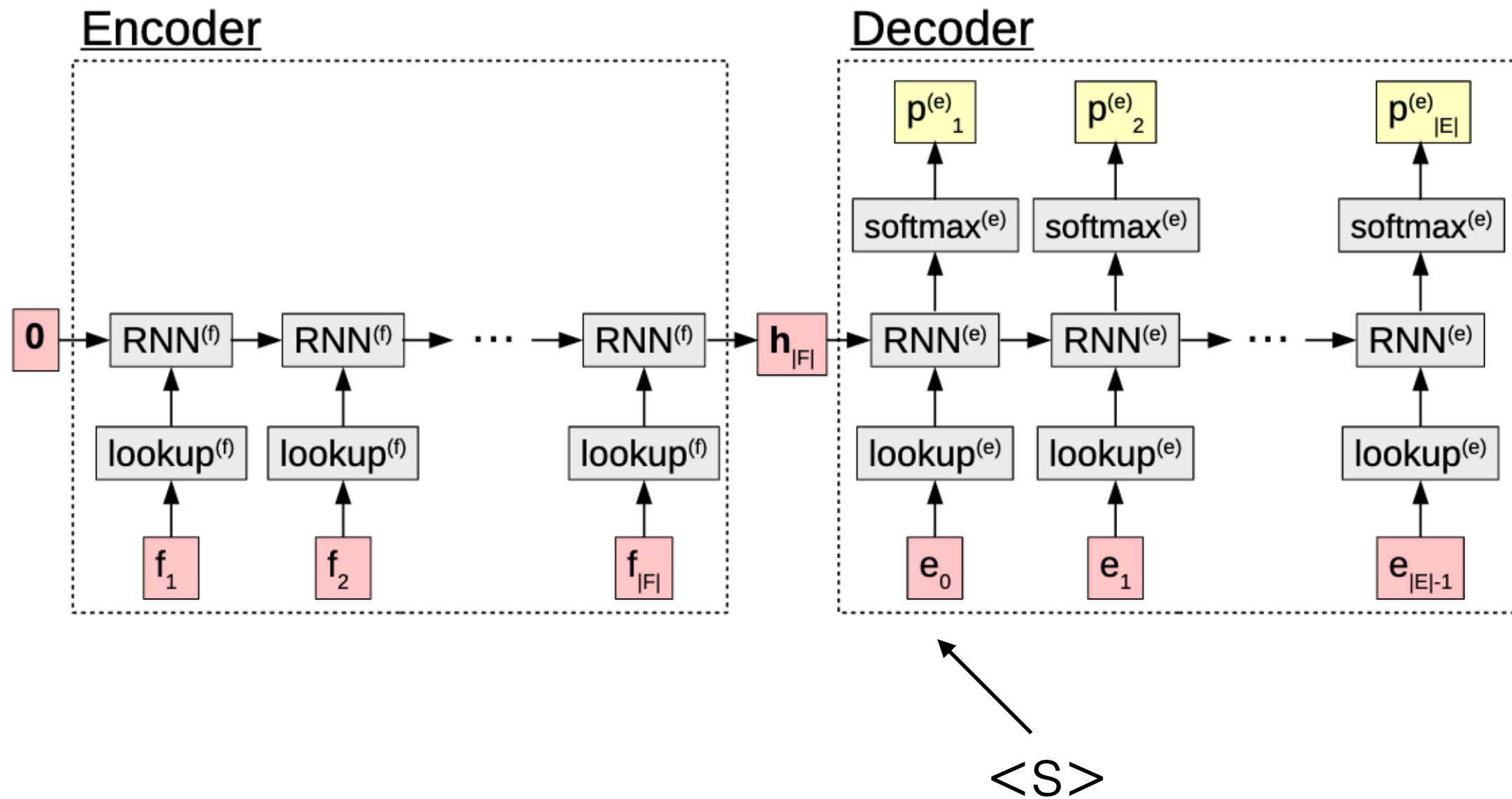
