



Using deep learning to trade
practical lessons for technologists

Why use Deep Learning?

The problem

Assets managed globally: \$164 trillion

Fees charged : more than \$1 trillion a year

Yet, we are no closer to solving the problem

Towards a science of investing

“ In future, we should be investing with a trustworthy tool and not experts.

The tool should look at every aspect of the data.

The tool should be affordable and efficient.

The tool should know what we have learned already.”

- Benjamin Graham



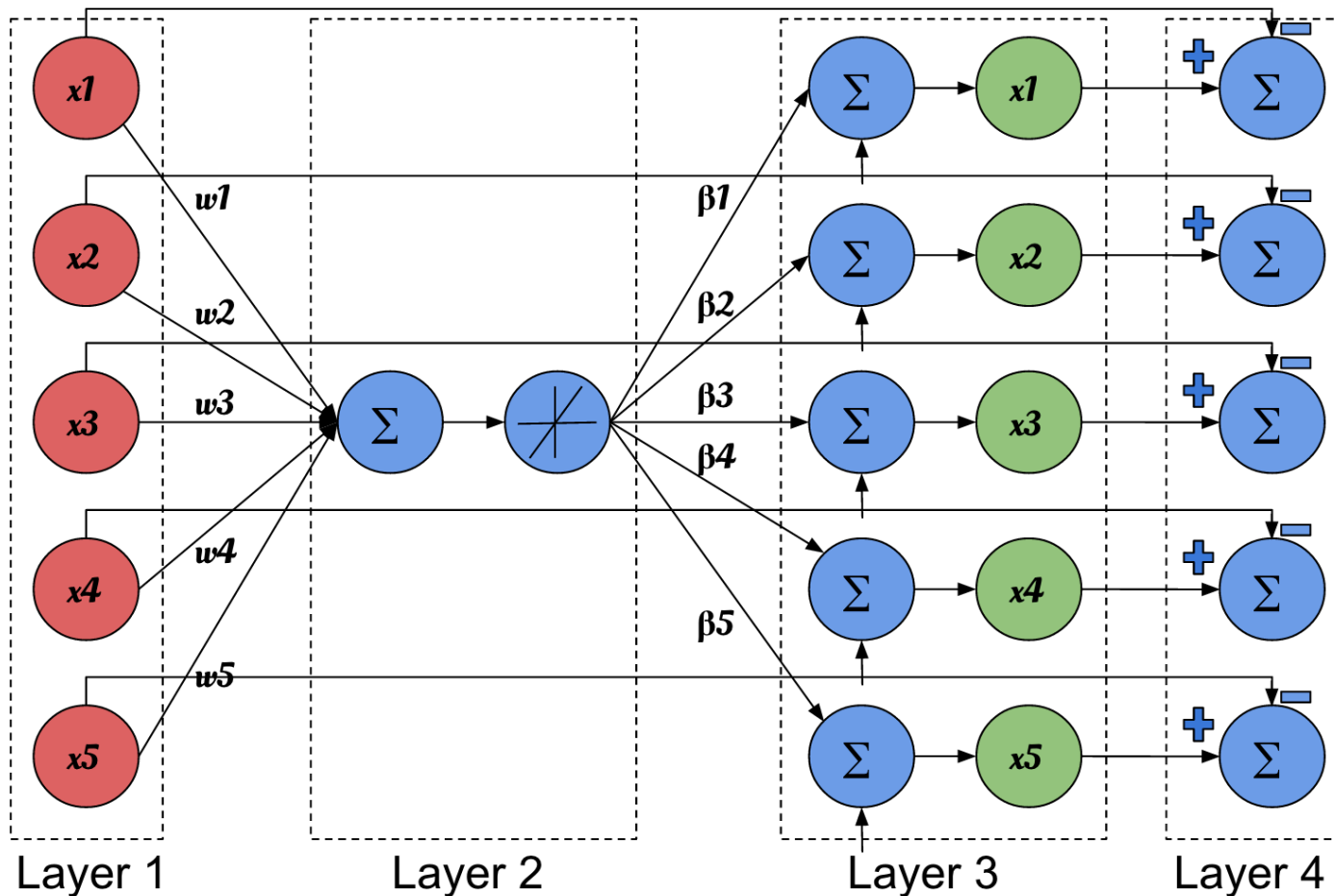
... and it should keep learning

The answer is obvious ... Deep Learning

How do we use DL at qplum?

