STUDYPIE

Predicting Financial Time Series using Deep Learning

Module1. Introduction to the course

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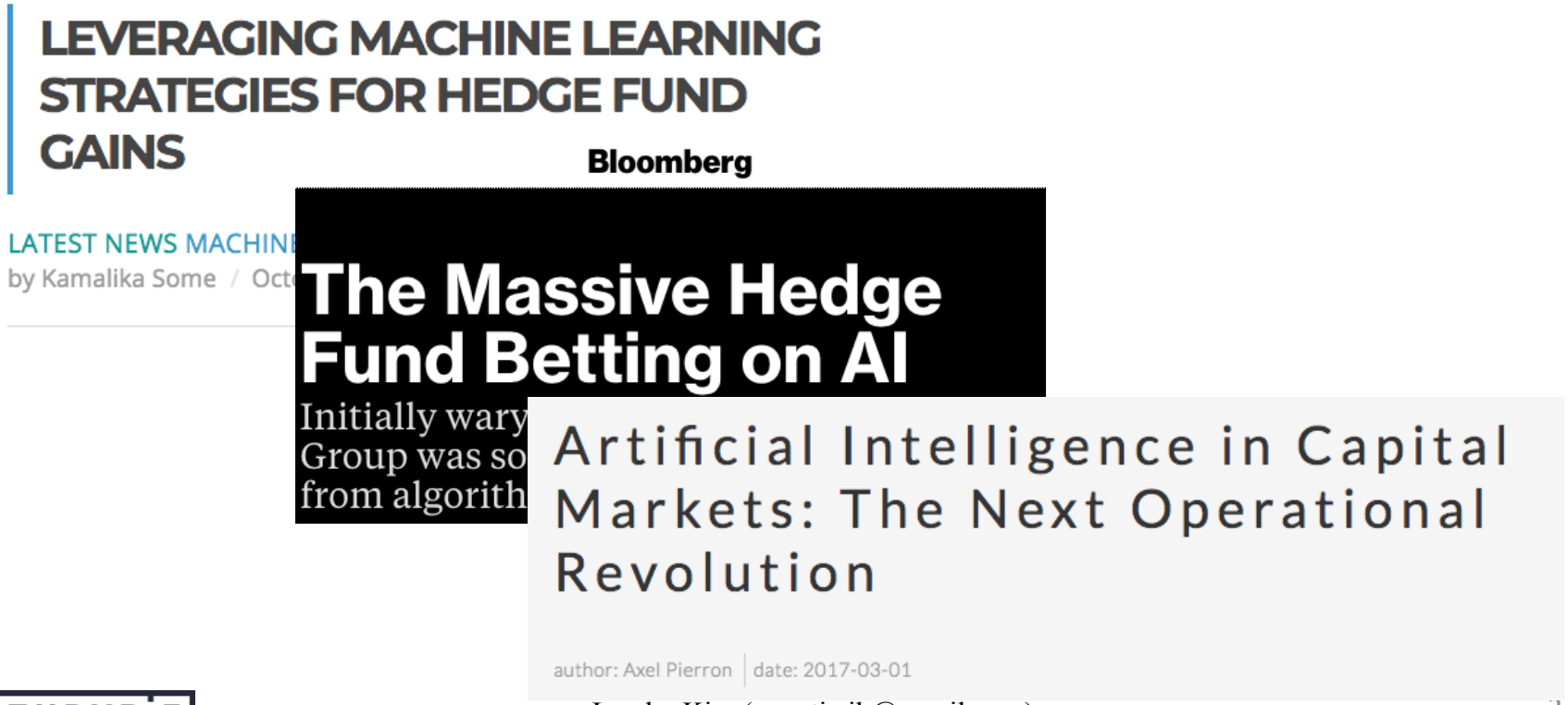
Fall, 2018

