Predicting The Stock Market With Deep Learning

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Introduction

- Predicting the stock market?

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- Deep Learning and prediction

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- Deep Learning and prediction
- Can deep learning be a tool to solve it?

History

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- Data processing issues, back propagation attempt
- Simulating

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- Everything is in the form of time series data

Event Based Prediction

- Open IE combined with a simple neural network

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- Expansion with Neural Tensor Networks and a CNN
- Common practice for event based prediction

Results

	Index Prediction		Individual Stock Prediction		
	Acc	MCC	Acc	MCC	Profit
Luss [2012]	56.38%	0.07	58.74%	0.25	$8,671
Ding [2014]	58.83%	0.16	61.47%	0.31	$10,375
EB-CNN	64.21%	0.40	65.48%	0.41	$16,774

Figure: (Ding et al, 2015)

Corporate and Education Realm

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- Google and other companies teamed up with universities like Stanford to test LSTMs

Limit Order Books

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- Popular for testing European stock market prediction

CNN and LSTM Combinations

Model	Accuracy %	Precision %	Recall %	F1 %
Prediction Horizon k = 10				
SVM [28]	-	39.62	44.92	35.88
MLP [28]	-	47.81	60.78	48.27
CNN-I [26]	-	50.98	65.54	55.21
LSTM [28]	-	60.77	75.92	66.33
CNN-II [27]	-	56.00	45.00	44.00
B(TABL) [25]	78.91	68.04	71.21	69.20
C(TABL) [25]	84.70	76.95	78.44	77.63
DeepLOB	84.47	84.00	84.47	**83.40**
Prediction Horizon k = 20				
SVM [28]	-	45.08	47.77	43.20
MLP [28]	-	51.33	65.20	51.12
CNN-I [26]	-	54.79	67.38	59.17
LSTM [28]	-	59.60	70.52	62.37
CNN-II [27]	-	-	-	-
B(TABL) [25]	70.80	63.14	62.25	62.22
C(TABL) [25]	73.74	67.18	66.94	66.93
DeepLOB	74.85	74.06	74.85	**72.82**
Prediction Horizon k = 50				
SVM [28]	-	46.05	60.30	49.42
MLP [28]	-	55.21	67.14	55.95
CNN-I [26]	-	55.58	67.12	59.44
LSTM [28]	-	60.03	68.58	61.43
CNN-II [27]	-	56.00	47.00	47.00
B(TABL) [25]	75.58	74.58	73.09	73.64
C(TABL) [25]	79.87	79.05	77.04	78.44
DeepLOB	80.51	80.38	80.51	**80.35**

Figure: (Passalis et al., 2018)

