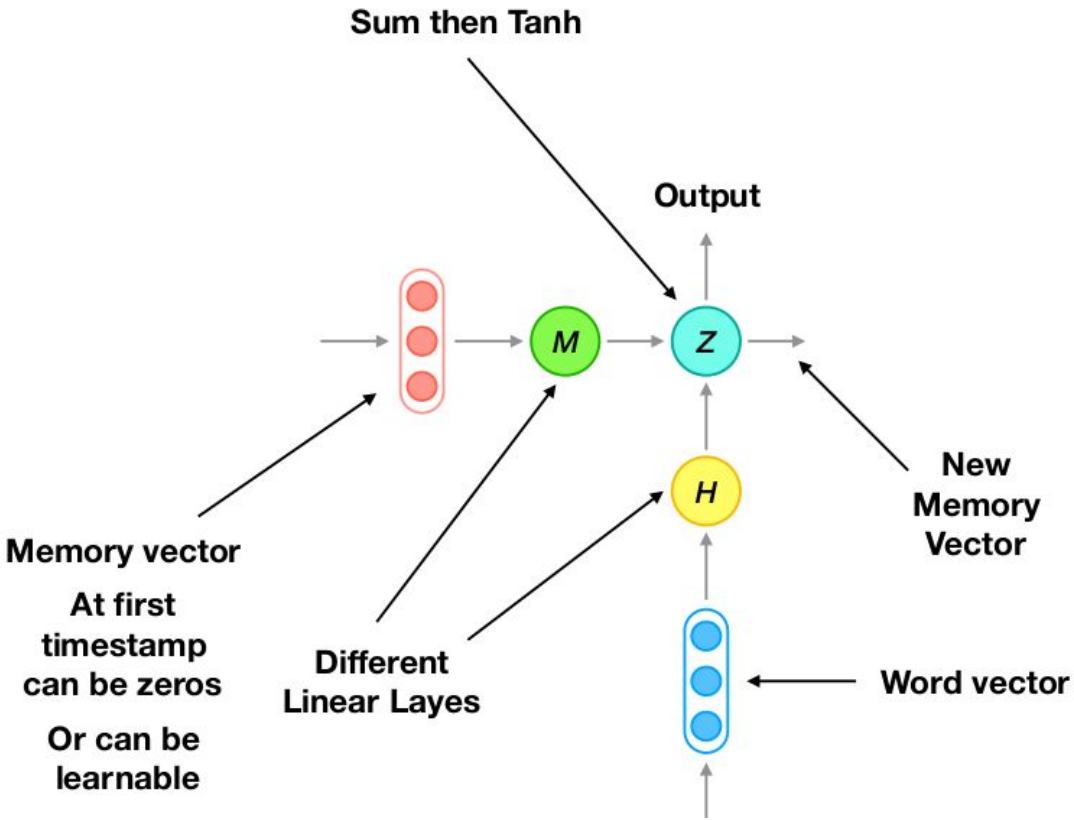
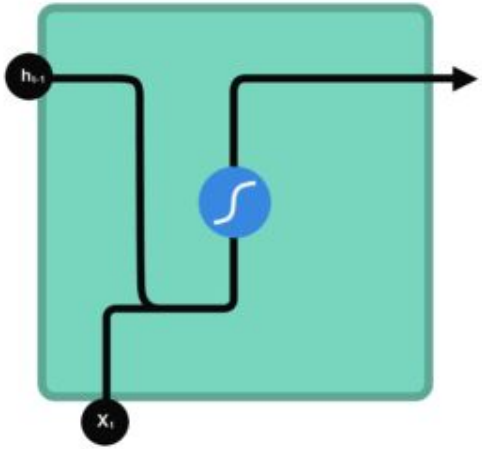
RNN and CNN

