



CSIS 4260 – 002: Assignment 1

Stock Price Analysis & Prediction

Dashboard Screenshots

Prepared For:

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Github Link: <https://github.com/desporamon/stock-analysis-a1>

Live Dashboard: <https://sp500-desmond-stockprediction.streamlit.app>

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Page 1: Overview

The overview page displays key dataset statistics (619,040 rows, 505 companies, date range 2013–2018), a brief project description explaining what each dashboard page covers, and a sample of the data table showing both original columns and the calculated technical indicators.

Navigation

Select a page:

Overview

Benchmark Results

Stock Prediction

Technical Indicators

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Share ☆ ↻ 🔍 ⋮

S&P 500 Stock Price Analysis & Prediction

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Total Records

Companies

Date Range

To

619,040

505

2013-02-08

2018-02-07

About This Dashboard

This interactive dashboard presents the results of a comprehensive stock price analysis project covering:

Benchmark Results

Stock Prediction

Technical Indicators

Use the sidebar to navigate between pages. Select different stock tickers to see company-specific analysis.

Share ☆ ↻ 🔍 ⋮

Stock Prediction — Next-day closing price predictions using Linear Regression and Random Forest models

Technical Indicators — SMA, RSI, Volatility, and other indicators visualized per company

Use the sidebar to navigate between pages. Select different stock tickers to see company-specific analysis.

