Predicting S&P 500 Returns Using Gramian Angular Field and Multiple Input CNN's

Team Jonas contribution to ERP Prediction Contest, February 15, 2019 - May 15, 2019

Hull Tactical, University of California Santa Barbara Department of Statistics and Applied Probability and the Center for Financial Mathematics and Actuarial Research

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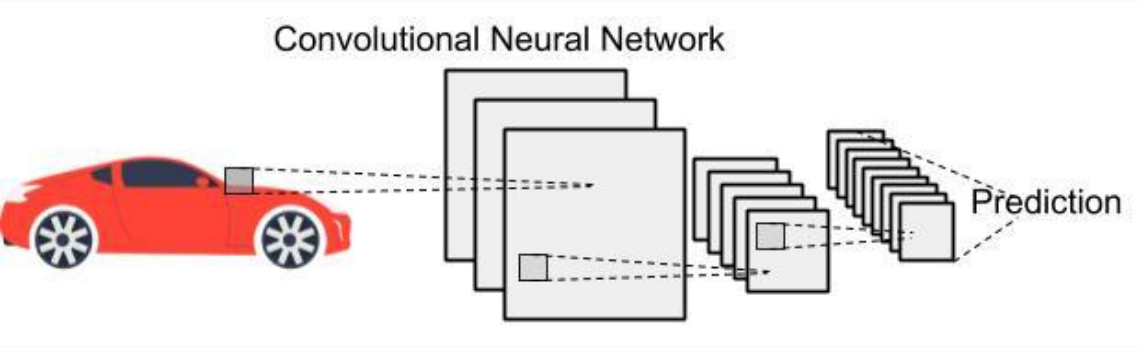
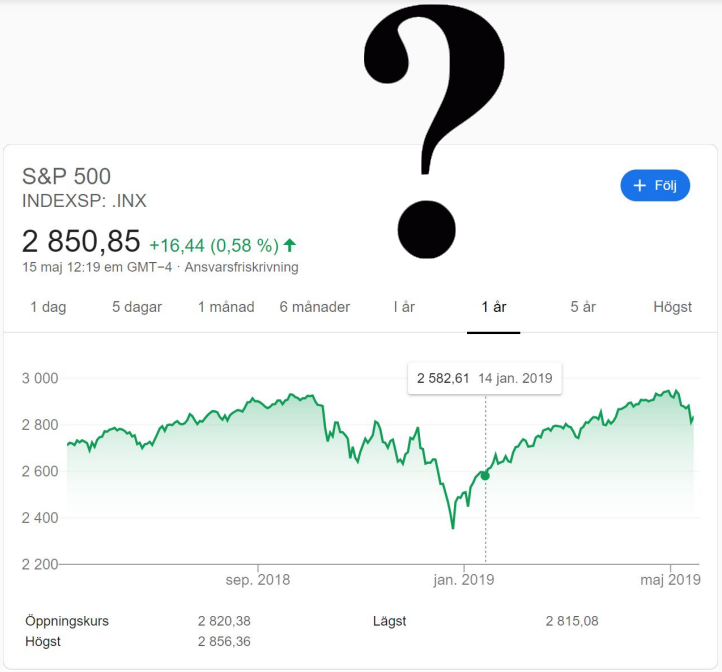
University of California Santa Barbara

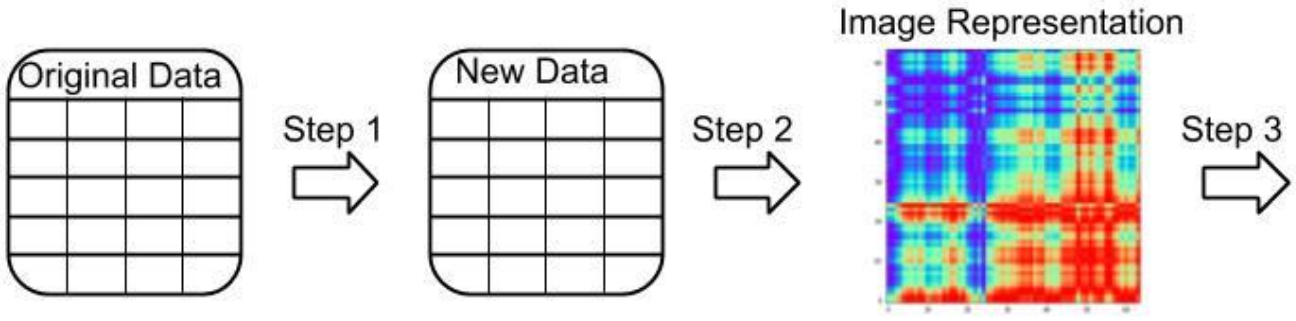
Thank you!

