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Sequence to sequence models

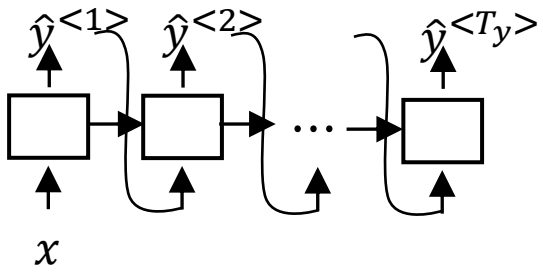
Transformers Intuition

Transformers Motivation

In that these all intermediate feels like a bottleneck to the flow

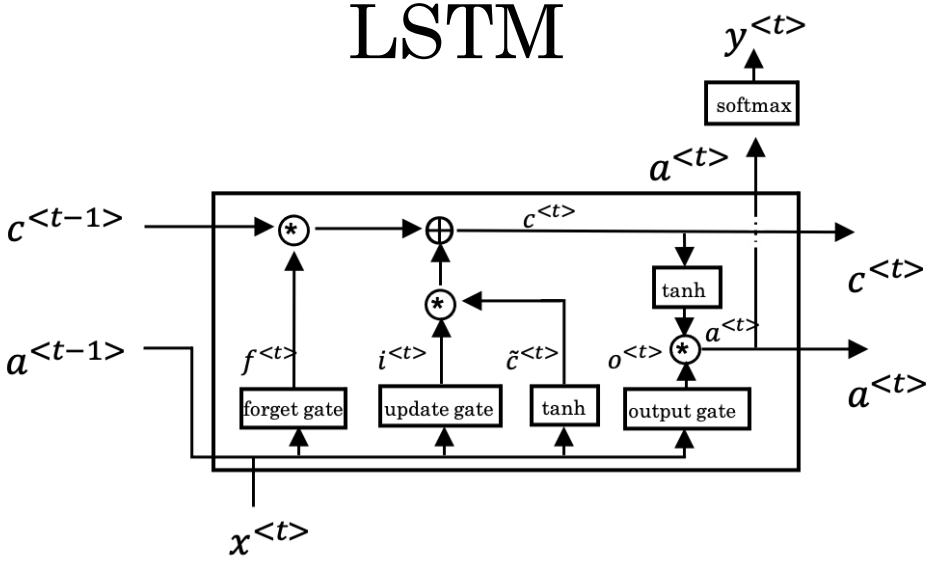
Increased complexity, sequential

RNN



GRU

LSTM



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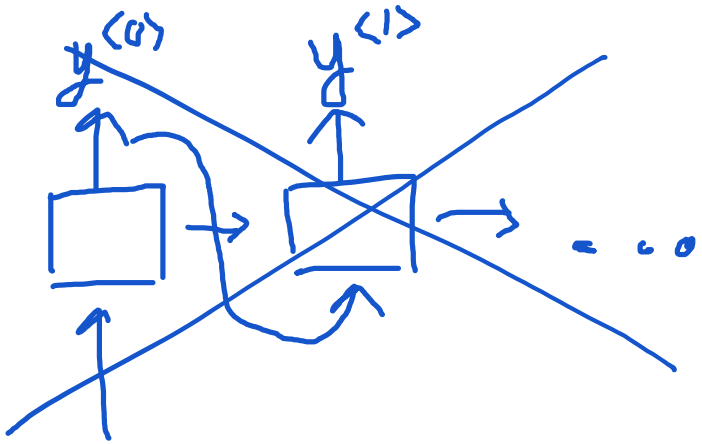
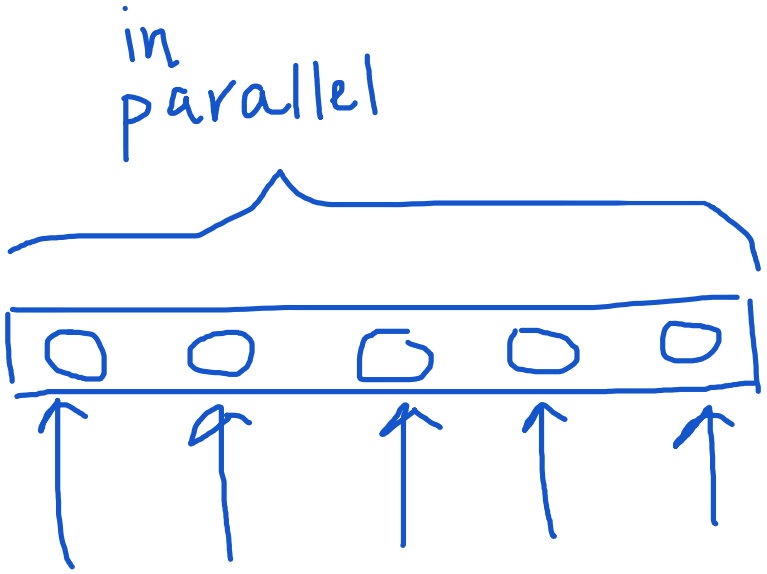
Transformers Intuition

