

Recurrent Models & NLP

ICDSS

Overview

Recurrent Neural Networks

LSTMs & GRU

Applications to Computer Vision

NLP

Demo

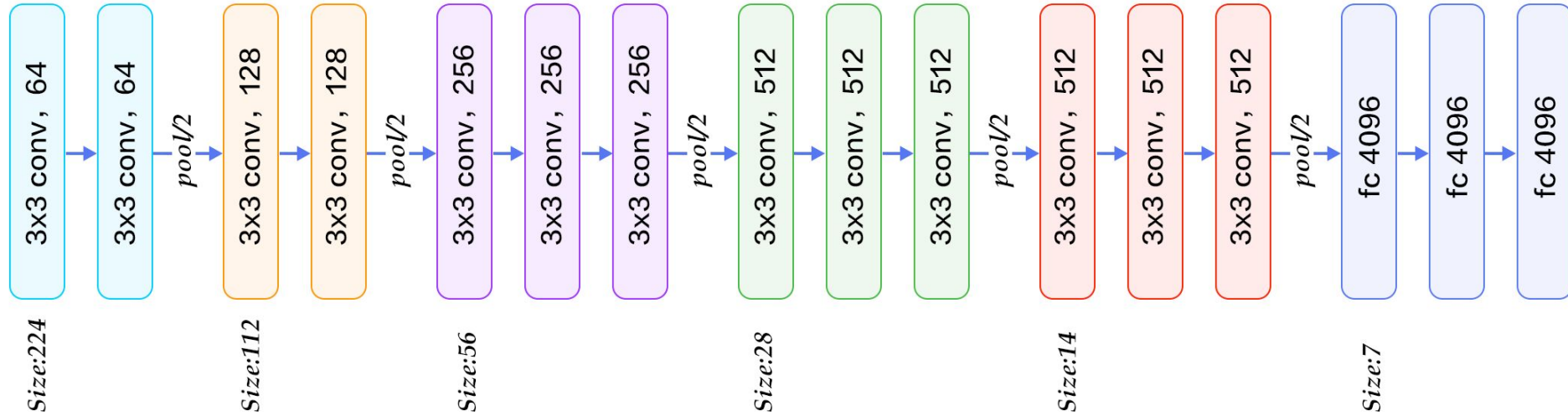


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APPLICATION: 2021.aihack.org

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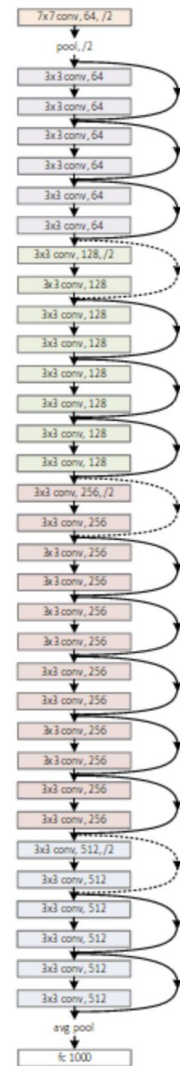
Recall - Feed forward NNs



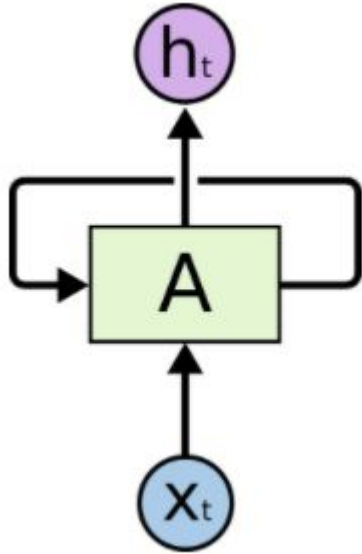
Problem

Neural networks can get super deep and hard to train

How can we get the benefits of deep neural networks with less overhead?



