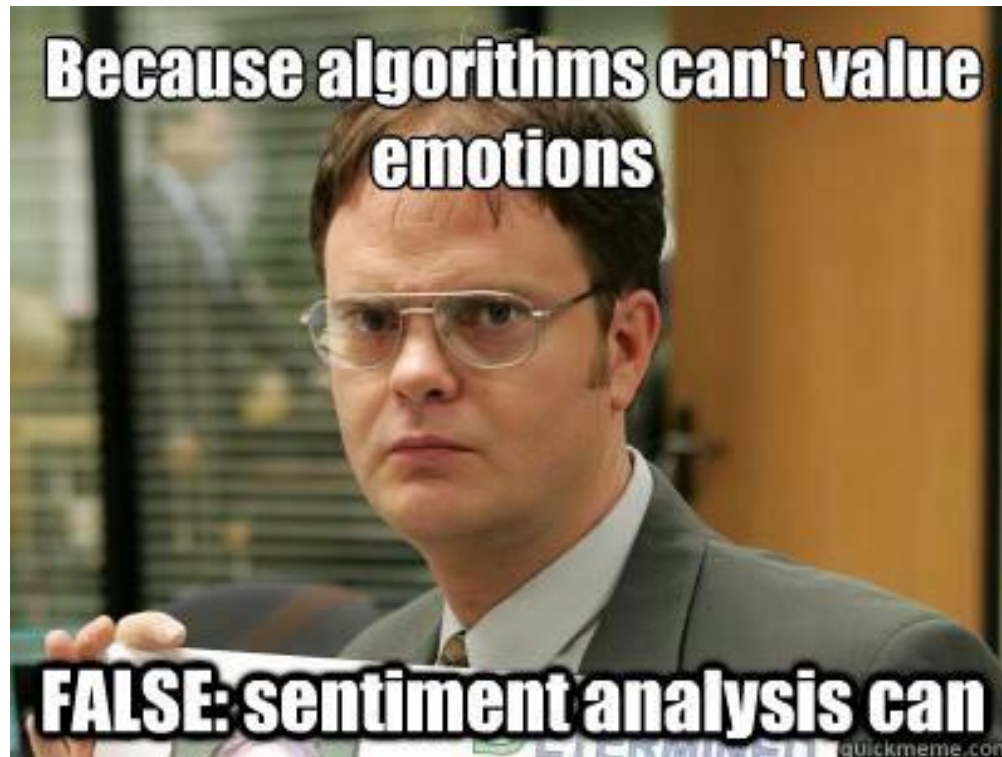


CISC 372

Text Analytic III

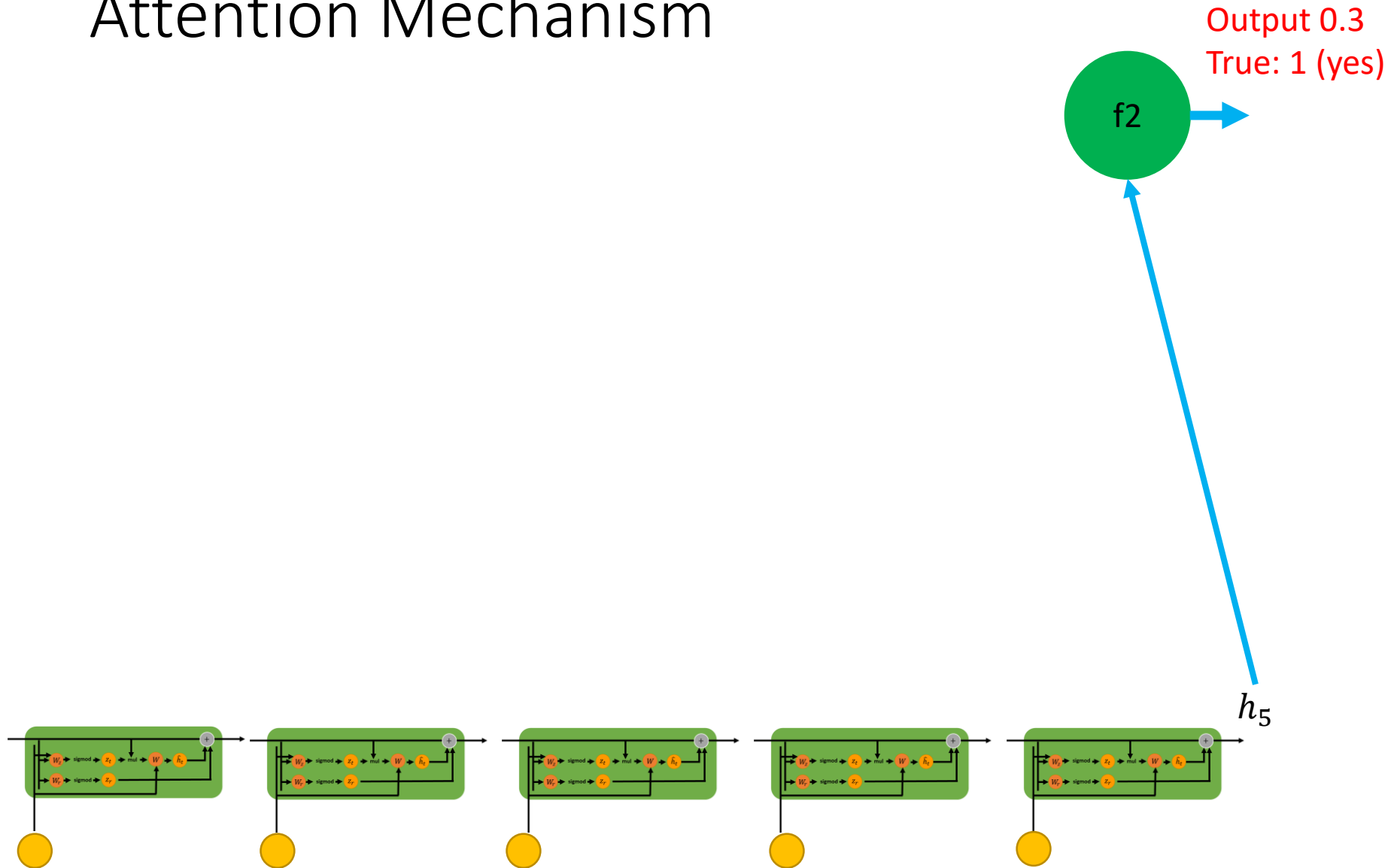
NLP Cont'd