Reccurent Cell



Recurrent Cell



Tanh function

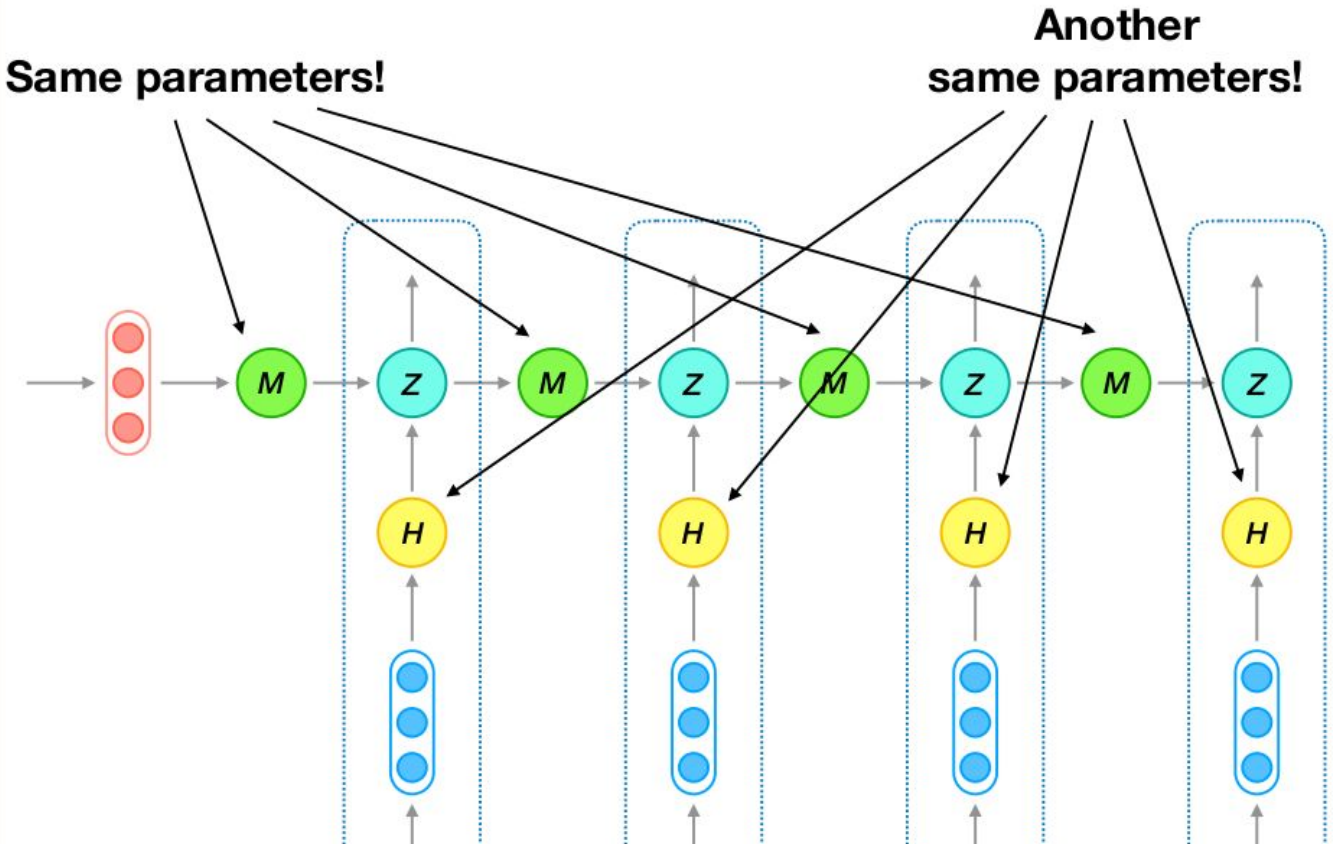
h_t new hidden state

h_{t-1} previous hidden state

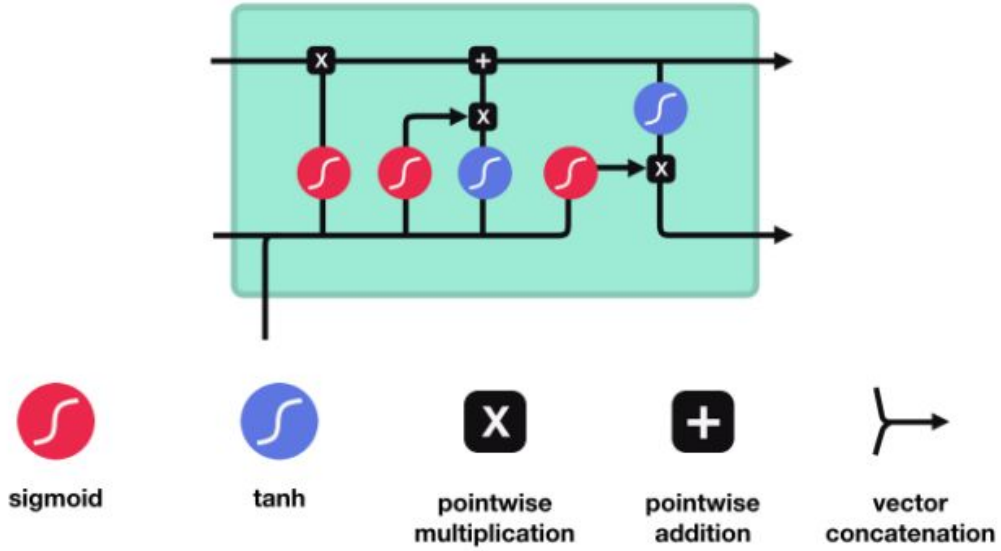
x_t input

concatenation

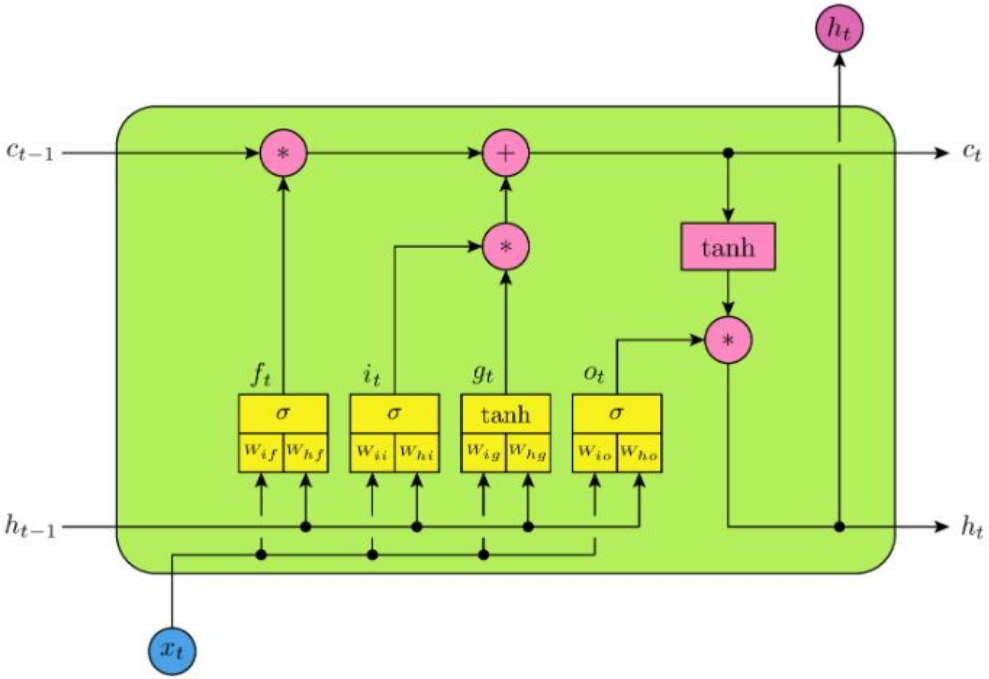
Reccurent Mechanism



LSTM Cell


sigmoid
tanh
pointwise multiplication
pointwise addition
vector concatenation

LSTM Cell



[More info]

x(t): the external input at time t

h(t-1)/h(t): the hidden state at times t-1 (‘input’) or t (‘output’).