Kinds of DL that we found useful and blind
alleys that we have gone down

A better relative value trade



Layer 1
(Input layer. These can be the returns of all stocks in the past 10 days)

Layer 2
(Just one node! We have shown it here in two parts to convey the linear sum and the sigmoid activation)

Layer 3
(Train first to be same as input layer to learn $\{w\}$ and $\{\beta\}$)

Layer 4

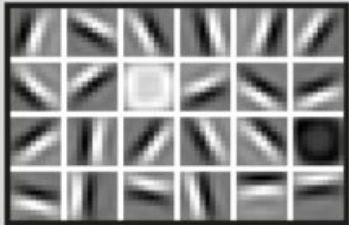
A lot more unsupervised learning

FACIAL RECOGNITION

Deep-learning neural networks use layers of increasingly complex rules to categorize complicated shapes such as faces.



Layer 1: The computer identifies pixels of light and dark.



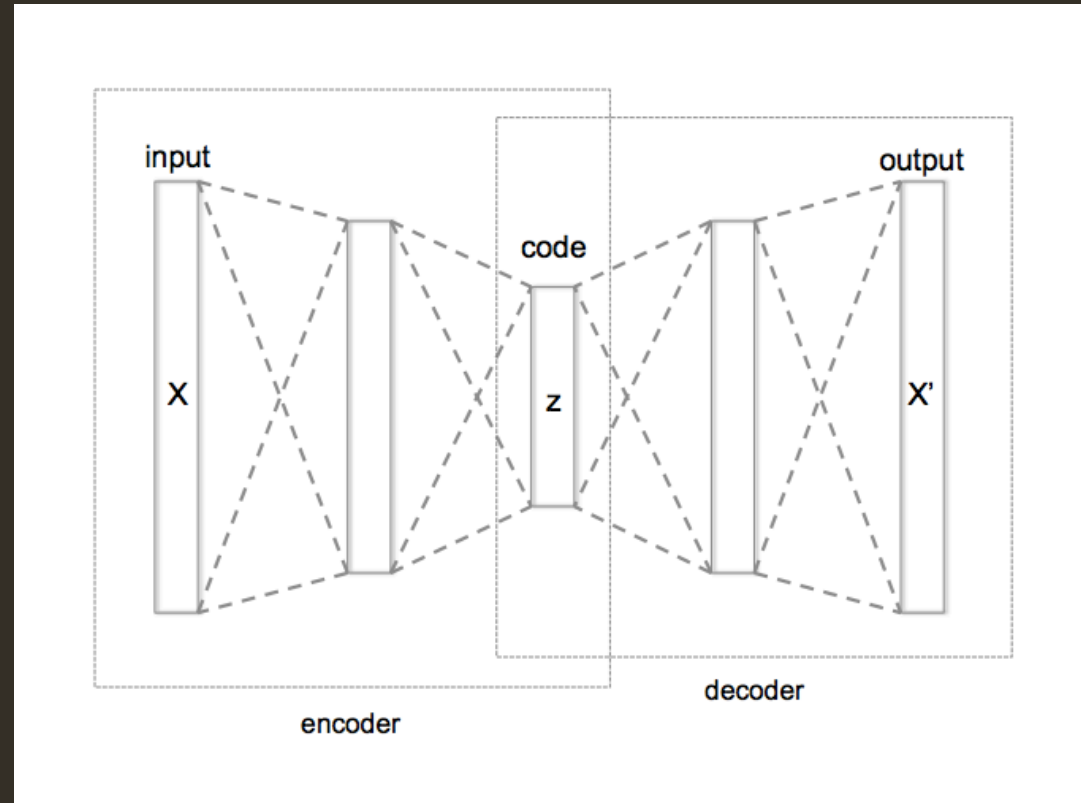
Layer 2: The computer learns to identify edges and simple shapes.