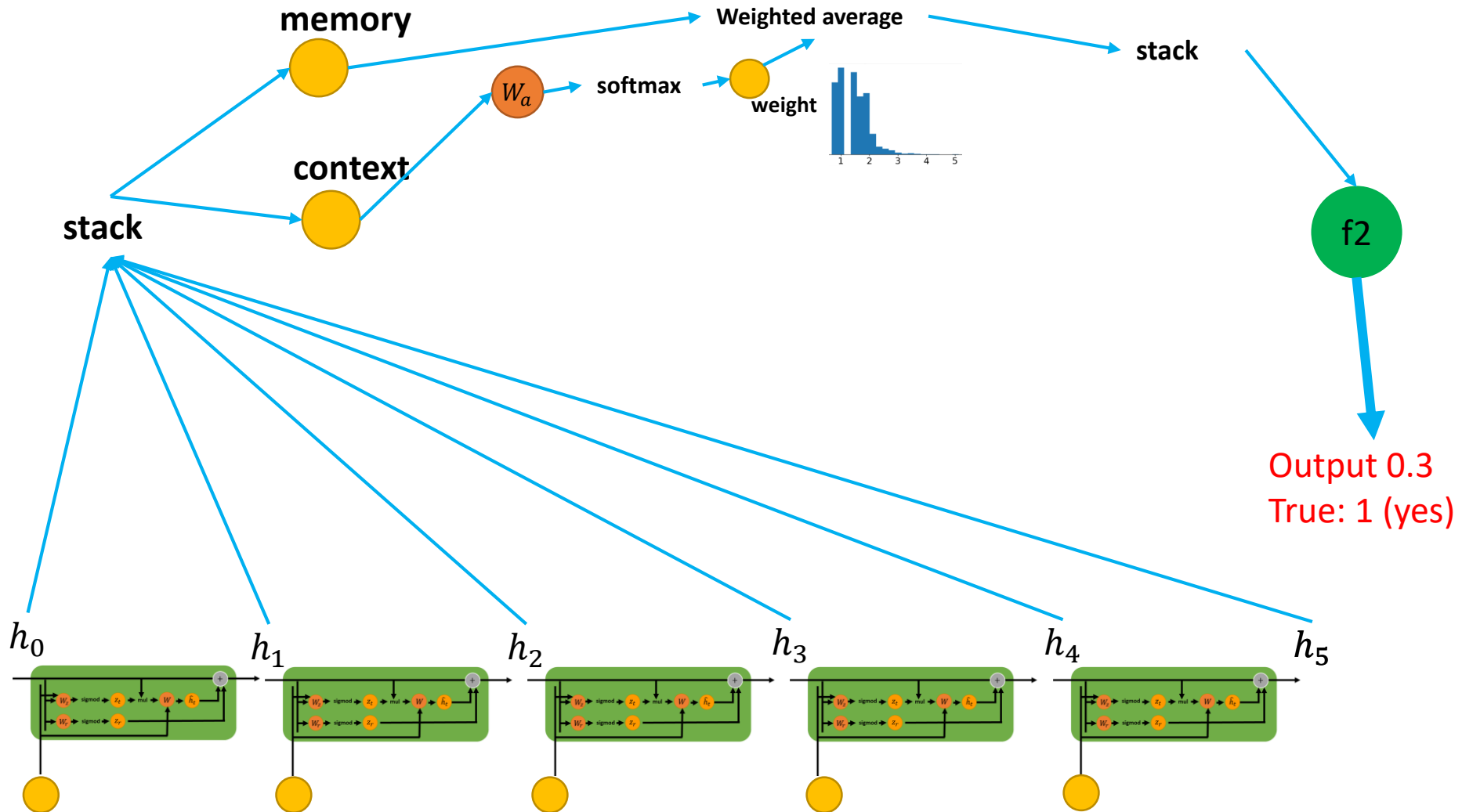
Last lectures

- Text Analysis
 - Vanilla RNN
 - Gated Recurrent Unit
 - LSTM
 - Attention Mechanism

