

Deep Learning을 활용한 Language Sequence 처리

DEEP LEARNING AND NATURAL LANGUAGE PROCESSING

10

APPLICATION

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and learn like humans.

The term may also be applied to any machine that exhibits intelligent behavior, such as learning and problem-solving.

Artificial intelligence (AI) refers to the simulation of human intelligence.

Notice

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Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and learn like humans.

이 교육과정은 교육부 ‘성인학습자 역량 강화 교육콘텐츠 개발’ 사업의 일환으로써
교육부로부터 예산을 지원 받아 고려사이버대학교가 개발하여 운영하고 있습니다.
제공하는 강좌 및 학습에 따르는 모든 산출물의 저작권은 교육부, 한국교육학술정보원,
한국원격대학협의회와 고려사이버대학교가 공동 소유하고 있습니다.

THINKING

생각해보기

- ✓ Deep Learning을 활용한 Language Sequence 처리는 어떻게 할까요?

학습목표

Artificial Intelligence (AI) refers
to the simulation of human

GOALS

Artificial Intelligence has
helped to the simulation of
human intelligence in various
tasks and environments. It helps
us to understand and learn from
the world.

The technology can be applied
to various fields such as
healthcare, education, and
entertainment.

- 1 Seq2Seq 모델을 이해하고 설명할 수 있다.
- 2 Seq2Seq 모델이 사용되는 곳에 대해 이해하고 설명할 수 있다.
- 3 Encoder-Decoder 모델을 이해하고 설명할 수 있다.
- 4 Seq2Seq 모델의 작동 범위를 이해하고 설명할 수 있다.
- 5 실제 데이터를 통해 Seq2Seq 모델의 동작을 이해하고 설명할 수 있다.



"The more things you know, the better you
are at making decisions."
This is the motto of the book, and it is the motto
of the book.

Artificial Intelligence (AI) is the science of making
machines that can think like humans.
This book is the first book to introduce AI to the
general public.

CONTENTS

- 1 Sequence to Sequence
- 2 Encoder-decoder
- 3 Implementation & dataset
- 4 Encoder - Decoder inputs
- 5 Training
- 6 실습

학습내용

Artificial Intelligence (AI) refers
to the simulation of human

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APPLICATION

01

Seq2Seq 모델 이해



01 Sequence to Sequence란?

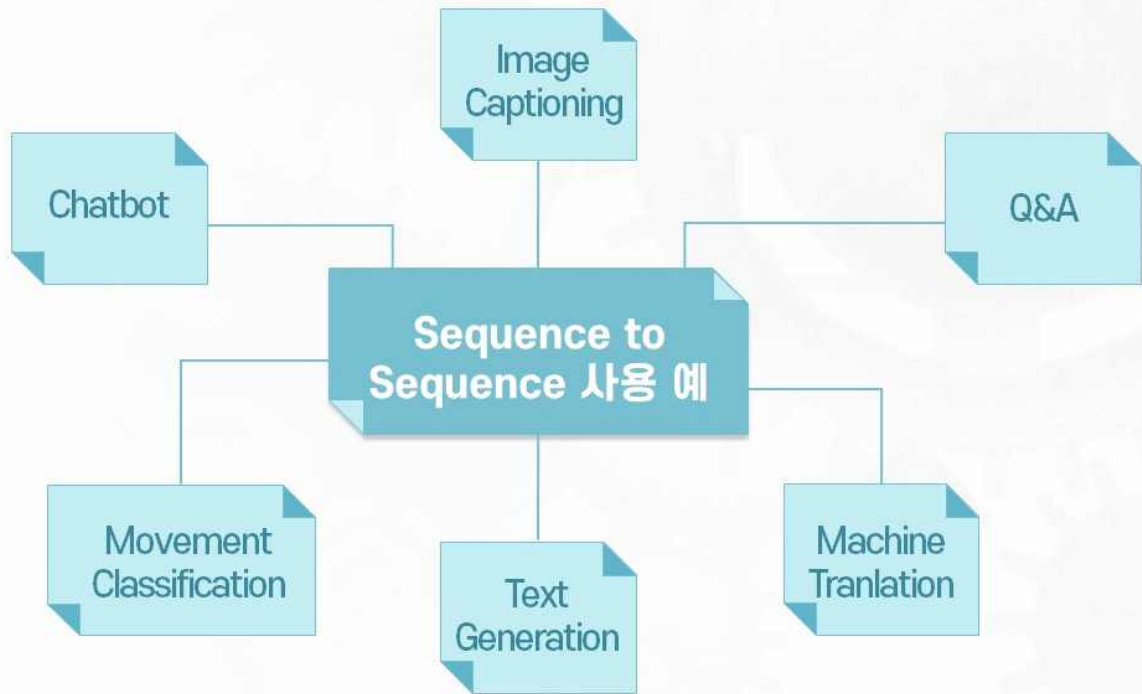
Artificial intelligence (AI) refers
to the simulation of human

