

Introduction to Seq2Seq Models

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Abolfazl Mahdizade

Outline

- *Introduction and Concepts*
- *High Level View*
- *Seq2Seq Different Views*
- *What is Embedding*
- *Why Seq2Seq Works*
- *Seq2Seq Training*
- *Seq2Seq with TensorFlow*

Sequence to Sequence Model: Introduction and Concepts

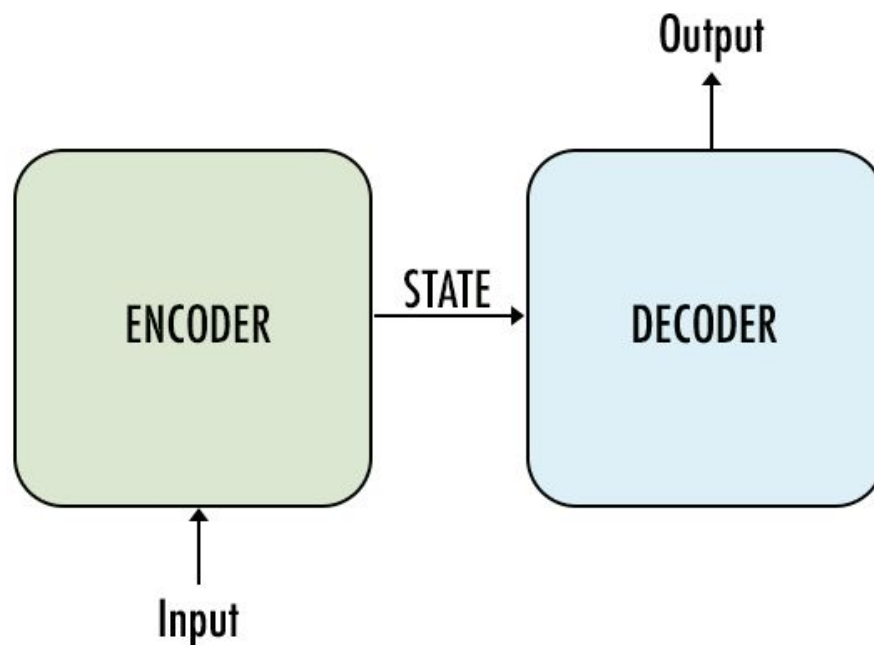
<https://goo.gl/4tky9Q>

<https://indico.io/blog/sequence-modeling-neuralnets-part1>

<https://github.com/tensorflow/nmt>

High Level View

- A seq2seq model has encoder, decoder and intermediate step as its main components



High Level View (Continue)

- *Encoder*

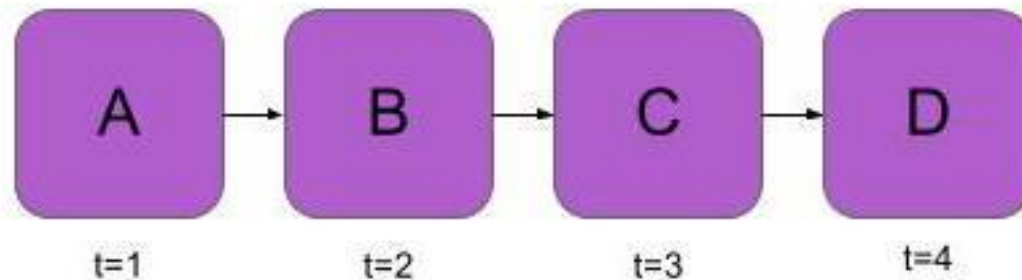
- *A model (LSTM) converts an input sequence (such as an English sentence) into a fixed representation (called Context Vector)*