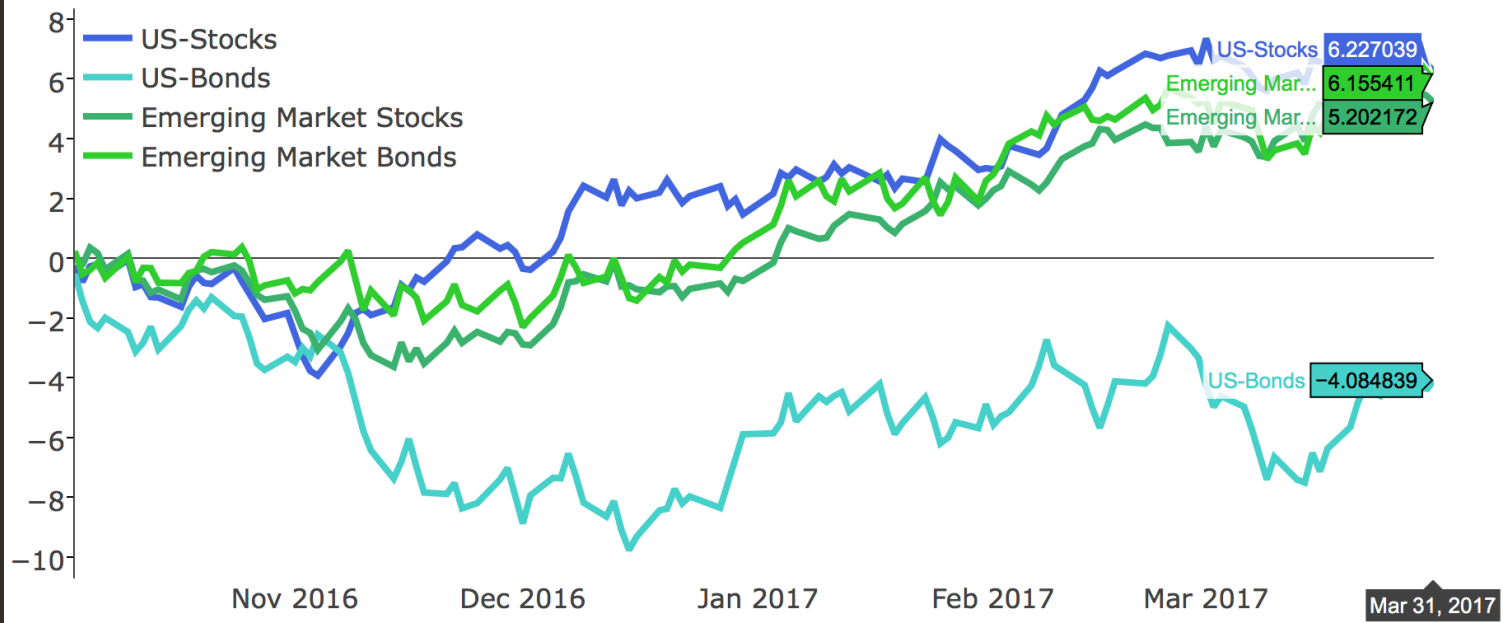
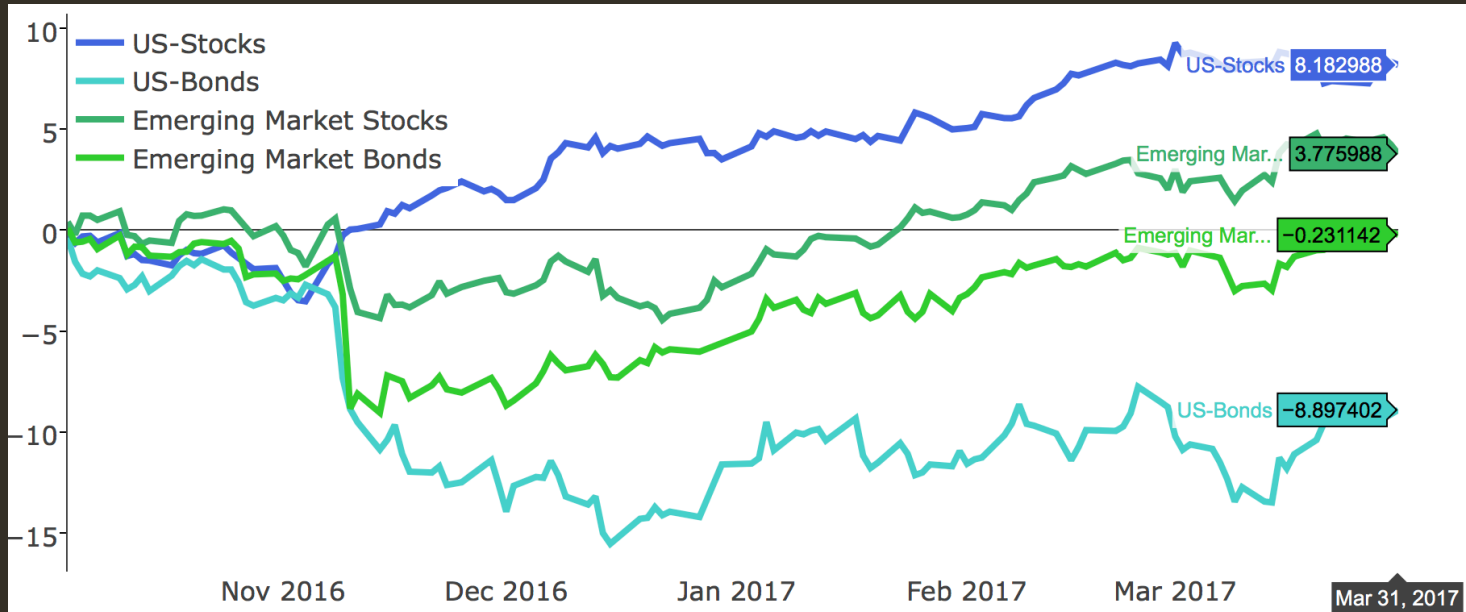
Layer 3: The computer learns to identify more complex shapes and objects.



