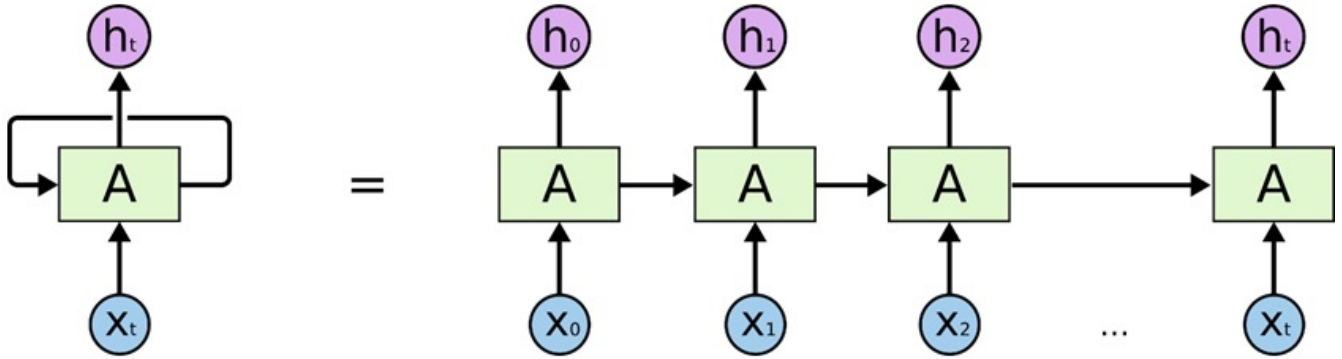
RNN

16기 문예진

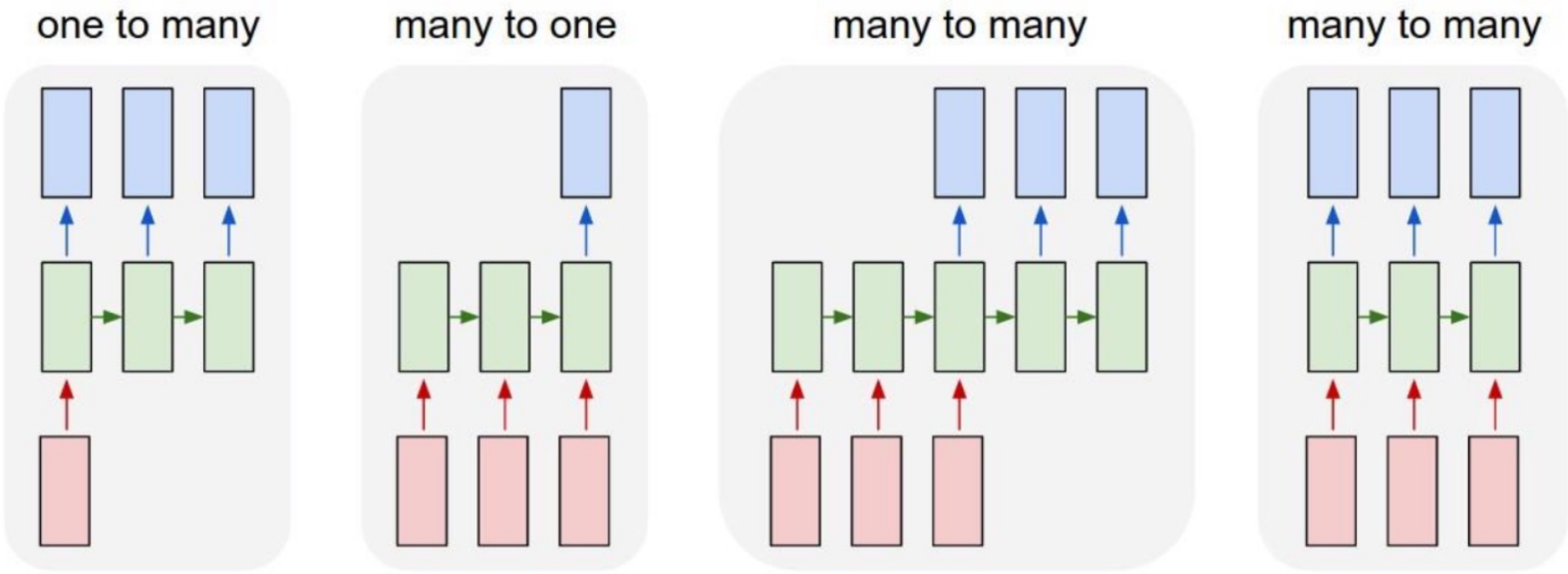
RNN이란?

