

# RNN

**Practical NLP**  
Text Generation

 **Data Trainers**

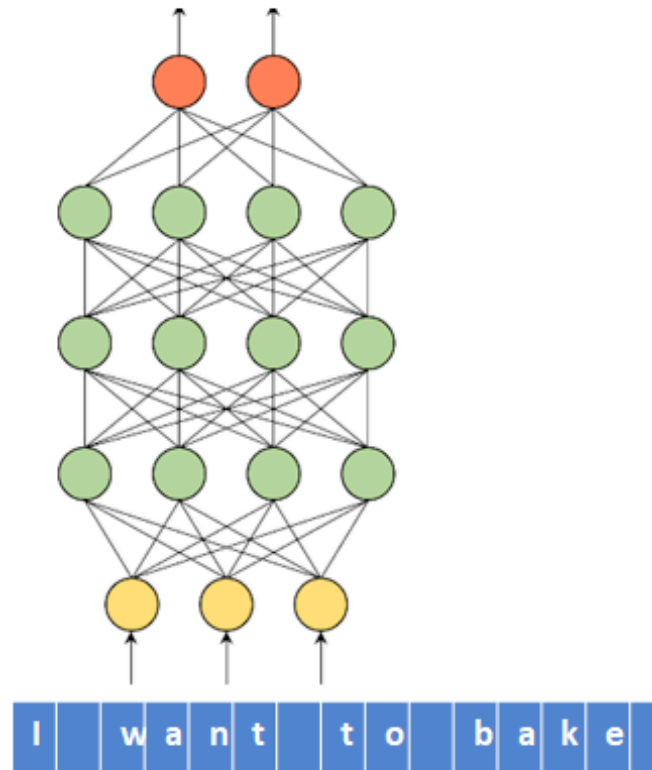
## How do we generate text?

Probabilities  
over char set

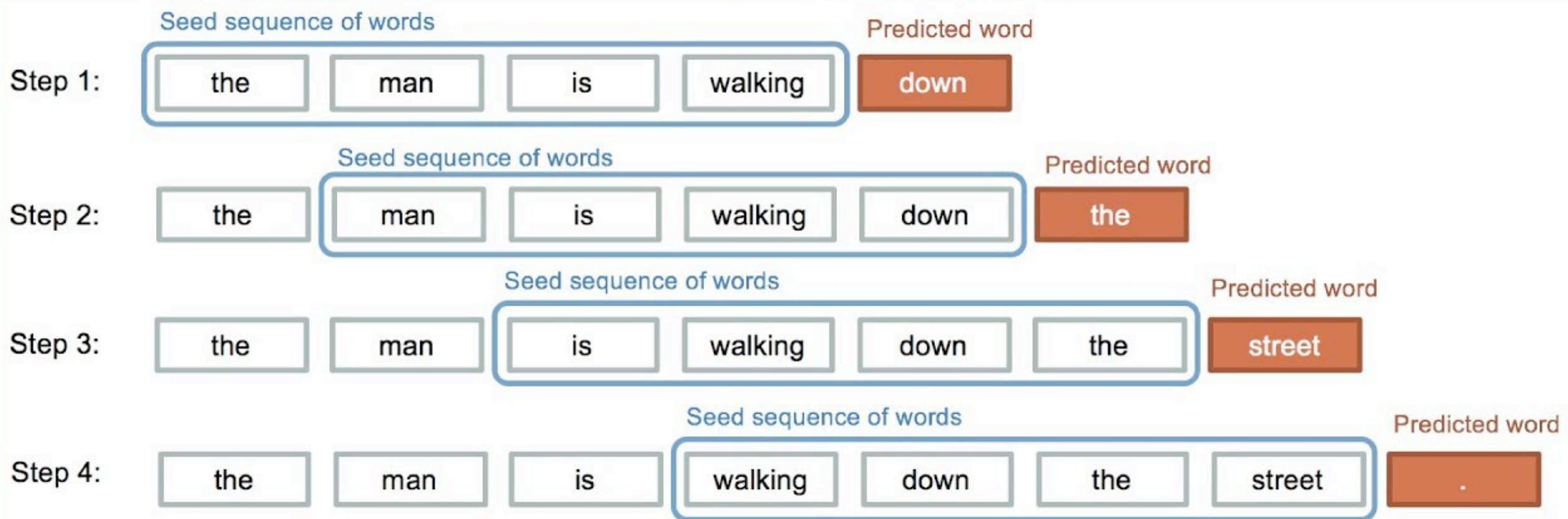
	a	b	c	d	e	f	g	...	z
0.01	0.02	0.36	0.25	0.02	0.001	0.22	0.001	...	0.06