c(t-1)/c(t): the ‘cell state’ or ‘memory’ at times t-1 and t

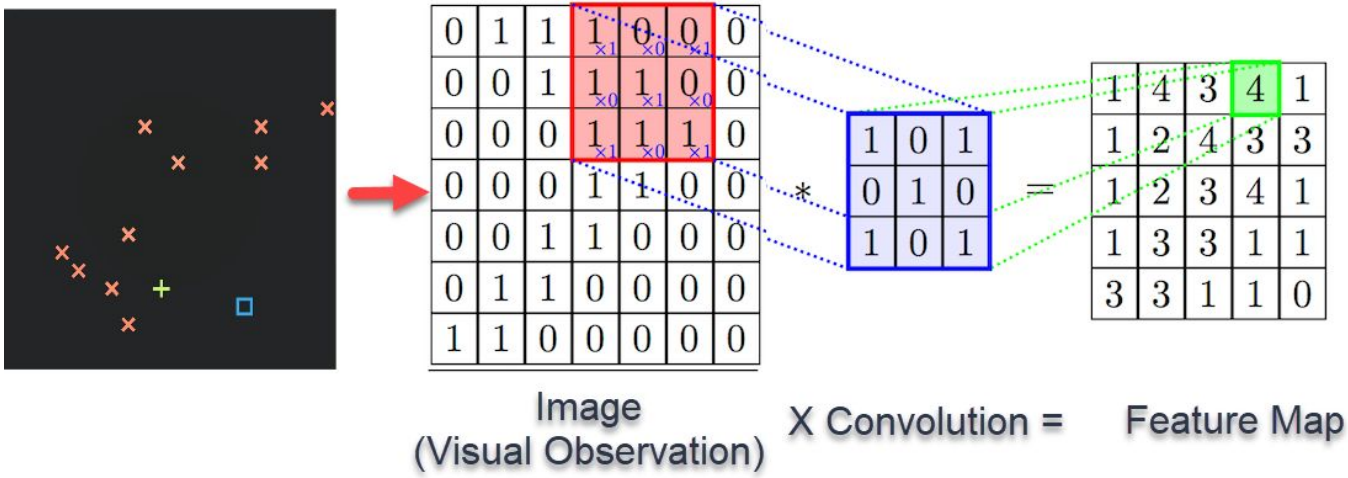
f(t): the result of the forget gate. For values close to zero the cell will ‘forget’ its memories c(t-1) from the past, for values close to one it will remember its history.

i(t): the result of the input gate, determining how important the (transformed) new external input is.

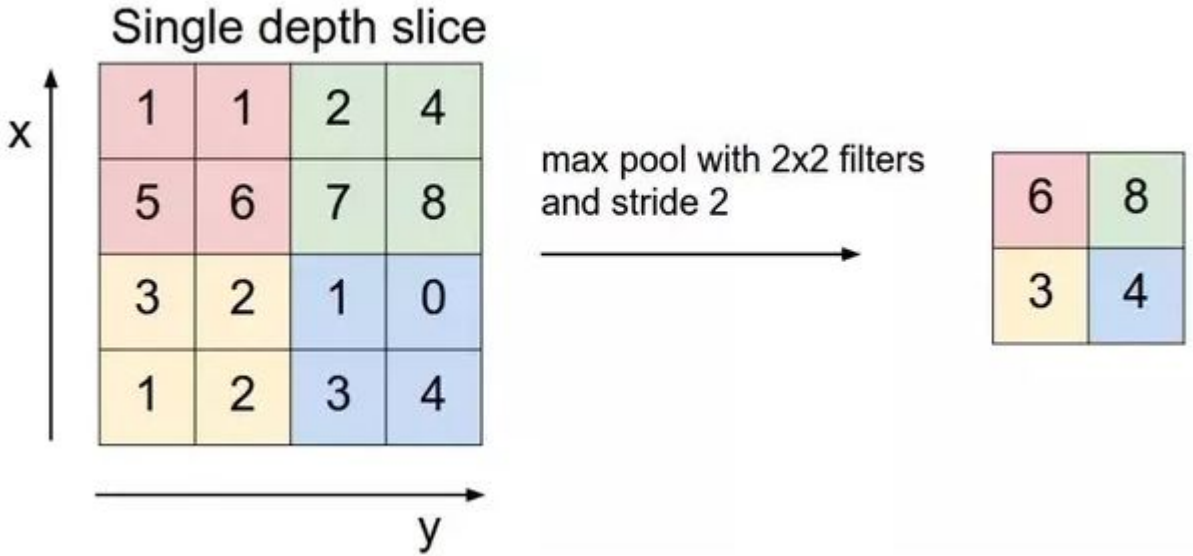
g(t): the result of the cell gate, a non-linear transformation of the new external input x(t)