- *Decoder*

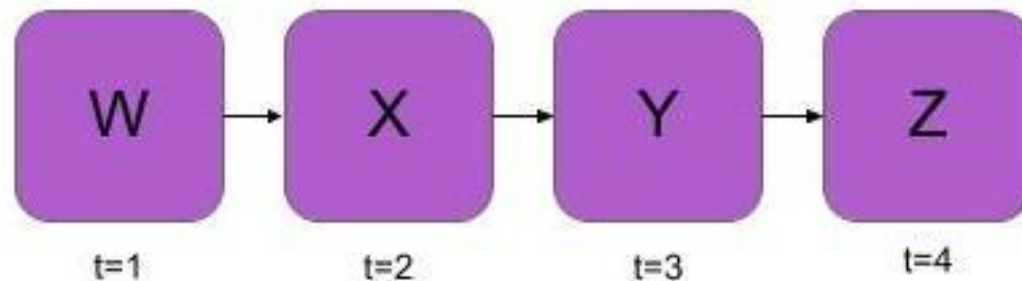
- *A model (LSTM) is trained on both the output sequence (such as the translated sentence) as well as the fixed representation from the encoder*

Seq2Seq Different Views

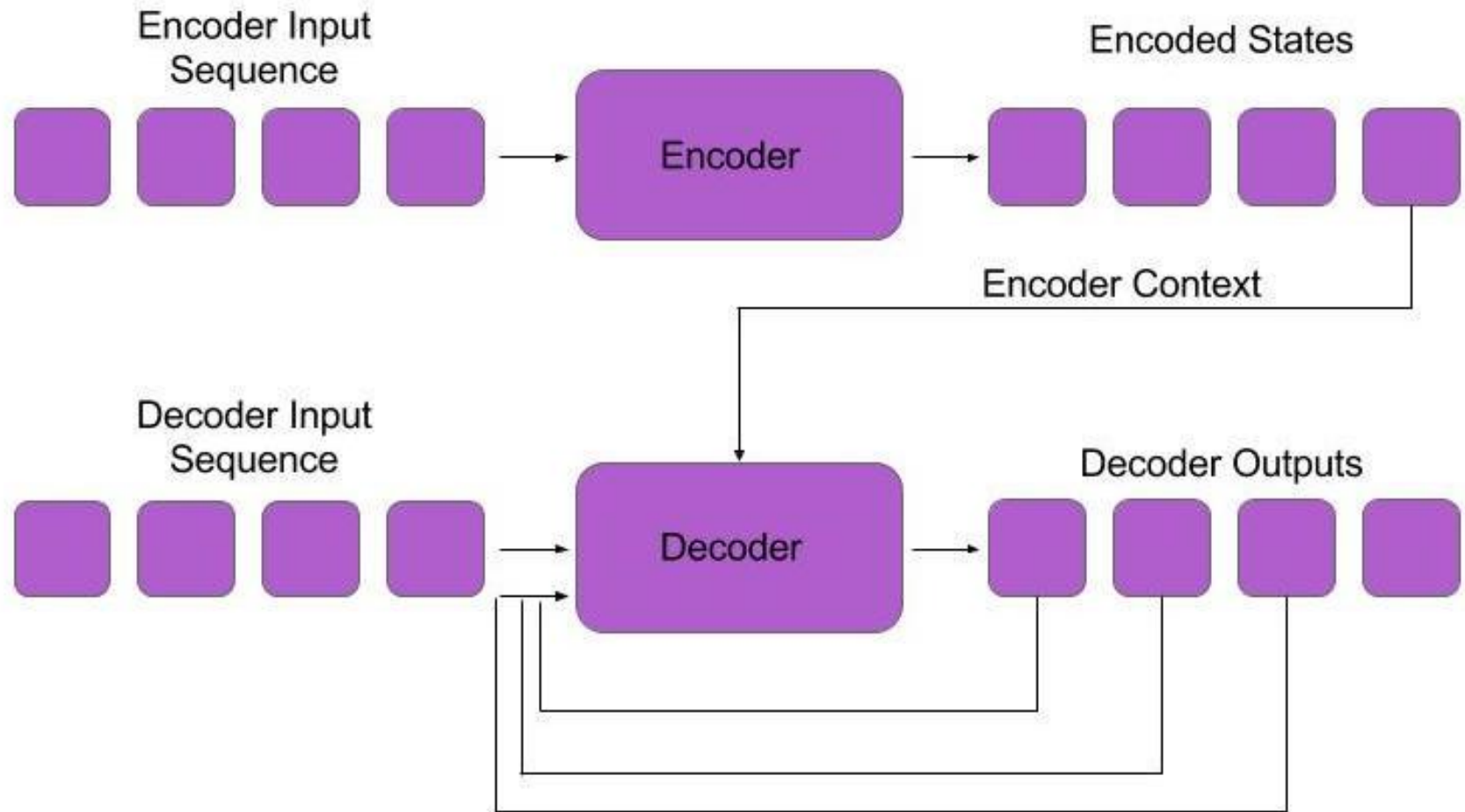
Input Sequence



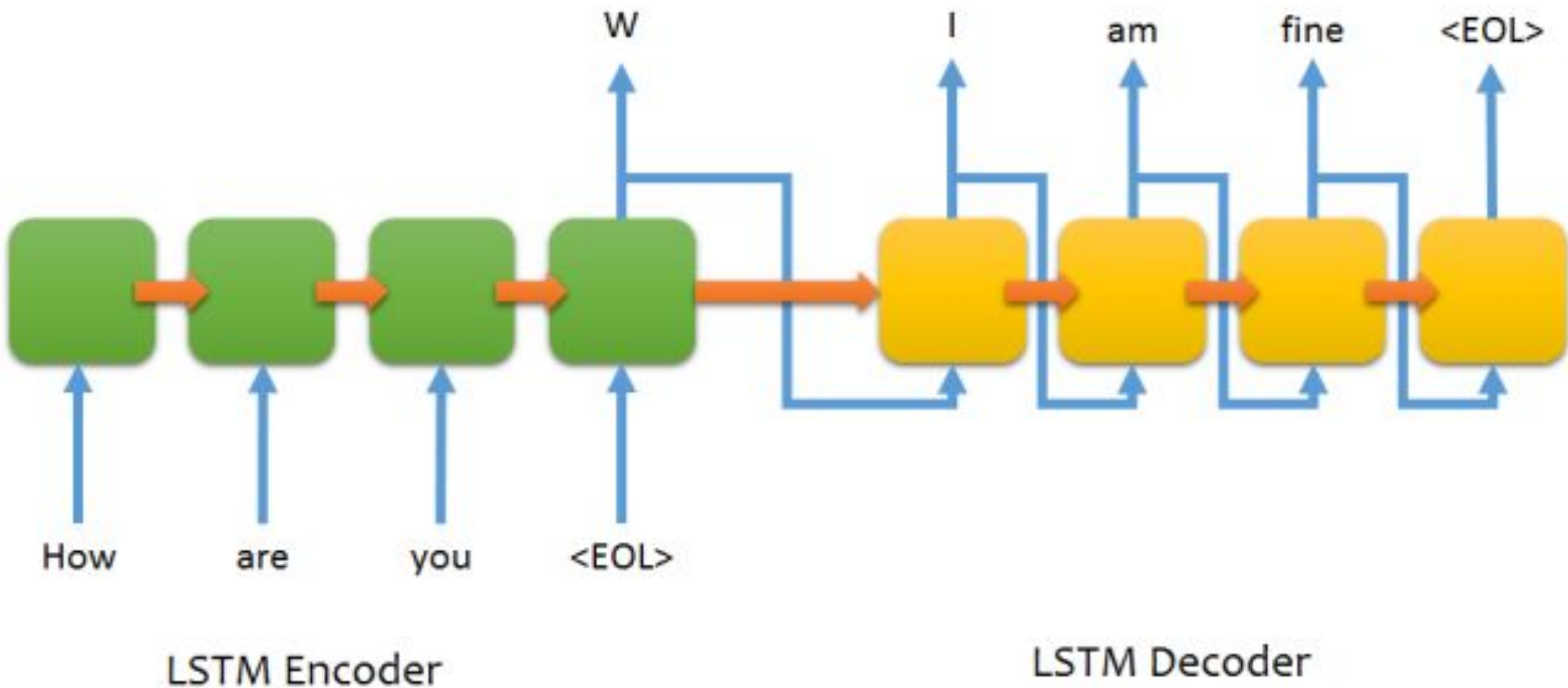
Target Sequence



Seq2Seq Different Views (Continue)