Recurrent Neural Network 순환 신경망

- 은닉 계층 안에 하나 이상의 순환 계층을 갖는 신경망
- Sequential 데이터의 “순서”가 고려되어야 할 경우, 순서를 유지하며 학습



RNN task 종류



RNN task 종류

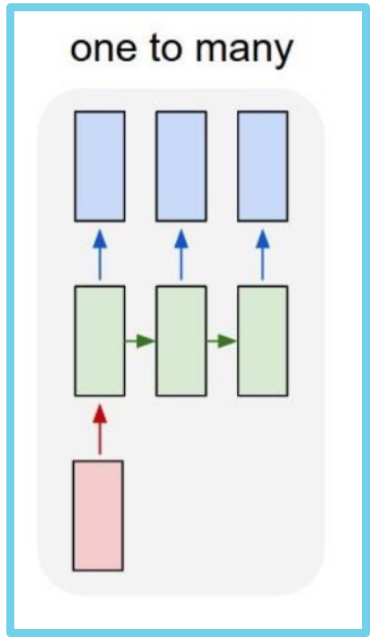
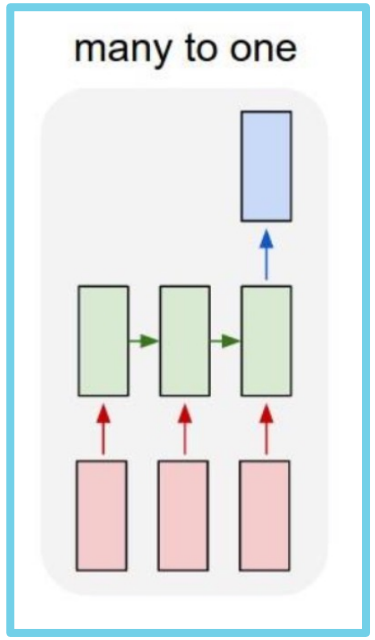


Image Captioning

- one : image vector
- many : sequence of words

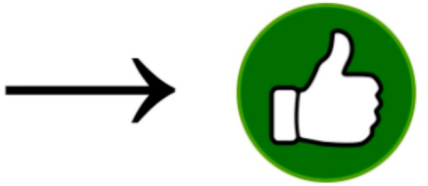
RNN task 종류



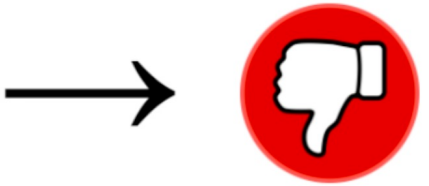
Sentiment Classification

- many : sequence of words
- one : sentiment(좋/싫)

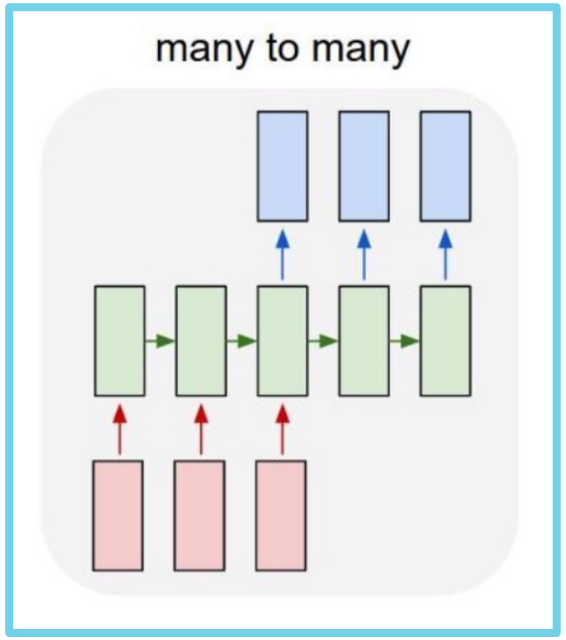
"I love this movie.
I've seen it many times
and it's still awesome."