Recurrent layers



$$\boxed{h_t} = \boxed{f_W}(\boxed{h_{t-1}}, \boxed{x_t})$$

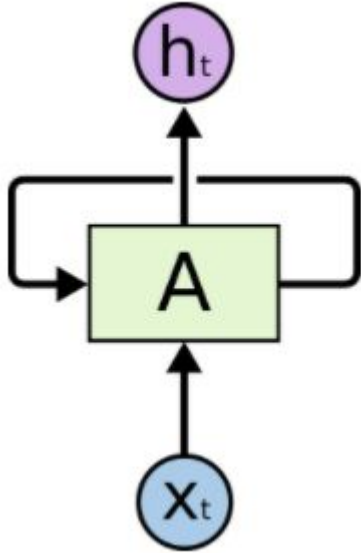
new state

some function with parameters W

old state

input vector at some time step

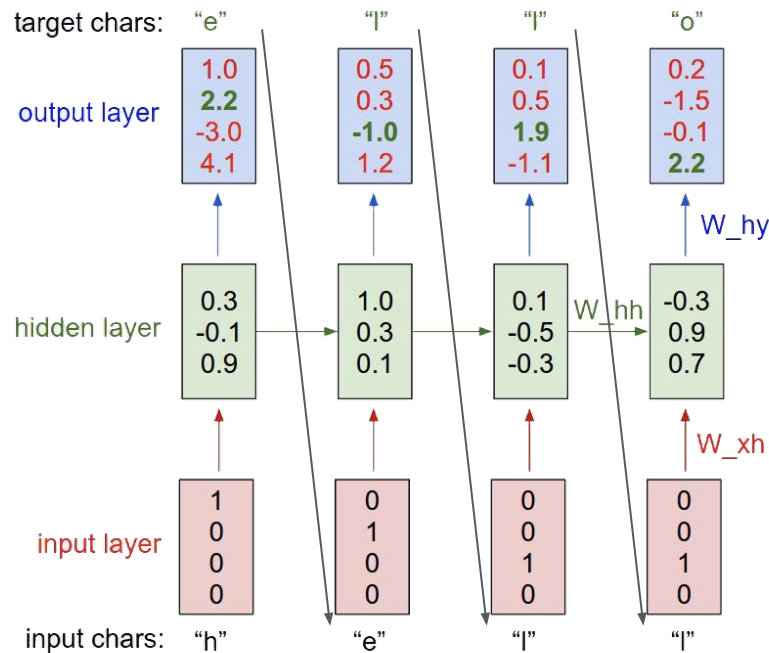
Recurrent layers



$$h_t = \tanh(W_{hh}h_{t-1} + W_{xh}x_t)$$

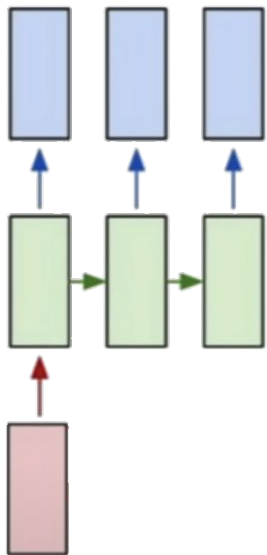
Training RNNs

- Pass output of previous iteration to next iteration
- We sample the output to turn into a one hot encoded vector
- Accumulate error at every step and backpropagate at end of sequence

