Recurrent Models & NLP

ICDSS

Overview

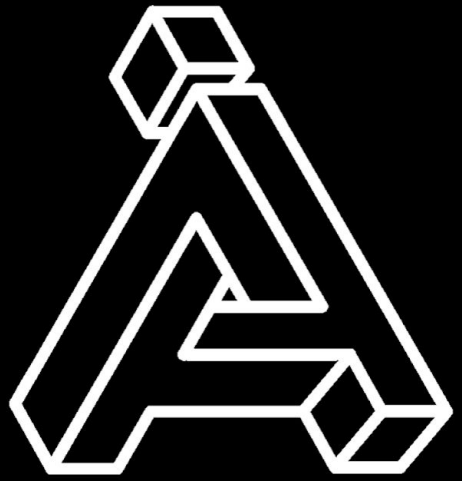
Recurrent Neural Networks

LSTMs & GRU

Applications to Computer Vision

NLP

Demo



20-21 Feb 2021

APPLICATION: 2021.aihack.org

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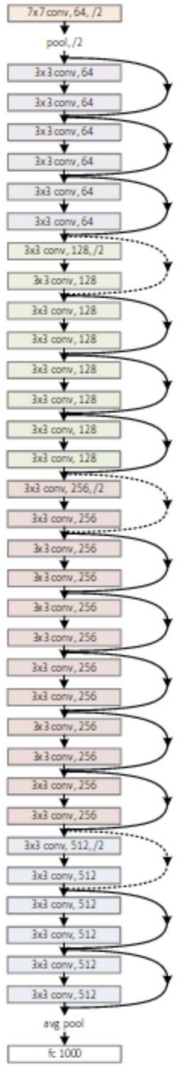
Recall - Feed forward NNs