Language  
Model

Train Input  
from Corpus



## How do we generate text?



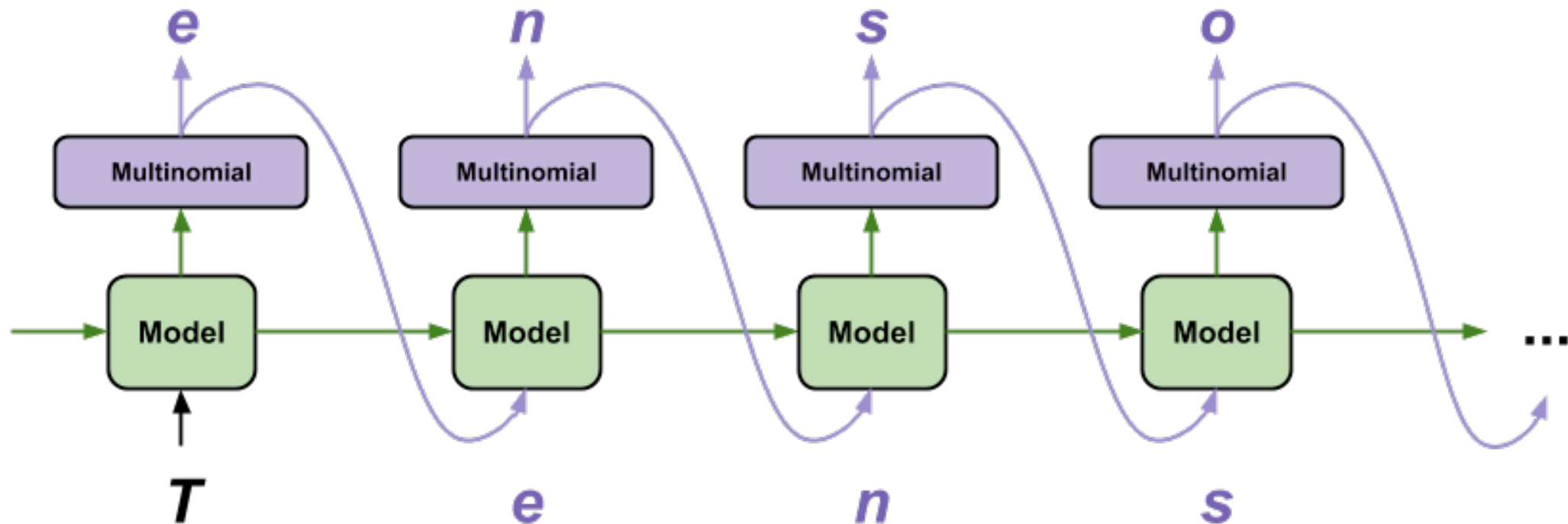
## Problems



- ▶ If we used a normal NN, we would need a window of fixed size to predict the next character/word.
- ▶ But in text, sometimes the core meaning comes at the end, however long it is the sequence.
  - ▶ *“Hospitals are sued by 7 foot doctors”*
  - ▶ *Local high school dropouts cut in half*
- ▶ These problems are and for normal NN because they cannot remember!