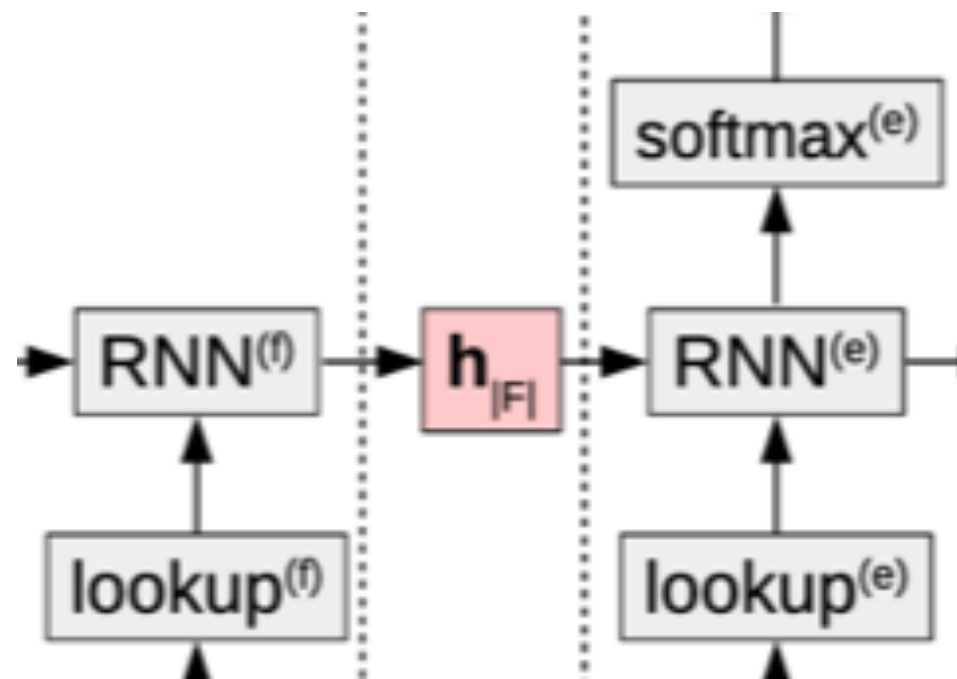