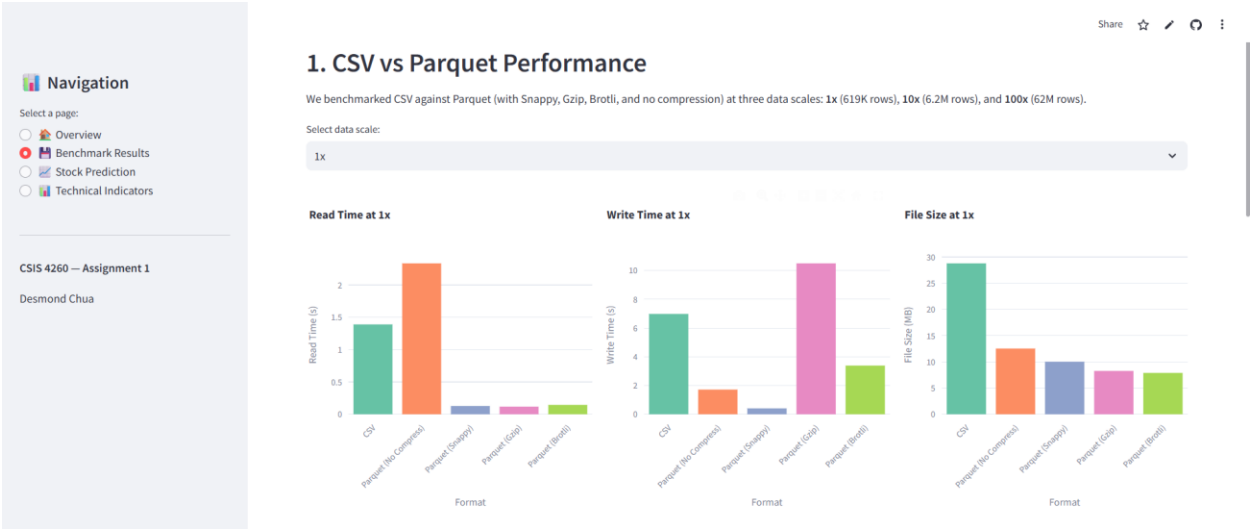
Dataset Sample

	date	open	high	low	close	volume	name	sma_20	sma_50	rsi_14	volatility	daily_return	price_momentum	next_close
0	2013-02-08 00:00:00	45.07	45.35	45	45.08	1,824,755	A	45.08	45.08	50	None	None	0	44.6
1	2013-02-11 00:00:00	45.17	45.18	44.45	44.6	2,915,405	A	44.84	44.84	0	0.3394	-1.0648	-0.24	44.62
2	2013-02-12 00:00:00	44.81	44.95	44.5	44.62	2,373,731	A	44.7667	44.7667	4	0.2715	0.0448	-0.1467	44.75
3	2013-02-13 00:00:00	44.81	45.24	44.68	44.75	2,052,338	A	44.7625	44.7625	23.8095	0.2219	0.2913	-0.0125	44.58
4	2013-02-14 00:00:00	44.72	44.78	44.36	44.58	3,826,245	A	44.726	44.726	18.75	0.2088	-0.3799	-0.146	42.25
5	2013-02-15 00:00:00	43.48	44.24	42.21	42.25	14,657,315	A	44.3133	44.3133	4.7923	1.0279	-5.2266	-2.0633	43.01
6	2013-02-19 00:00:00	42.21	43.12	42.21	43.01	4,116,141	A	44.1271	44.1271	23.3933	1.0598	1.7988	-1.1171	42.24
7	2013-02-20 00:00:00	42.84	42.85	42.225	42.24	3,873,183	A	43.8913	43.8913	19.5279	1.1865	-1.7903	-1.6512	41.63
8	2013-02-21 00:00:00	42.14	42.14	41.47	41.63	3,415,149	A	43.64	43.64	17.2676	1.3417	-1.4441	-2.01	41.8
9	2013-02-22 00:00:00	41.83	42.07	41.58	41.8	3,354,862	A	43.456	43.456	19.8529	1.3923	0.4084	-1.656	41.29

Page 2: Benchmark Results

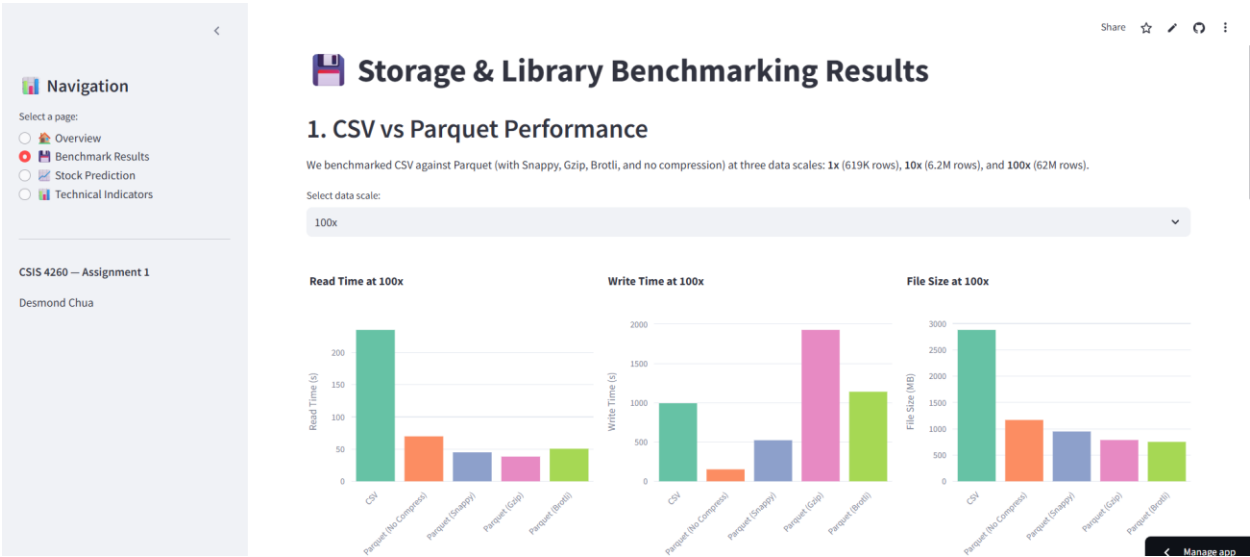
CSV vs Parquet — 1x Scale

Bar charts comparing read time, write time, and file size for CSV and four Parquet variants (no compression, Snappy, Gzip, Brotli) at the original data scale of 619K rows.