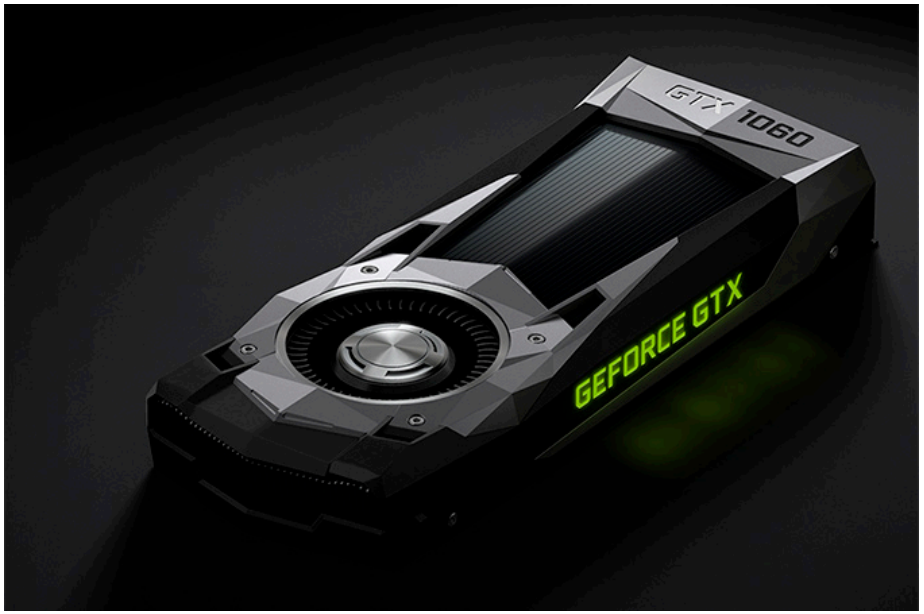
The Future of Asset Management

"Worldwide, by 2025 we expect AI technologies to reduce employees in the capital markets by 230,000 people. **The asset management industry** will shrink most, **with around 90,000 people being replaced by machines**." (Optimas, 2018)



The Future of Asset Management

Change is Coming!



Deep Learning: Financial Time Series Prediction

• Welcome to “Predicting Financial Time Series using Deep Learning”

• This session is designed to learn a framework for predictive trading using deep learning

• We mainly focus on stock / coin price prediction based on deep learning, pursuing the most essential algorithms

Motivation of This Session

- Don’t have a boss. Be the boss with AI.

- What is the most important thing of systematic trading?
  - Alpha generating capability

> “**Alpha** is a measure of the active return on an investment, the performance of that investment compared with a suitable market index. An alpha of 1% means the investment's return on investment over a selected period of time was 1% better than the market during that same period.” (wikipedia)

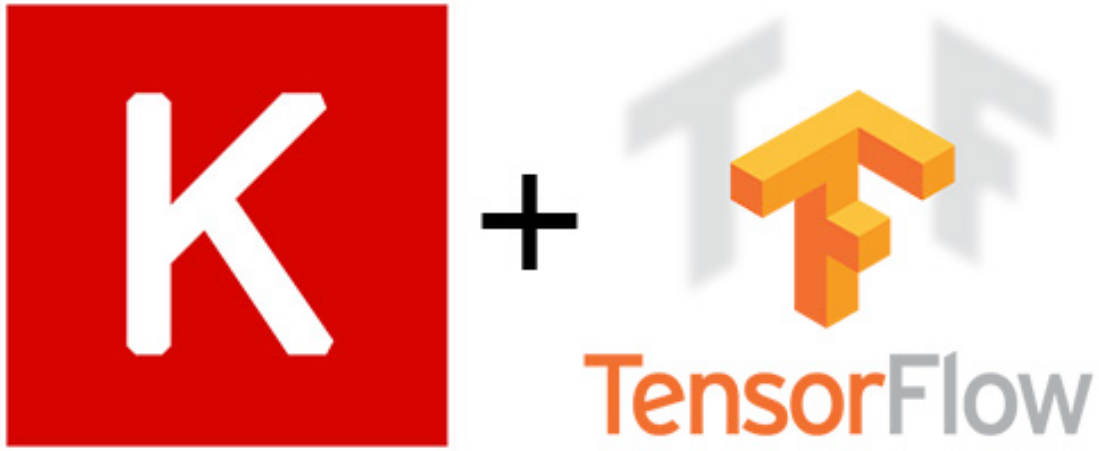
- Why Deep Learning Approach?
  - Deep Learning performs much better than other traditional methods in predictive analytics

Goals of This Session

- Implement three neural network models from the simple model to advanced models with cryptocurrency data
- Understand the problems with financial time series predictions and advantages/disadvantages of machine learning
- Learn how to implement FNN, CNN, RNN models using Tensorflow Keras API on [Google Colaboratory](https://colab.research.google.com/)
- Learn which metrics could be important for robustness of time series prediction algorithms

Why Do We Use Tensorflow Keras API?