Encoder/decoder RNN

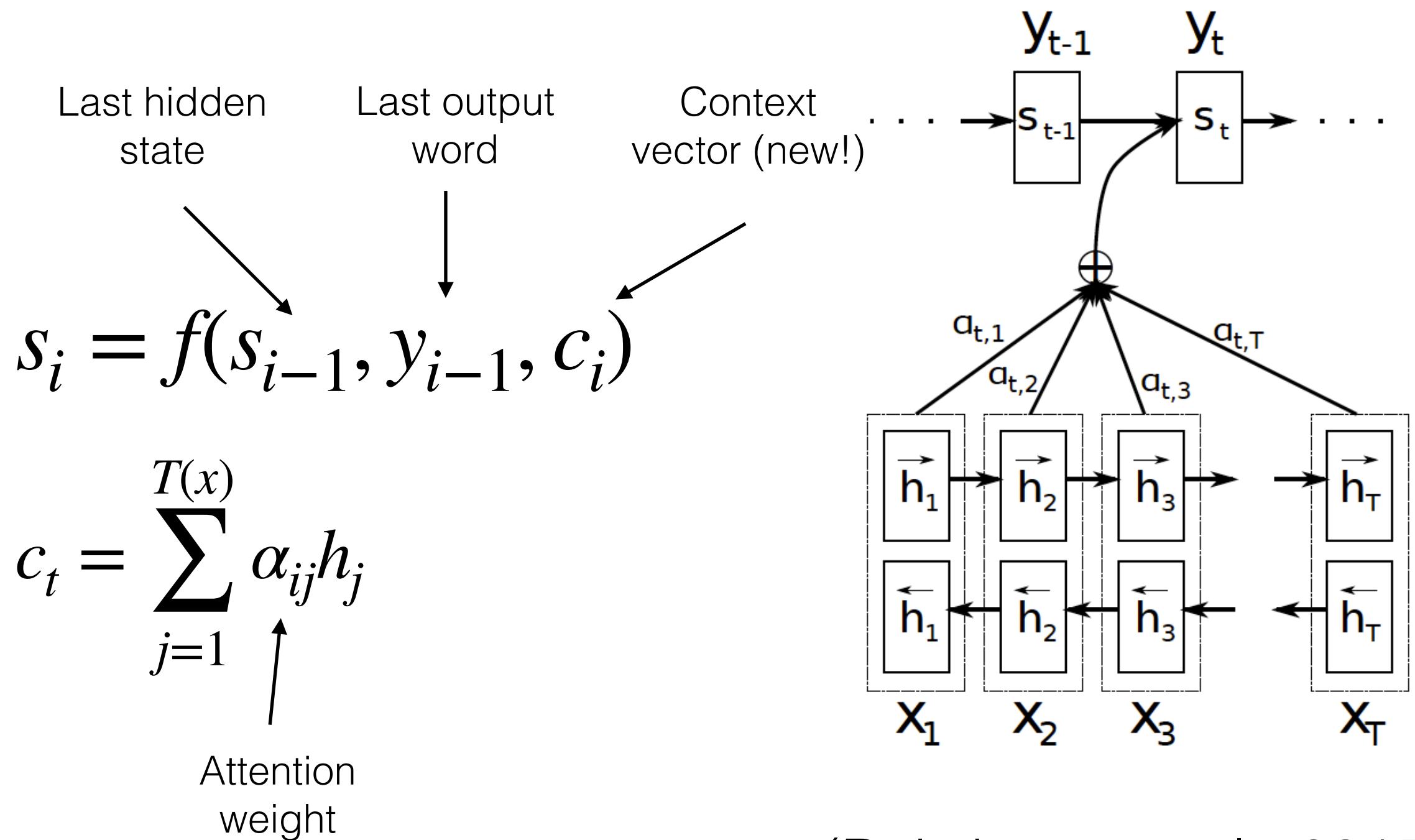


Attention motivation

Sentences vary a lot in length; why limit ourselves to a fixed-size vector bottleneck?



