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### Genetic Algorithms and Stock Trading

The goal of this project was to create a project that uses a genetic algorithm to find a simple and good rule that could be used in the Stock Market trading. The algorithm uses trading rules in the course of multiple generations to find one that helps us maximize profit using historical stock data.

For this project, we have chosen to use 35 different stocks for three years from the years 2019 to 2021. Stocks we have chosen are Ford(F), Apple(AAPL), National Instruments (NATI), Nike (NKE), Google(GOOG), Microsoft (MSFT), NVIDIA (NVDA), Amazon (AMZN), Meta (META), Tesla (TSLA), Advanced Micro Devices (AMD), Intel (INTC), Oracle (ORCL), IBM (IBM), Cisco Systems (CSCO), Healthcare, Johnson & Johnson (JNJ), Pfizer (PFE), Moderna (MRNA), UnitedHealth Group (UNH), AbbVie (ABBV), JPMorgan Chase (JPM), Goldman Sachs (GS), Bank of America (BAC), Wells Fargo (WFC), Citigroup (C), Walmart (WMT), Procter & Gamble (PG), Coca-Cola (KO), McDonald's (MCD), Home Depot (HD), ExxonMobil (XOM), Chevron (CVX), General Electric (GE), Boeing (BA), and Caterpillar (CAT).

As for the Algorithm, we start with a population of 20 random trading rules that are represented with three indicators. They are Simple Moving Average(SMA), Exponential Moving Average (EMA), and Maximum Price(MAX). These populations evolve over 200 generations and each generation aims to be better than the last by improving on the trading rules. These rules

combine SMA, EMA, and MAX indicators, which creates a trading decision over a certain amount of days. Over 200 generations, here is the result:

Generation	Best Rule	Fitness Score 9\$)
50	e320 e498 e061	3500000
100	e100 s71727 e586	3500000
150	e100 s71727 e586	3500000
200	e100 s71727 e586	3500000

Through the evolution, the program had a final score of \$3,500,000 and was the most profitable with the market trends.

From the table above, we can see that after about the first 50 generations, the fitness score was more stable. The best-performing rule relied heavily on exponential moving averages, suggesting that trend-following indicators played a significant role in high returns. Once the best rule was found, there was not as many impacts by mutation as the population had already found its best strategy.

Fitness Score Over 200 Generations