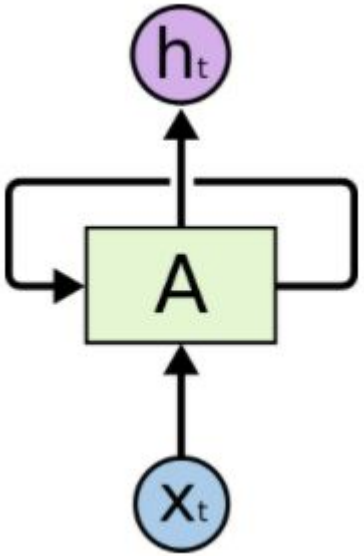
Problem

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



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

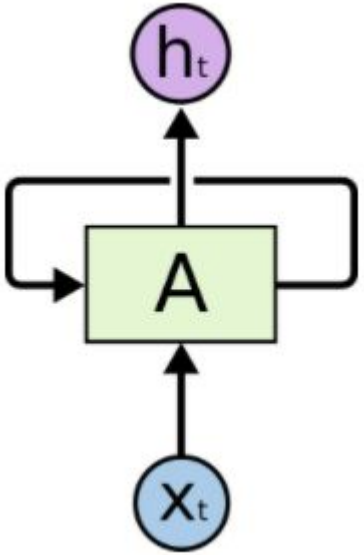
new state

some function with parameters W

old state

input vector at some time step

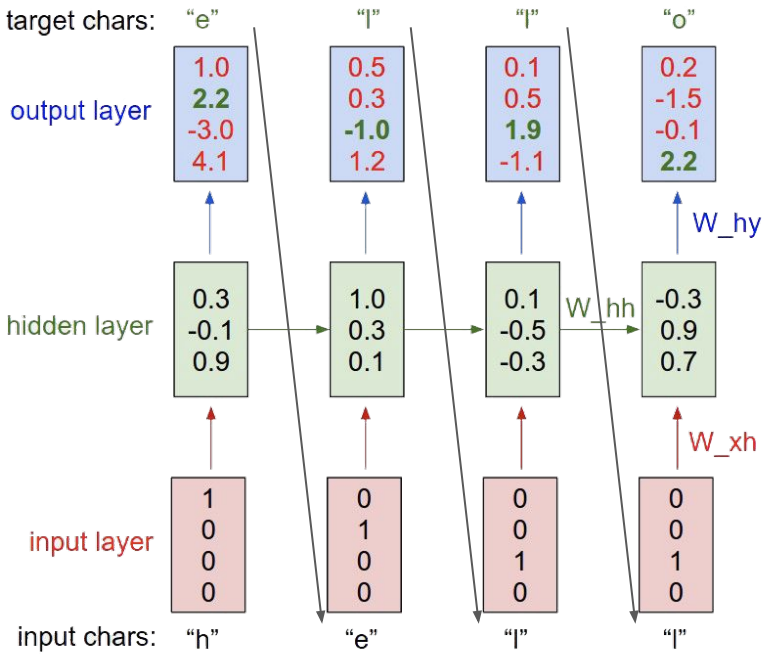
Recurrent layers



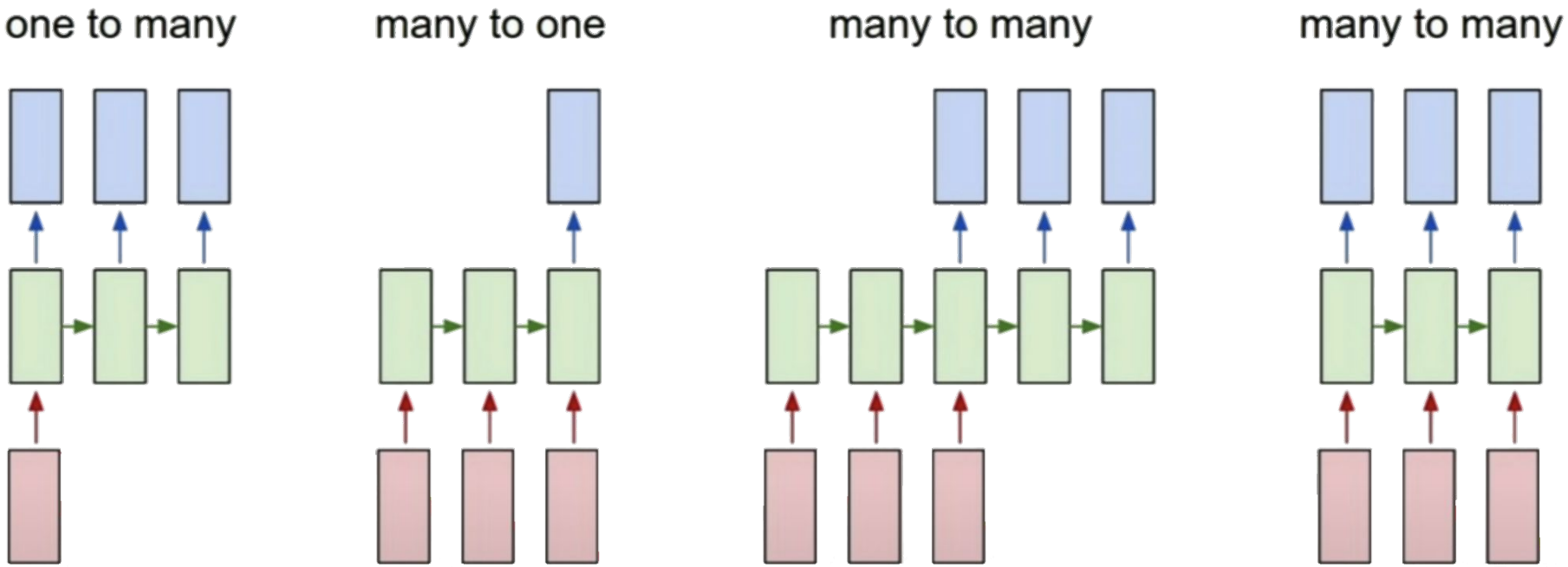
$$h_t = \tanh(W_{hh}h_{t-1} + W_{xh}x_t)$$

Training RNNs

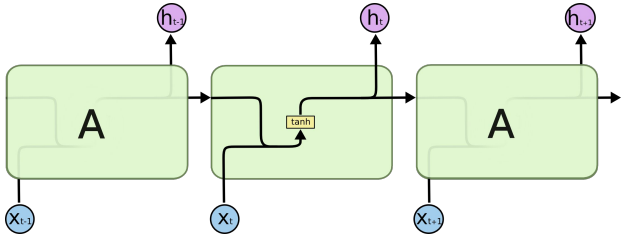
- Pass output of previous iteration to next iteration
- We sample the output to turn into a one hot encoded vector
- Accumulate error at every step and backpropagate at end of sequence