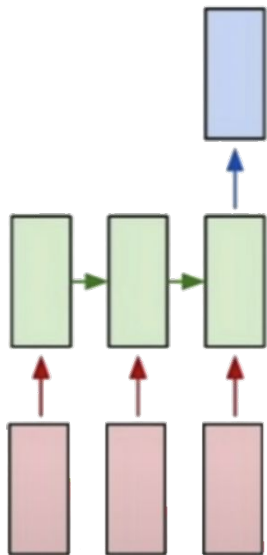


RNN sampling

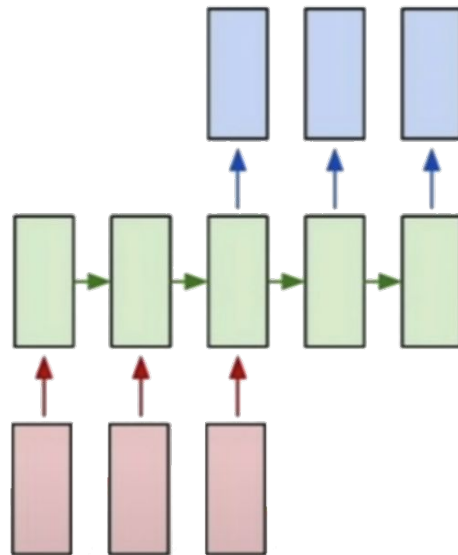
one to many



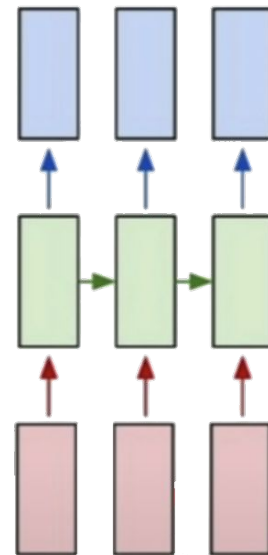
many to one



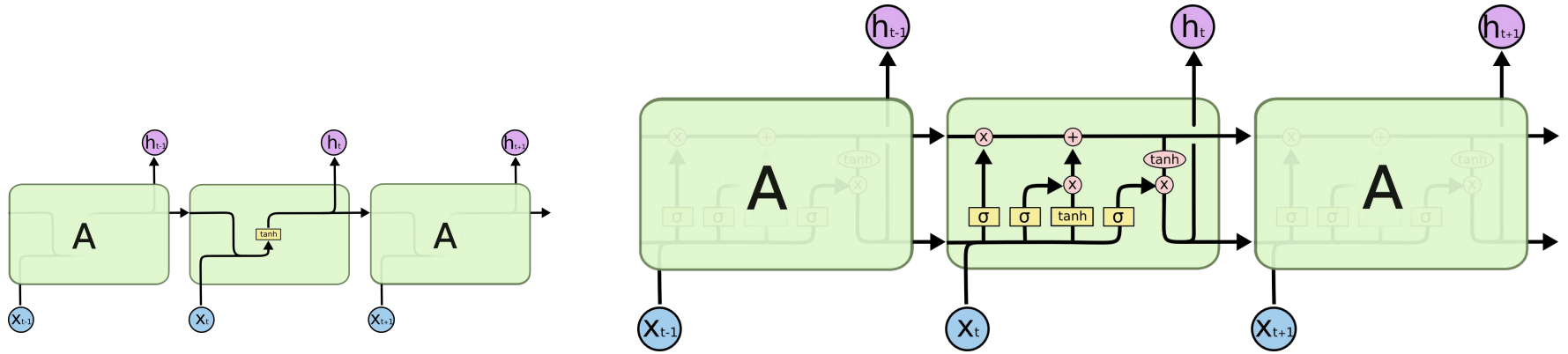
many to many



many to many

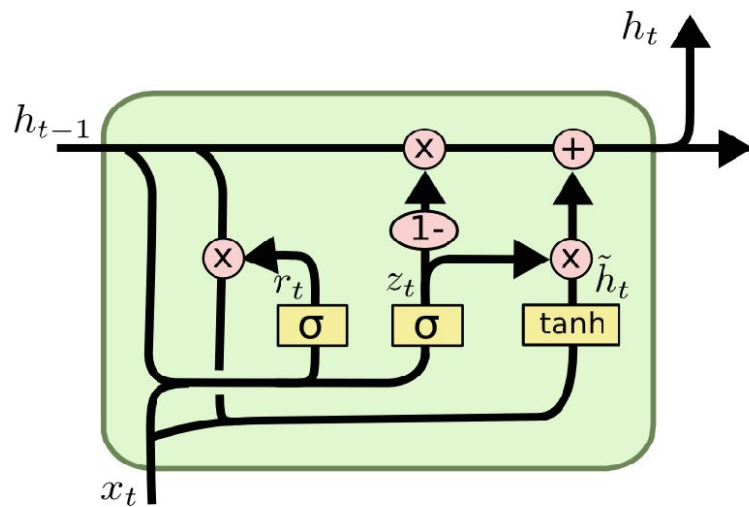