연속된 형태의 Data를 입력 받아

연속된 형태의 Data를 **출력**하는 모델

02 Sequence to Sequence 사용 예

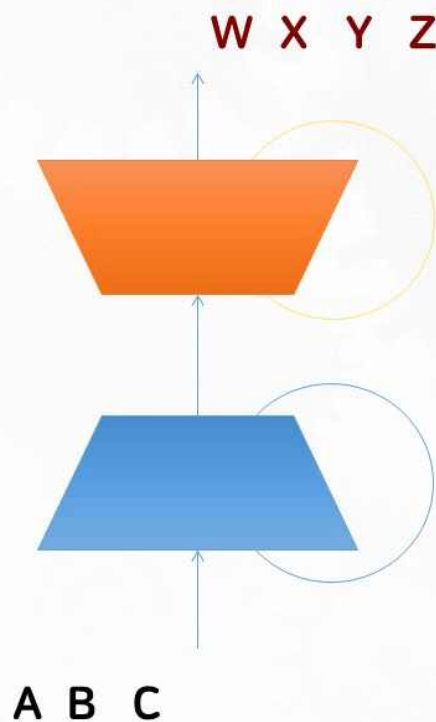
Artificial Intelligence (AI) refers
to the simulation of human



03 Encoder-decoder

Artificial Intelligence (AI) refers
to the simulation of human

 model

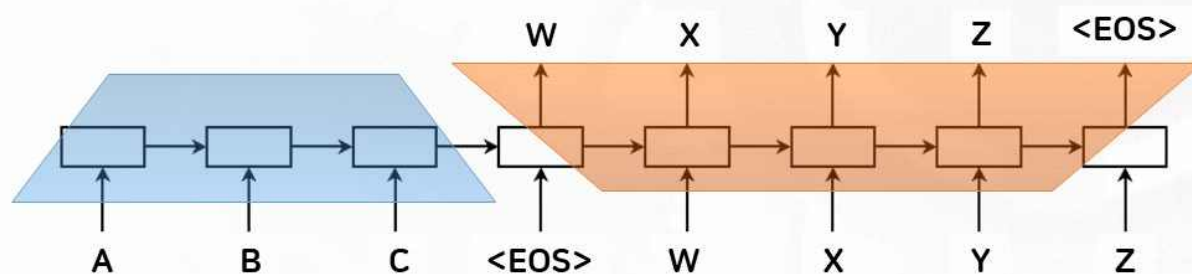


03 Encoder-decoder model

Artificial intelligence (AI) relies on the simulation of human

Input ABC

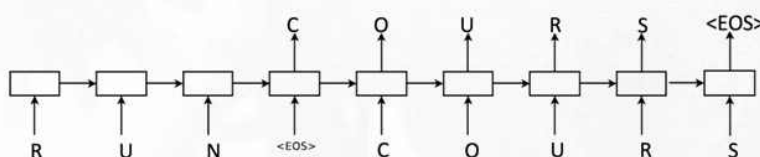
Output WXYZ



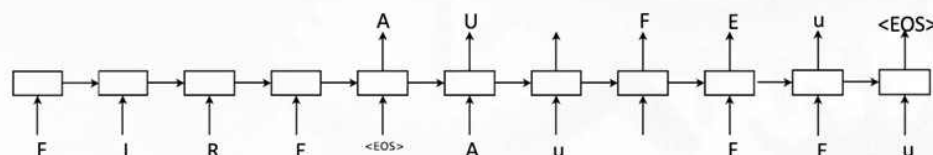
04 Example