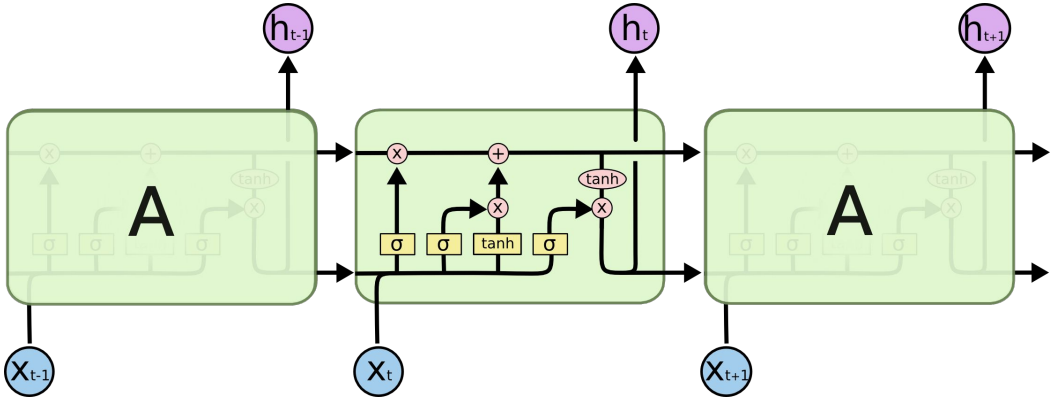


RNN sampling



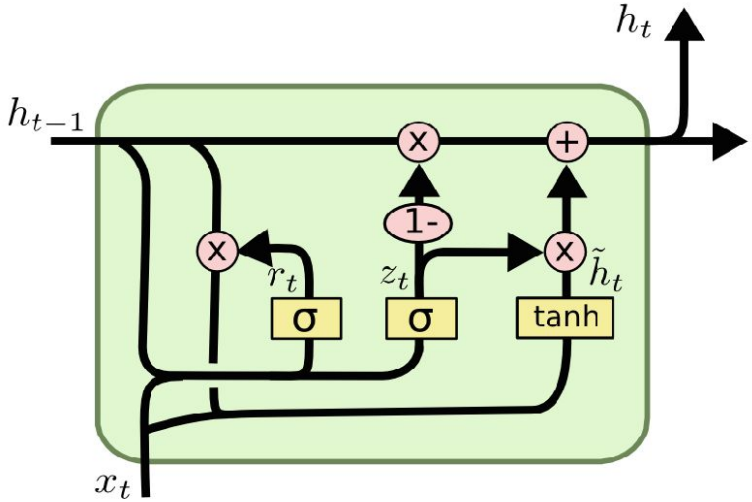
RNN Cells: LSTM



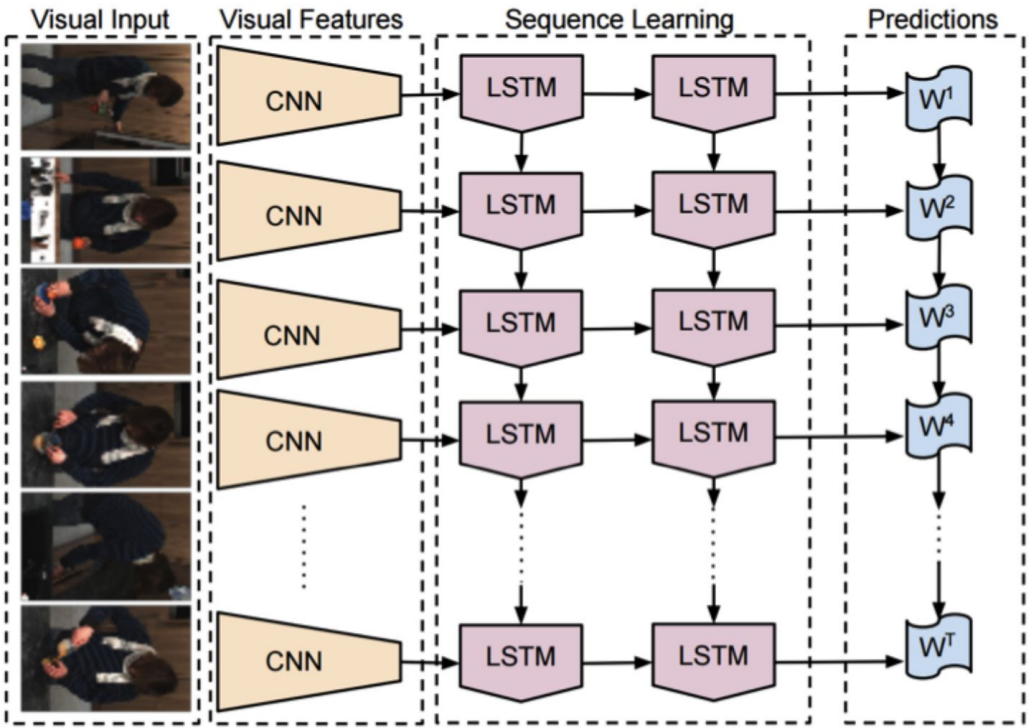


Check out http://colah.github.io/posts/2015-08-Understanding-LSTMs/

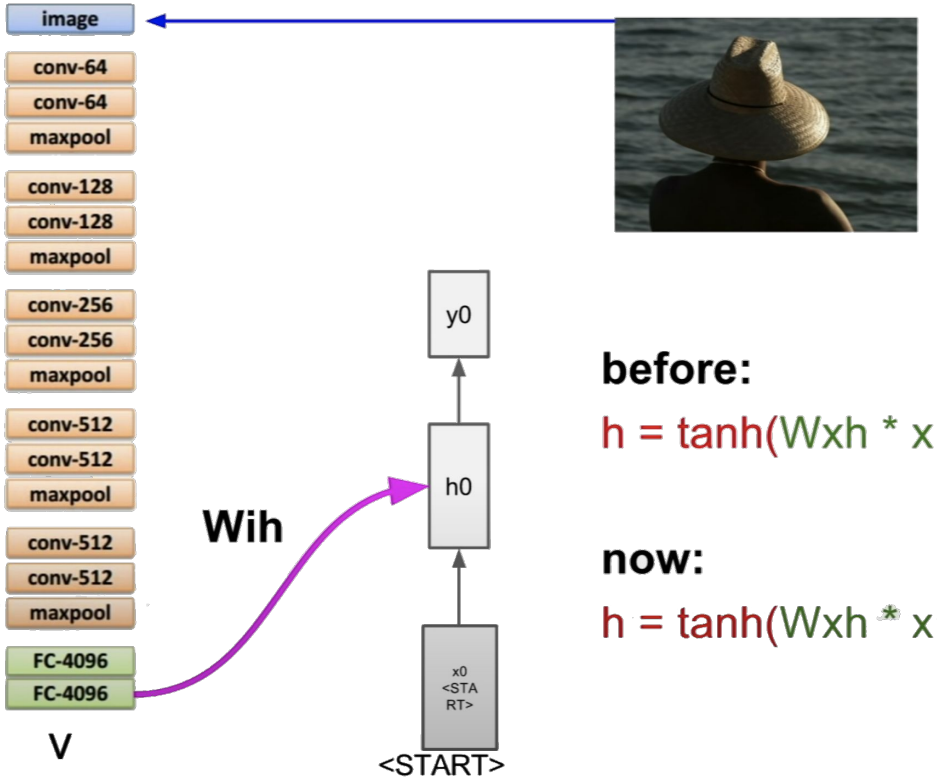
RNN Cells: GRU



RNNs with CNNs: Video classification



RNNs with CNNs: Image captioning



before:

$h = \tanh(W_{xh} * x + W_{hh} * h)$

now:

$h = \tanh(W_{xh} * x + W_{hh} * h + \mathbf{W_{ih} * v})$

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?