- Keras is a simple, high-level neural networks library
- Proper level of abstraction for this session
- You can probably learn the basics of Keras in 5-10 minute



Four Modules of This Session

- Module 1. Deep Learning Revisiting
- Module 2. RNN Model for Price Prediction
- Module 3. CNN Encoder + RNN Model for Price Prediction
- Module 4. Wavelet Denoising + Auto Encoder Model + RNN Prediction Model for Price Prediction

How to Study by Yourself in This Session

- Write code
  - There will be suggested exercise with template codes
  - At the end of each module, solutions will be given
  - But I strongly recommend write the code by yourself

- Using the Q&A is a must (I want you to succeed)

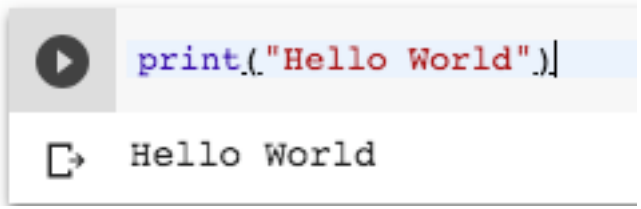
- Where to get the code and data (will be updated weekly)
  - https://github.com/jonghkim/financial-time-series-prediction-v2
  - git clone url or download zip from page

Quick Tutorial for Google Colab

Hello World on Colab

Access to URL: https://colab.research.google.com/notebooks/welcome.ipynb#recent=true

Hello World on Colab



- print(“Hello World”)
- Click button or type “CTRL + ENTER”

File Upload on Colab

Access to URL: https://colab.research.google.com/notebooks/io.ipynb

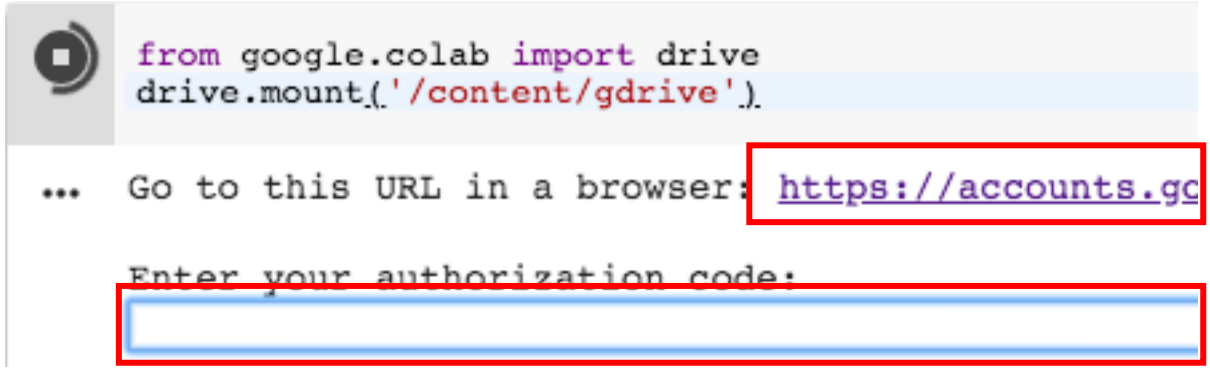
```
from google.colab import files

uploaded = files.upload()

for fn in uploaded.keys():
  print('User uploaded file "{name}" with length {length} bytes'.format(
      name=fn, length=len(uploaded[fn])))
```

