Transformer Model to predict trade signals

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This is a basic transformer model to predict the most appropriate action (BUY, SELL or HOLD) for “AAPL” stock.

I am not very familiar with how transformer is implemented from scratch, so I took guidance from these references:

* <https://towardsdatascience.com/build-your-own-transformer-from-scratch-using-pytorch-84c850470dcb>
* <https://medium.com/@Matthew_Frank/stock-price-prediction-using-transformers-2d84341ff213>

Then I adjusted hyper parameters such as sequence length and epochs to get the best possible model to predict next day (t+1) stock price from the given features at time t. The error metric used was MSE and RMSPROP was used as an optimizer.

The inputs to the model are:

Market features -

'ts\_recv', 'ts\_event', 'rtype', 'publisher\_id', 'instrument\_id',

'action', 'side', 'depth', 'price', 'size', 'flags', 'ts\_in\_delta',

'sequence', 'bid\_px\_00', 'ask\_px\_00', 'bid\_sz\_00', 'ask\_sz\_00',

'bid\_ct\_00', 'ask\_ct\_00', 'symbol', 'Close', 'Volume', 'High', 'Low',

'Open', 'RSI', 'MACD', 'MACD\_signal', 'MACD\_hist', 'Stoch\_k', 'Stoch\_d',

'OBV', 'Upper\_BB', 'Middle\_BB', 'Lower\_BB', 'ATR\_1', 'ATR\_2', 'ATR\_5',

'ATR\_10', 'ATR\_20', 'ADX', '+DI', '-DI', 'CCI', 'DLR', 'TWAP', 'VWAP'

The transformer predicts the next day stock price using these features and additional features such as percentage change in the price in the past days.

How the trading strategy works:

1. Predict the next day stock price using transformer
2. If sufficiently higher than today, action = BUY. If sufficiently lower, action = SELL. If near around then HOLD.
3. Next, we run the strategy using these actions and compute the actual PnL.
4. If BUY action at time t: PnL = Actual Close Price (t+1) - Actual Close Price (t)
5. If SELL action at time t: PnL = Actual Close Price (t) - Actual Close Price (t+1)

After training my model for 59k timestamps, the realized PnL was approximately $334.345

I was not able to fully integrate this with the trading blotter. However, the cumulative reward for the blotter was -12231.775689639546, and the transformer model delivered positive overall PnL.