- Attention + CNN
  - Self-Attention
  - Multi-Head Attention

The goal of self-attention is for a sentence of five words it will end up computing 5 representation for these 5





[Vaswani et al. 2017, Attention Is All You Need]

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Sequence to sequence models

Self-Attention

Self-Attention Intuition

$A(q, K, V)$= attention-based vector representation of a word

calculate for each word

Calculate that A for each of the word. In our case 5 words A1, A2, ,A3, A4, A5. Like

RNN Attention

$$\alpha^{<t,t'>} = \frac{\exp(e^{<t,t'>})}{\sum_{t'=1}^{T_x} \exp(e^{<t,t'>})}$$

Transformers Attention

$$A(q, K, V) = \sum_i \frac{\exp(e^{<q \cdot k^{<i>}>})}{\sum_j \exp(e^{<q \cdot k^{<j>}>})} v^{<i>}$$

Query Key and Value.

$x^{<1>}$ Jane $x^{<2>}$ visite $x^{<3>}$ l'Afrique $x^{<4>}$ en $x^{<5>}$ septembre

[Vaswani et al. 2017, Attention Is All You Need]

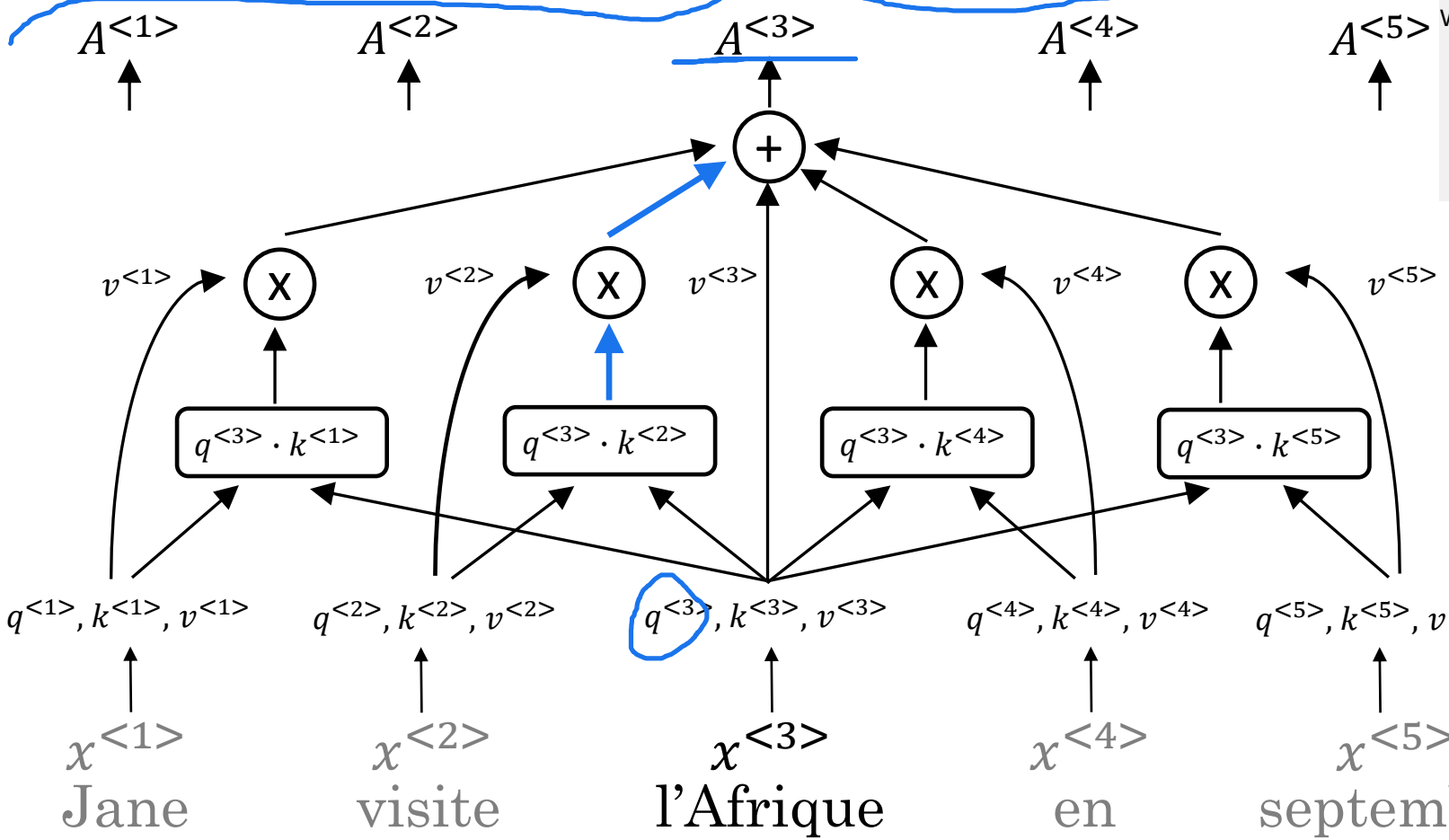
Self-Attention

$$A(q, K, V) = \sum_i \frac{\exp(e^{\langle q \cdot k^{<i>} \rangle})}{\sum_j \exp(e^{\langle q \cdot k^{<j>} \rangle})} v^{<i>}$$

Softmax

$$\textbf{Attention}(\boldsymbol{Q}, \boldsymbol{K}, \boldsymbol{V}) = \textbf{softmax}\left(\frac{\boldsymbol{Q}\boldsymbol{K}^T}{\sqrt{\boldsymbol{d_k}}}\right)\boldsymbol{V}$$

We are going to associate each of the word with 3 values called query,k



Query (Q)	Key (K)	Value (V)
$q^{<1>}$	$k^{<1>}$	$v^{<1>}$
$q^{<2>}$	$k^{<2>}$	$v^{<2>}$
$q^{<3>}$	$k^{<3>}$	$v^{<3>}$
$q^{<4>}$	$k^{<4>}$	$v^{<4>}$
$q^{<5>}$	$k^{<5>}$	$v^{<5>}$

person
action
Jane
visit
What's happening there?

W^Q, W^K, W^V

[Vaswani et al. 2017, Attention Is All You Need]

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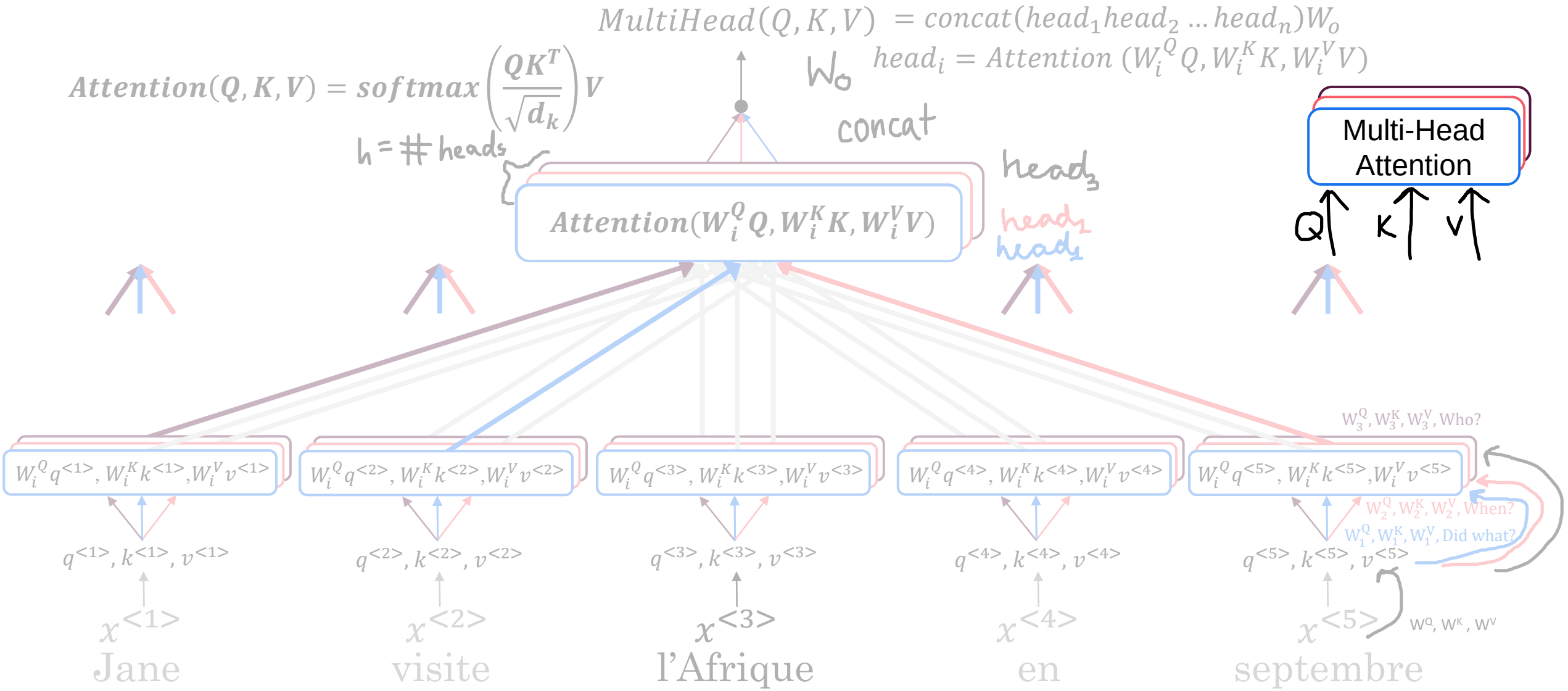
Sequence to sequence models