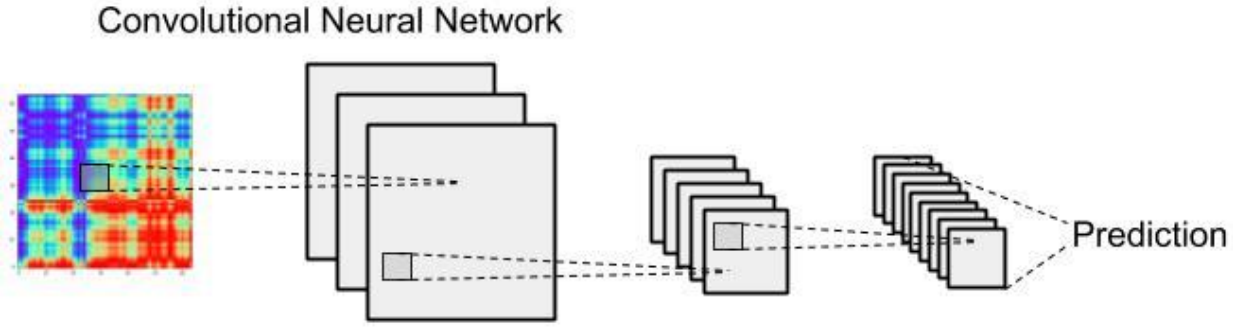
Idea


Convolutional Neural Network
Prediction


S&P 500
INDEXSP: .INX
+ Följ
2 850,85 +16,44 (0,58 %)
15 maj 12:19 em GMT−4 · Ansvarsfriskrivning
1 dag
5 dagar
1 månad
6 månader
I år
1 år
5 år
Högst
2 582,61 14 jan. 2019
3 000
2 800
2 600
2 400
2 200
sep. 2018
jan. 2019
maj 2019
Öppningskurs 2 820,38
Högst 2 856,36
Lägst 2 815,08