"This movie is bad.
I don't like it it all.
It's terrible."



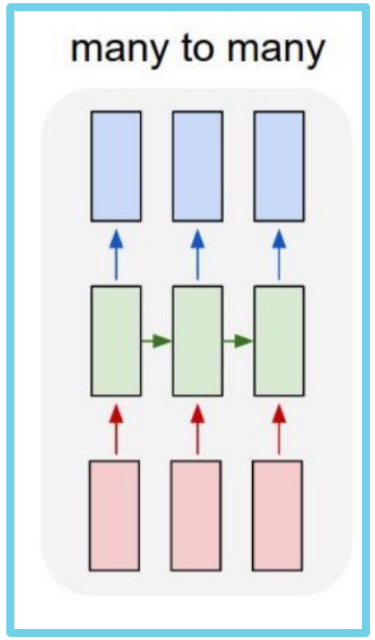
RNN task 종류



Machine Translation

- many : sequence of words
- many : 단어 순차 데이터(문장)
- “Sequence to Sequence”

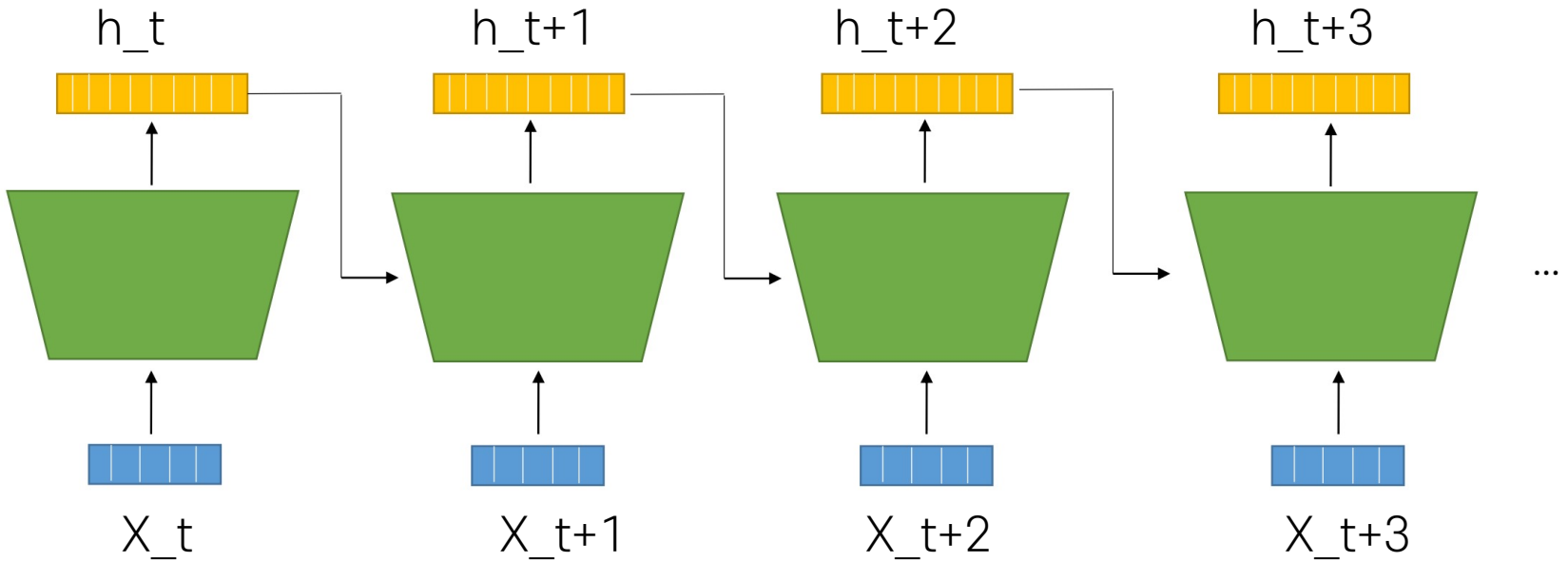