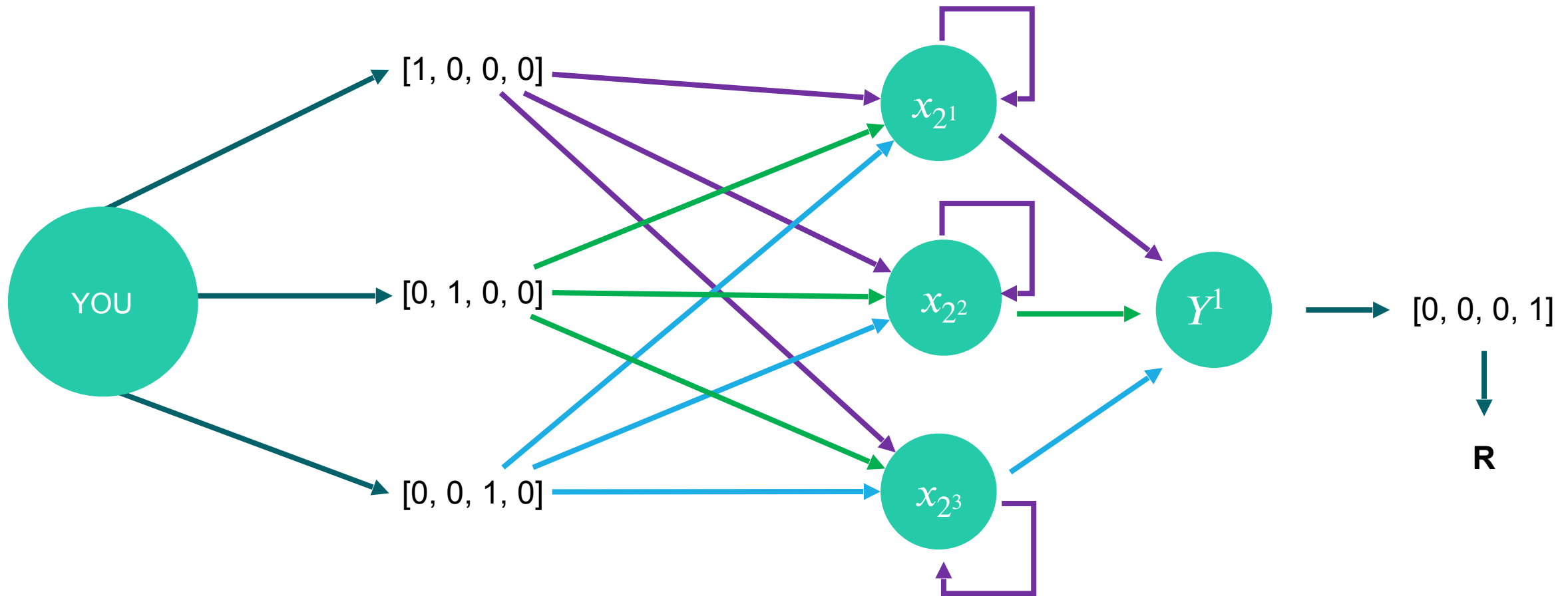


## Character level text generation “passing memory”

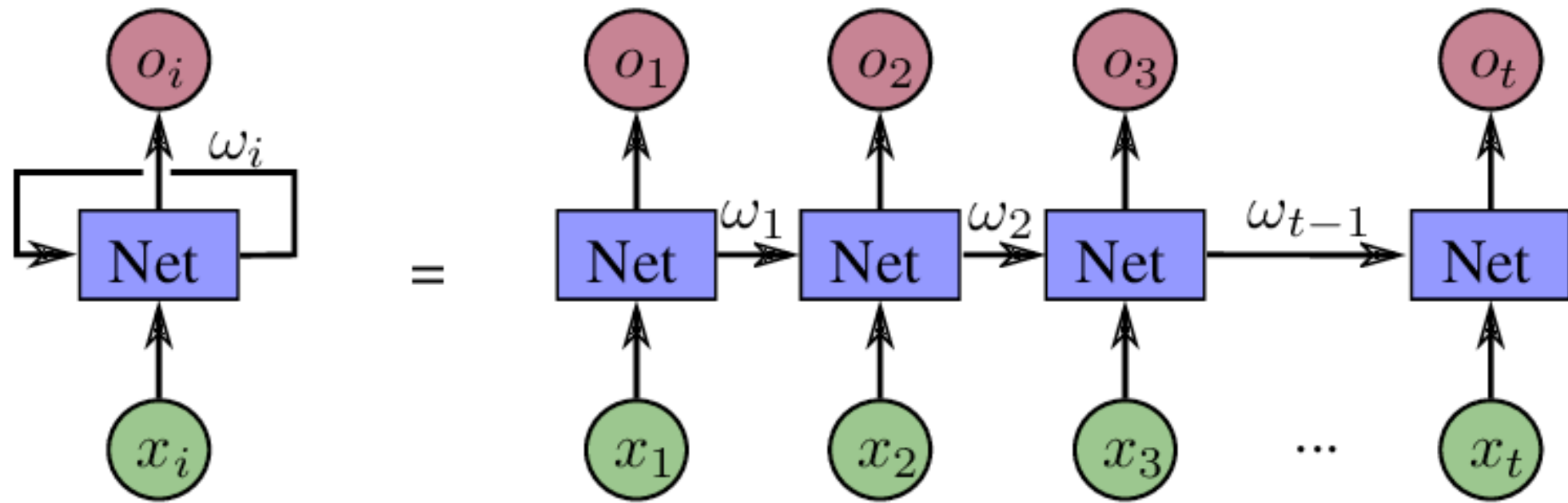


The “key” is to pass the state as input to remember

## Recursive Neural Networks



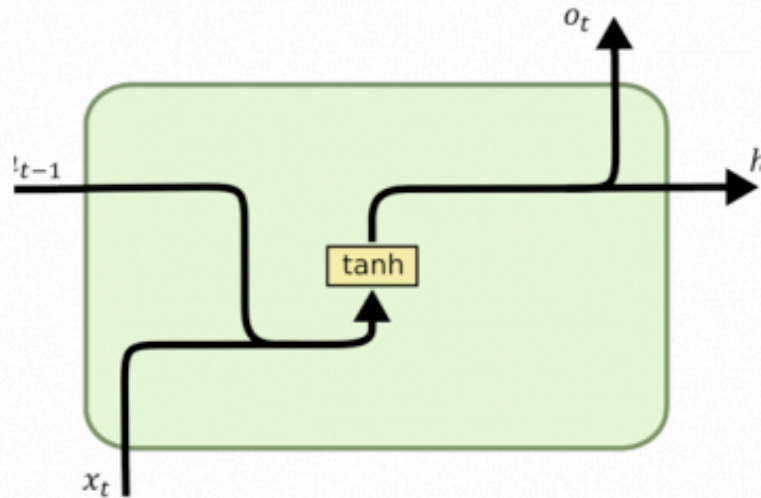
## Recursive Neural Networks



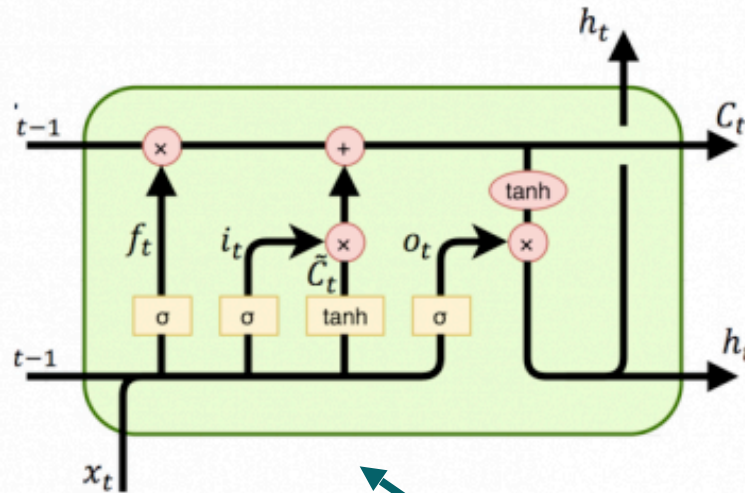