Google Drive Access on Colab

- First Step: Upload your data on Google Drive

http://drive.google.com

- Second Step: Enter Authentication Code on Google Colab



Check Data Available on Google Drive

- !ls "/content/gdrive/My Drive/”

```
[ ]  !ls "/content/gdrive/My Drive/Lecture/StudyPie/Data"

     crypto_data.zip  kagglecatsanddogs_3367a.zip  PetImages.zip
```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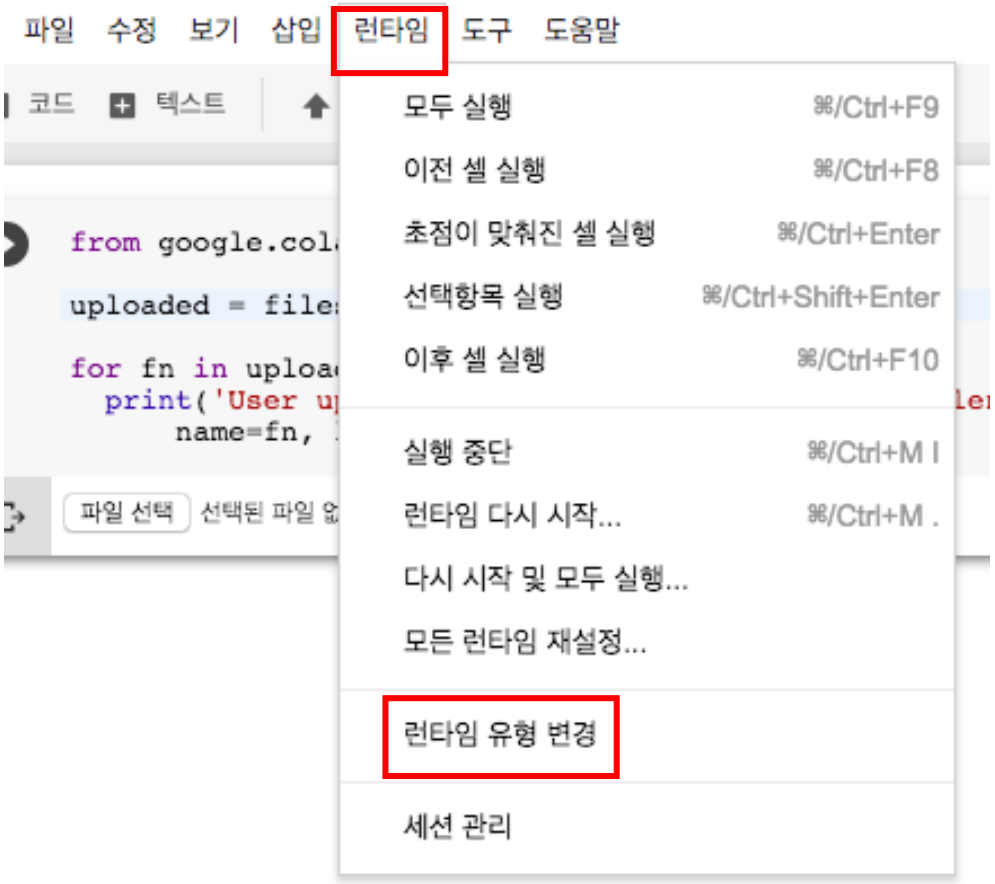
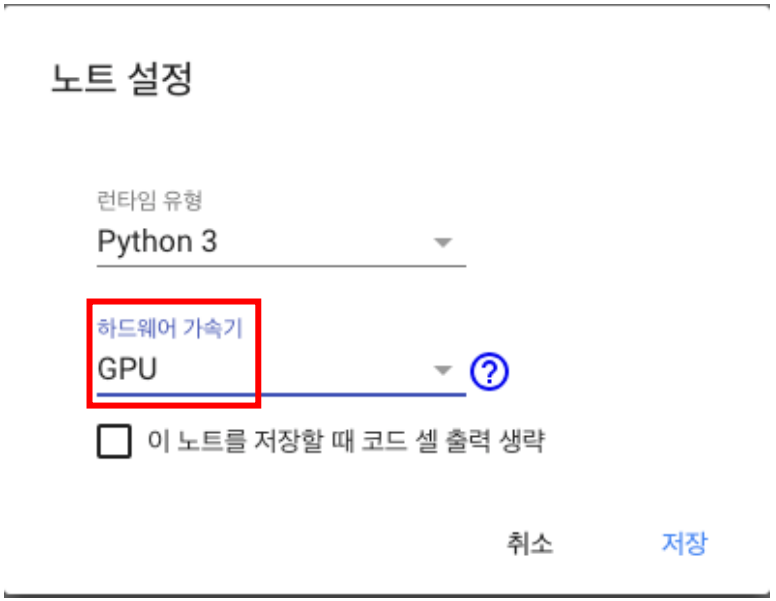
Set GPU on Colab





Google Colaboratoy Useful Shortcuts

Actions	Colab	Jupyter
show keyboard shortcuts	Ctrl/Cmd M H	H
Insert code cell above	Ctrl/Cmd M A	A
Insert code cell below	Ctrl/Cmd M B	B
Delete cell/selection	Ctrl/Cmd M D	DD
Interrupt execution	Ctrl/Cmd M I	II
Convert to code cell	Ctrl/Cmd M Y	Y
Convert to text cell	Ctrl/Cmd M M	M
Split at cursor	Ctrl/Cmd M -	Ctrl Shift -

Thank you ☺

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Appendix1. For Machine Learning Beginner

• Although we will review essential concepts of machine learnings, this session recommends to study below lectures in parallel for beginners

• 모두를 위한 딥러닝 강좌
https://www.youtube.com/watch?v=BS6O0zOGX4E&list=PLlMkM4tgfjnLSOjrEJN31gZATbcj_MpUm

Appendix2. How to Download Files on Github