What I did

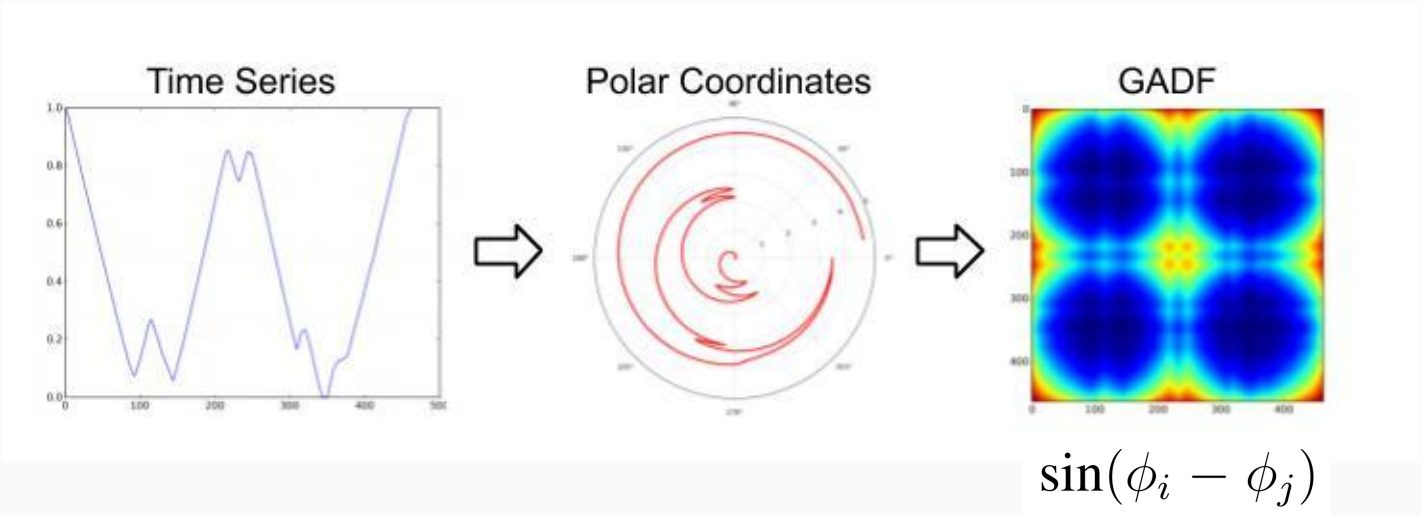




1. Feature Engineering
2. **Image Representation**
3. **Convolutional Neural Network**

Image Representation

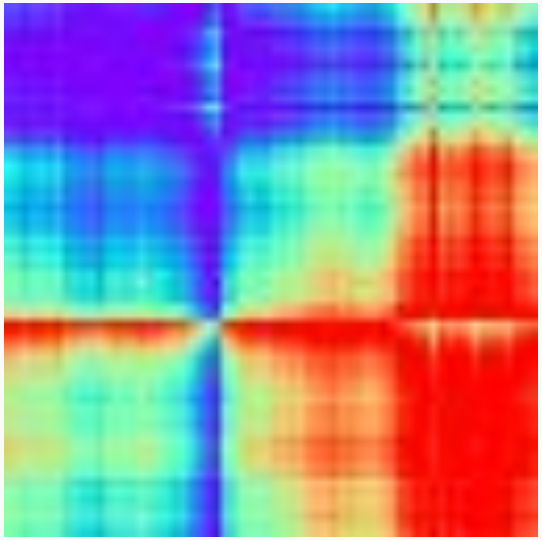
$$\begin{cases} \phi_i = \arccos(x_i) \\ r_i = \frac{i}{N} \end{cases}$$



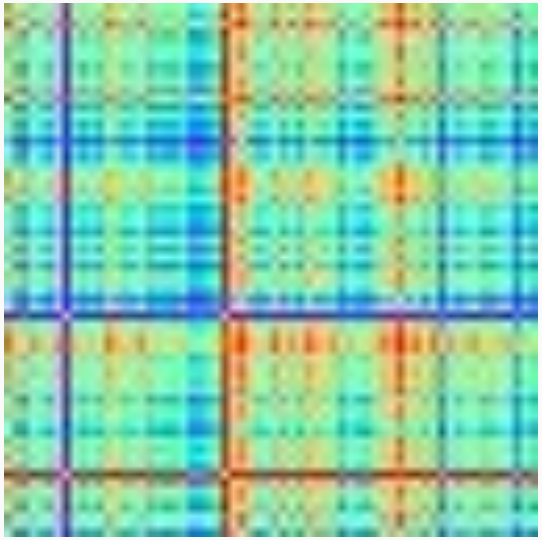
[*] Z Wang and T Oates. *Imaging Time-Series to Improve Classification and Imputation*. arXiv:1506.00327v1, 2015.