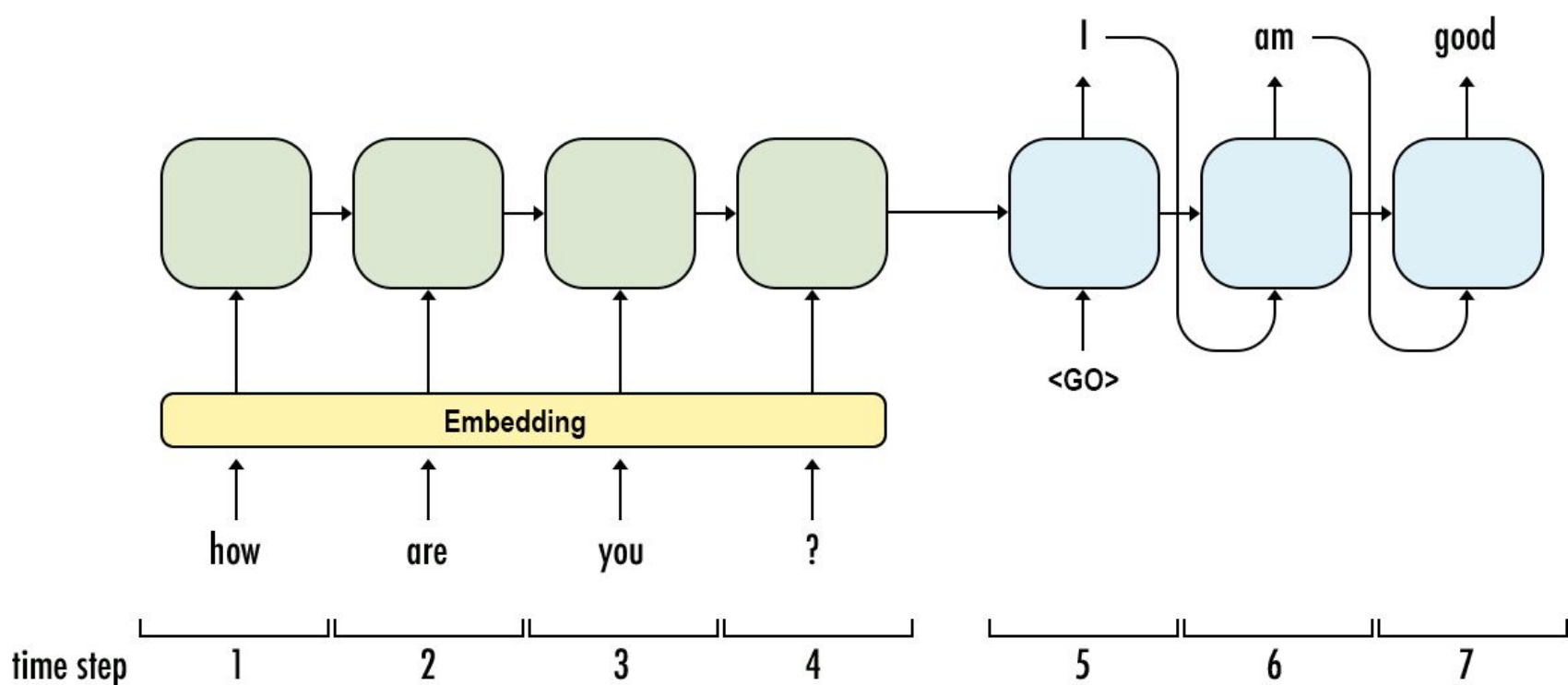
Seq2Seq Different Views (Continue)



Seq2Seq Different Views (Continue)

