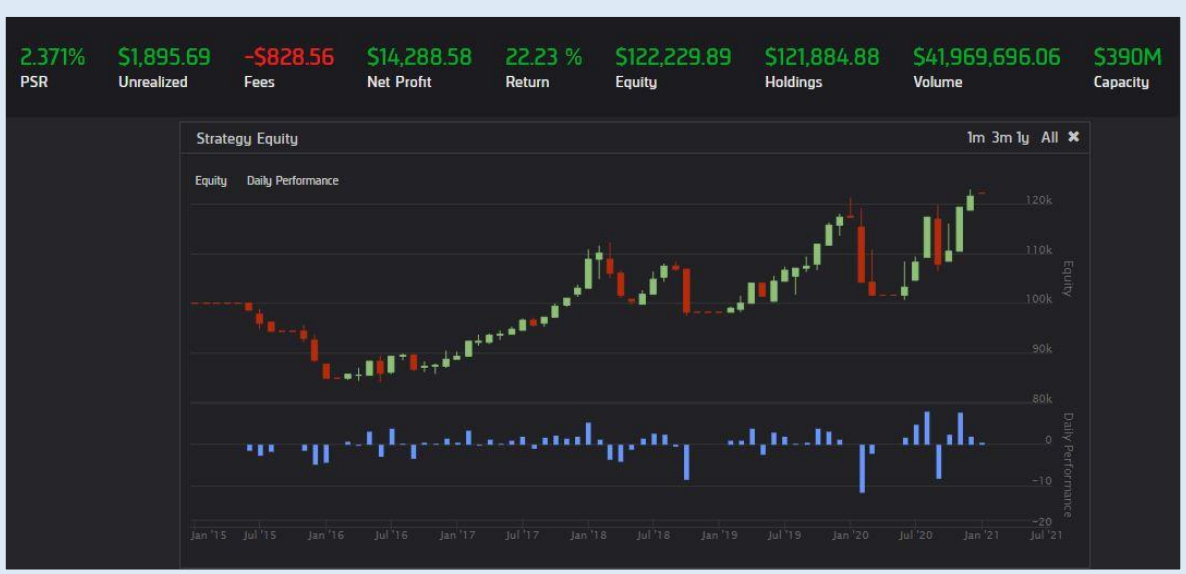
## Results

### Training



Fast-20, Slow-120, RSI-50

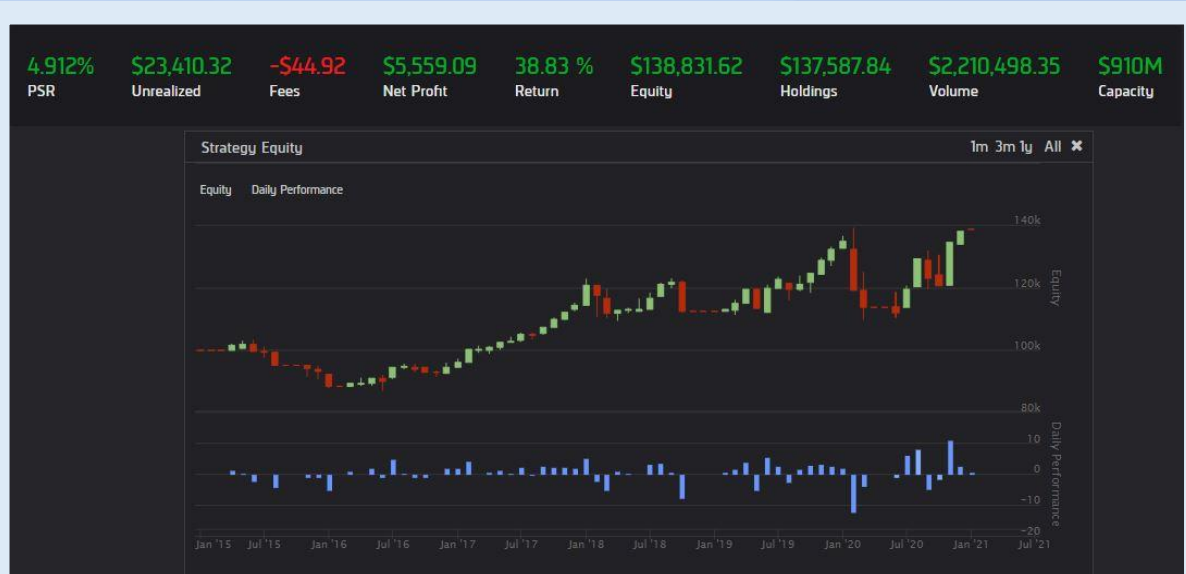
### Testing



Fast-35, Slow-60, RSI-33



Fast-42, Slow-66, RSI-9



## Conclusion & Future Work

- Genetic algorithms can converge algorithmic trading parameters toward a more optimal outcome on the market
- However, evolutionary algorithms tend to overfit, and the results partially confirm overfit parameters
- The RSI implementation was devolved out of the strategy
- In the future, multiple training sets all over diverse periods of the market would avoid overfitting
- Detailed RSI conditions would allow for usefulness

## Application

- Predict price action in the market in order to reduce the chances of an unforeseen crash
- Produce consistent returns rather than periods of high and low margins, market stability being the central intent.
- Under widespread use, reduce harsh movement and cut sudden surges and quick crashes in favor of sustained consistent growth.