

# Demo: Neural Machine Translation

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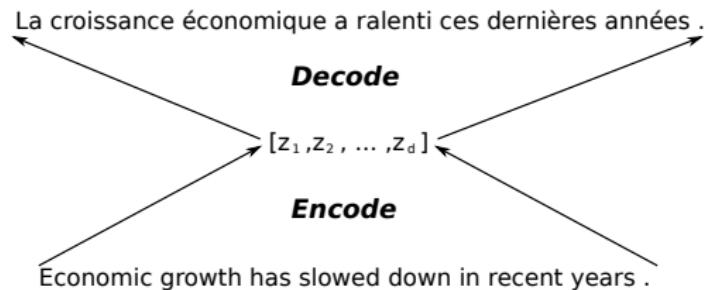
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# Machine Translation as Nothing, but a *Supervised Learning Task*



## Properties

- ▶ *Variable-length* input/output
- ▶ *Many-to-many* mapping
- ▶ *End-to-end* trainable

## Implications

- ▶ *Order-sensitive*
- ▶ *Probabilistic*
- ▶ *End-to-end Smooth*

# Learning to Align and Translate Jointly – (1)

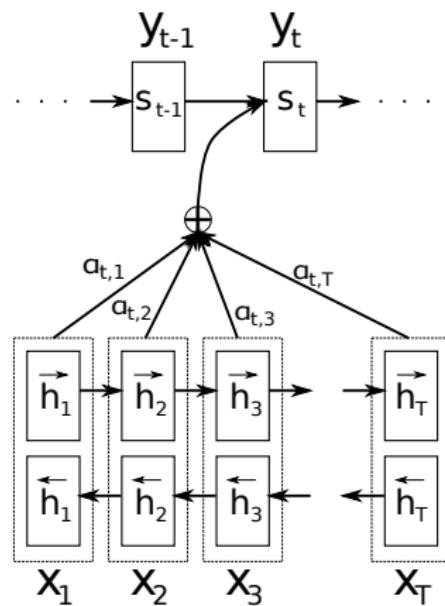
Annotation vector  $h_j = [\overrightarrow{h}_j; \overleftarrow{h}_j]$

- ▶  $\overrightarrow{h}_j$ : Forward RNN
- ▶  $\overleftarrow{h}_j$ : Backward RNN

For each target word  $y_t$ ,

1. Compute  $\alpha_{t,j} = f(h_j, s_{t-1})$ 
  - ▶  $\sum_j \alpha_{t,j} = 1$
  - ▶  $f$  is a feedforward neural network
2. Get a context vector  $c_t = \sum_j \alpha_{t,j} h_j$

And, train the whole model  
with SGD and backpropagation!



## Learning to Align and Translate Jointly – (2)

The agreement on the European Economic Area was signed in August 1992 .

L' accord sur l' Espace économique européen a été signé en août 1992 .

A diagram illustrating word alignment between two sentences. Above the English sentence, there are seven vertical lines. Below the French sentence, there are ten vertical lines. Curved lines connect specific words from one sentence to corresponding words in the other. For example, the first word 'L'' in French aligns with 'The' in English, and 'accord' aligns with 'agreement'. The word 'européen' in French has two arrows pointing to 'European' in English, indicating it covers both 'European' and 'Economic'.

" This will change my future with my family , " the man said .

" Cela changera mon avenir avec ma famille " , dit l' homme .

A diagram illustrating word alignment between two sentences. Above the English sentence, there are seven vertical lines. Below the French sentence, there are ten vertical lines. Curved lines connect specific words from one sentence to corresponding words in the other. For example, 'Cela' in French aligns with 'This' in English, and 'famille' aligns with 'family'. The word 'homme' in French has two arrows pointing to 'man' in English, indicating it covers both 'man' and 'male'.

Demo available now at...

<http://lisa.iro.umontreal.ca/mt-demo>