Layer 4: The computer learns which shapes and objects can be used to define a human face.

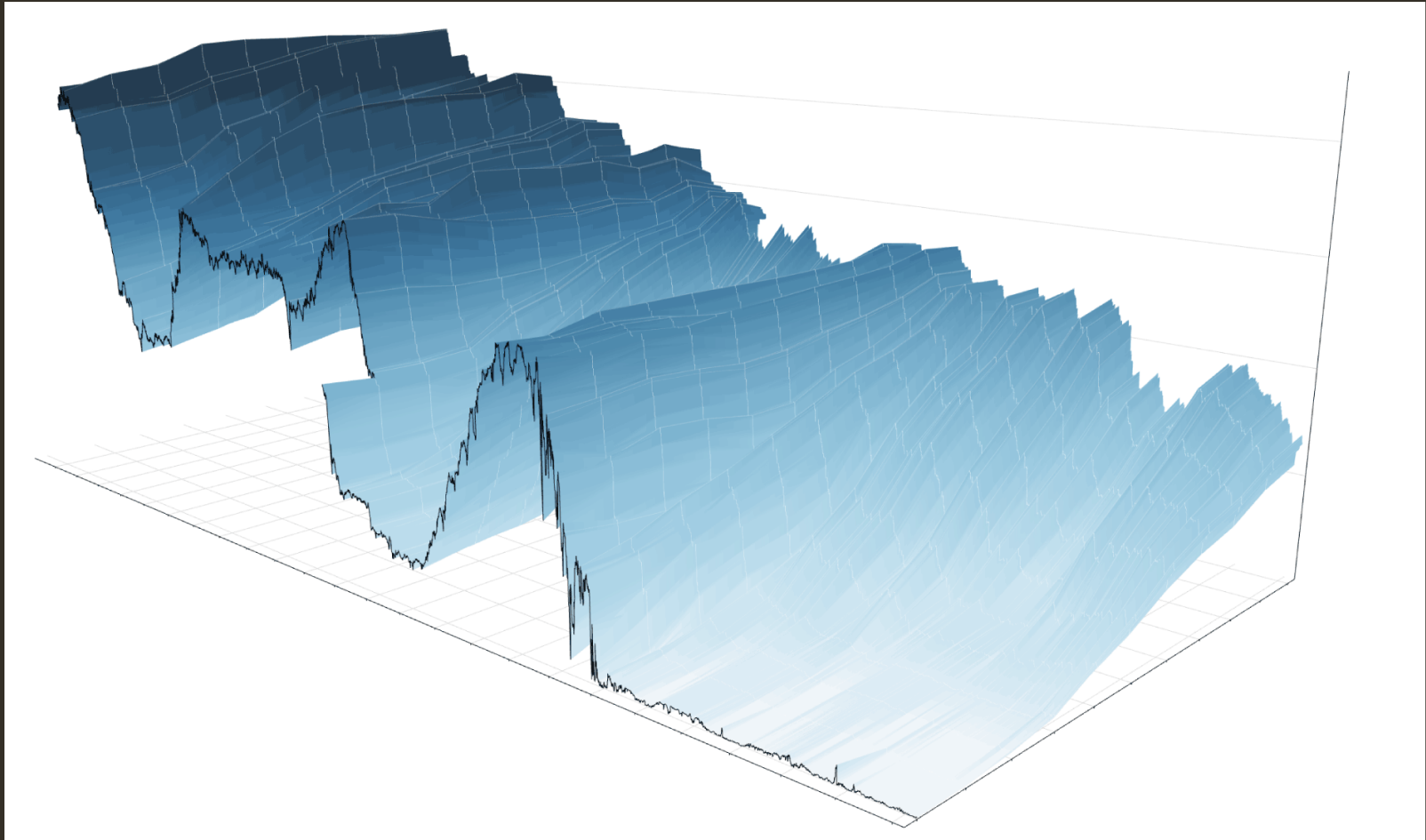


A better global macro trade



Understanding the yield curve

.. the way humans do



Technical aspects of DL at qplum

Technical and operational aspects

Supervised / unsupervised

Number of layers

What sort of data

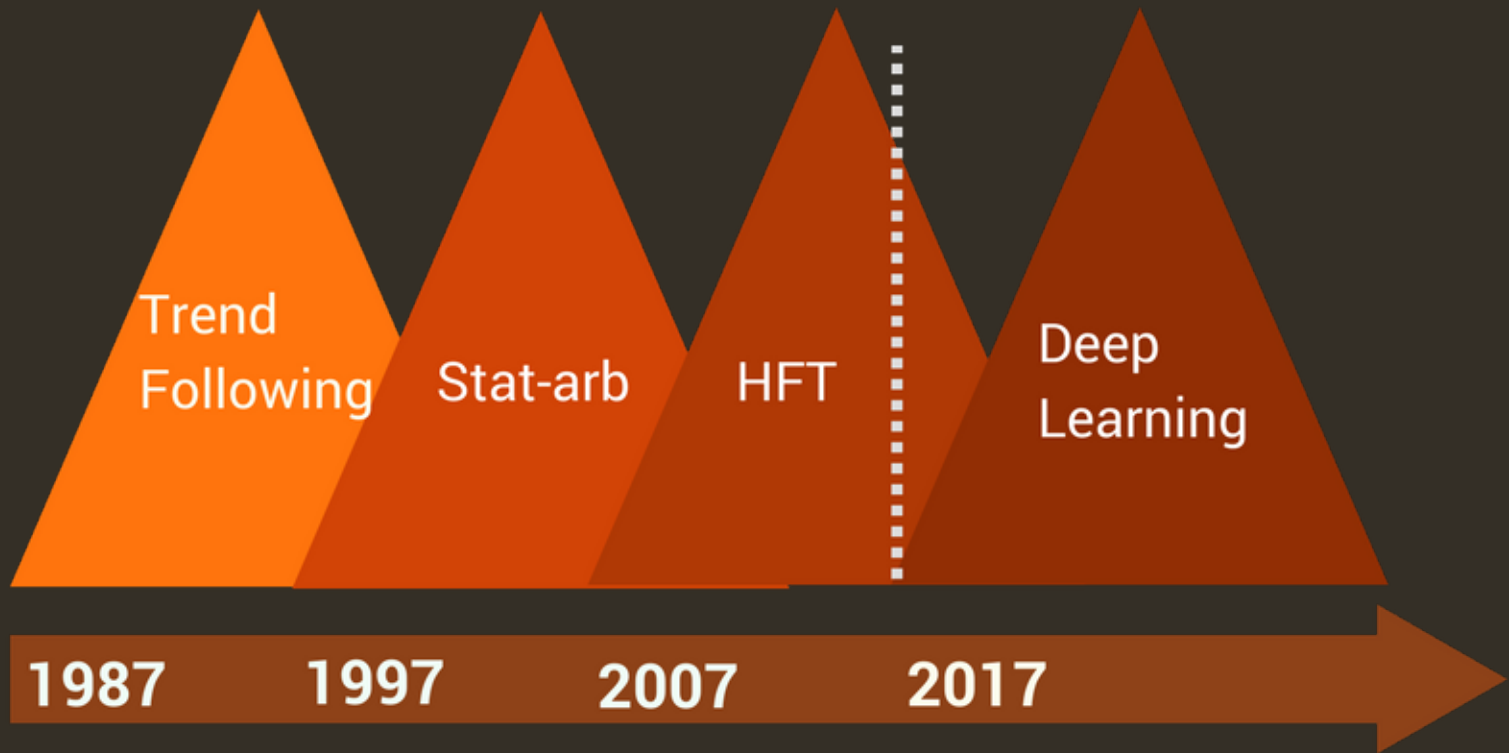
Key bottlenecks in training and
inference

Software hardware and deployment

- Keras / Tensorflow / Caffe 2
- GPUs / CPUs - how many?
- Instance type and Devops

Business drivers for DL in Trading: Why now?

1987, 1997, 2007, 2017?



Why now? - Lots of data

- High Frequency trading and systematic trading, in general, has led to a lot of data. We are generating more data in one day now than we were in the entire decade of 1990s.
- The traditional quant approach does not spend as much time in discarding noise.

Why now? - Hardware and Software optimized for DL

- GPUs and customized hardware that allows us to solve problems in hours that would have taken weeks a year or two ago.
- Software like Tensorflow/PyTorch and MapReduce make all of this cheap enough for small companies to innovate with.

Why now? - ML in social sciences

- Trading is a social science and until recently all machine learning was focused on pure sciences. Deep Learning is perfect for social sciences.

Why now? - ML is better than traders

- A shift in power from star traders to complex systems.
- Five years ago, no serious money manager would let us touch their money with DL

Why now? - Because of us

- Availability of talented engineers in DevOps, Data Infrastructure and Machine Learning who can make it happen, who want to make inroads into this last bastion of inequality, who want to stop people from selling crap to investors.


How is it different from the traditional
quant approach?

The traditional quant approach

1. Hire lots of quants.
2. They all think of trading strategies.
3. They backtest them
4. The firm invests in the strategies that have the best returns.

Problem: Too much data at every step

- This requires hiring a lot of quants
- They will then make millions and billions of features.
- Challenge then is to pick the needle in a haystack of trading strategies, with very little data.



Investing is a science, a utility, not
a game or competition, but a
genuinely inclusive process

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