## Variations of RNNs



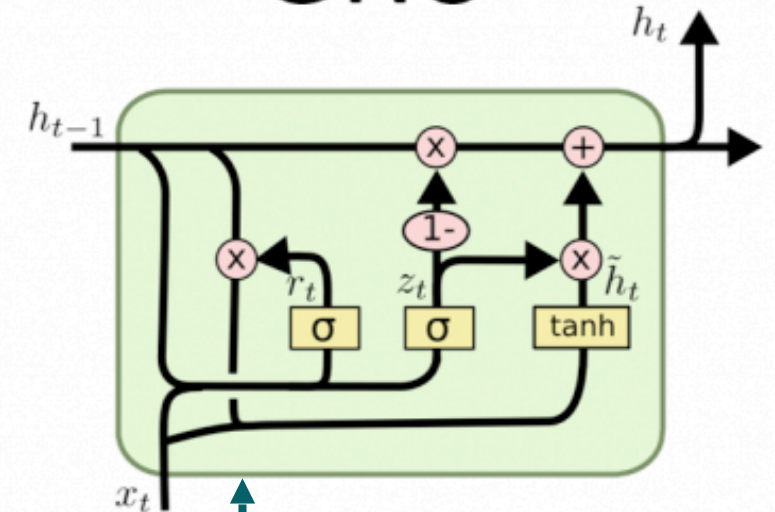
### RNN



### LSTM



### GRU



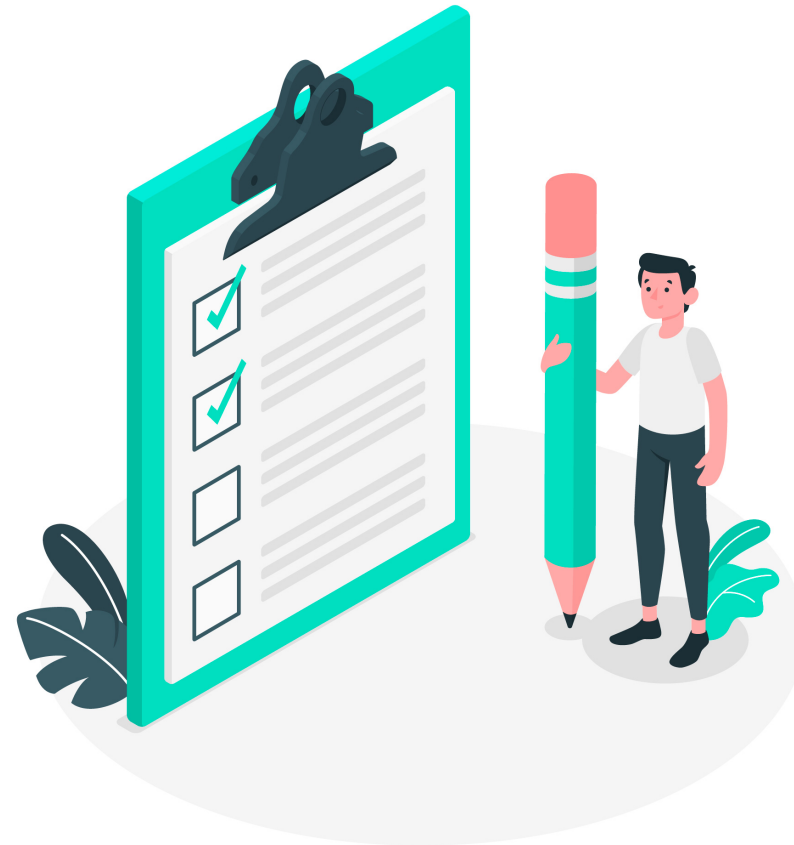
These extra gates provide memory and forgetfulness



**LAB**

## Train a LSTM RNN

- ▶ Train an RNN from scratch with LSTM cells.
- ▶ Put attention to the dataset preparation since this will be a “word based” model.



## Summary

- ▶ Using text generation we can generate rental ads easy.
- ▶ This way we can make the task easier for users by allowing them to be lazy.
- ▶ Under the hoods, we need a model with recursive structure to maintain memory of the state.
- ▶ If we have time at the end, we can discuss about distillation!  
(Please remind me)



