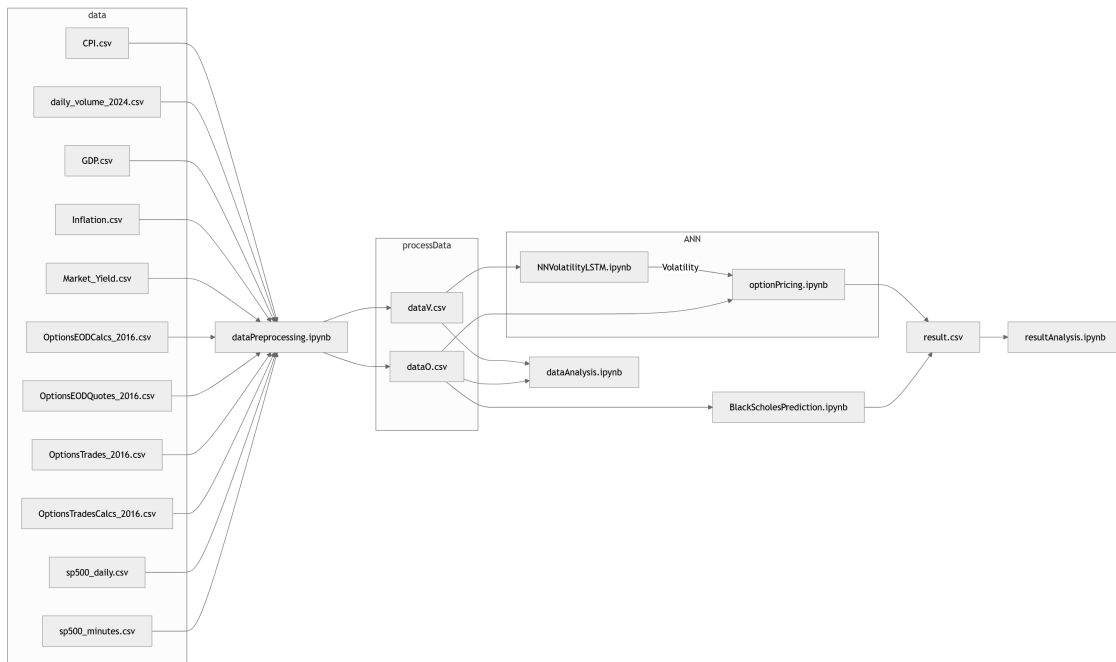# Research Project Report

February 18, 2025

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1 Introduction

This document will clearly outline the advancement of the research project. Based on the Scrum and sprint methodology, I will update the document every week, including what is new and what is next.
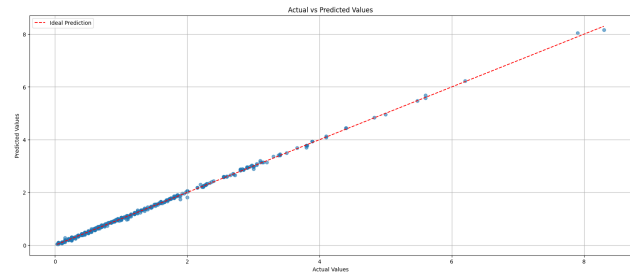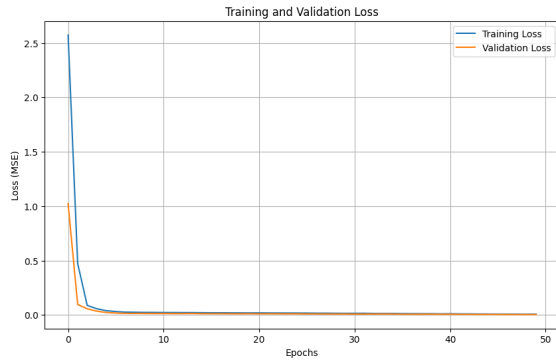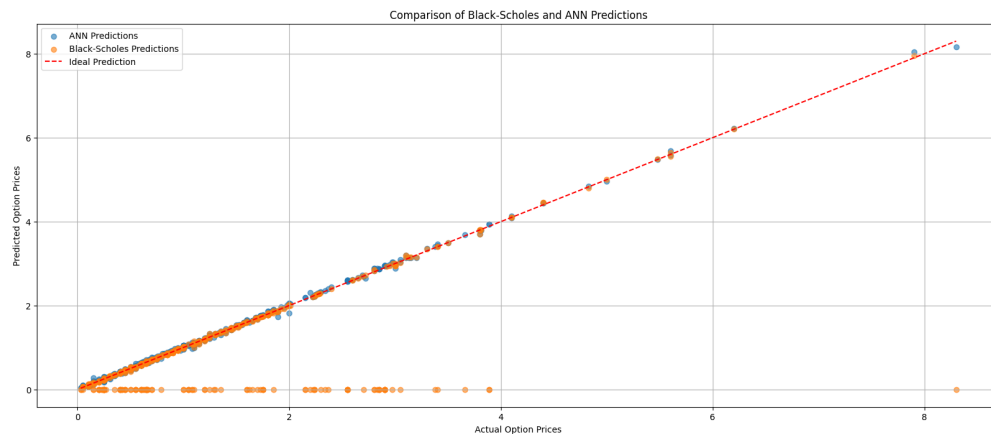
Iteration 1