Artificial intelligence (AI) relies on the simulation of human

Input(english) : RUN
Output(French) : COURS



Input (english) : FIRE
Output (French) : AU REu



Eng-French dataset

- 영어 총 문자 수 : 90
- 프랑스 총 문자 수 : 113

English : Go. French : Va !

English : Hi. French : Salut !

English : Hi. French : Salut.

English : Run! French : Cours !

English : Run! French : Courez !

English : Who? French : Qui ?

English : Wow! French : ça alors ! English

: Fire! French : Au feu !

English : Help! French : À l'aide ! English

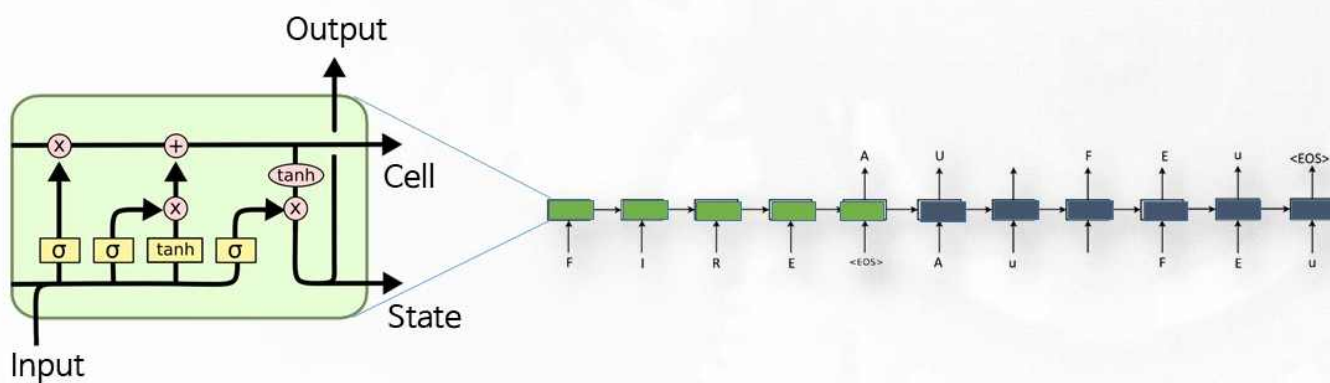
: Jump. French : Saute.