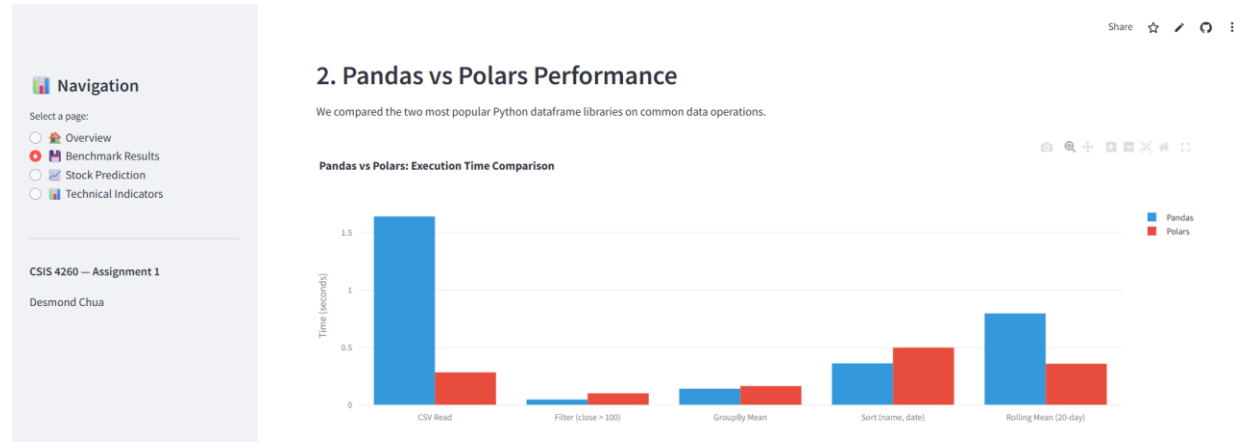
CSV vs Parquet — 100x Scale

Same charts at 100x scale (62M rows). At this scale the performance gap is dramatic — CSV takes almost 4 minutes to read while Parquet Snappy takes 45 seconds.



Pandas vs Polars Comparison


Grouped bar chart and results table comparing execution times for Pandas and Polars across five common data operations. Polars is faster for CSV reading (5.8x) and rolling calculations (2.2x), but Pandas was chosen for this project due to better Scikit-learn and Streamlit integration.



Page 3: Stock Prediction

Company Ticker Selection

The dashboard provides a searchable dropdown containing all 505 S&P 500 company tickers. Selecting a different company updates all prediction charts and error analysis below in real time. This demonstrates the dashboard meets the requirement of making predictions available for all companies.

 **Navigation**

Select a page:

☐

 Overview

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 Benchmark Results

☒

 Stock Prediction

☐

 Technical Indicators

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 **Stock Price Prediction**

Select a company ticker:

AJG

A

AAL

AAP

AAPL

ABBV

ABC

ABT

ACN

\$0.9072

\$1.3553

R² Score

0.9997

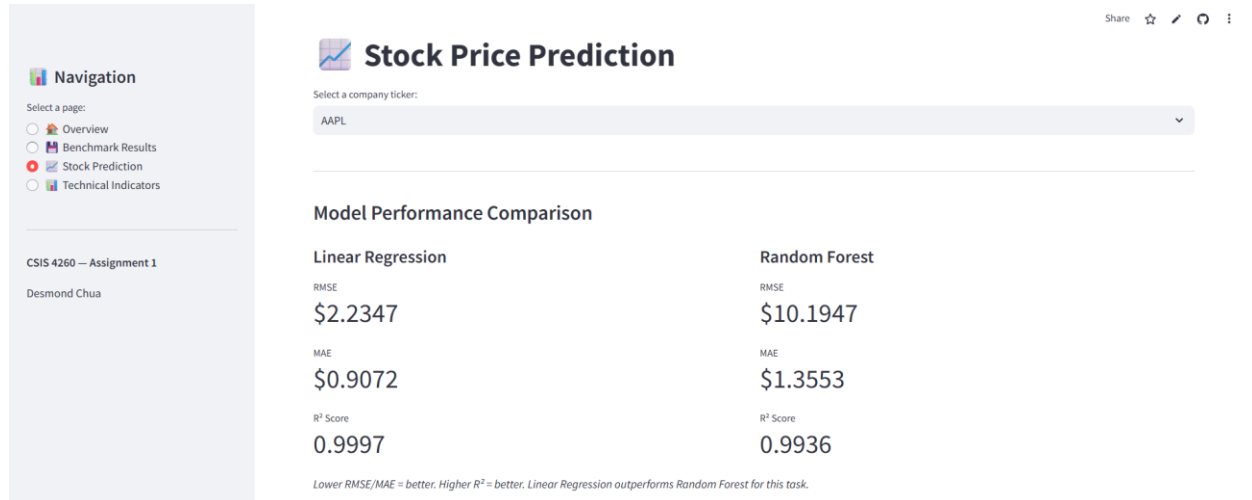
R² Score

0.9936

Lower RMSE/MAE = better. Higher R² = better. Linear Regression outperforms Random Forest for this task.

Model Performance Metrics

Side-by-side comparison of Linear Regression and Random Forest performance. Linear Regression outperformed across all metrics (RMSE: \$2.23 vs \$10.19, MAE: \$0.91 vs \$1.36, R^2 : 0.9997 vs 0.9936). This is because stock prices follow a near-linear day-to-day pattern.



Actual vs Predicted — AAPL

Actual closing price (black line) compared with Linear Regression (blue dotted) and Random Forest (red dotted) predictions for Apple on the test set. Both models closely track the actual price.

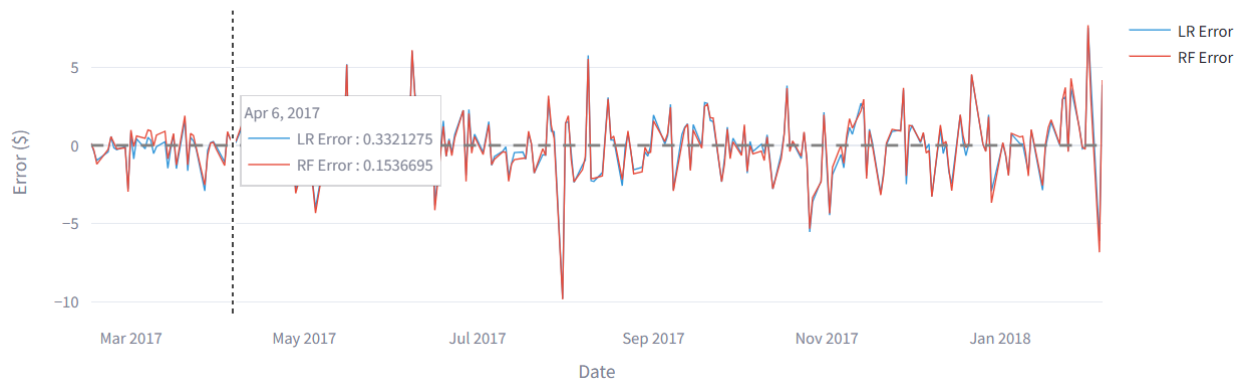
AAPL — Actual vs Predicted Closing Price (Test Set)



Prediction Error — AAPL

Error chart showing how far each model's prediction deviates from the actual price over time. Linear Regression error stays near \$0, while Random Forest shows larger spikes.

AAPL — Prediction Error Over Time



Actual vs Predicted — GOOG

Same prediction view for Google, demonstrating that the company ticker dropdown works and all charts update dynamically when a different company is selected.