Attention



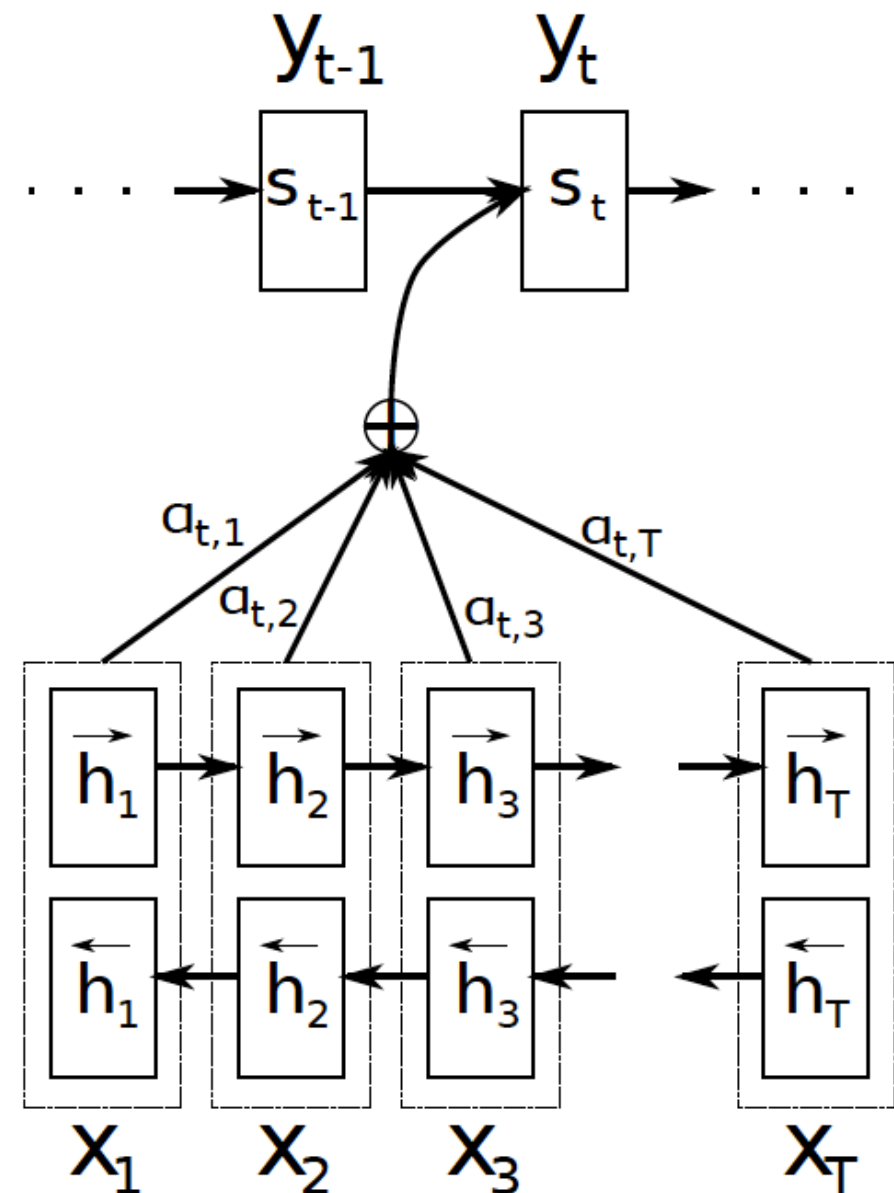
(Bahdanau et al., 2015)

Attention weights

Attention
function

$e_{ij} = a(s_{i-1}, h_j)$

$$\alpha_{ij} = \frac{\exp(e_{ij})}{\sum_j \exp(e_{ij})}$$



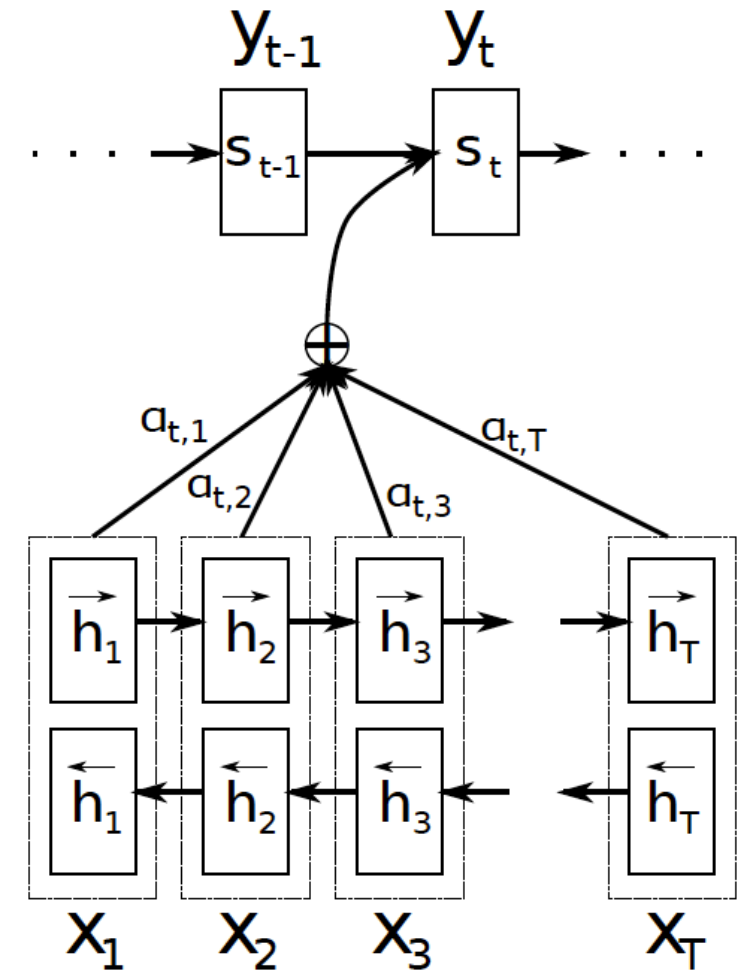
(Bahdanau et al., 2015)

