**Black Swan Analysis of S&P 500 returns**

**Overview**
This project analyzes extreme market events (Black Swans) in S&P 500 returns by comparing two statistical distributions: Normal distribution and Lévy Stable distribution. The analysis demonstrates how traditional models often underestimate the frequency of extreme market movements.

**Motivation**
Financial markets experience rare impactful events, Black Swans, much more frequently than is suggested by the Normal distribution. This project quantifies how often extreme market events should theoretically occur under different statistical assumptions, visualizes the fat-tailed nature of actual market returns and demonstrates why Lévy distributions provides a more realistic model for extreme events then the Normal distribution.

**Features**
- Fetch historical S&P 500 Data
- Extreme Event Detection (5 most extreme positive and negative return events)
- Dual distribution Fitting for Normal-and Lévy-Parameters
- Probability Calculations for extreme events
- Comparative Visualization between the two distributions

**Installation**
pip install matplotlib yfinance numpy scipy
Required files: “levy_ergebnisse.pkl” which can be computed using the file: “lévy_distributions”
Python 3.7+

**Expected Visual Output**