Seq2Seq 모델 구축



01 Implementation & dataset

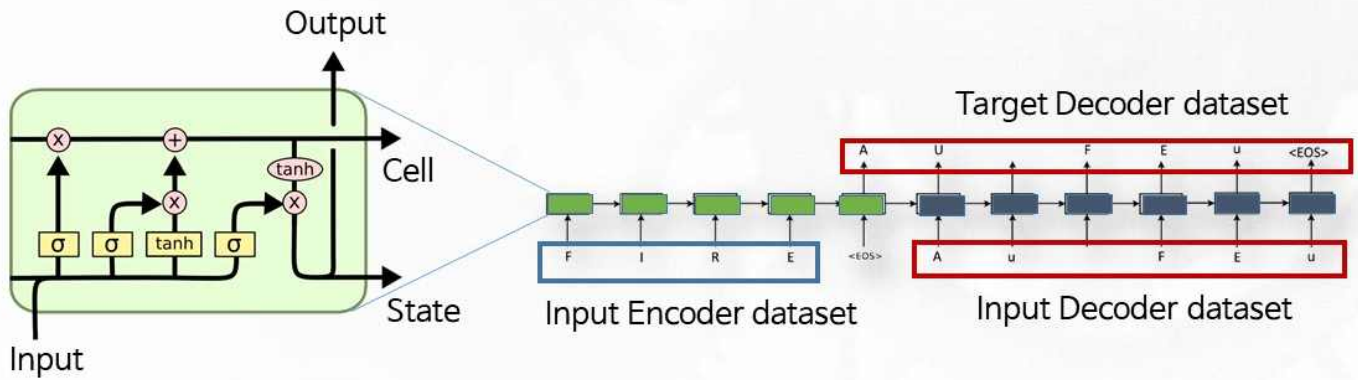
Implementation



Encoder Cell : LSTM
Decoder Cell : LSTM

01 Implementation & dataset

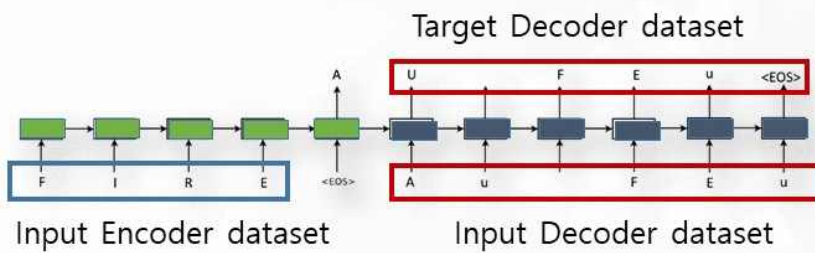
dataset



출처: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

01 Implementation & dataset

dataset



Input Encoder dataset :

F	I	R	E	<EOS>
---	---	---	---	-------

Input Decoder dataset :

A	U		F	E	u
---	---	--	---	---	---

Target Decoder dataset

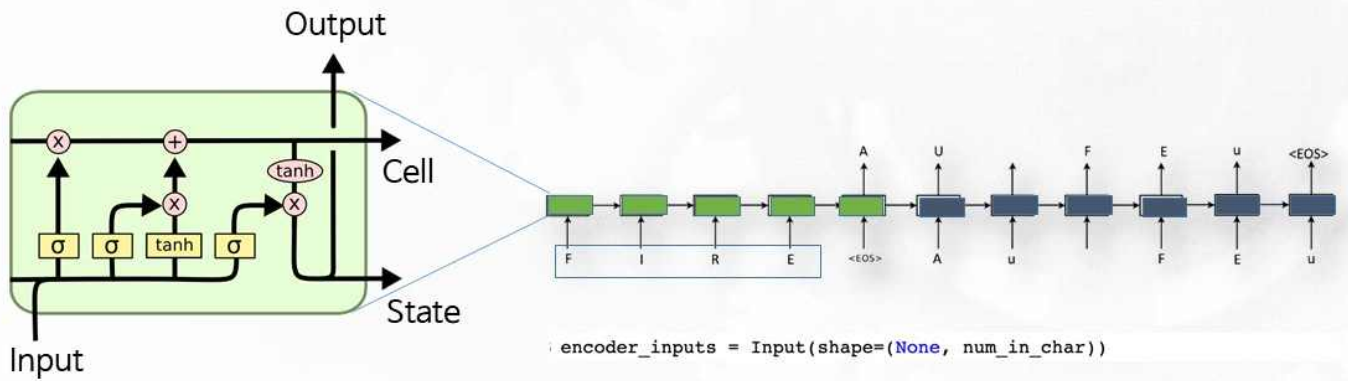
U		F	E	u	<eos>
---	--	---	---	---	-------

출처: 퍼블릭에이아이 (www.publicai.co.kr)