Attention Mechanism



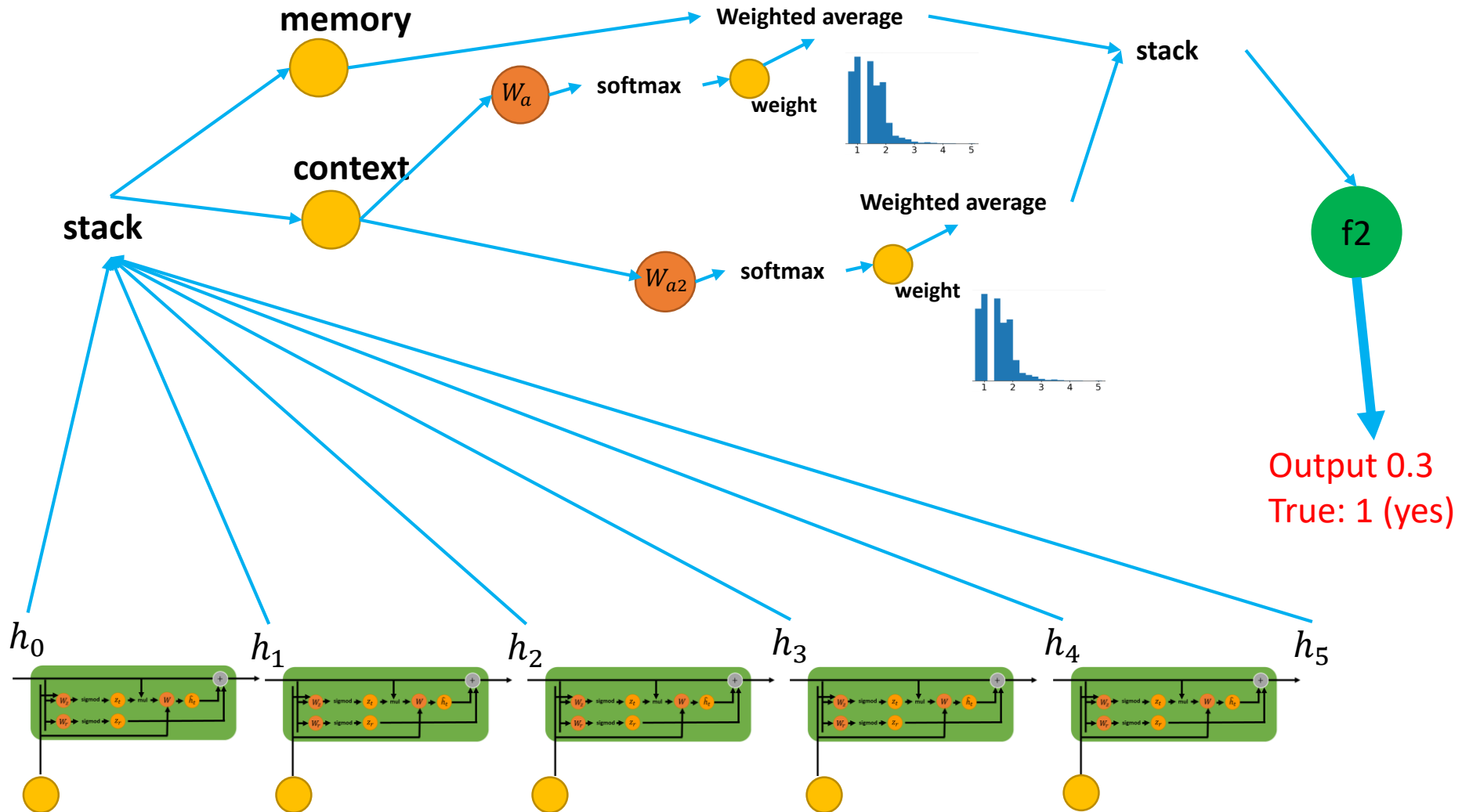
Attention Mechanism



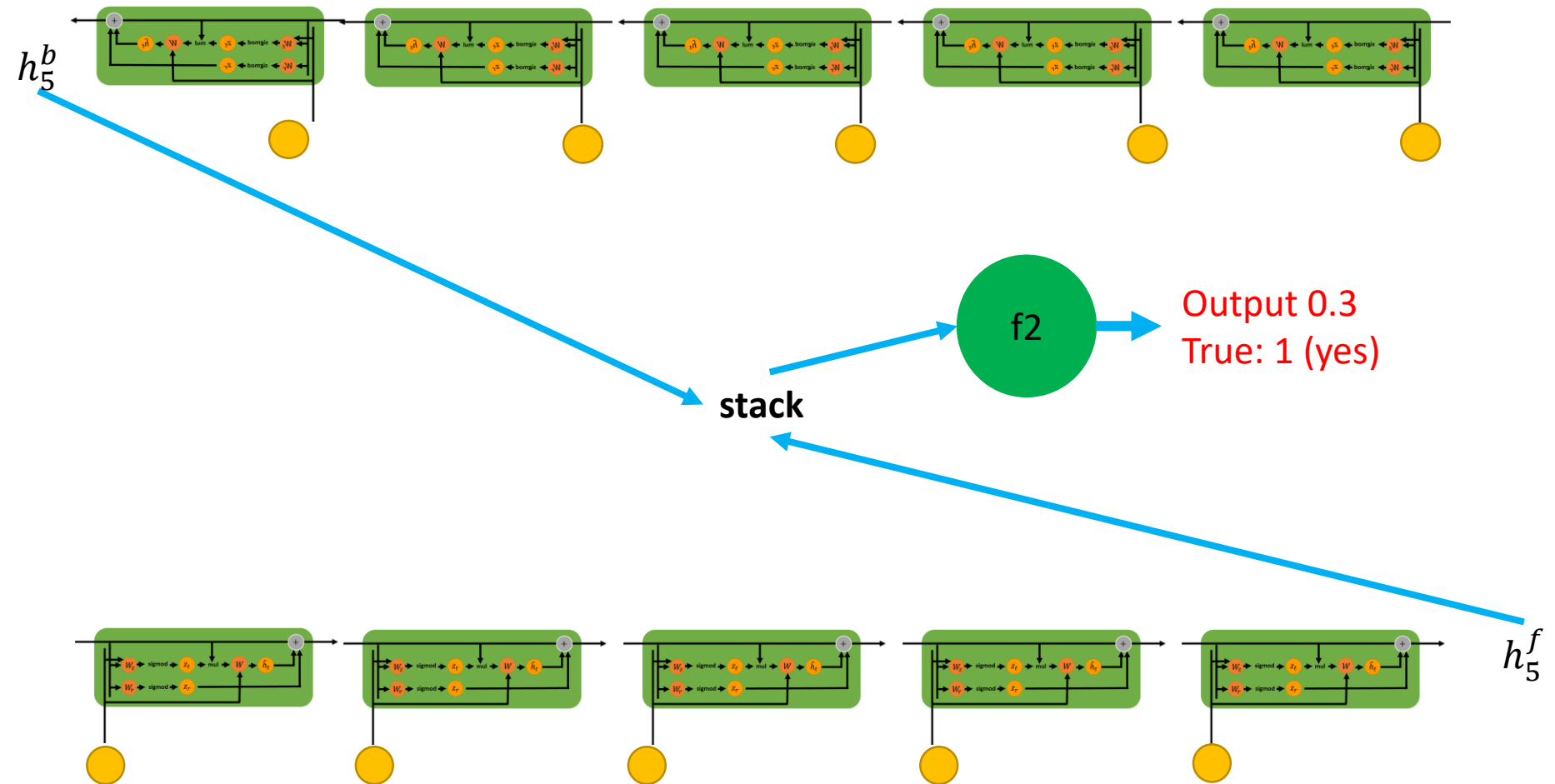
Attention Mechanism - Explainability

- I really enjoy Ashley and Ami salon she do a great job be friendly and professional I usually get my hair do when I go to MI because of the quality of the highlight and the price the price be very affordable the highlight fantastic thank Ashley i highly recommend you and ill be back
- love this place it really be my favorite restaurant in Charlotte they use charcoal for their grill and you can taste it steak with chimichurri be always perfect Fried yucca cilantro rice pork sandwich and the good tres lech I have had.The desert be all incredible if you do not like it you be a mutant if you will like diabeetus try the Inca Cola
- this place be so much fun I have never go at night because it seem a little too busy for my taste but that just prove how great this restaurant be they have amazing food and the staff definitely remember us every time we be in town I love when a waitress or waiter come over and ask if you want the cab or the Pinot even when there be a rush and the staff be run around like crazy whenever I grab someone they instantly smile acknowlegde us the food be also killer I love when everyone know the special and can tell you they have try them all and what they pair well with this be a first last stop whenever we be in Charlotte and I highly recommend them
- great food and good service what else can you ask for everything that I have ever try here have be great
- first off I hardly remember waiter name because its rare you have an unforgettable experience the day I go I be celebrate my birthday and let me say I leave feel extra special our waiter be the best ever Carlos and the staff as well I be with a party of 4 and we order the potato salad shrimp cocktail lobster amongst other thing and boy be the food great the lobster be the good lobster I have ever eat if you eat a dessert I will recommend the cheese cake that be also the good I have ever have it be expensive but so worth every penny I will definitely be back there go again for the second time in a week and it be even good this place be amazing