Attention functions

$$a(s_i, h_j) = s_i^T h_j$$

$$a(s_i, h_j) = \text{MLP}([s_i; h_j])$$

...



LSTM with self-attention

The FBI is chasing a criminal on the run .
 The FBI is chasing a criminal on the run .
 The FBI is chasing a criminal on the run .
 The FBI is chasing a criminal on the run .
 The FBI is chasing a criminal on the run .
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 The FBI is chasing a criminal on the run .
 The FBI is chasing a criminal on the run .
 The FBI is chasing a criminal on the run .

(Cheng et al.
2016)

$$\alpha_i^t = v^T \tanh(W_h h_i + W_x x_t + W_{\tilde{h}} \tilde{h}_{t-1}) \quad s_i^t = \text{softmax}(\alpha_i^t)$$

$$\tilde{h}_t = \sum_i^{t+1} s_i^t h_i \quad \tilde{c}_t = \sum_i^{t+1} s_i^t c_i$$

$$c_t = f_t \odot \tilde{c}_t + i_t \odot g_t \quad i_t = \sigma(W_i \cdot [\tilde{h}_t; x_t])$$

Copying for summarization

Original Text (truncated): lagos, nigeria (cnn) a day after winning nigeria's presidency, *muhammadu buhari* told cnn's christiane amannpour that **he plans to aggressively fight corruption that has long plagued nigeria** and go after the root of the nation's unrest. *buhari* said he'll "rapidly give attention" to curbing violence in the northeast part of nigeria, where the terrorist group boko haram operates. by cooperating with neighboring nations chad, cameroon and niger, **he said his administration is confident it will be able to thwart criminals** and others contributing to nigeria's instability. for the first time in nigeria's history, the opposition defeated the ruling party in democratic elections. *buhari* defeated incumbent goodluck jonathan by about 2 million votes, according to nigeria's independent national electoral commission. **the win comes after a long history of military rule, coups and botched attempts at democracy in africa's most populous nation.**

Baseline Seq2Seq + Attention: UNK UNK says his administration is confident it will be able to **destabilize nigeria's economy**. UNK says his administration is confident it will be able to thwart criminals and other **nigerians**. **he says the country has long nigeria and nigeria's economy.**

Pointer-Gen: *muhammadu buhari* says he plans to aggressively fight corruption **in the northeast part of nigeria**. he says he'll "rapidly give attention" to curbing violence **in the northeast part of nigeria**. he says his administration is confident it will be able to thwart criminals.