Multi-Head Attention

Multi-Head Attention



[Vaswani et al. 2017, Attention Is All You Need]

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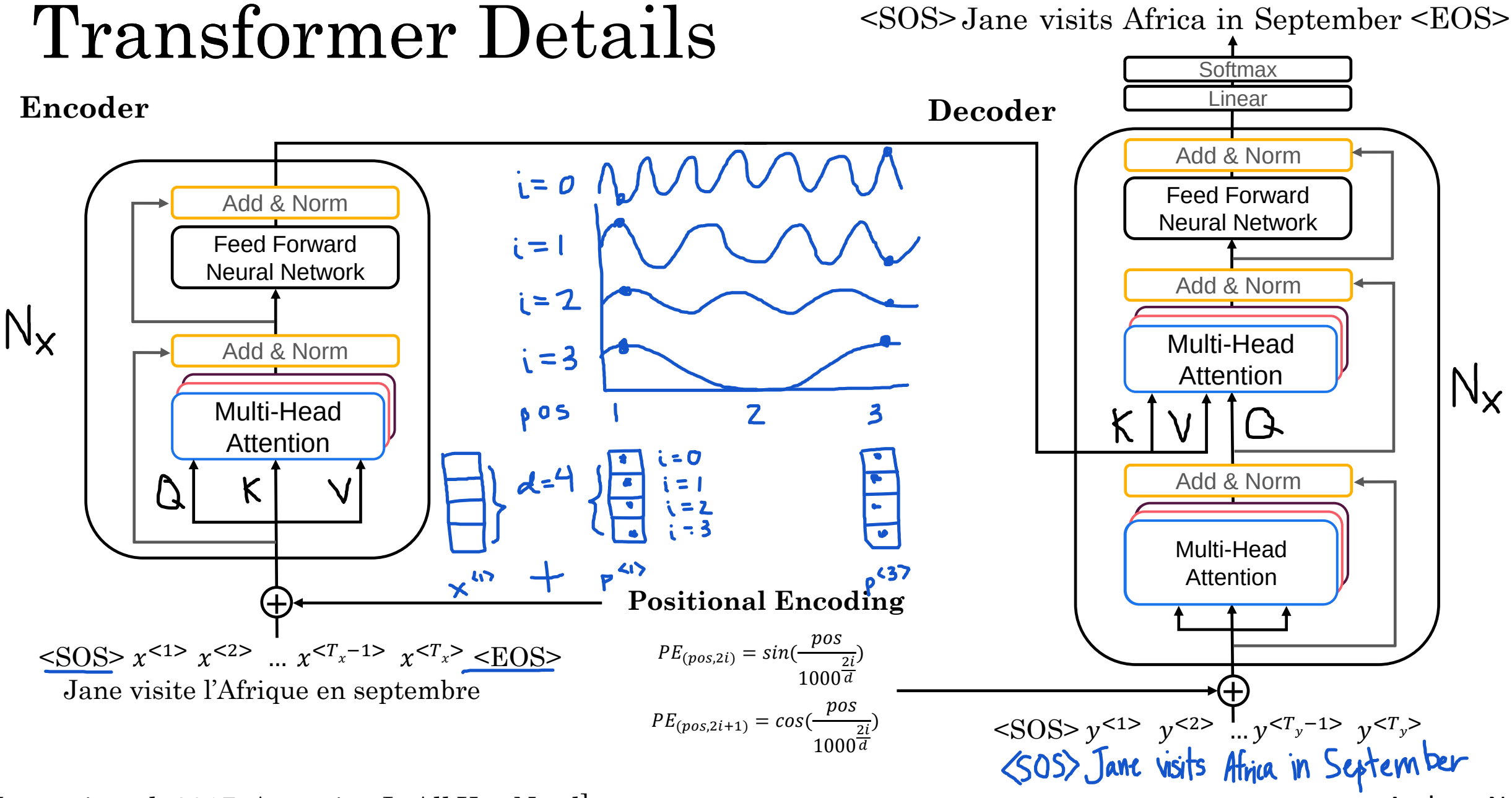
Sequence to sequence models

Transformers

Transformer Details



[Vaswani et al. 2017, Attention Is All You Need]

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