RNN task 종류



Noun Classification

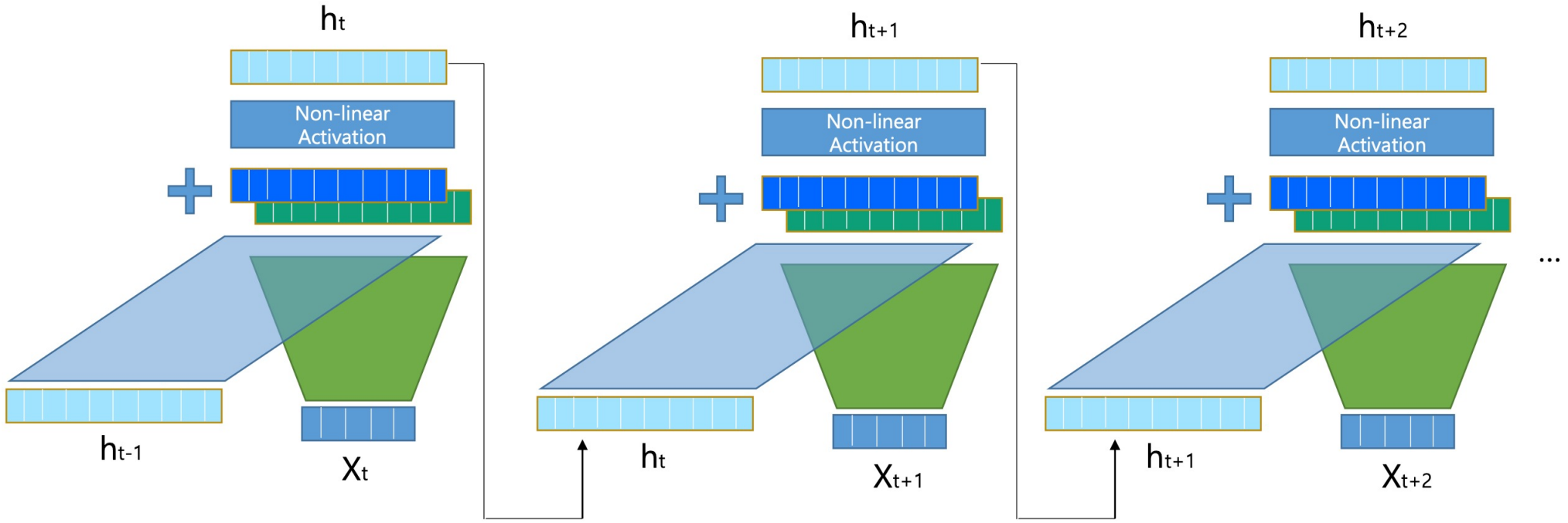
- many : sequence of words
- many : classifier of each word

RNN 작동원리



새로운 h_t를 만들 때, h_t-1의 정보도 반영하자!

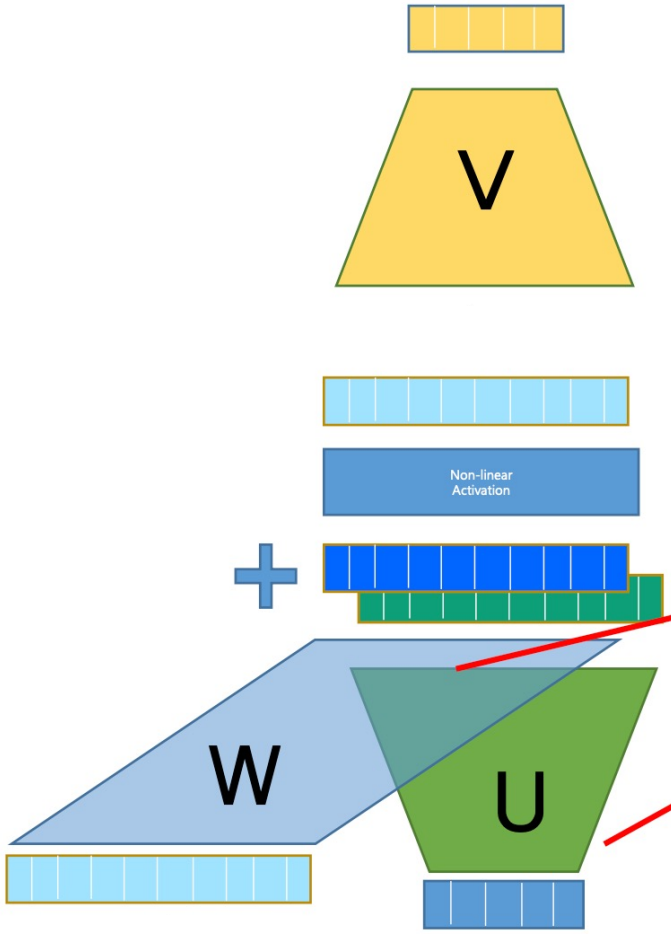
RNN 작동원리



새로운 h_t를 만들 때, h_t-1의 정보도 반영하자!