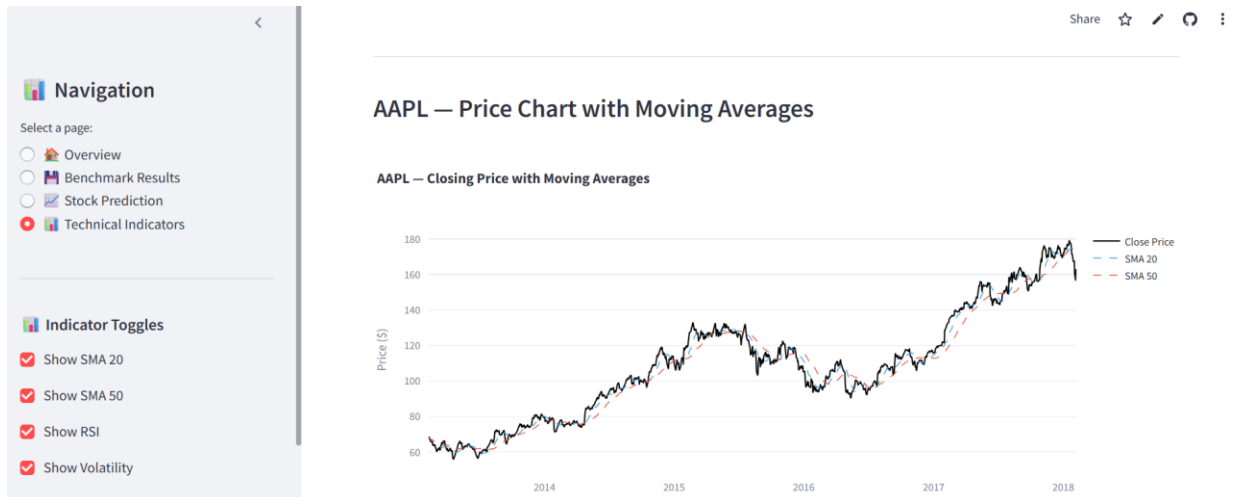
GOOG — Actual vs Predicted Closing Price (Test Set)



Page 4: Technical Indicators

Price Chart with Moving Averages

Closing price line chart with SMA 20 (short-term) and SMA 50 (medium-term) moving average overlays. The sidebar shows toggle checkboxes that allow turning each indicator on and off interactively.

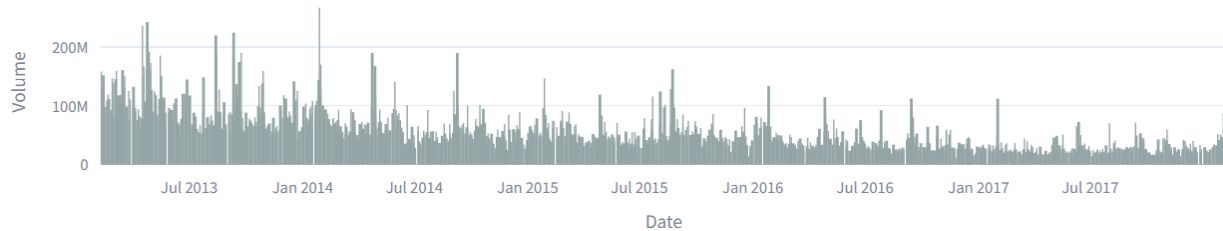


Trading Volume

Daily trading volume bar chart for the selected company, showing how actively the stock was traded each day.