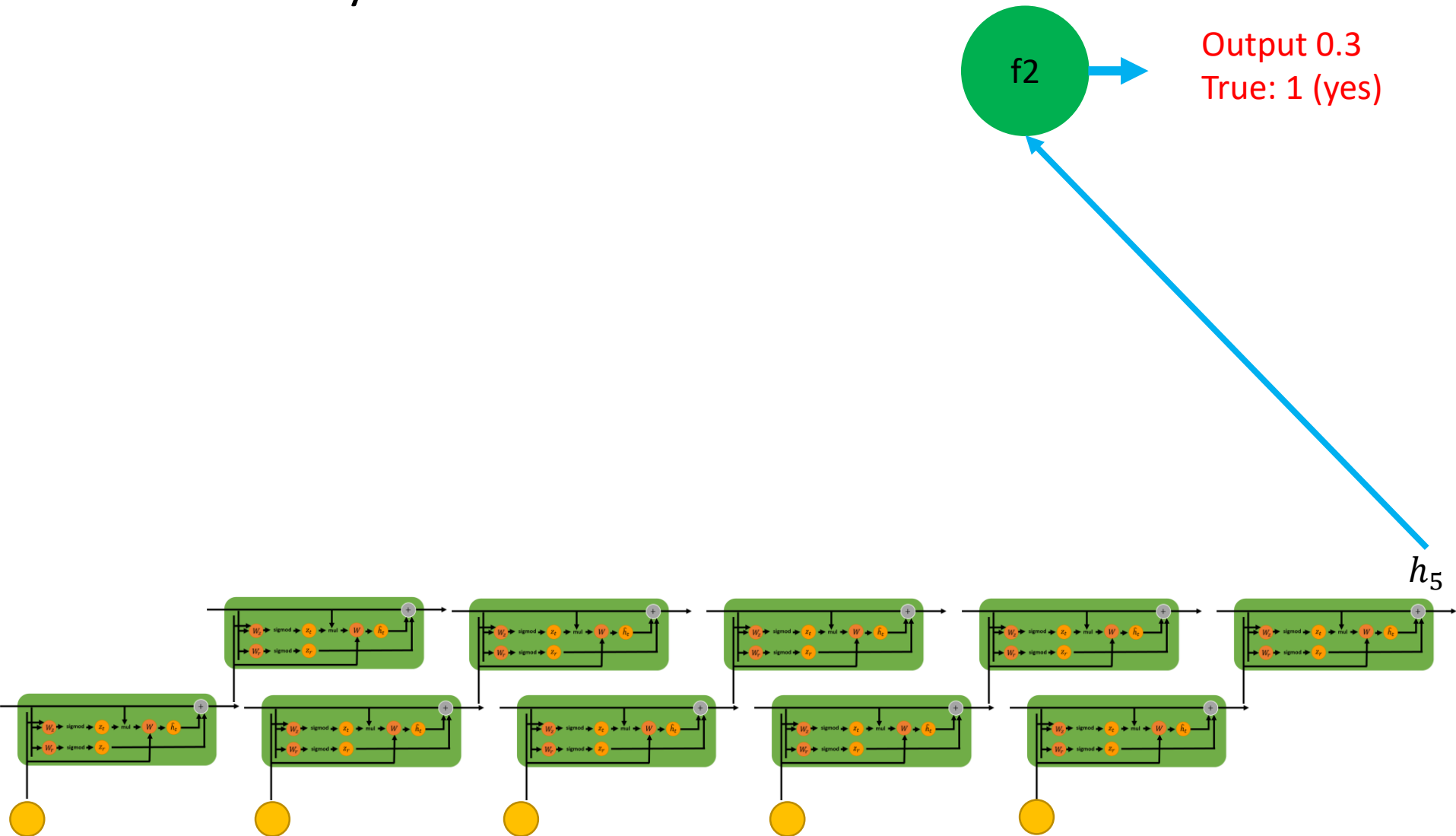
Multi-Head Attention Mechanism (here we have two heads)



Bidirectional Neural Network



Multi-layer RNN

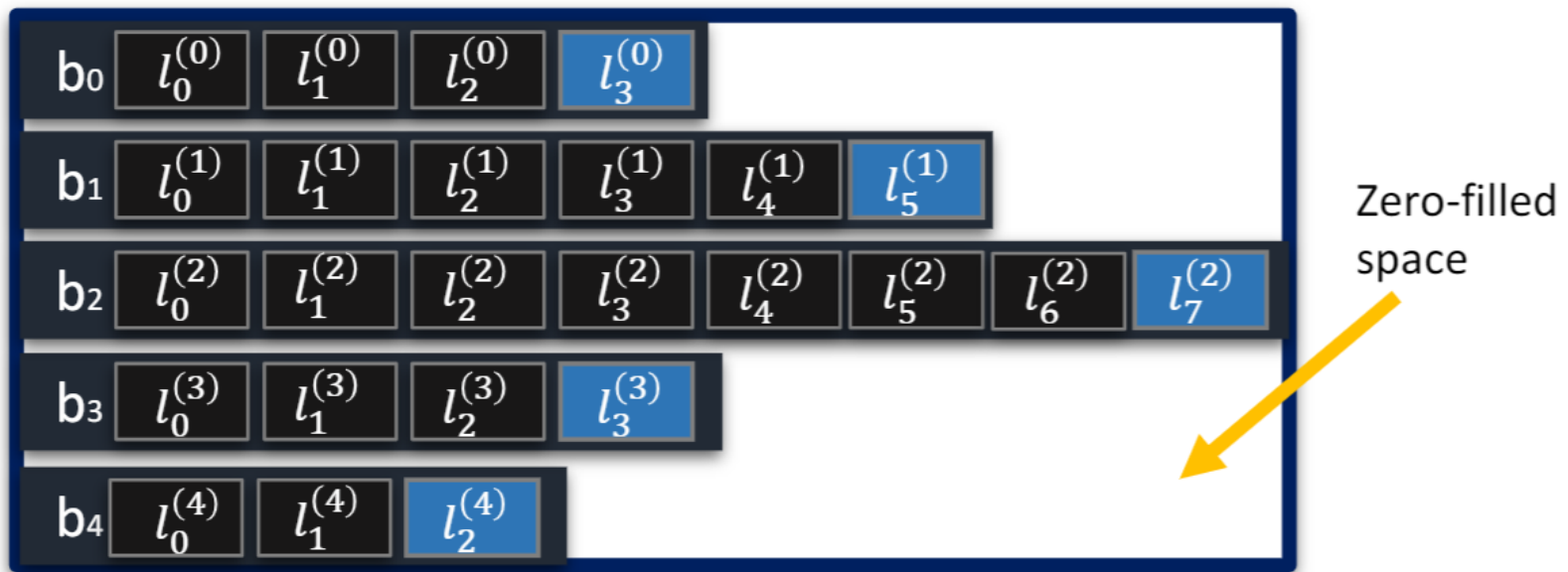


More designs..