ENCODER

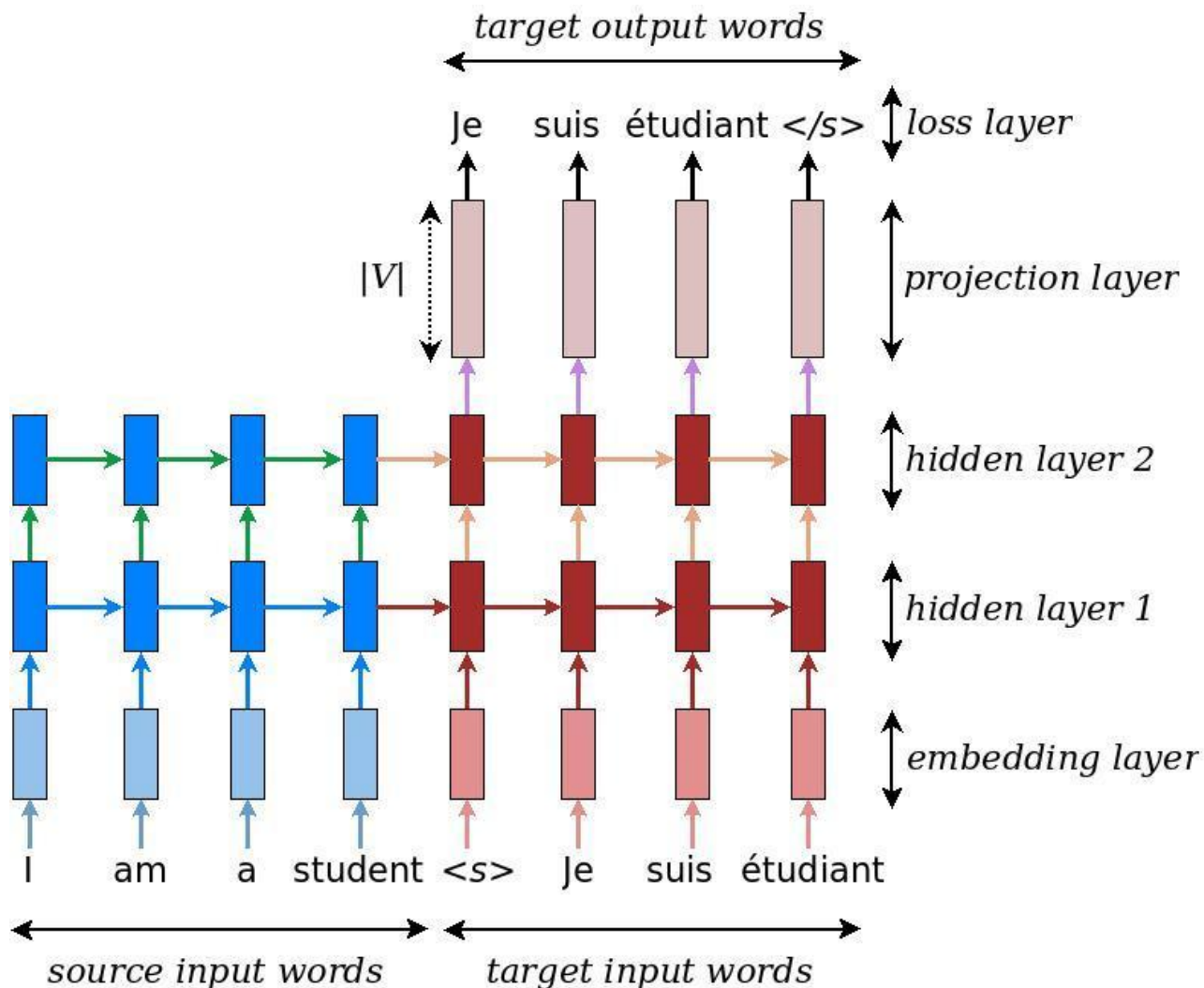
DECODER



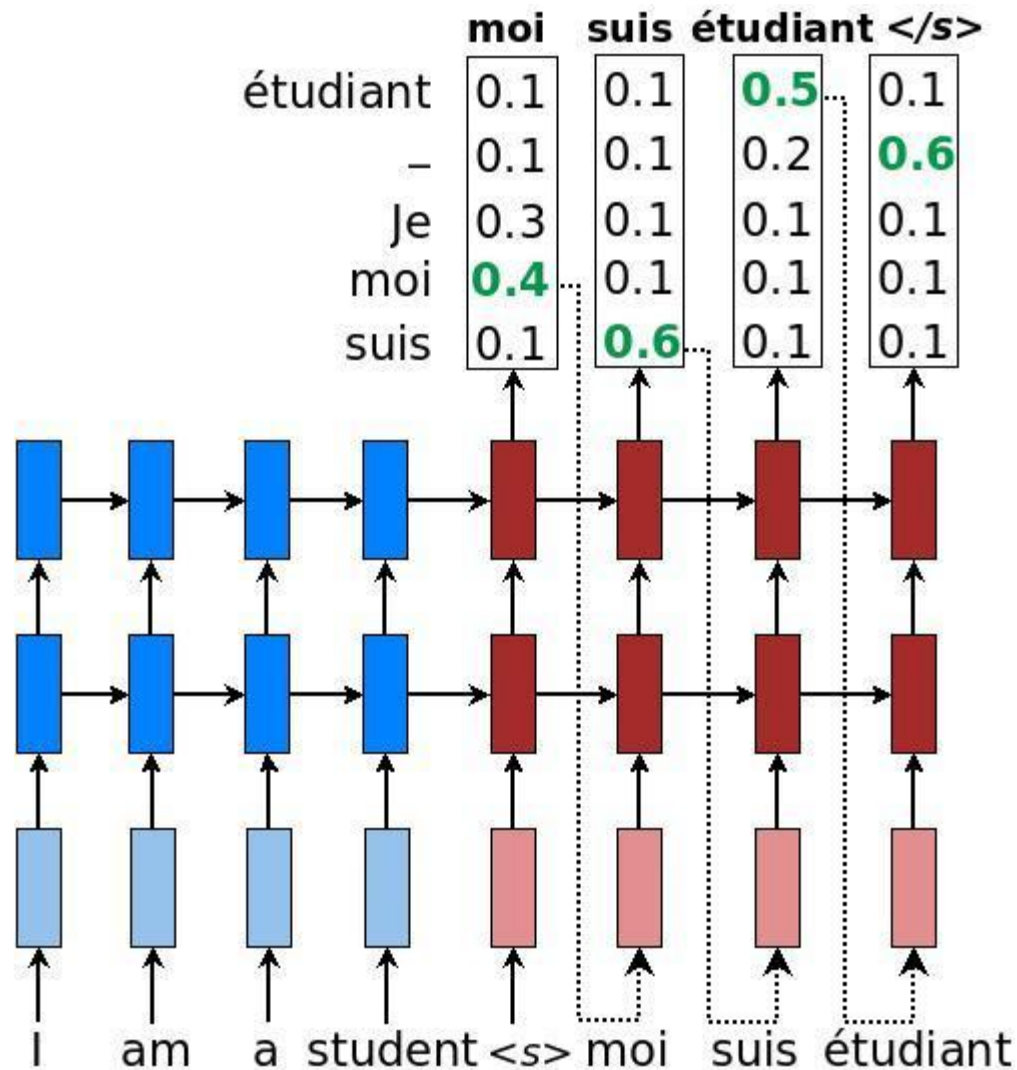
What is Embedding

- *Similar to Word2Vec*
 - *Dense Representation of Words in Vector Space*
- *Pretrain Embeddings*
 - *Word2Vec*
 - *GloVe*
- *Embedding Layer*
 - *Lookup table (2D weights)*