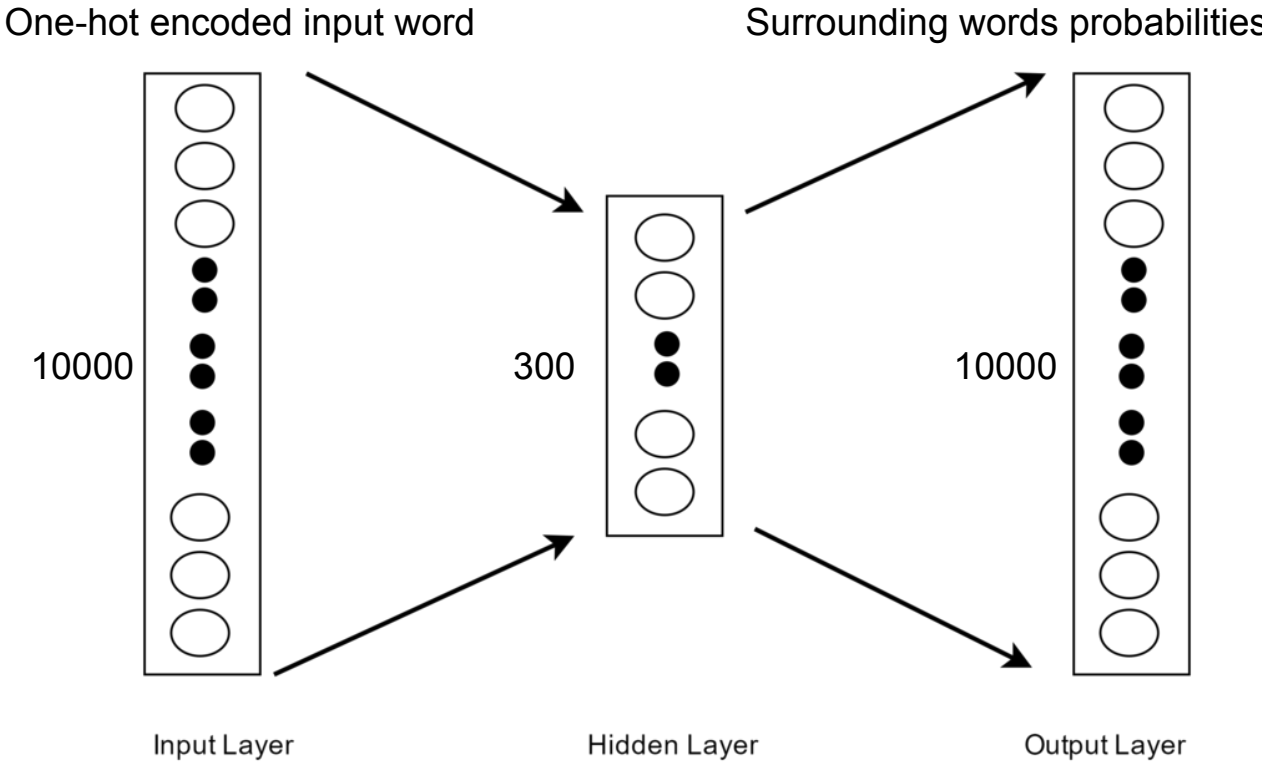
word2vec

Reduce entire vocab to much smaller vector

=> forces hidden layer to ‘learn’ compact meaningful representation

“I pet my cat”

“I pet my dog”