Deep ConvLSTM Project

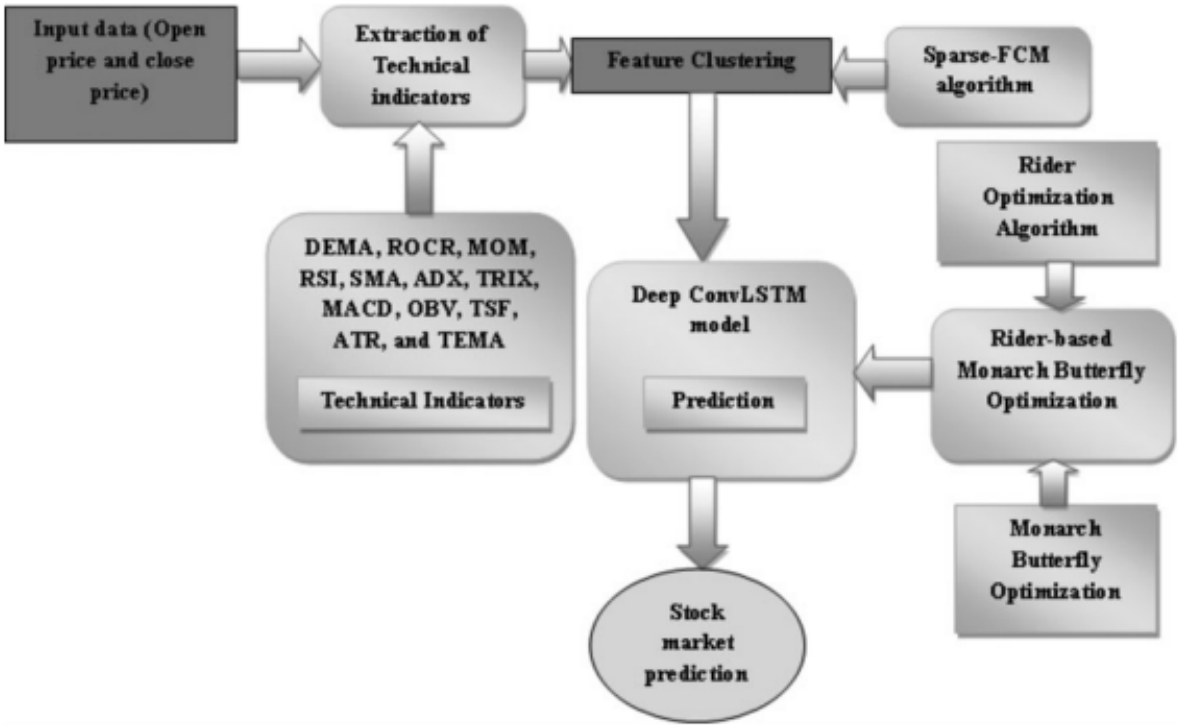

Figure: (Kelotra, 2020)

Reinforcement Learning

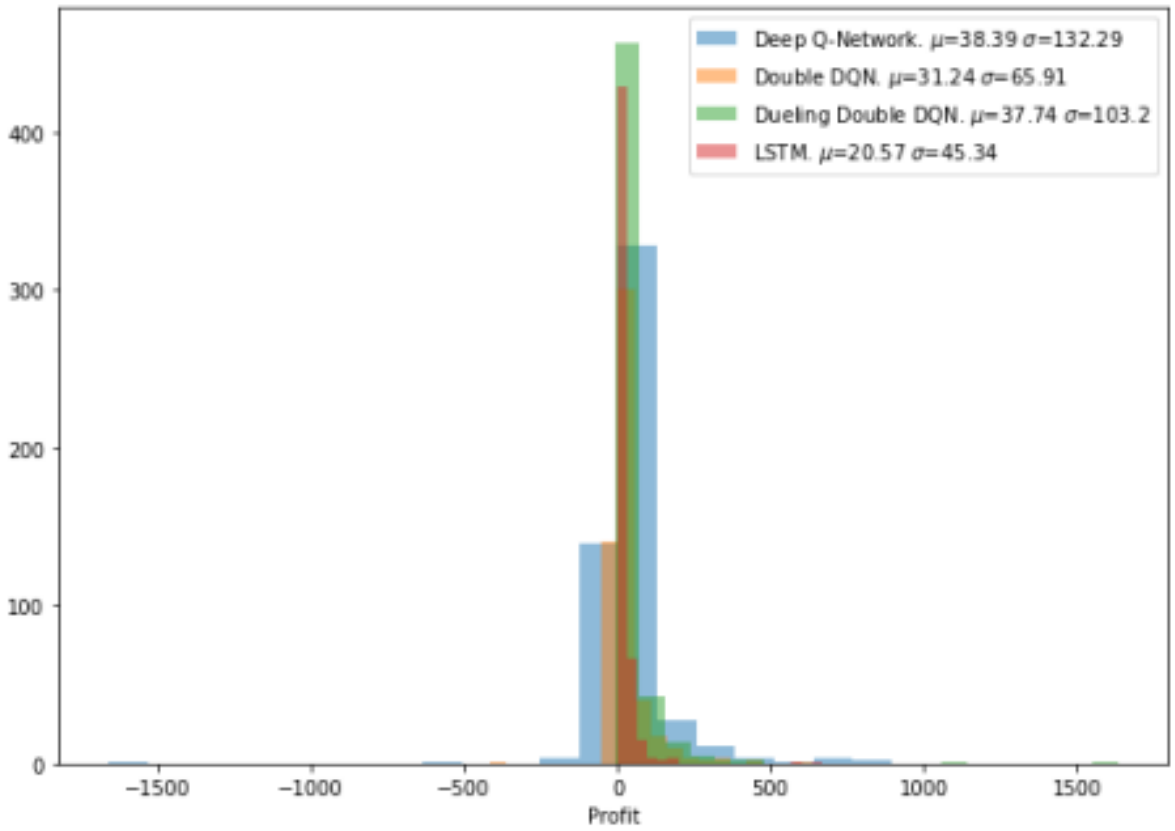

Figure: (Dang, 2019)

What We've Learned

- A lot closer to understanding stock market prediction

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- Feature Extraction

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- A lot closer to understanding stock market prediction
- Feature Extraction
- Best at doing this task

Future Work

- Triple check dates, website citations

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- Try implementing these kind of models

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- Triple check dates, website citations
- Try implementing these kind of models
- Track how popular the 2019/2020 papers become

Resources

Holmblad, Michael. Survey of Deep Learning and Stock Market Prediction

Questions?