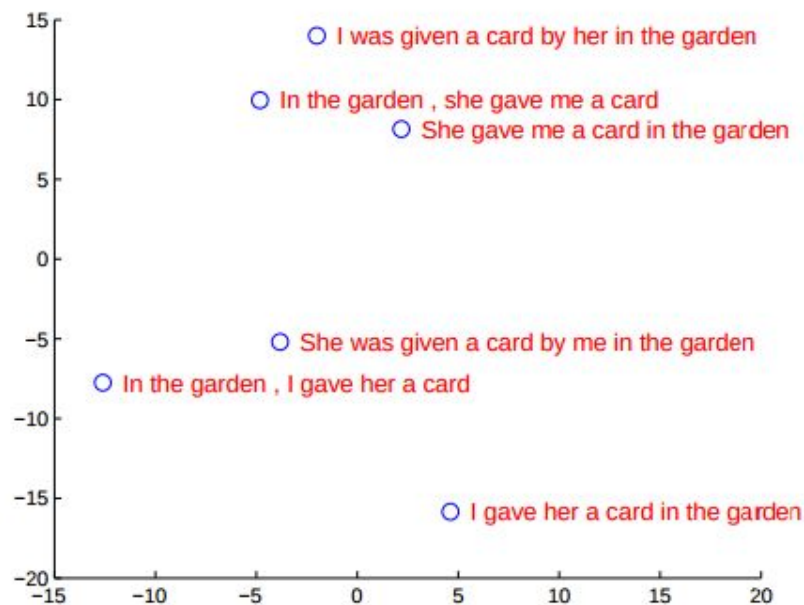
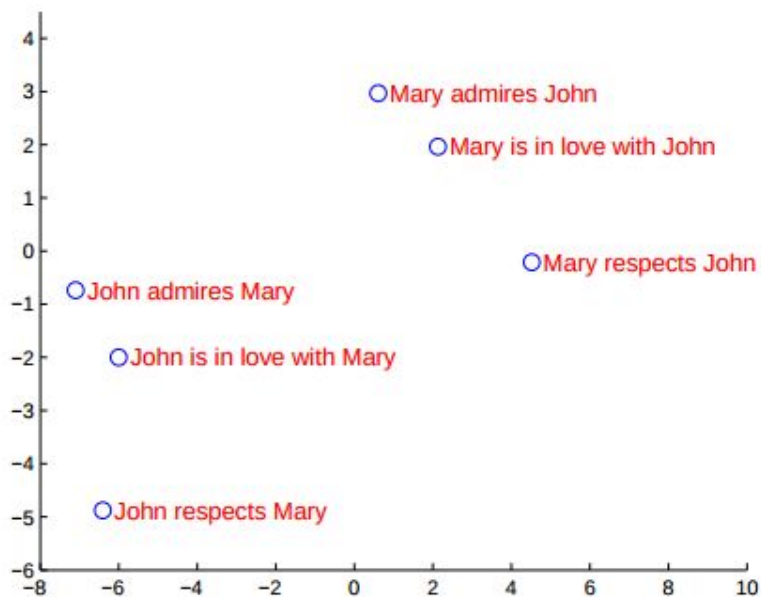
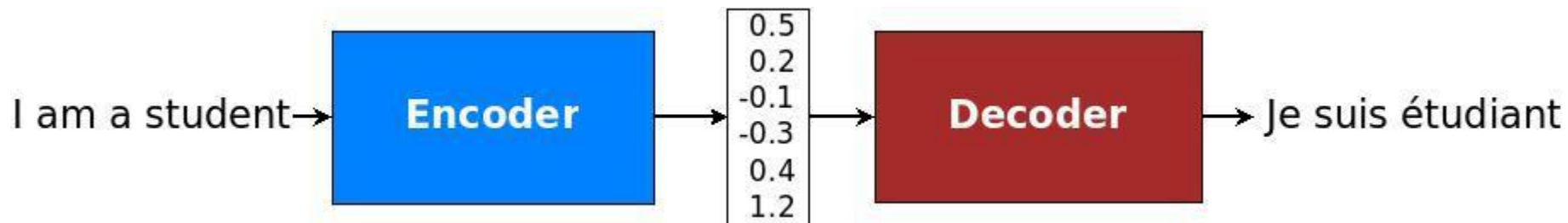
Seq2Seq Different Views (Continue)



Seq2Seq Different Views (Continue)