o(t): the result of the output gate which controls how much of the new cell state c(t) should go to the output (and the hidden state)

Convolution filter



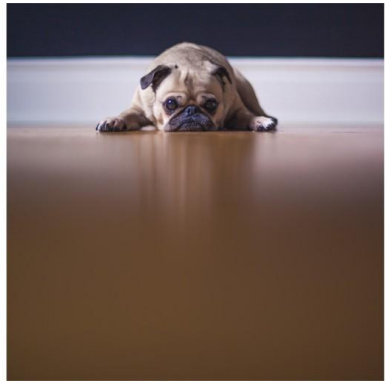
Pooling

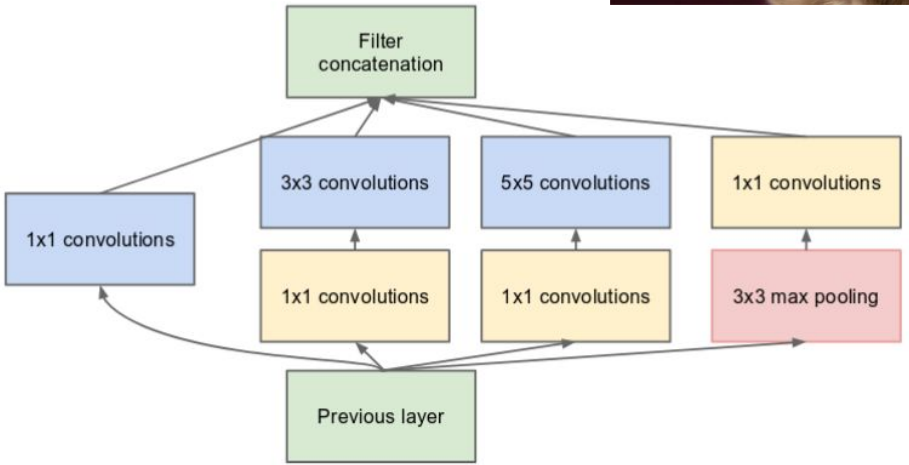


- Max Pooling
- Average Pooling
- Sum Pooling

CNN

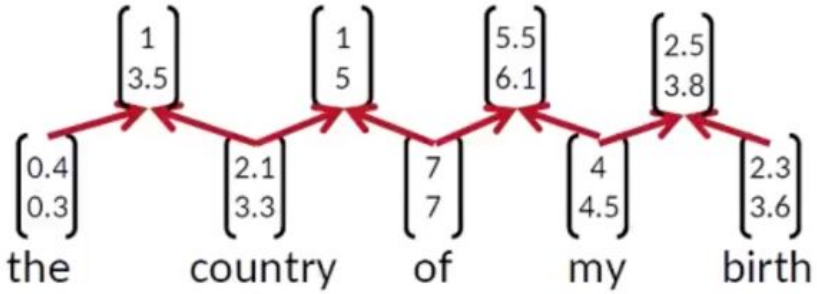






(b) Inception module with dimension reductions

Convolutional Neural Network



$$p = \tanh\left(W \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} + b\right)$$

More info