## Named Entity Recognition

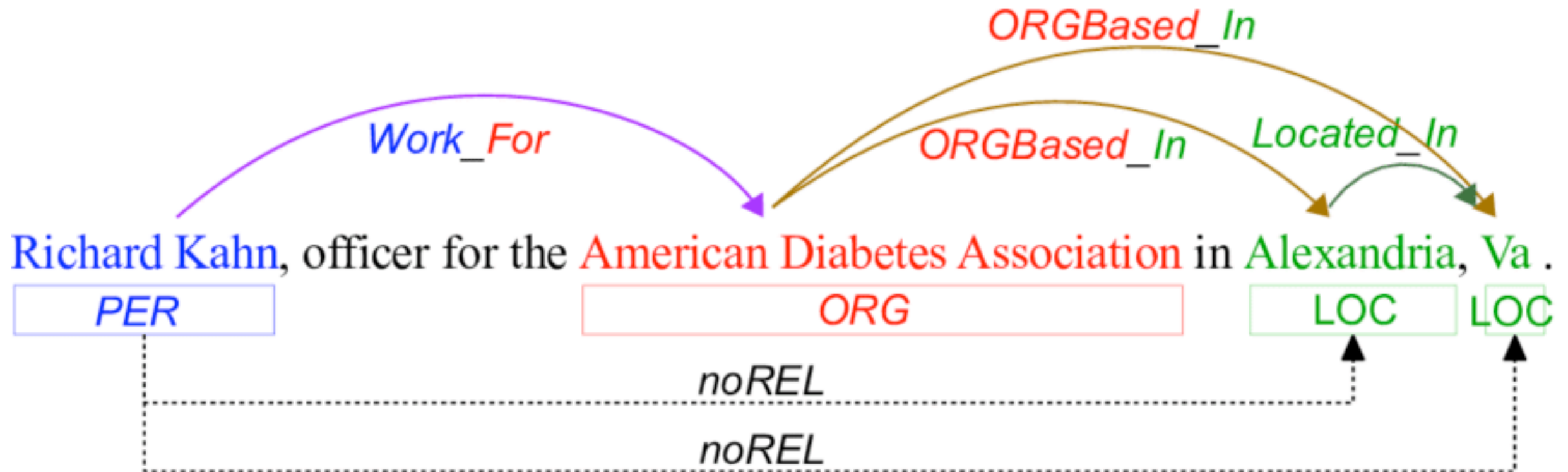


- ▶ All of these tags extract information from the text.

When **Sebastian Thrun** PERSON started at **Google** ORG in **2007** DATE, few people outside of the company took him seriously. “I can tell you very senior CEOs of major **American** NORP car companies would shake my hand and turn away because I wasn’t worth talking to”, said **Thrun** PERSON, now the co-founder and CEO of online higher education startup Udacity, in an interview with **Recode** ORG **earlier this week** DATE.

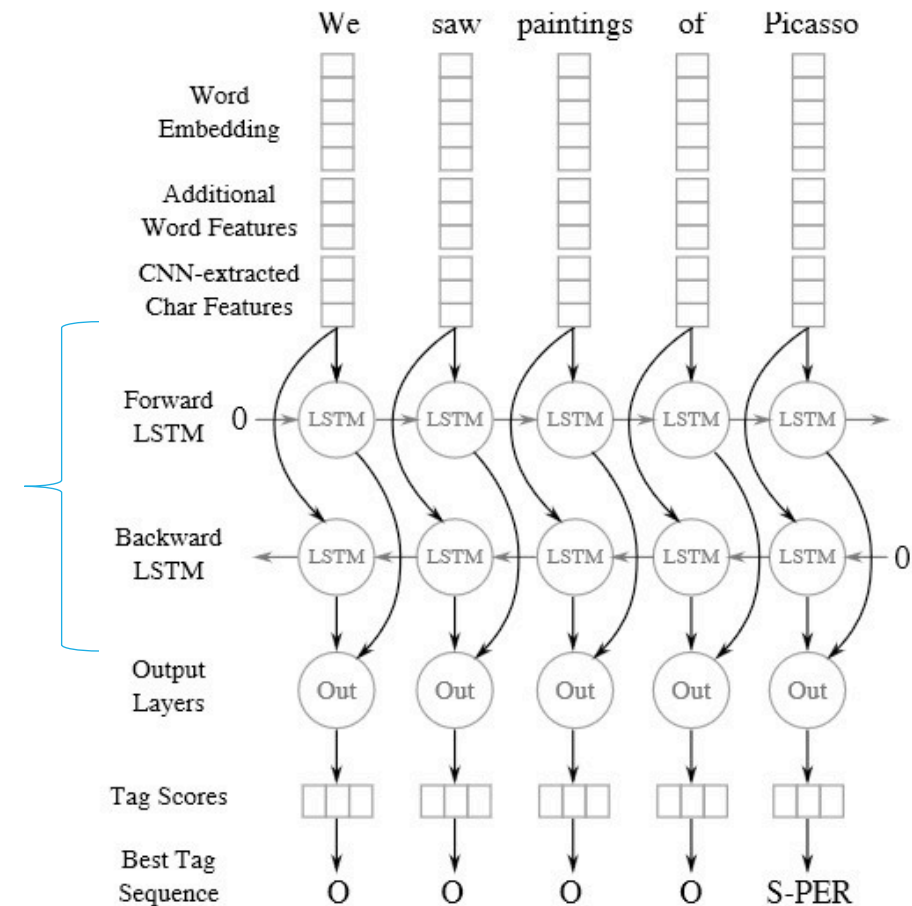
A little **less than a decade later** DATE, dozens of self-driving startups have cropped up while automakers around the world clamor, wallet in hand, to secure their place in the fast-moving world of fully automated transportation.

## Named Entity Recognition



## Bi-LSTM

- We need a forward and backward pass because some tags at the beginning only make sense after reading the whole sentence.



## LAB

## Perform NER with Bi-LSTM

- ▶ Create a Bidirectional LSTM trained on the NER dataset to predict entities.
- ▶ Put special attention to the **metric** used! Does accuracy make sense here?