- Multi-layer RNN
- Bidirectional RNN
- Multi-layer Bidirectional RNN
- + Attention
- + Multi-head Attention

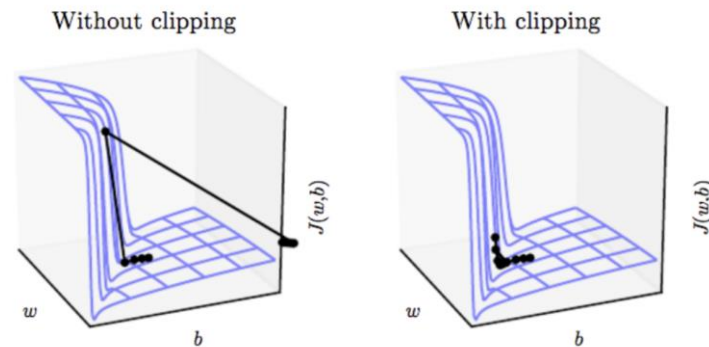
Training Tricks - Padding

- Sequence comes with different length
 - Padding sequence with a special token
 - Typically a <EOS> token



Training Tricks – Gradient Clipping

- Normalize (clipping) the gradient
- Limit the scale of gradient
 - If gradient explode happens:
 - Avoid the number to be too large



```
optimizer = tf.train.AdamOptimizer(1e-3)
```

```
gradients, variables = zip(*optimizer.compute_gradients(loss))
```

```
gradients, _ = tf.clip_by_global_norm(gradients, 5.0)
```

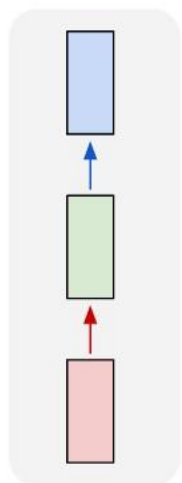
```
optimize = optimizer.apply_gradients(zip(gradients, variables))
```

— Goodfellow et al., *Deep Learning*

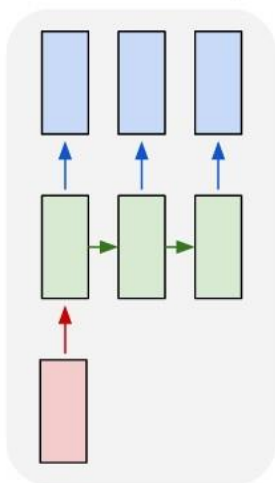
Multiple layers of recurrent neural network

- What we have learned so far:
 - Single-label supervised learning
 - Suitable for multiple input/output types:
 - Many-to-One: Sentiment Analysis
 - Many-to-Many: Translation
 - Many-to-Many (aligned): Part-Of-Speech Tag Learning

