

COMP 4332 / RMBI 4310
Big Data Mining and Management
Advanced Data Mining for Risk Management and
Business Intelligence (2025 Spring)

Tutorial 8: Recurrent Neural Network
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Content

- Task
 - Sentiment Analysis
- Seq2seq models
 - Unidirectional and Bidirectional layer
 - RNN cell
 - LSTM cell
- Word2Vec

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Sentiment Analysis



The best tablet, but not a necessary one., November 25, 2014

By [Andy, an Amazon Customer](#) (Fargo, ND) - [See all my reviews](#)

This review is from: Apple iPad Air 2 MH0W2LL/A (16GB, Wi-Fi, Gold) NEWEST VERSION (Personal Computers)

Short version: if you don't have a tablet yet, this is the one to get holiday 2014. If you already have a tablet that you're mostly happy with, whether an iPad or Android version, keep it.

I purchased the new iPad Air 2, in Gold, 16GB capacity about a week ago at Walmart, and I'd like to give a few impressions of the hardware and software here. I had particularly high hopes for this device, and have been waiting a long time to buy one; after holding a friend's brand new 64GB version, and being really impressed by how light the device seemed, I bought one for myself! :)

A little bit of background: My other experience with tablets involves a 2013 Nexus 7 that I use at least weekly; an Asus Transformer Pad, with a Tegra 3 1920x1080 screen, an Acer android tablet whose screen cracked 3 months after purchase; a Kindle Fire HD; I have also used both an iPad 2 and an iPad Mini (original) off and on, but never owned an iPad before. I use an iPhone 5.

The device is extremely light and thin. Its shocking, honestly - its far lighter than my chunky Kindle Fire HD 7. I bought it in gold (because why not live a little?) and it looks really nice. It feels like a premium device. The back is metal, which can be a little cold to the touch, but is smooth and easy to hold. It does get tedious holding it up while lying in bed, however. Probably this is due part to the small side bezels; my palm or thumb was nearly always bumping the screen.

The screen is gorgeous. Bright, easy to read, and I haven't no noticed any reflections on it yet, which is fantastic. Honestly, its beautiful. And it shows off photographs really really well. I haven't used it to take any pictures, and probably won't, so I can't really comment on that aspect.

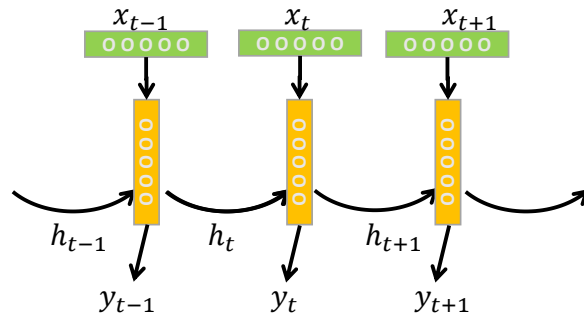
The software is good, but I was honestly expecting something noticeably better than iOS 8 on my iPhone, which just isn't the case. In fact, because of the animations, and the larger screen, it feels almost slower than my two year old iPhone.

Content

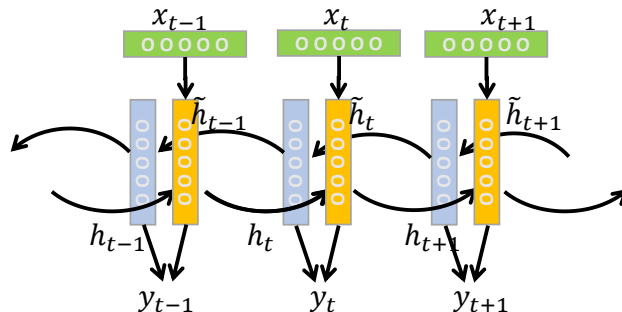
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Recurrent Neural Network