02 Encoder - Decoder inputs

Artificial Intelligence (AI) starts
in the simulation of human

Encoder - input shape



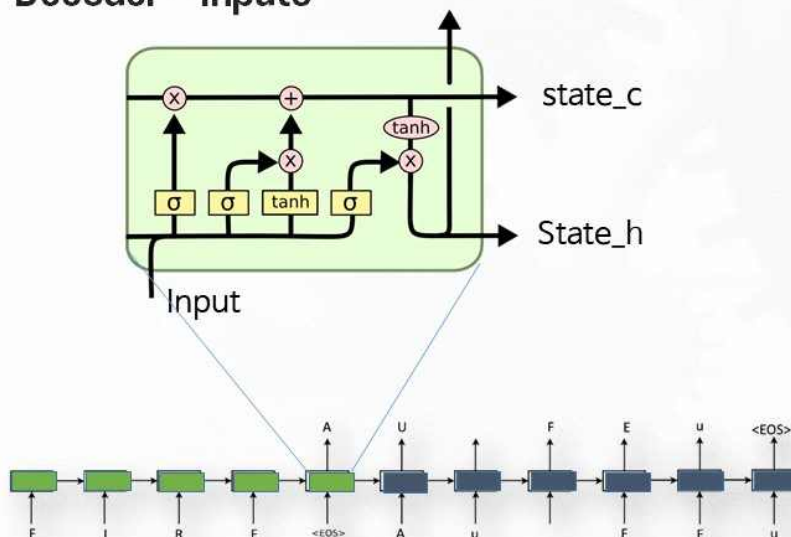
Input shape : (batch size, None, num_English_char)

출처: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

02 Encoder - Decoder inputs

Artificial Intelligence (AI) starts
in the simulation of human

Decoder - inputs

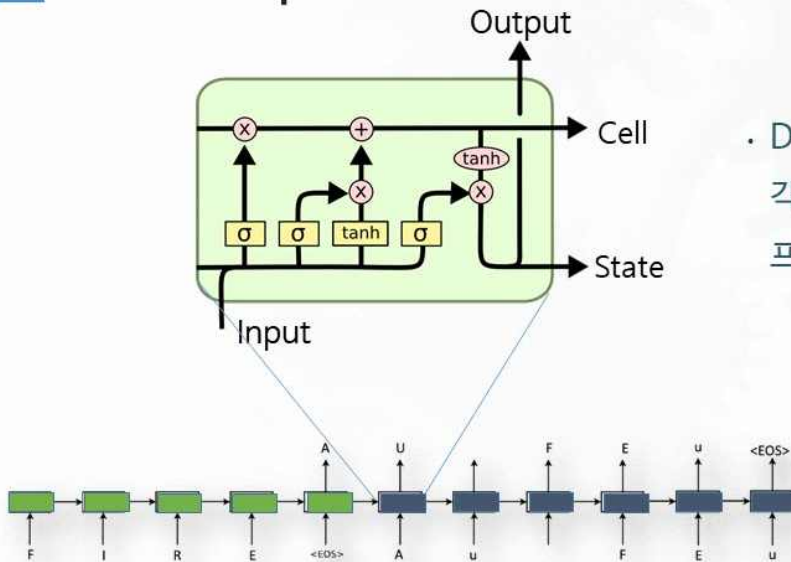


LSTM 모델을 사용합니다.

```
encoder = LSTM(latent_dim, return_state=True)
encoder_outputs, state_h, state_c = encoder(encoder_inputs)
```

출처: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

Decoder - inputs



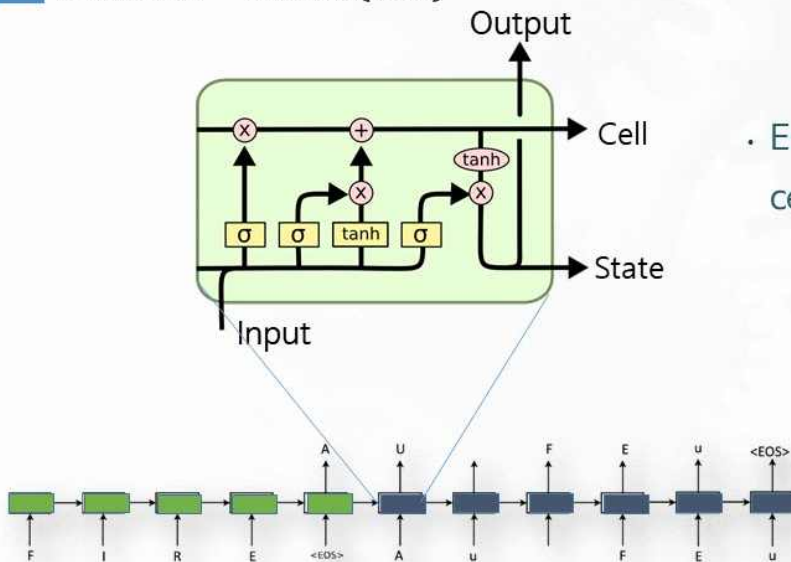
```
encoder_inputs = Input(shape=(None, num_in_char))
```