RNN Cells: LSTM

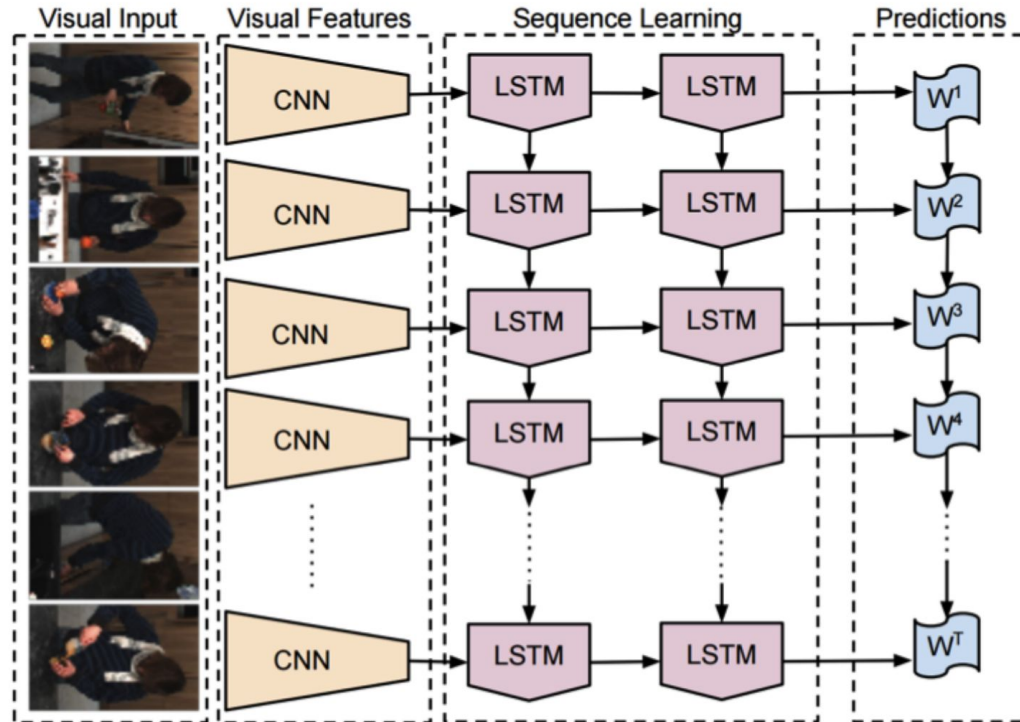


Check out <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

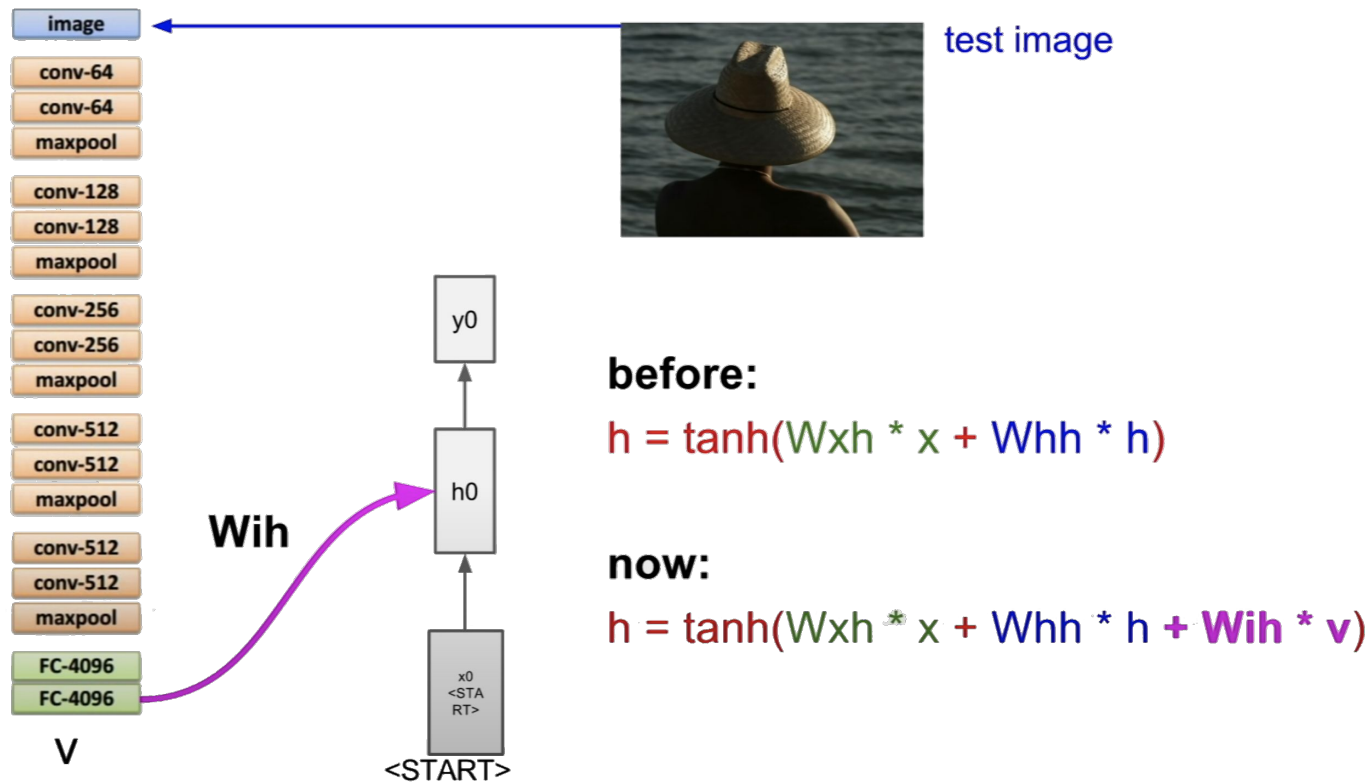
RNN Cells: GRU



RNNs with CNNs: Video classification



RNNs with CNNs: Image captioning



RNNs for NLP: Word embeddings

Problem: when using words instead of characters, the vocab size can get massive

Also words next to each other may be completely unrelated

> How can we associate words to smaller vectors, and hopefully get some sense of out those vectors?