- 1 cell for a unidirectional layer



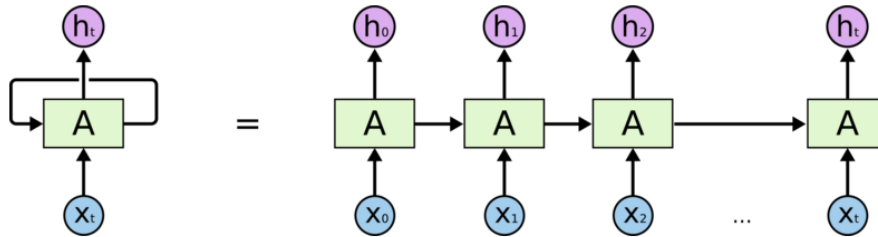
- 2 cells for a bidirectional layer



Content

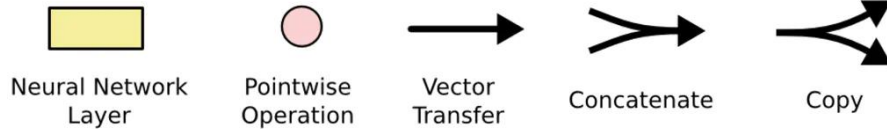
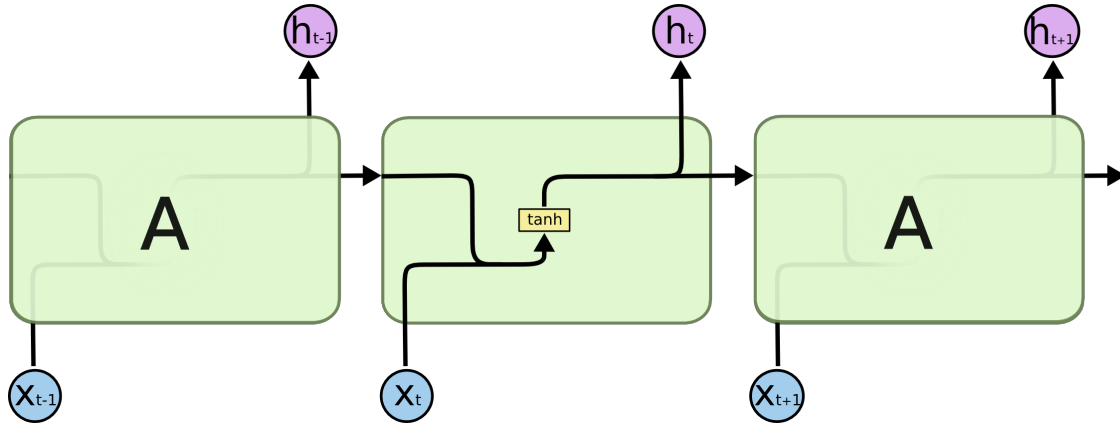
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Recurrent Neural Network Cell



An unrolled recurrent neural network.