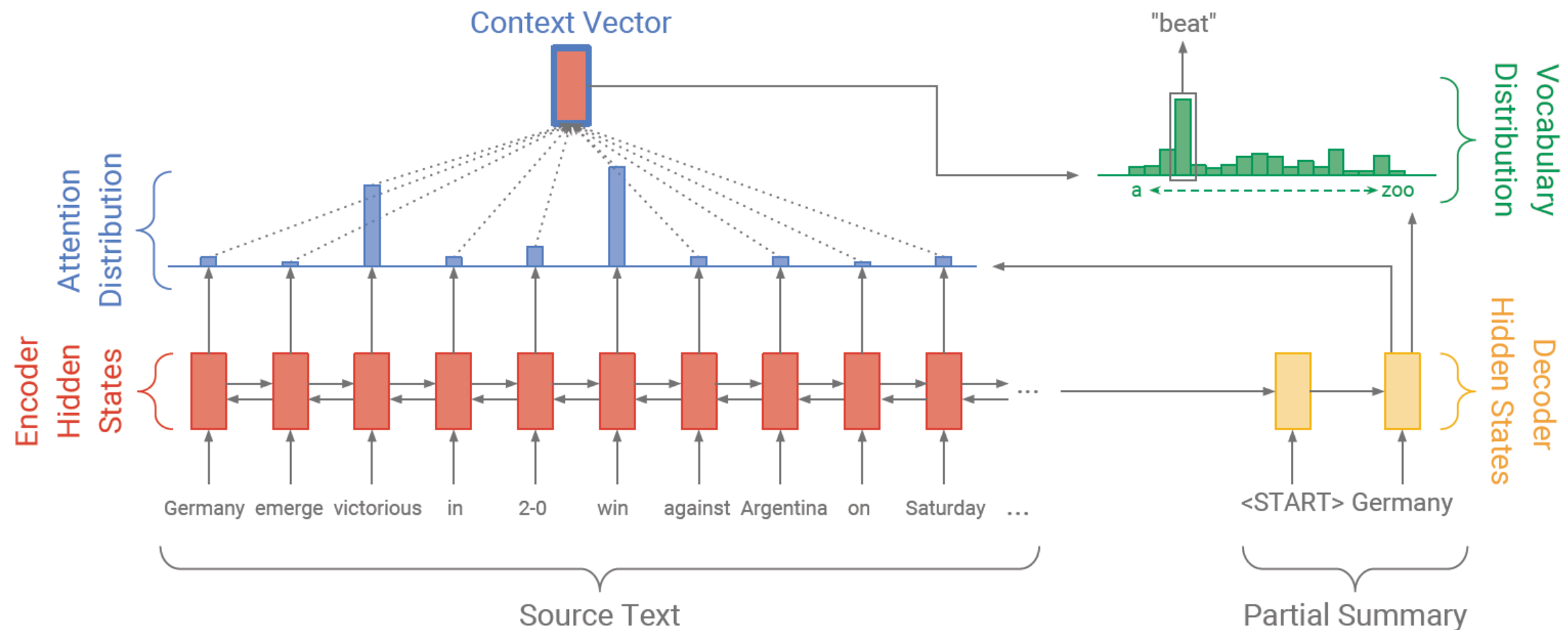
Pointer-Gen + Coverage: *muhammadu buhari* says he plans to aggressively fight corruption that has long plagued nigeria. he says his administration is confident it will be able to thwart criminals. the win comes after a long history of military rule, coups and botched attempts at democracy in africa's most populous nation.

