

# Hands-on with LSTM Networks

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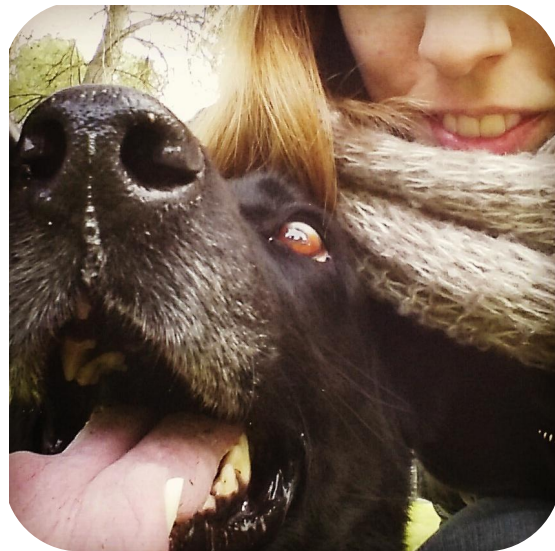
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# 1.

**Deep Learning  $\subset$  Machine Learning**



*A computer program is said to learn from experience  $E$  with respect to some class of tasks  $T$  and performance measure  $P$  if its performance at tasks in  $T$ , as measured by  $P$ , improves with experience  $E$ .*

Tom M. Mitchell



## Human version

- » T = recognizing and classifying handwritten digits within images
- » P = percent of digits correctly classified
- » E = database of digits with given classifications

A computer program learns to classify digits (T) with at least a P percent positives given the database of already classified digits (E).

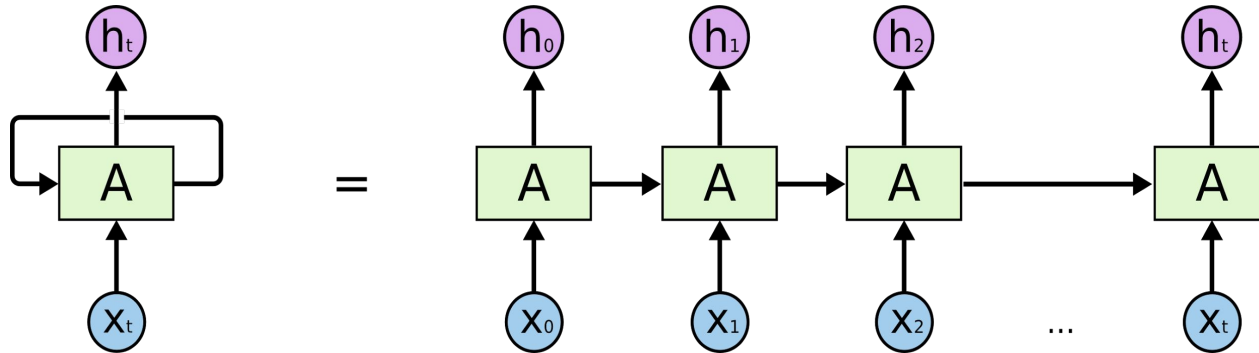


## Neural networks

- » Computer program  $\cong$  brain
  - » Large number simple interconnected elements  $\cong$  neuron
  - » Computes a simple function  $\cong$  signals
  - » Passes the output to the next *neuron*  $\cong$  signal propagation

## LSTM: Long Short Term Memory

Remembering information for long periods of time is practically their default behavior.



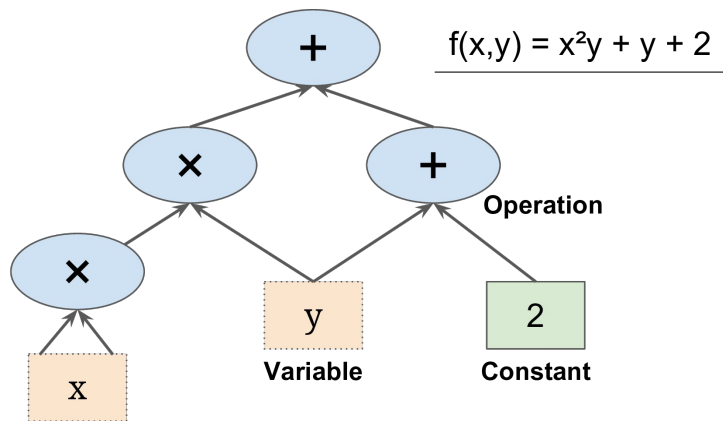


# 2.

## **TensorFlow & Keras**

## TensorFlow

- » Runs efficiently using optimized C++ code
- » Large computations in a short period of time
- » Distributed training



## Keras

- » High-level neural networks library
- » Written in Python, runs on top of either TensorFlow or Theano
- » Easy model in Keras:
  - » 

```
model = Sequential()  
model.add(Dense(1))  
model.compile(loss='mean_squared_error', optimizer='adam')  
model.fit(trainX, trainY, nb_epoch=4, batch_size=1, verbose=2)  
model.predict(testX)
```

# 3.

**Let's get this party started**

3...2...1

GO!



# 4.

**For more information**



### Beginner

[Learning AI if you suck at math Pt.IV](#)

[Getting started with TensorFlow](#)

[The Unreasonable Effectiveness of Recurrent Neural Networks](#)

[Learn TensorFlow and DeepLearning](#)

### Advanced

[An Introduction to Tensors for Students of Physics and Engineering](#)

[Long Short-Term Memory in Recurrent Neural Networks](#)

[Understanding LSTM Networks](#)

[Introduction to RNNs](#)

[Playground](#)

[Tinker With a Neural Network](#)

[TensorFlow & Keras](#)

[Google Cloud](#)

THANKS!

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# Any questions?

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