

# Deep RL Stock Trading

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## 1 Objective

To trade stocks (and eventually other securities) with a capability that matches or exceeds human traders.

## 2 Implementation

In order to effectively implement the required functionality for this project in a modular and easily maintainable/modifiable way, the following approach is suggested

### 2.1 Gym

An environment for training and evaluating reinforcement learning algorithms on financial data must be created. When run, the operator will specify

- a. A timespan over which historical prices will be evaluated
- b. A trained model that will receive price data iteratively
- c. An initial portfolio value, possibly with constraints on max loss

From these inputs, the training environment should do the following

- a. Seed an initial window of price data that ends at the opening price of stocks on the start day to the agent. This should be achieved by explicitly creating a window, rather than returning copied values. The output will be a  $10,000 \times 180 \times 5$  tensor assuming 10,000 securities over a 180 day window with 5 price metrics.
- b. The agent should yield a key value structure representing stocks to buy, sell, or short. Assume that selling a stock that isn't currently owned indicates a shorting position.
- c. The environment steps to the next trading day and yields a new portfolio value, along with a new window of price data.

## 3 Architecture

### 3.1 Time Insensitive Analysis

Some technical analysis metrics used by human traders are relatively time insensitive, meaning that they provide insights into the general viability of a security by looking at trends over a long period of time. For example, support and resistance levels can be defined over some period of relevance, call it 180 days. The times at which these levels were established are not of massive significance.

As such, there may be value in a network architecture that exhibits temporal translation invariance. The approach will be to apply a convolutional neural network to price and volume data over a constrained historical window.

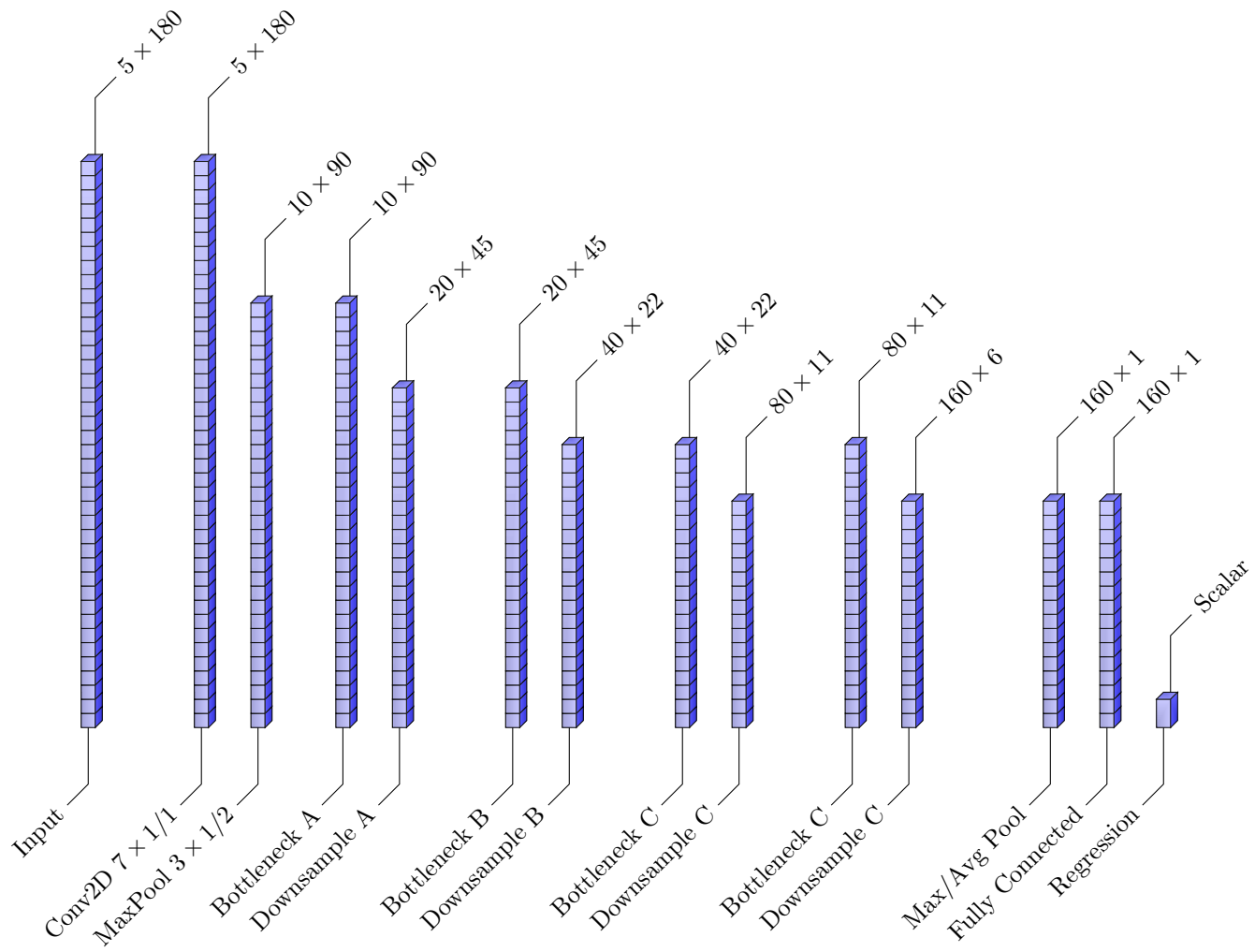


Figure 1: Possible convolutional architecture.