Recurrent Neural Nets for FX Price Prediction

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Special thanks to
Inspiration - DeepMind

Space Invaders

[Image: Space Invaders game interface]

Google DeepMind

General Artificial Intelligence
Agenda

• What are we about
• Neural networks
• Using neural nets on time series
• Dropout for RNNs paper
• What we’re working on next
General Super Intelligence
Canada, eh?

• Toronto is boring!
• Canada invented deep learning.
• Home of the 2015 World Series Champs.
What is a Neural Network?

Input → Output

DeepLearning
What can a Neural Network do?

- Speech recognition
- Handwriting recognition
- Fraud detection
- Optical Character recognition
- Image recognition

Self-driving cars

Identify cats

Discover drugs
AlexNet crushes ImageNet 2012 with 50% error reduction
Why are we looking at FX?

• Time series is a good building block for all future work

• We’re not a hedge fund / prop desk
Things we tried

• Feed forward

• Temporal convolution

• Echo state networks
What is Recurrent Neural Network (RNN)?

- A neural network where some of the connections can connect back on themselves
  - “Have memory”
The trouble with RNNs

- **Difficult to train**
- **Solution:** Long Short-Term Memory (LSTM)
The concept of Dropout

- Technique to improve performance and training.
- Each time we present a training example we randomly omit each hidden unit with a 50% probability.
Dropout and RNNs

Standard Dropout technique results in memory loss. Not a desired state for RNNs.
Recurrent Neural Network Regularization
by Zaremba, Sutskever, Vinyals

- Getting RNNs, LSTM and Dropout to work together
- Applying Dropout to the non recurrent connections only.
Recurrent Neural Network Regularization
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Method works on:

• Language modeling
• Speech recognition
• Image caption generation
• Machine translation
One architecture we tested

Input: Bid/Ask currency pair

Hidden LSTM layer with 20 neurons

Output: Predicted price
LSTM dropout vs no dropout

• @10% relative improvement compared to no dropout
Lessons Learned

• Be open to different frameworks
  We switched from torch to python which is a lot easier to work with

• Architecture matters
  Experimenting with different types of models was better than larger models

• Let the machine do the work
  Automating model selection and testing saves time and effort
What is next for DeepLearning?

- **Recommender System**
  What products to sell to retail customers

- **Time series prediction**
  Trading

- **Classification**
  Good credit card risk, bad credit card risk

- **Ensemble Learning**
  Using neural nets to put it all together

DeepLearning
DeepLearning Vision

- Banks are complicated systems with lots of moving parts
- We can leverage research to build generic systems
- Combine parts to make small AIs
- Unify AIs to create a general super intelligence

General Super Intelligence
Thank you!

(we will be at NIPS Montreal in December)

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