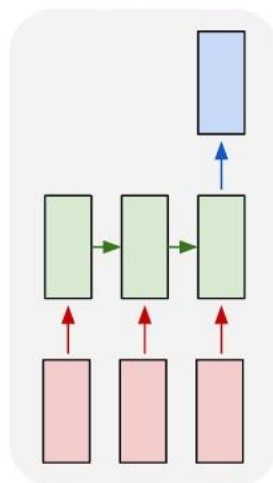
one to one



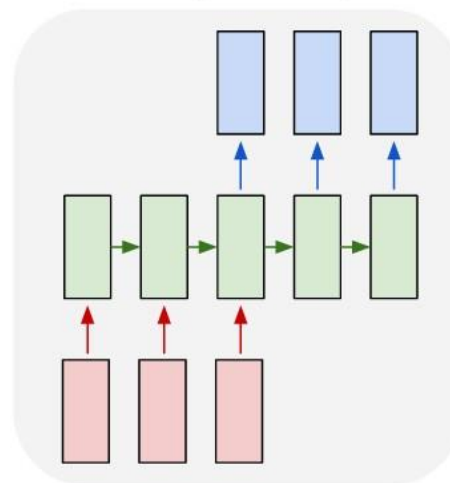
one to many



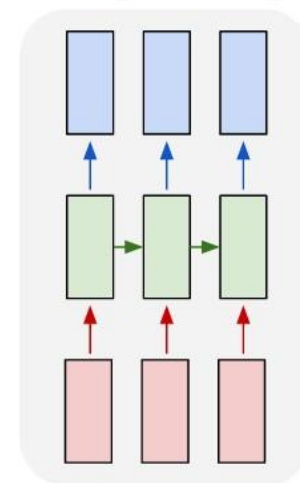
many to one



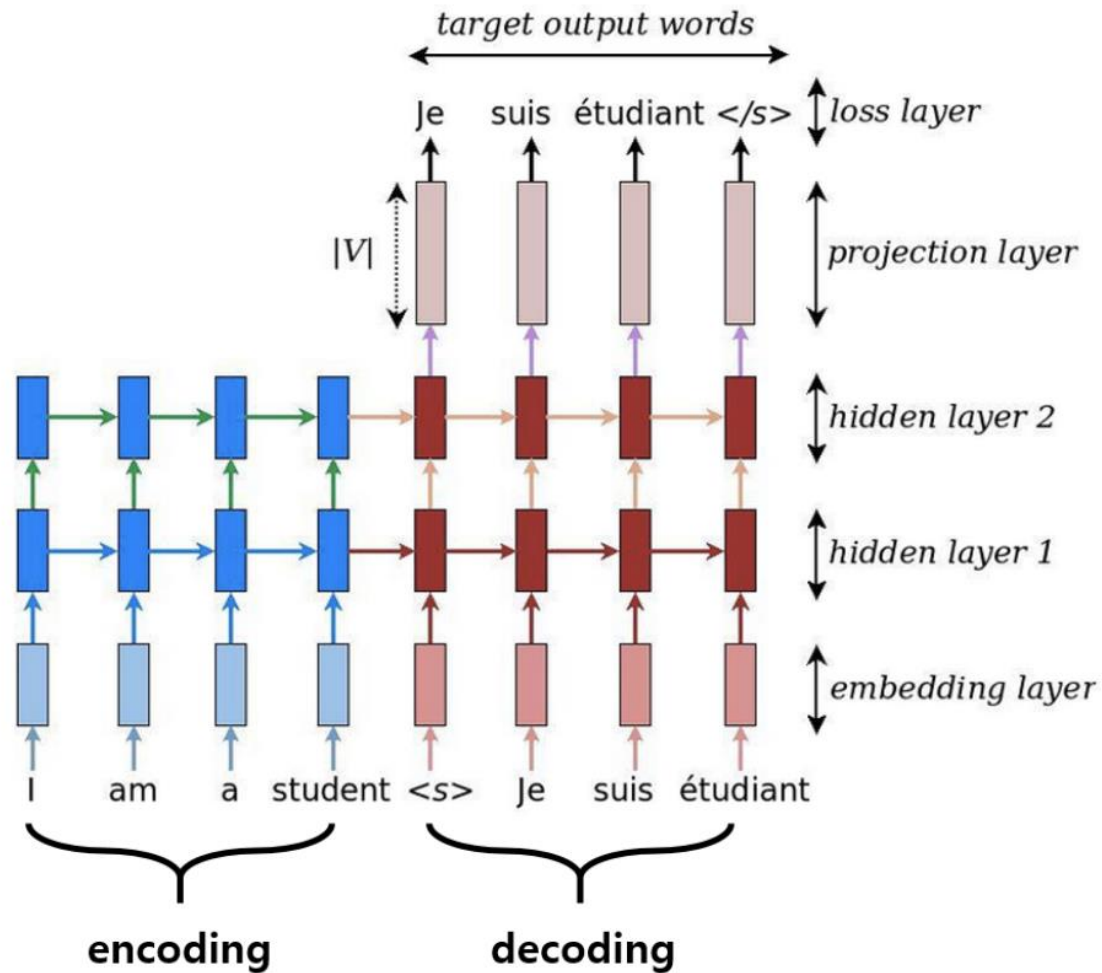
many to many



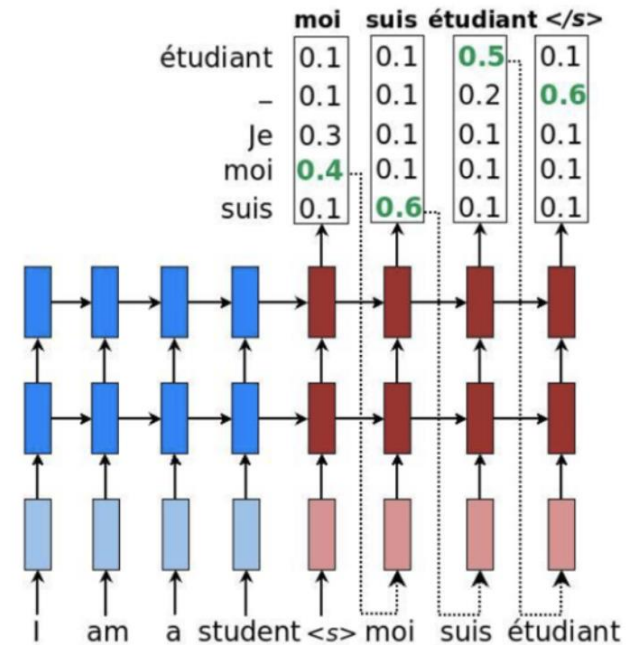
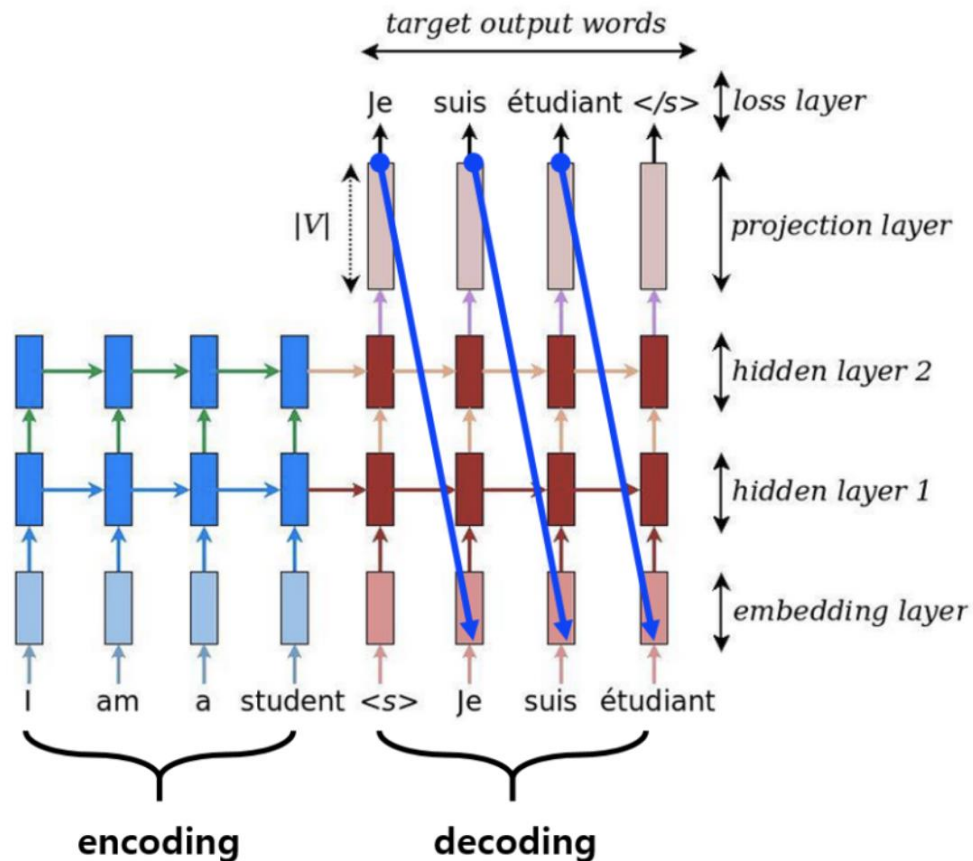
many to many