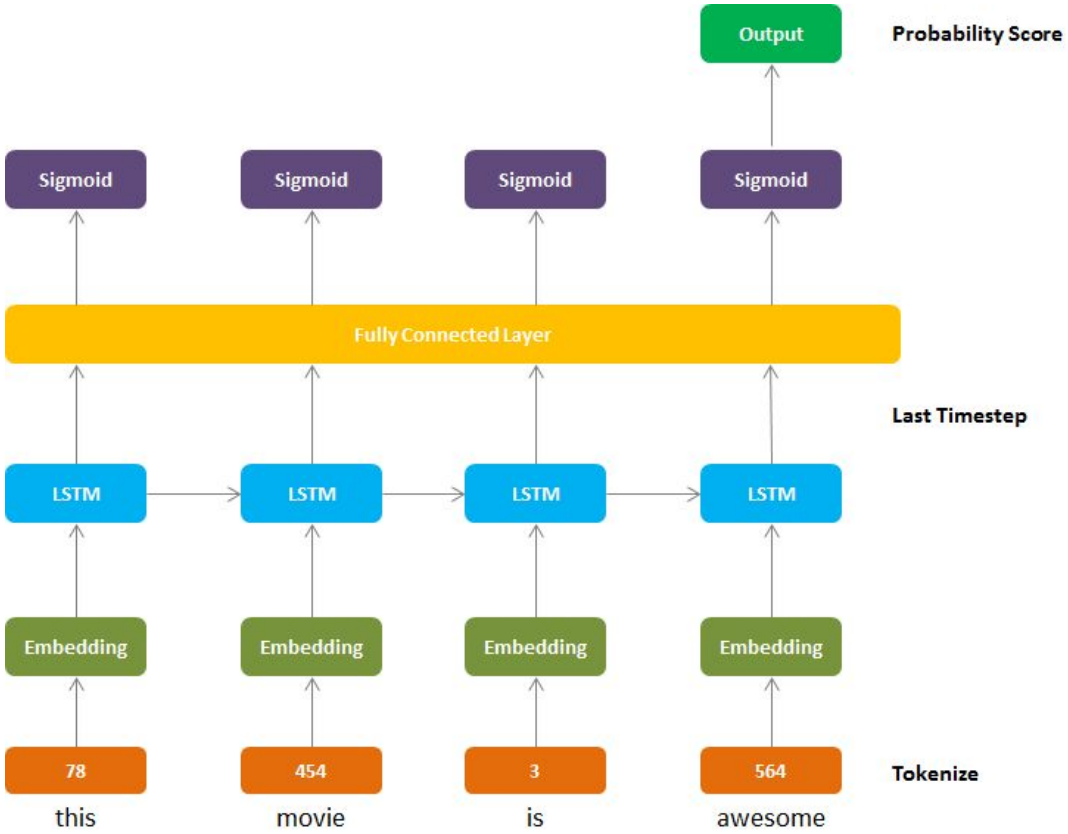
PyTorch word embeddings

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

Acts as a lookup table mapping word -> vec

Sits as a layer and gets trained along with the model

RNNs for NLP: Sentiment analysis



Live Demo

Generating Donald Trump tweets

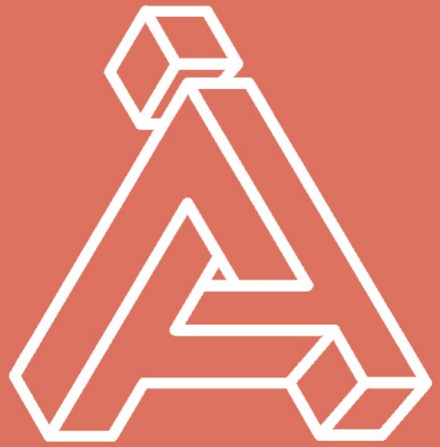
Sources & Further Reading

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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APPLICATION: 2021.aihack.org

BATCH 1 : 15 Jan – 22 Jan

BATCH 2 : 27 Jan – 07 Feb

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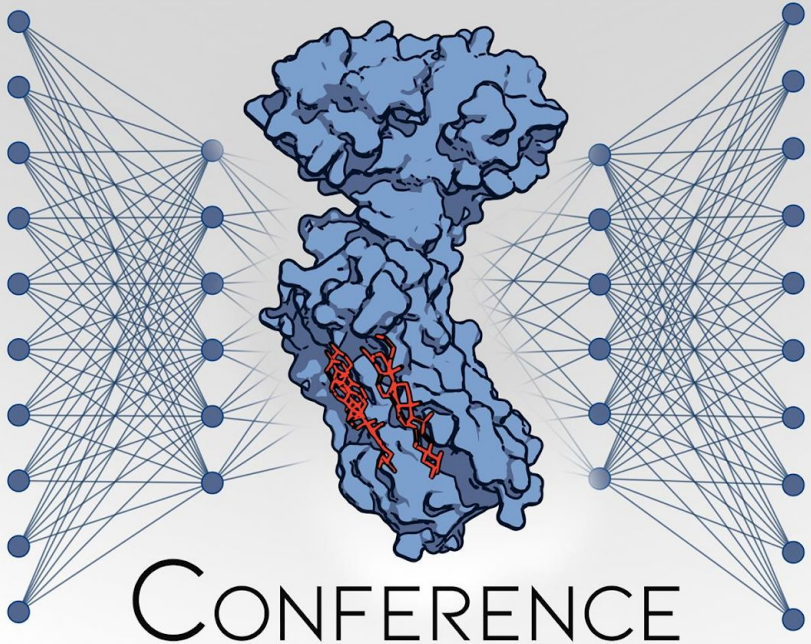
DETAILS TBA

AI IN DRUG DISCOVERY



CONFERENCE

Benevolent AI

AstraZeneca

BASECAMP RESEARCH

healx

ONETHREE BIOTECH

UNIVERSITY OF CAMBRIDGE

PHARMENABLE

SAT 27TH FEB

Imperial College
Computational Biology Society