What Is New?

- Created and trained a ANN MLP model for option pricing, using Black-Scholes parameters to target option prices.

- Compared the model's performance against Black-Scholes models:

- Started to build a custom LSTM model with NumPy. For now, I think Python allows better flexibility and development time than C++, while still maintaining decent performance using only NumPy. I want the model to be compatible with TensorFlow formatting for easier use.

What Is Next?

- Finish the custom MLP model.

- Outliers suppression

Iteration 2

What Is New?

- First principle implementation of artificail neural network **multilayer perceptron**. Can be found here : /code_/models/annModels.py

-
  ```
  mlp = am.MLP(n_input=22, n_hidden1=64, n_hidden2=32, n_output=1)
  epochs = 5000
  learning_rate = 0.001

  #Training
  history = mlp.train(X_train_normalized, y_train, epochs, learning_rate)

  # Predict
  train_preds = mlp.forward(X_train_normalized)
  y_pred = mlp.forward(X_test_normalized)

  #---
  Final Training Loss: 0.41194406219492513
  Final Test Loss: 0.41460153925356924
  ```
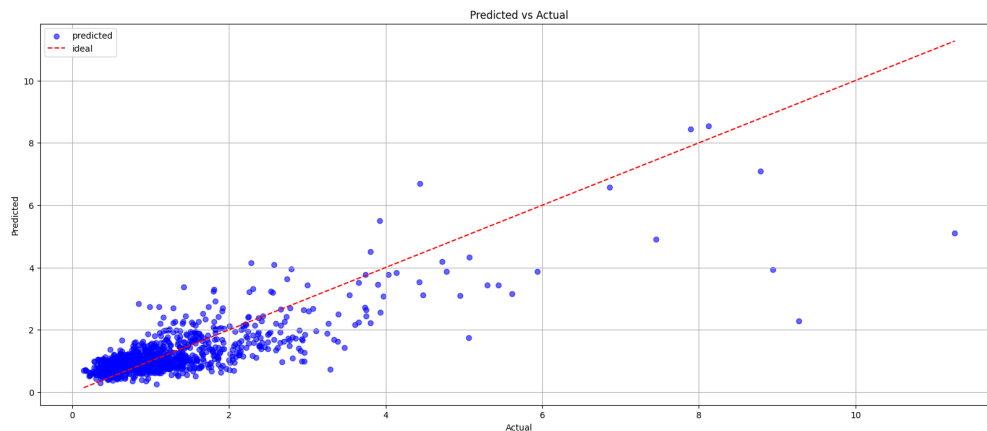

What Is Next?

- Paramater optimization for custom model implementation ?

- Would a Transformer work better ? - Wiki Transformer

  - Very likely, However, to get a working transformer model, the data volume is much more advanced than we currently use.

Iteration 3

What Is New?

- Finnish data gathering with scipt :/code_/tools/getData.ipynb, all the assets data are gather in /data/stocks (around 200 symbols)

- Transformer implementation in progress

- Benchmark against LSTM model

- Paramater optimization for custom model implementation ?

What Is Next?

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