STOCK CLOSING PRICE FORECAST - LSTM

INTRODUCTION

- Stock prices are crucial for investment. A good model that forecast the price will provide a good return on your investment.

- Predict stock price for the next day (or a few days ahead).

- Be closer to the real price than simple methods.

Why it's hard

- Markets change quickly (news, earnings).
- Patterns are messy and not straight lines.

What we want

- A model that learns from recent history and adapts.

WHAT IS AN LSTM?

Plain idea: An LSTM is a neural net made for time-ordered data.

- Order matters: yesterday → today → tomorrow.
- The path (last few weeks) can signal momentum or reversals.
- We need a model that remembers recent steps, not just a single number.

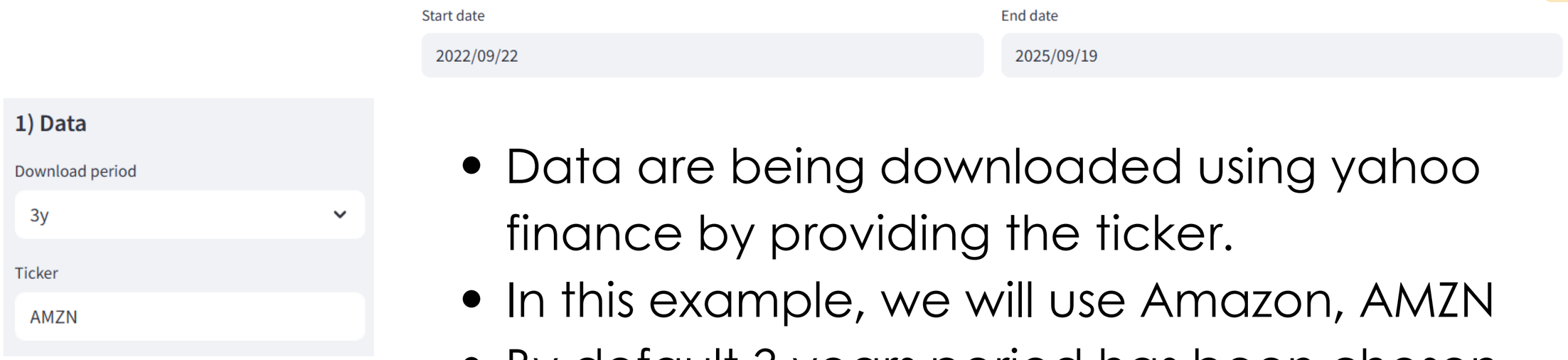
So we use a sequence model that takes a window of past days as input.

LSTM = smart memory for sequences.

OUR LSTM MODEL SETUP

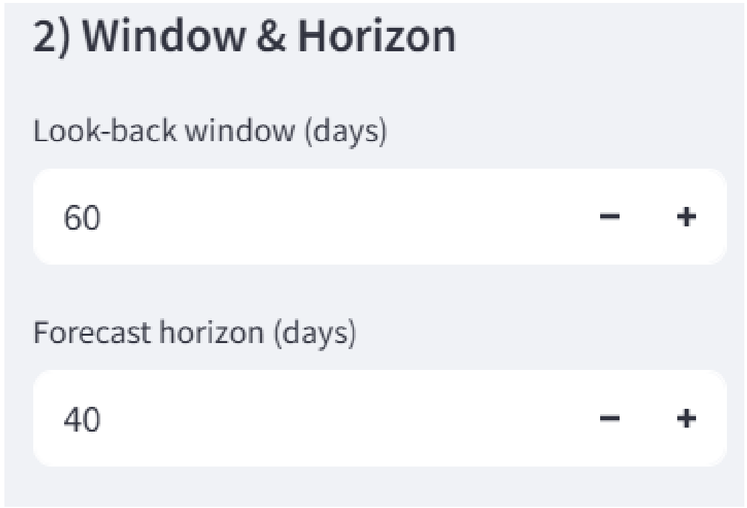
- Lookback: last N days of Close (scaled).
- Model: LSTM(64) → Dropout → LSTM(64) → Dense(32) → Output(1).
- Training: time split (80/20), EarlyStopping, ReduceLROnPlateau.
- Forecast: predict next day; for multiple days, feed each prediction back in.
- Metrics: MAE, RMSE, R^2.

SETUP



- Data are being downloaded using yahoo finance by providing the ticker.
- In this example, we will use Amazon, AMZN
- By default 3 years period has been chosen,
- The Start Date and End Date will let us customize the start and end date.
- The longer the date is often better for the model.

SETUP



- The look back period for the LSTM can be customizable to get a better result.
- The forecast horizon is set here to predict how many days ahead from the latest stock price closing date.

In our forecast model, How it works (simple):

- Looks back at the last N days.
- Take the forecast days.
- Predict the next day.
- Remove the last look back day value and add in the new predict day
- Loop back until all forecast days has been predicted.
- Will get a forecast price based on how many days ahead.

Look back is 5
Forecast is 2
price = [[10], [11], [12], [13], [14]]
pred = 15
wind = [[11], [12], [13], [14], [15]]
pred = 16
wind = [[12], [13], [14], [15],[16]]

RESULT

- Test metrics
  - MAE: $3.98(average error)
  - RMSE: $5.68 (penalizes big misses)
  - R^2: 0.665 (explains ~70% of variation)

- We're usually within a few dollars of the true close.
- Bigger misses happen on volatile days.
- The model captures a good chunk of day-to-day moves.

RESULT

Forecast

	Forecast_$
2025-09-29 00:00:00	230.49
2025-09-30 00:00:00	229.89
2025-10-01 00:00:00	229.58
2025-10-02 00:00:00	229.48
2025-10-03 00:00:00	229.52
2025-10-06 00:00:00	229.66
2025-10-07 00:00:00	229.86
2025-10-08 00:00:00	230.11
2025-10-09 00:00:00	230.38
2025-10-10 00:00:00	230.68

Download forecast CSV

LIMITS OF LSTM

- Surprises (earnings, big news) aren’t predictable from past prices.
- Regime changes (market mood shifts) can break old patterns.
- Bad setup hurts results: data leakage, no scaling, no validation.

THANK YOU