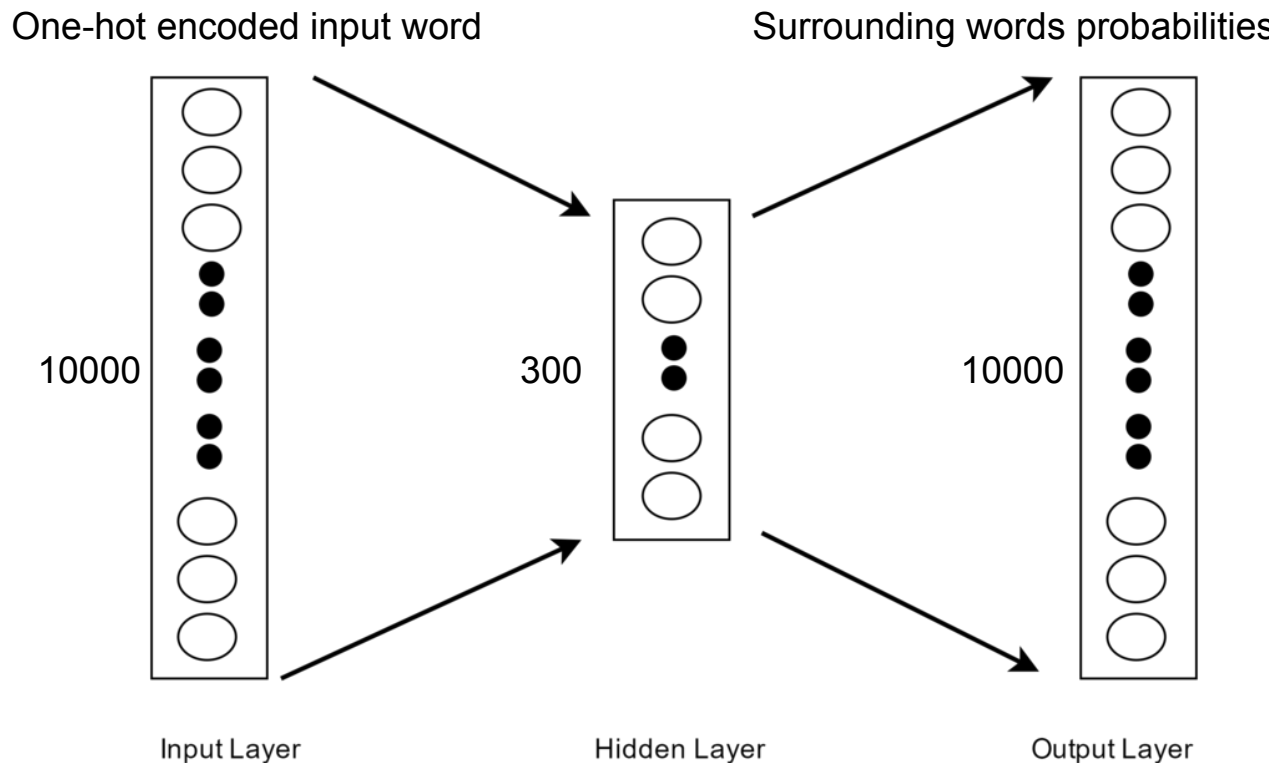
word2vec

Reduce entire vocab to
much smaller vector

=> forces hidden layer to
'learn' compact
meaningful representation

"I pet my cat"

"I pet my dog"