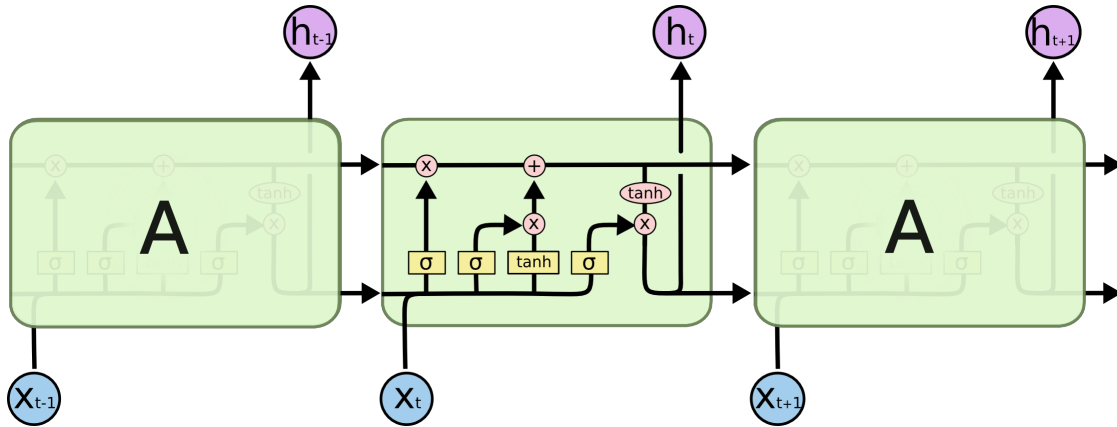
RNN Cell




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LSTM Cell



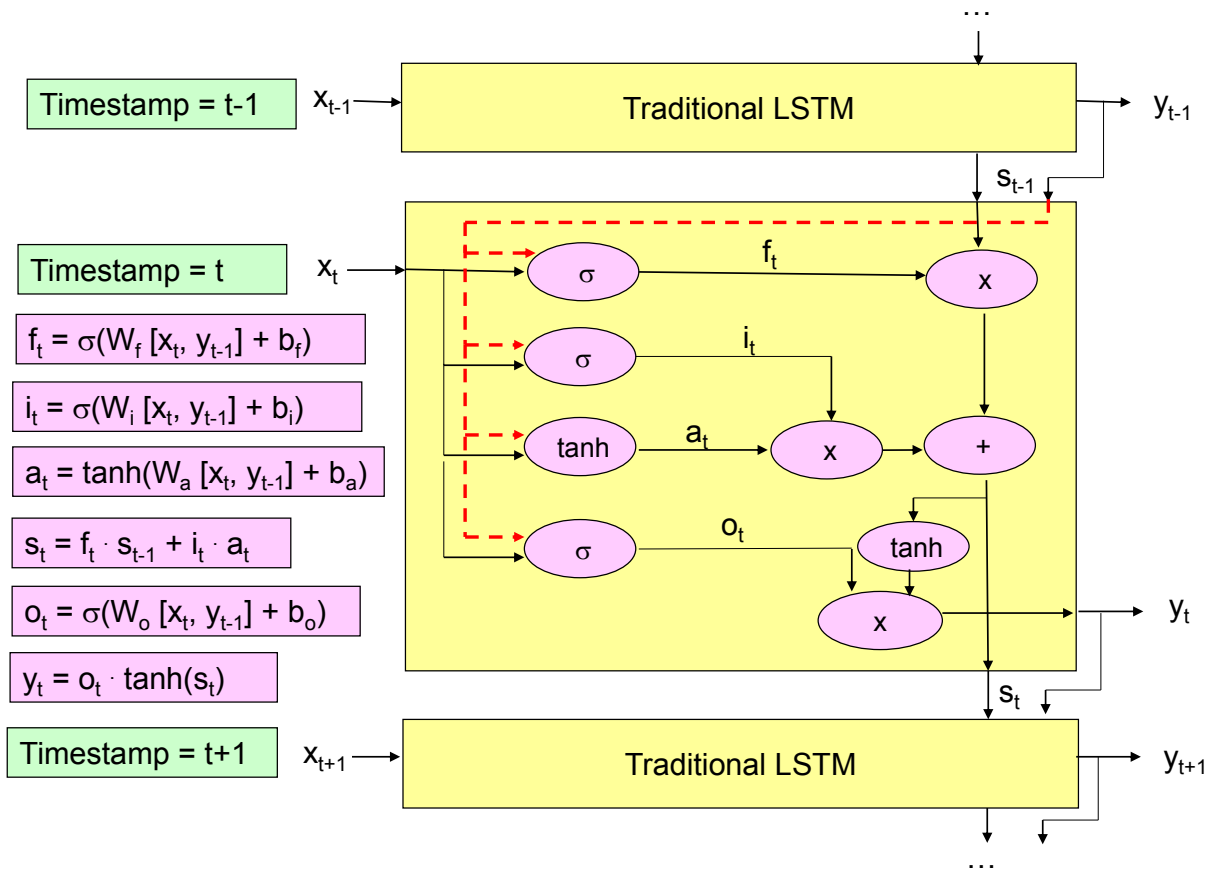

Neural Network
Layer


Pointwise
Operation


Vector
Transfer


Concatenate


Copy



Recurrent Layer

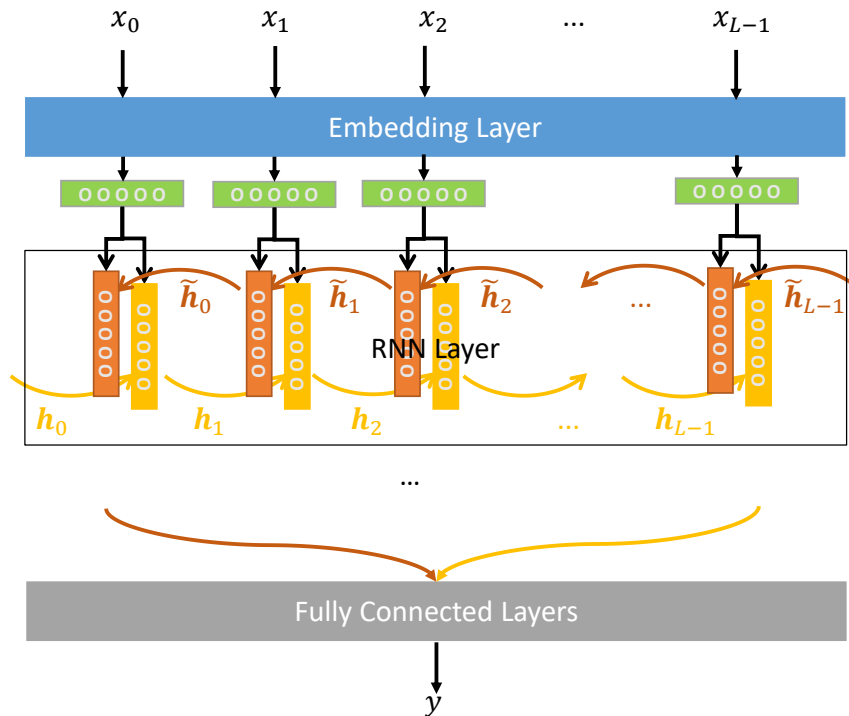
- **RNN**
 - `keras.layers.SimpleRNN(
 units=128, return_sequences=True, return_state=True)`
- **LSTM**
 - `keras.layers.LSTM(
 units=128, return_sequences=True, return_state=True)`

<code>return_sequences</code>	Boolean. Whether to return the last output in the output sequence, or the full sequence. Default: <code>False</code> .
<code>return_state</code>	Boolean. Whether to return the last state in addition to the output. Default: <code>False</code>

Recurrent Layer

- BiRNN
 - `keras.layers.Bidirectional(keras.layers.SimpleRNN(units=64, return_sequences=True, return_state=True))`
- BiLSTM
 - `keras.layers.Bidirectional(keras.layers.LSTM(units=64, return_sequences=True, return_state=True))`