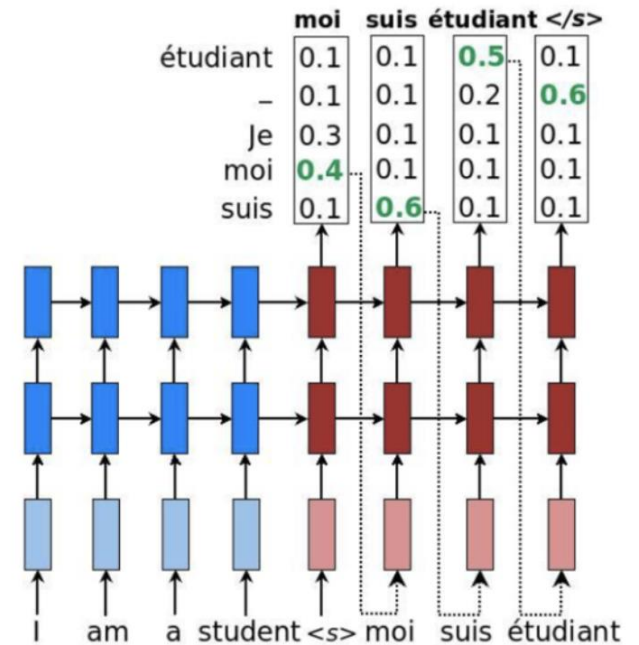
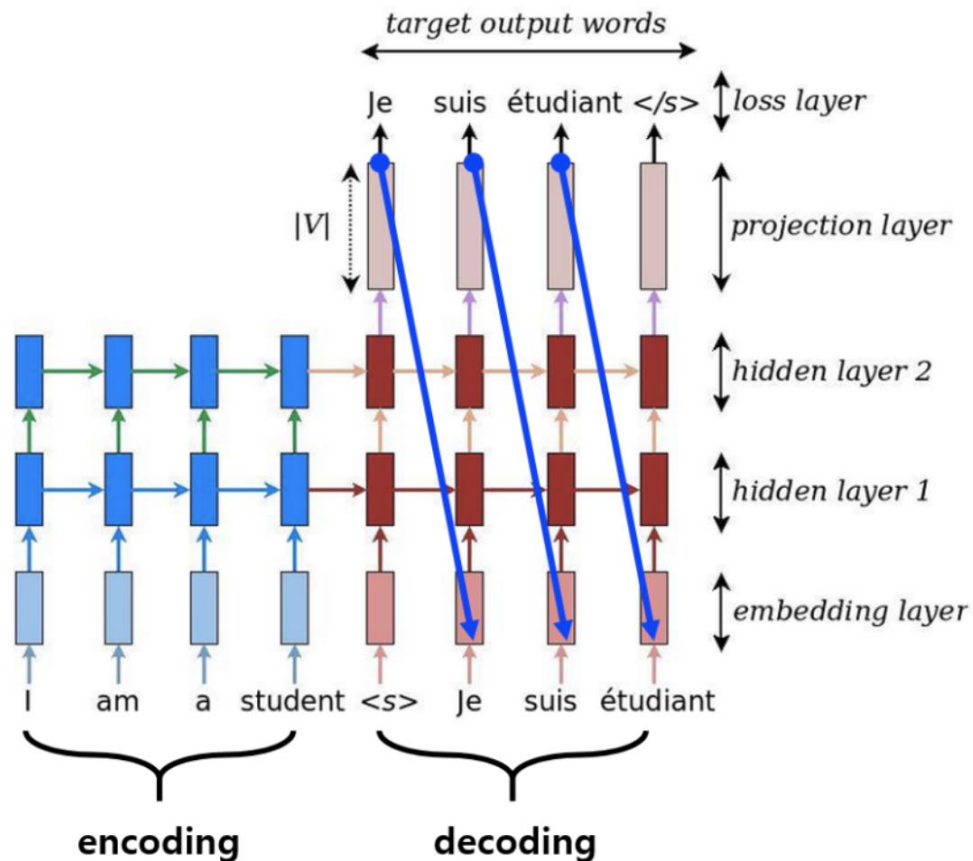
Many-to-Many (Training)



Many-to-Many (Testing)



Many-to-Many (Testing)



Many-to-Many (with Attention)