Image Representation of 2017 Data

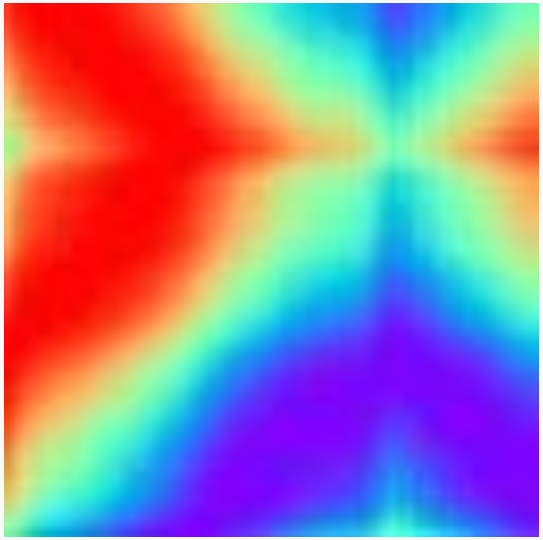
Closing price



% Change day to day



Predictor based on Moving Average



Convolutional Neural Network

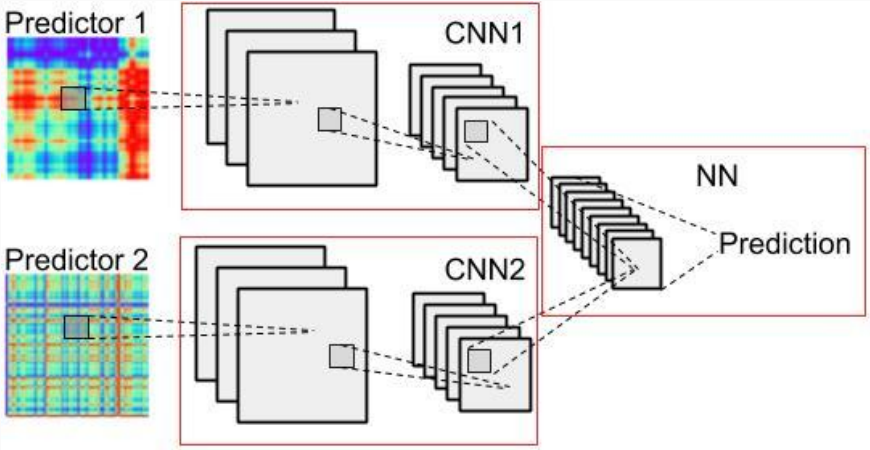
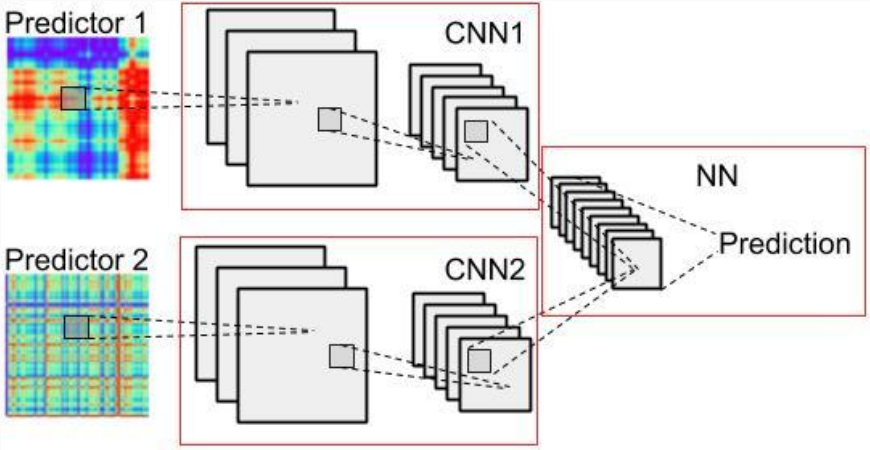


Table 1: Table of Results

Features included	**Training MSE**	**Training R^2**
CLOSE	6.1964e-4	-0.2549
Percentage	**5.8410e-4**	**-0.1347**
CLOSE & MA20050diff	7.3129e-4	-0.5069
Percentage & RSI	6.2992e-4	-0.2772
Percentage & BB	5.9430e-4	-0.1413
CLOSE & Percentage & MA20050diff & RSI	6.8879e-4	-0.4272
Percentage & BB & MA20050diff & MACD	7.4752e-4	-0.6261

Convolutional Neural Network



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Summary

- Use Convolutional Neural Networks in finance?

- Create meaningful image representation
  - More patterns and edges
  - Multiple features into 1 image

Questions?

https://github.com/LurreMcFly/ERP-PREDICTION-CONTEST/