RNN for Text

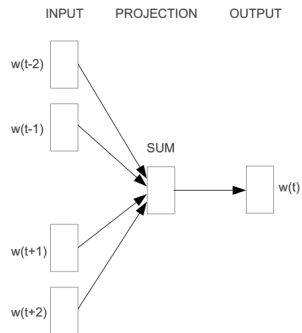


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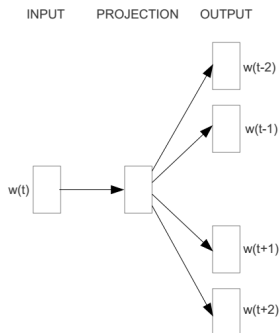
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Word2Vec: representing meanings of words

- 2 basic neural network models:
 - Continuous Bag of Word (CBOW): use a window of word to predict the middle word
 - Skip-gram (SG): use a word to predict the surrounding ones in window.



CBOW



Skip-gram

Word2Vec

- source code (written in C):
<https://code.google.com/archive/p/word2vec/>
- python API: <https://radimrehurek.com/gensim/models/word2vec.html>
- fastText: <https://github.com/facebookresearch/fastText>
 - binary file for windows (attached in .zip):
<https://github.com/xiamx/fastText/releases>

Pretrained Word Representations for Networks

- Run `word2vec` on the training texts to get word representations
- Load the word representations in memory
- Set the embedding matrix and fix it

Implementation

- See jupyter-notebook

Thank You