Recurrent Neural Networks

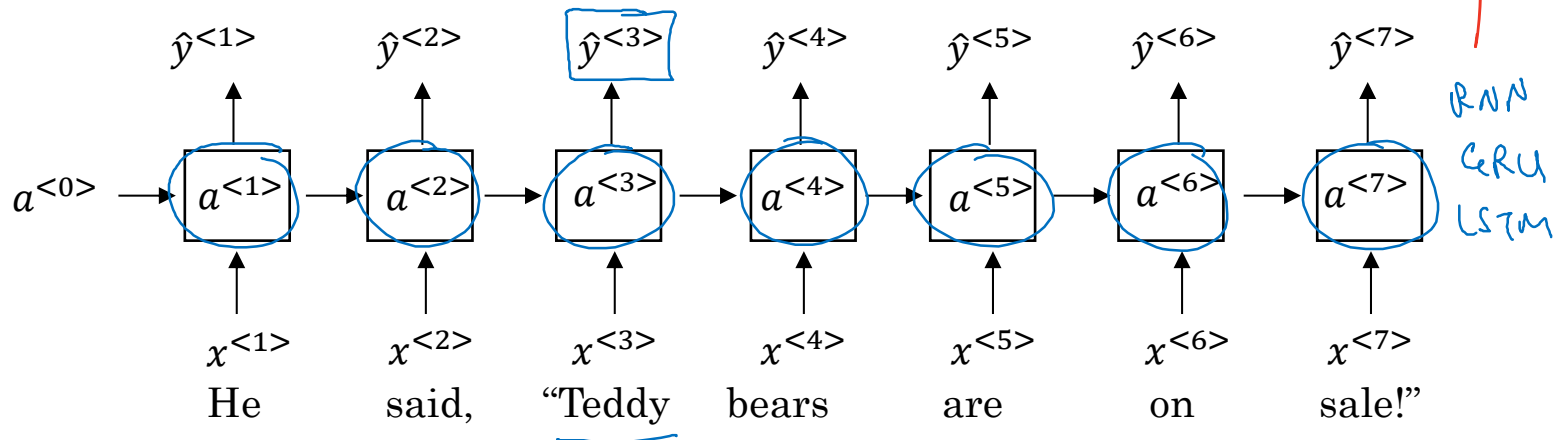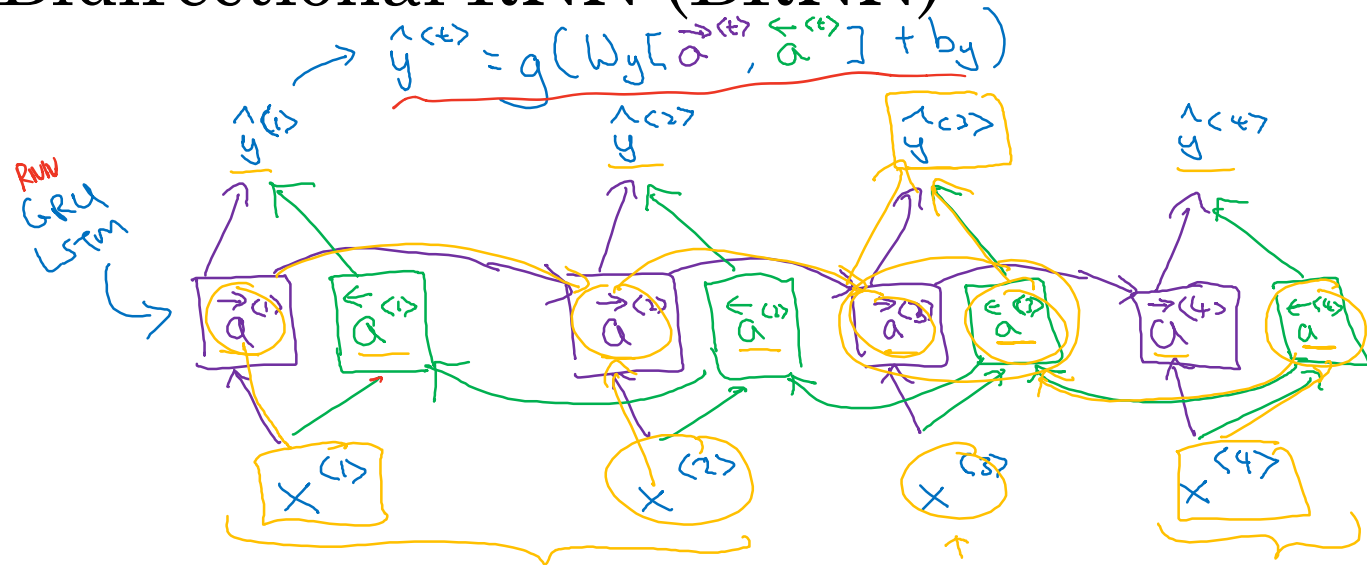## Bidirectional RNN

Getting information from the future

He said, "Teddy bears are on sale!"

He said, "Teddy Roosevelt was a great President!"

only one direction

RNN
GRU
LSTM

$\hat{y}^{<1>}$ $\hat{y}^{<2>}$ $\hat{y}^{<3>}$ $\hat{y}^{<4>}$ $\hat{y}^{<5>}$ $\hat{y}^{<6>}$ $\hat{y}^{<7>}$

$a^{<0>}$ → $a^{<1>}$ → $a^{<2>}$ → $a^{<3>}$ → $a^{<4>}$ → $a^{<5>}$ → $a^{<6>}$ → $a^{<7>}$

$x^{<1>}$ $x^{<2>}$ $x^{<3>}$ $x^{<4>}$ $x^{<5>}$ $x^{<6>}$ $x^{<7>}$

He   said,   "Teddy   bears   are   on   sale!"

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Bidirectional RNN (BRNN)

$$\hat{y}^{\langle t \rangle} = g(W_y [\overrightarrow{a}^{\langle t \rangle}, \overleftarrow{a}^{\langle t \rangle}] + b_y)$$

RNN
GRU
LSTM

$\hat{y}^{\langle 1 \rangle}$ $\hat{y}^{\langle 2 \rangle}$ $\hat{y}^{\langle 3 \rangle}$ $\hat{y}^{\langle 4 \rangle}$

$\overrightarrow{a}^{\langle 1 \rangle}$ $\overleftarrow{a}^{\langle 1 \rangle}$ $\overrightarrow{a}^{\langle 2 \rangle}$ $\overleftarrow{a}^{\langle 2 \rangle}$ $\overrightarrow{a}^{\langle 3 \rangle}$ $\overleftarrow{a}^{\langle 3 \rangle}$ $\overrightarrow{a}^{\langle 4 \rangle}$ $\overleftarrow{a}^{\langle 4 \rangle}$

$x^{\langle 1 \rangle}$ $x^{\langle 2 \rangle}$ $x^{\langle 3 \rangle}$ $x^{\langle 4 \rangle}$

Acyclic graph

无环图

He said, "Teddy Roosevelt ...."

BRNN with LSTM

NLP problem

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