AAPL — Trading Volume

AAPL — Daily Trading Volume

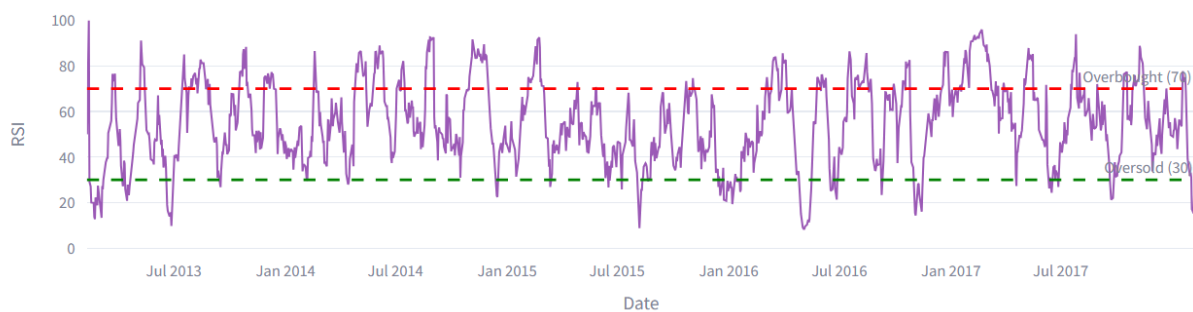


RSI (Relative Strength Index)

RSI chart with overbought (70) and oversold (30) threshold lines marked. RSI measures momentum — values above 70 suggest the stock may be overpriced, below 30 suggests it may be undervalued.

AAPL — Relative Strength Index (RSI) ⇄

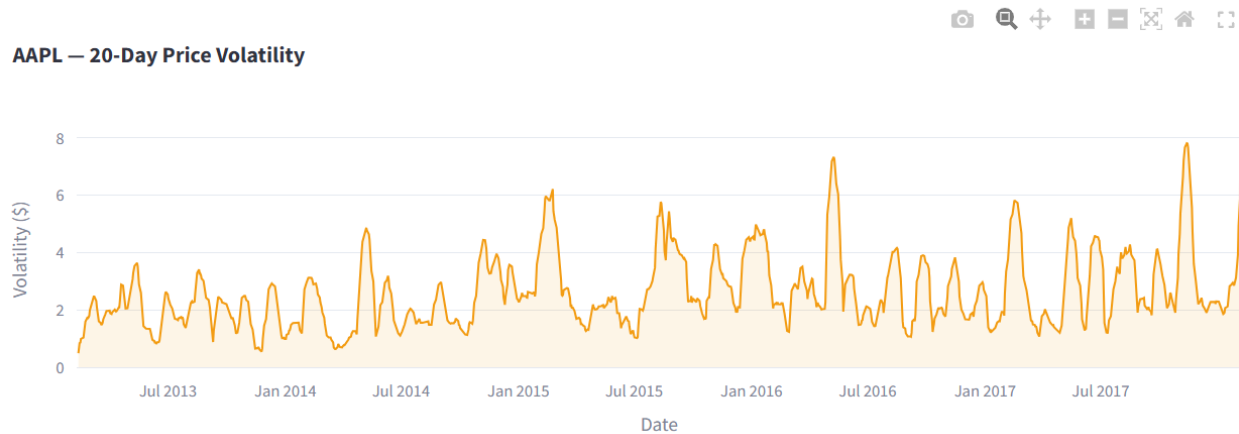
AAPL — RSI (14-Day)



Volatility

20-day rolling standard deviation chart showing price volatility over time. Spikes indicate periods where the stock price was swinging significantly.

AAPL — 20-Day Volatility



Summary Statistics

Descriptive statistics table for the selected company, including count, mean, standard deviation, min, max, and quartile values for close price, volume, SMA, RSI, volatility, and daily return.

AAPL — Summary Statistics

	close	volume	sma_20	rsi_14	volatility	daily_return
count	1,259	1,259	1,259	1,259	1,258	1,258
mean	109.07	54,047,899.74	108.31	55.01	2.61	0.08
std	30.56	33,468,353.34	30.21	18.45	1.27	1.46
min	55.79	11,475,922	59.38	8.21	0.5	-7.99
25%	84.83	29,694,376.5	80.64	41.94	1.69	-0.64
50%	109.01	45,668,931	109.18	54.16	2.29	0.04
75%	127.12	68,708,720	126.48	69.5	3.23	0.86
max	179.26	266,833,581	174.6	100	7.81	8.2