Factual
errors

Repetitions

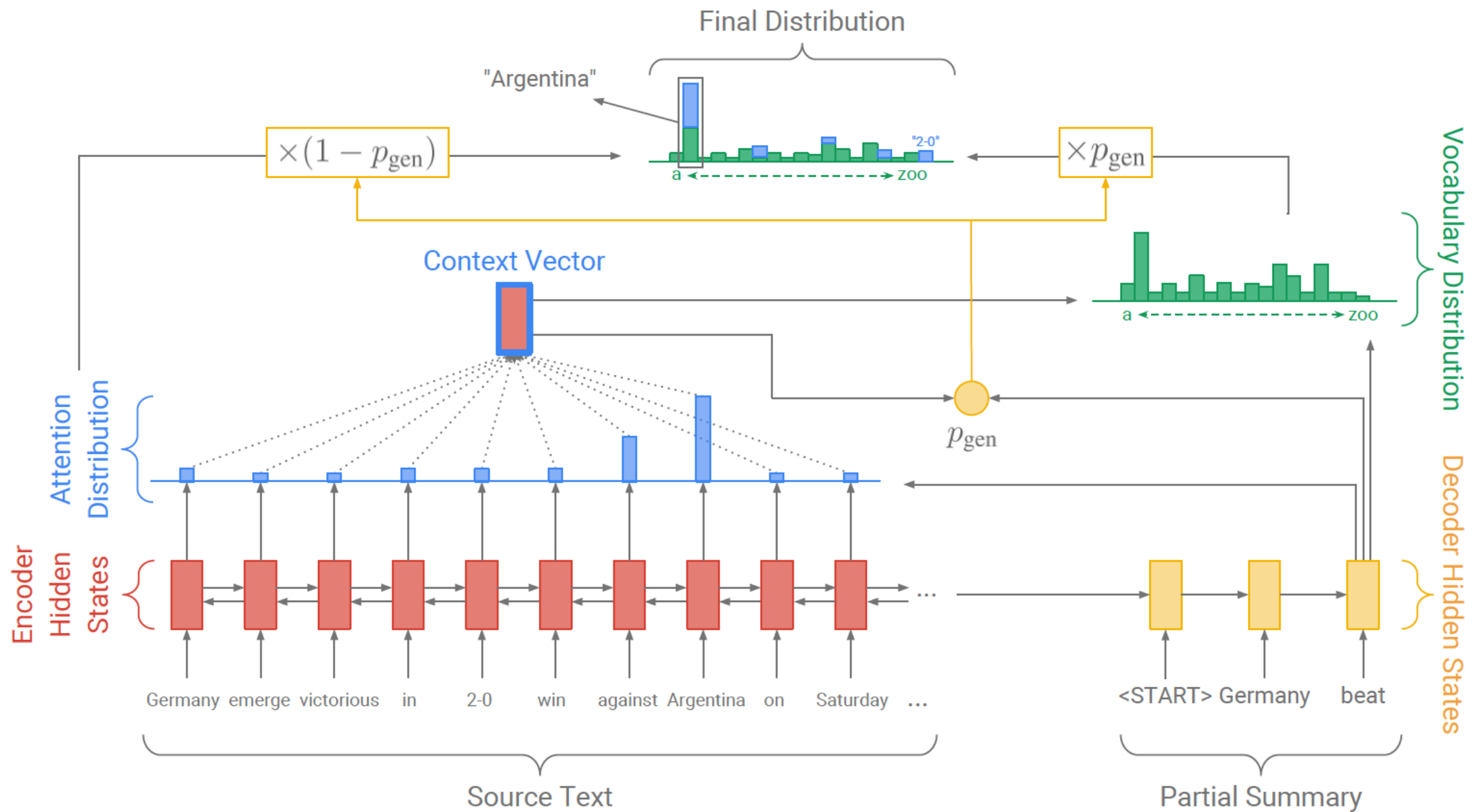
(See et al
2017)

Copying for summarization



(See et al 2017)

Copying for summarization



(Gu et al 2016; See et al 2017)

Coverage

Explicitly remind the model of all its previous attention vectors:

$$c_t = \sum_{t'=0}^{t-1} a^{t'}$$

$$e_i^t = v^T \tanh(W_h h_i + W_s s_t + w_c c_t^t + b)$$

Enforce divergence between the current attention vector and the sum of the previous ones:

$$\text{covloss} = \sum_i \min(a_i^t, c_i^t)$$

(Gu et al 2016; See et al 2017)

Copying for summarization

Original Text (truncated): lagos, nigeria (cnn) a day after winning nigeria's presidency, *muhammadu buhari* told cnn's christiane amannpour that **he plans to aggressively fight corruption that has long plagued nigeria** and go after the root of the nation's unrest. *buhari* said he'll "rapidly give attention" to curbing violence in the northeast part of nigeria, where the terrorist group boko haram operates. by cooperating with neighboring nations chad, cameroon and niger, **he said his administration is confident it will be able to thwart criminals** and others contributing to nigeria's instability. for the first time in nigeria's history, the opposition defeated the ruling party in democratic elections. *buhari* defeated incumbent goodluck jonathan by about 2 million votes, according to nigeria's independent national electoral commission. **the win comes after a long history of military rule, coups and botched attempts at democracy in africa's most populous nation.**

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(See et al
2017)