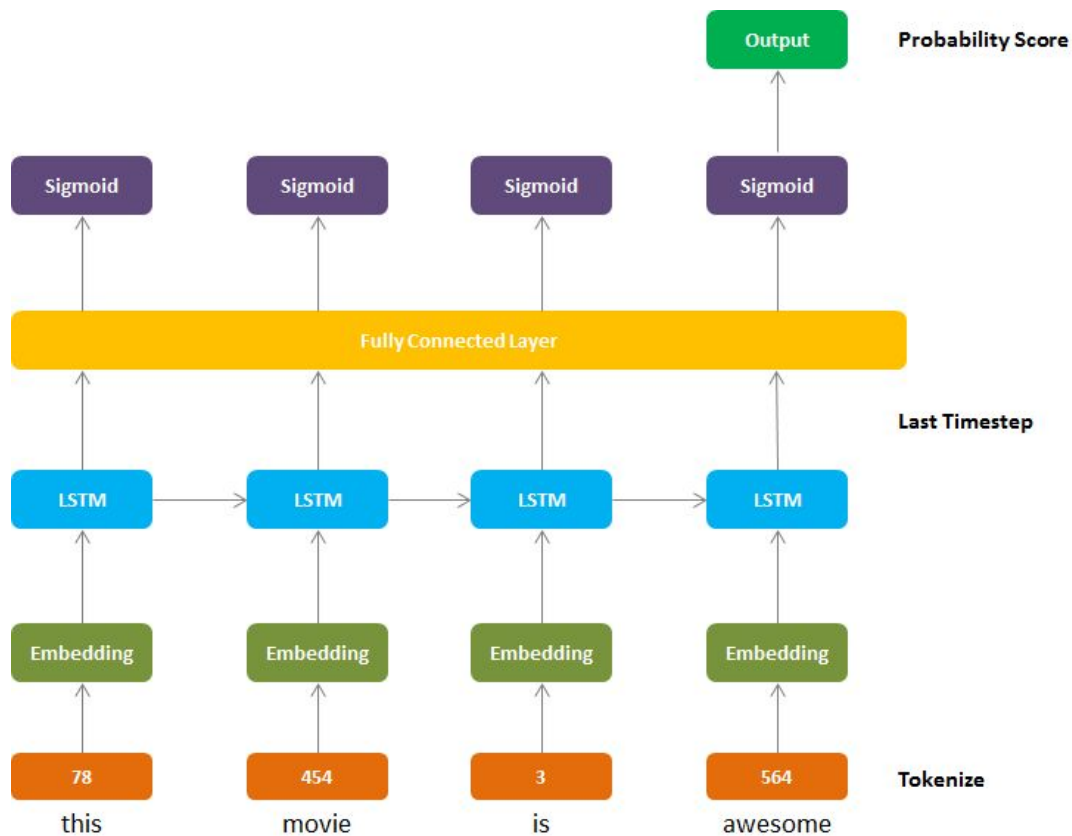
PyTorch word embeddings

We can create our own word embeddings using PyTorch's `nn.Embedding`

Acts as a lookup table mapping word \rightarrow vec

Sits as a layer and gets trained along with the model

RNNs for NLP: Sentiment analysis



Live Demo

Generating Donald Trump tweets

Go to <https://github.com/Imperial-College-Data-Science-Society/workshops>

Or search for 'github ICDSS'

Quizz!

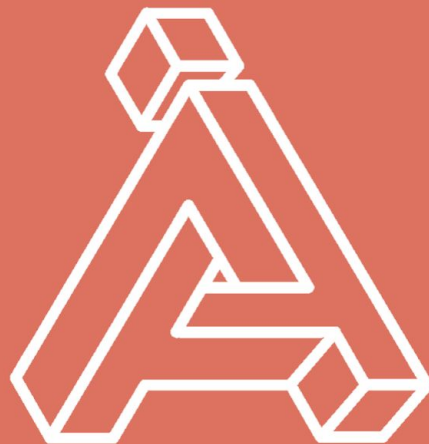
Sources & Further Reading

<http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

<https://www.youtube.com/watch?v=6niqTuYFZLQ>

https://www.youtube.com/watch?v=gQddtTdmG_8

<https://lamiae-hana.medium.com/a-step-by-step-guide-on-sentiment-analysis-with-rnn-and-lstm-3a293817e314>



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BATCH 1 : 15 Jan - 22 Jan

BATCH 2 : 27 Jan - 07 Feb

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AI IN DRUG DISCOVERY

DETAILS TBA

Benevolent^{AI}

AstraZeneca

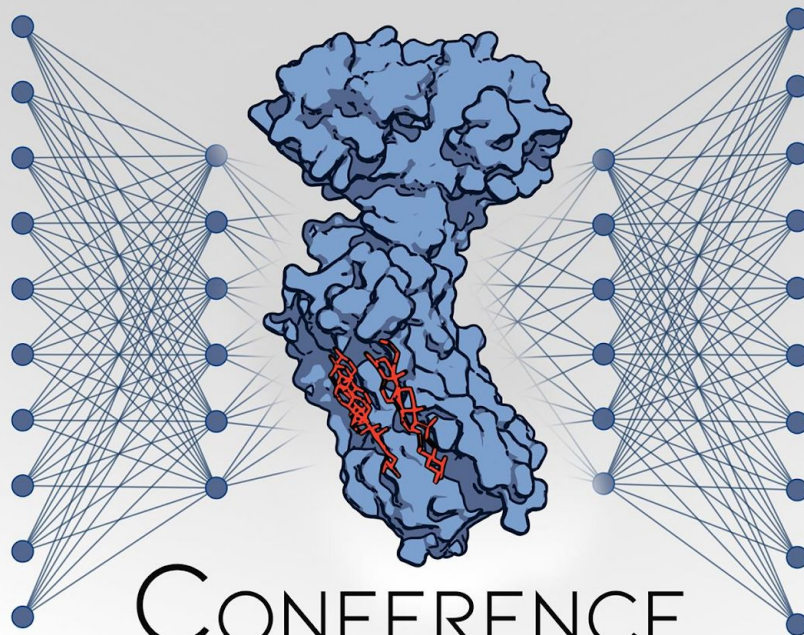
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