RNN 작동원리

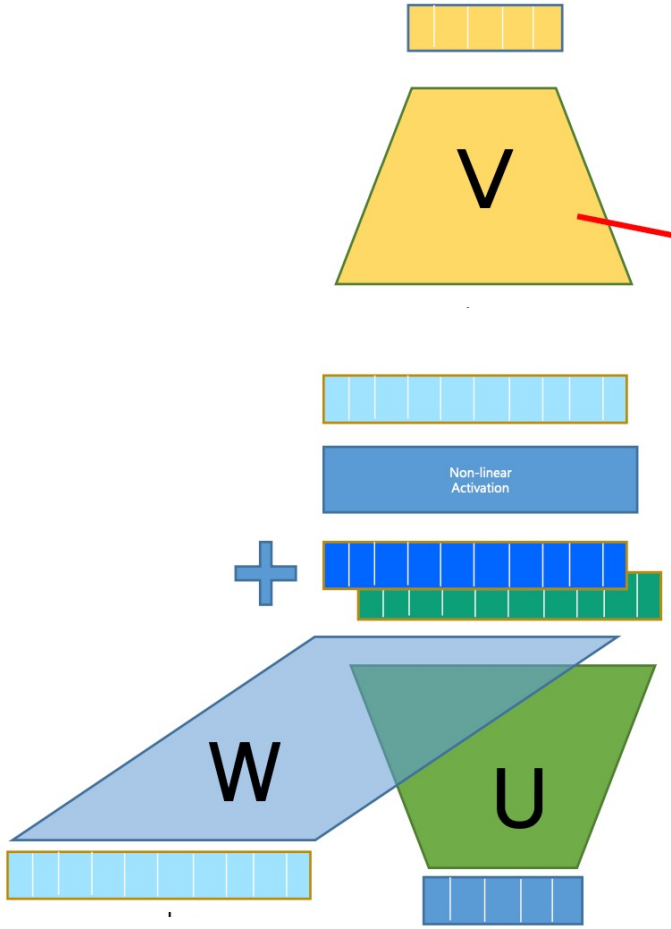
수식표현



$$h_t = f(Ux_t + Wh_{t-1})$$

RNN 작동원리

수식표현

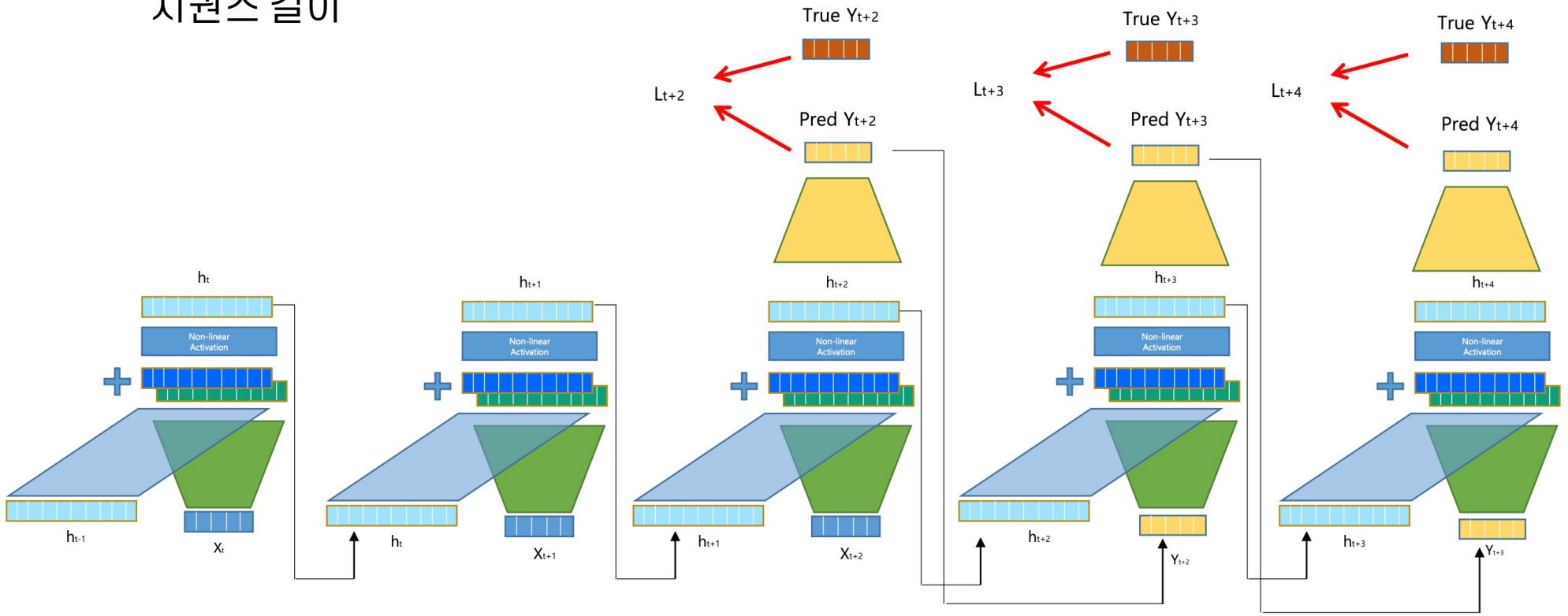


$$h_t = f(Ux_t + Wh_{t-1})$$

$$y_t = f(Vh_t)$$

RNN 작동원리

$$\text{Loss(i)} = \frac{\sum \text{loss}(\text{true } Y_t, \text{pred } Y_t)}{\text{시퀀스 길이}}$$



RNN 사용 예시

Language Model

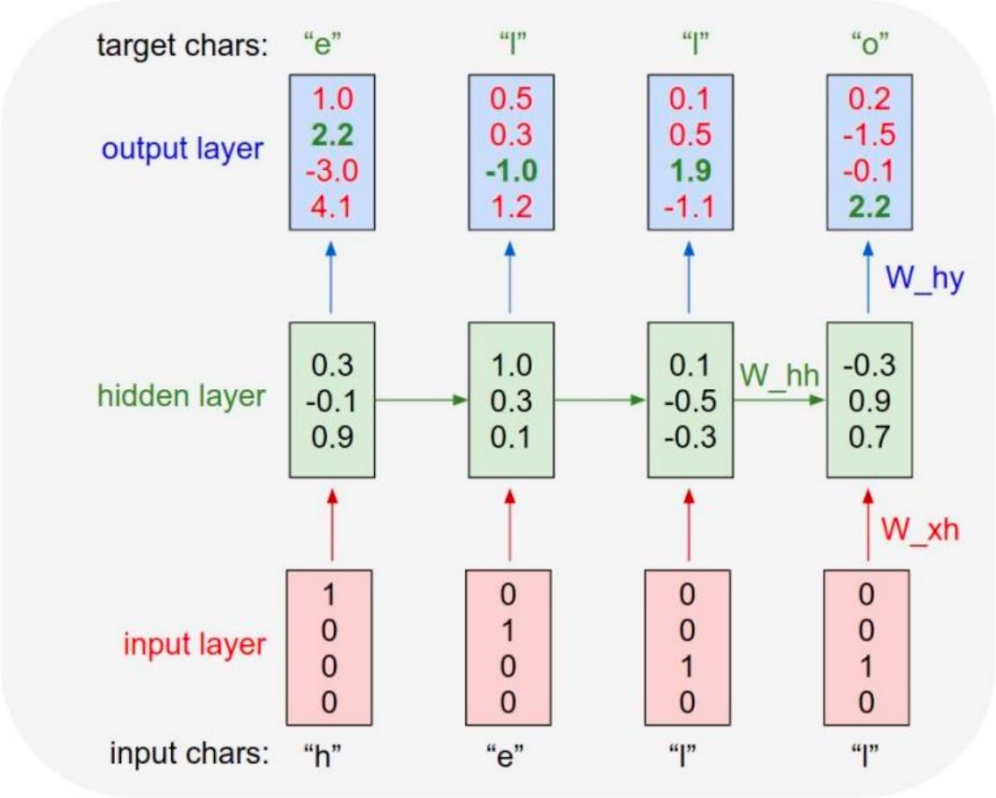
- X_t = hello → [h, e, l, o]
- 글자별로 one-hot encoding

  h : [1, 0, 0, 0]

  e : [0, 1, 0, 0]

  l : [0, 0, 1, 0]

  o : [0, 0, 0, 1]