Input shape : (batch size, None, num_English_char)

출처: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

- Decoder 에서도 timestep은 가변적이며
각 timestep마다 입력 또는 출력의 vector 크기는
프랑스 문자열의 모든 문자 종류와 같음

Decoder - model(cell)

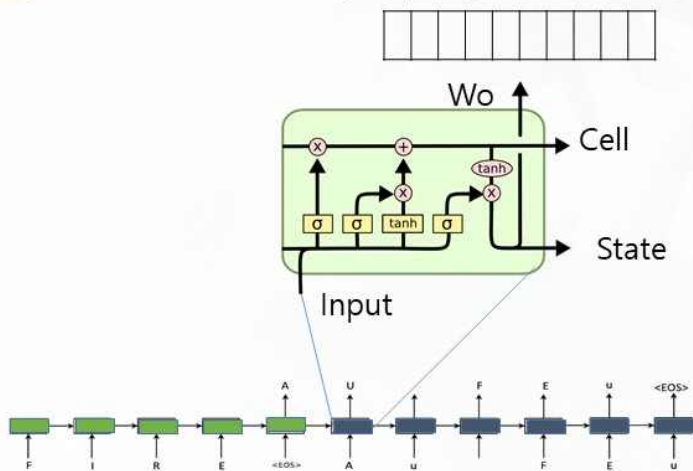


```
decoder_lstm = LSTM(latent_dim, return_sequences=True, return_state=True)
decoder_outputs, _, _ = decoder_lstm(decoder_inputs,
                                     initial_state=encoder_states)
```

출처: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

- Encoder에서 마지막 hidden state weights와
cell_weights을 재사용함

Decoder- model(output)



- Encoder 달리 Decoder는 모든 timestep Output을 사용함
- Classification 출력을 하기 위해 Dense Layer-softmax을 적용함

```
decoder_lstm = LSTM(latent_dim, return_sequences=True, return_state=True)
decoder_outputs, _, _ = decoder_lstm(decoder_inputs,
                                     initial_state=encoder_states)
decoder_dense = Dense(num_out_char, activation='softmax')
decoder_outputs = decoder_dense(decoder_outputs)
```

출처: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/>

```
# Run training
model.compile(optimizer='rmsprop', loss='categorical_crossentropy')
model.fit([encoder_input_data, decoder_input_data], decoder_target_data,
          batch_size=batch_size,
          epochs=epochs,
          validation_split=0.2)

# Save model
model.save('s2s.h5')
```


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03

실습



Artificial intelligence (AI) refers
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SUMMARY

학습정리

- ◆ Seq2Seq의 등장 배경
- ◆ Seq2Seq의 기본 아이디어
- ◆ Encoder-Decoder 모델
- ◆ Seq2Seq의 구조
- ◆ Seq2Seq의 input
- ◆ Seq2Seq 실제 문제에서의 활용

확장하기

1. Seq2Seq 모델이 등장하게 된 배경은 무엇일까요?
2. Seq2Seq 알고리즘의 기본 아이디어는 무엇일까요?
3. Seq2Seq 알고리즘의 기본 구조는 어떻게 구성될까요?
4. Encoder-Decoder 모델은 무엇일까요?
5. Seq2Seq 알고리즘은 실제로 어떻게 적용할 수 있을까요?



참고 문헌

REFERENCE

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◆ 참고 사이트

- 용어들에 대한 정의 : <https://ko.wikipedia.org/wiki>.
- 퍼블릭에이아이 (www.publicai.co.kr)
- <http://colab.github.io/posts/2015-08-Understanding-LSTMs/>

◆ 참고 논문

- I Sutskever. Sequence to Sequence Learning with Neural Networks, 2014