Why Seq2Seq Works

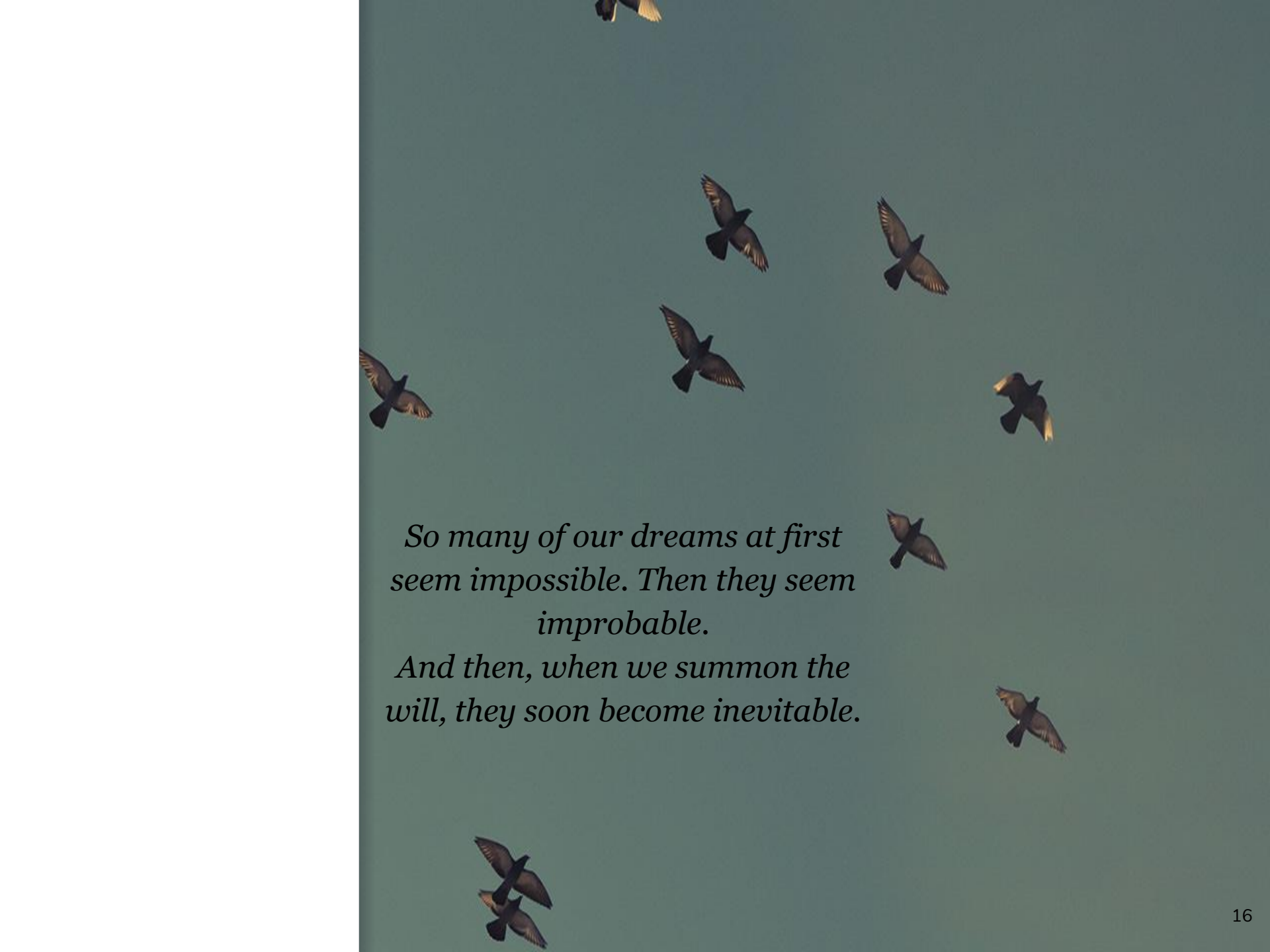


Seq2Seq Training

- *Inputs*
 - *A tensor contains IDs of the words in the sequence*
 - *IDs (numbers, 0, 1, 2, ...) stands for one hot vectors*
- *Some specific symbols (Spans)*
 - $\langle \text{PAD} \rangle = 0$
 - $\langle \text{EOS} \rangle = 1$
 - $\langle \text{UNK} \rangle = 2$

Seq2Seq Training (Continue)

- *<PAD>*
 - *Feed inputs in batch*
 - *The inputs in these batches all need to be the same width for the network to do its calculation*
 - *However examples are not of the same length*
 - *You should pad shorter inputs to bring them to the same width of the batch*
- *<EOS>*
 - *It is important on the decoder side*
 - *It tells the decoder where a sentence ends, and it allows the decoder to indicate the same thing in its outputs as well*
- *<UNK>*
 - *Use for unknown words*
 - *Unknown words = rare words in the corpora*

The background is a solid teal color. Scattered across the page are several birds in flight, likely pigeons or doves, shown from a side-on perspective with their wings spread. They are positioned at various heights and locations: one near the top center, one near the top right, one on the left side, one in the center, one on the right side, one near the bottom left, and one near the bottom right. The text is centered in the lower half of the image.

*So many of our dreams at first
seem impossible. Then they seem
improbable.*

*And then, when we summon the
will, they soon become inevitable.*