# Recurrent Neural Networks 

RNNs

Speaker: Simeon Harrison<br>Trainer with EuroCC Austria, VSC Research Center, TU Wien

## RNNs

## A Simple RNN

All previously covered ANNs have no memory. Each input is processed independently.

RNNs are different, as they have a "memory" in form of an internal loop.

Sequences are processed by interating through the elements and maintaining a state, which contains information of what the network as seen so far.

## LSTM

The problem with simple RNNs is that they do not have a long term memory (vanishing gradients), meaning they cannot process long sequences

LSTMs solve that problem by adding a long term memory track - a way to carry information across many timesteps.

GRUs are a simplified, more cost efficient version of LSTMs

The state is then reset between independent sequences

## Simple RNN cell



## Simple RNN -> LSTM



## LSTM cell



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