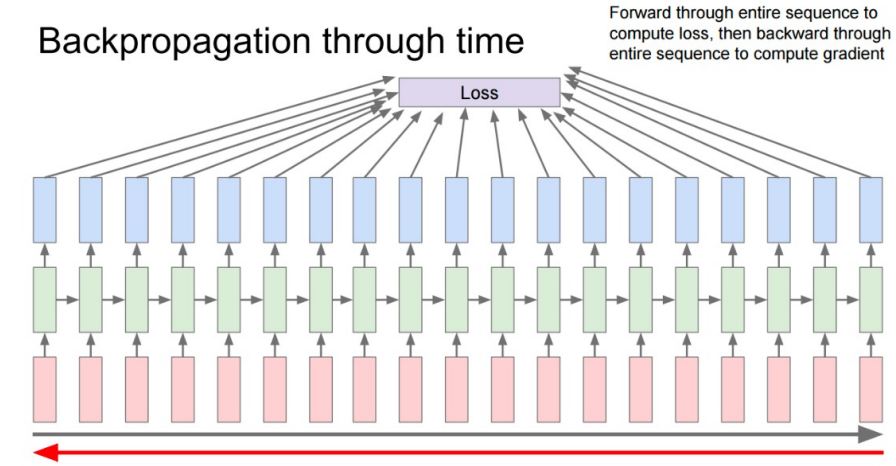


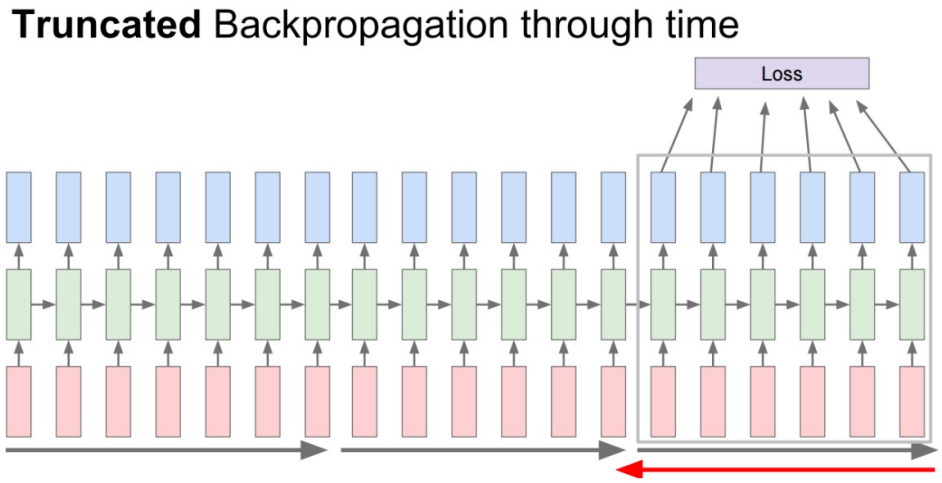
RNN 사용 예시

Language Model

- 매번 존재하는 출력값의 loss로 final loss 계산
  “Backpropagation Through Time”
- 시퀀스가 길면? 다 끝나야 한 번 gradient 계산

- 그래서 실제로는 일정 단위로 스텝 잘라서 계산
  “Truncated Backpropagation Through Time”





RNN의 단점

장기 의존성 Long-Term Dependency

- 데이터가 너무 길면, 뒤로 갈수록 앞쪽 데이터의 입력을 까먹음
- backward pass에서 gradient를 계산할 때 점점 작아짐 **“Gradient Vanishing”**

- 이걸 해결한 것이 LSTM

LSTM
으로 이어집니다