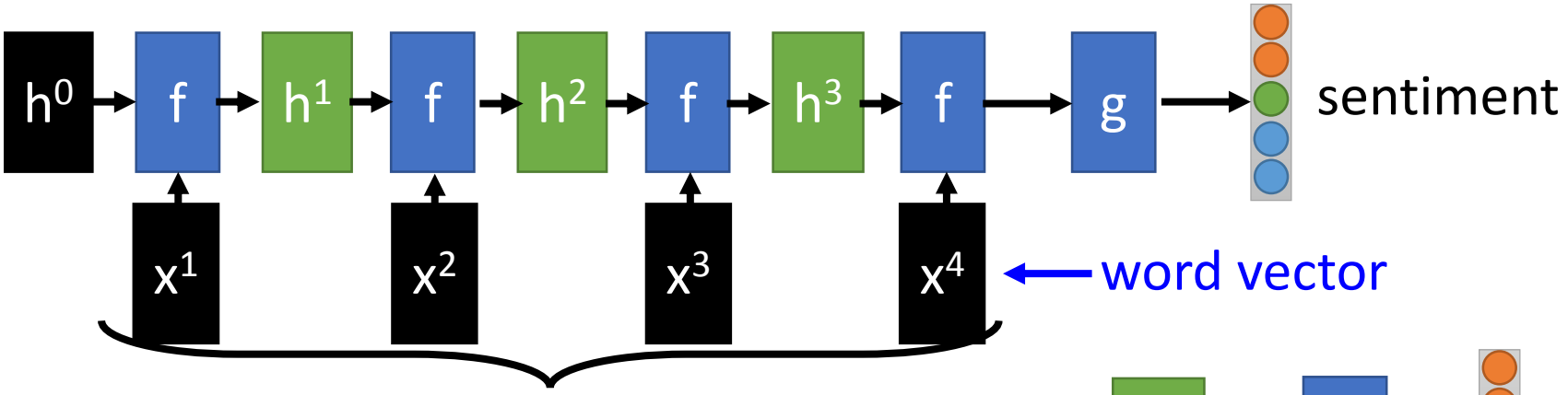
Recursive Structure

Application: Sentiment Analysis

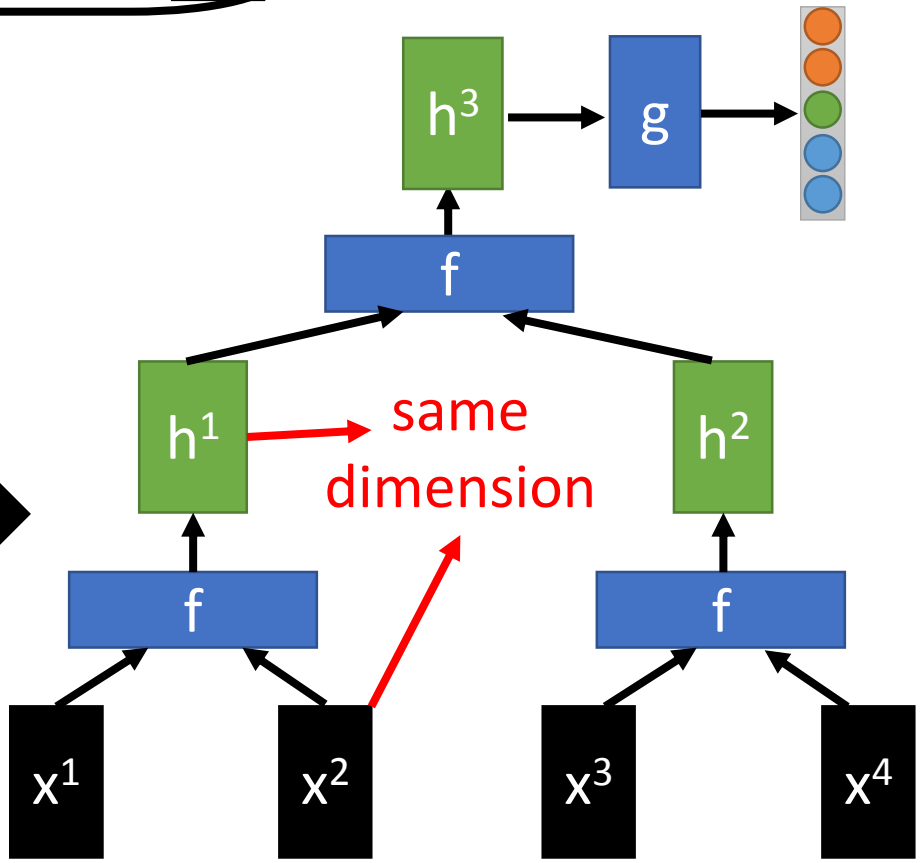


Recurrent Structure

Special case of recursive structure

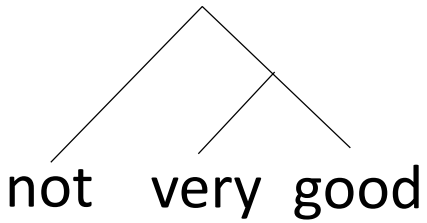
Recursive Structure

How to stack function f is already determined



Recursive Model

syntactic structure

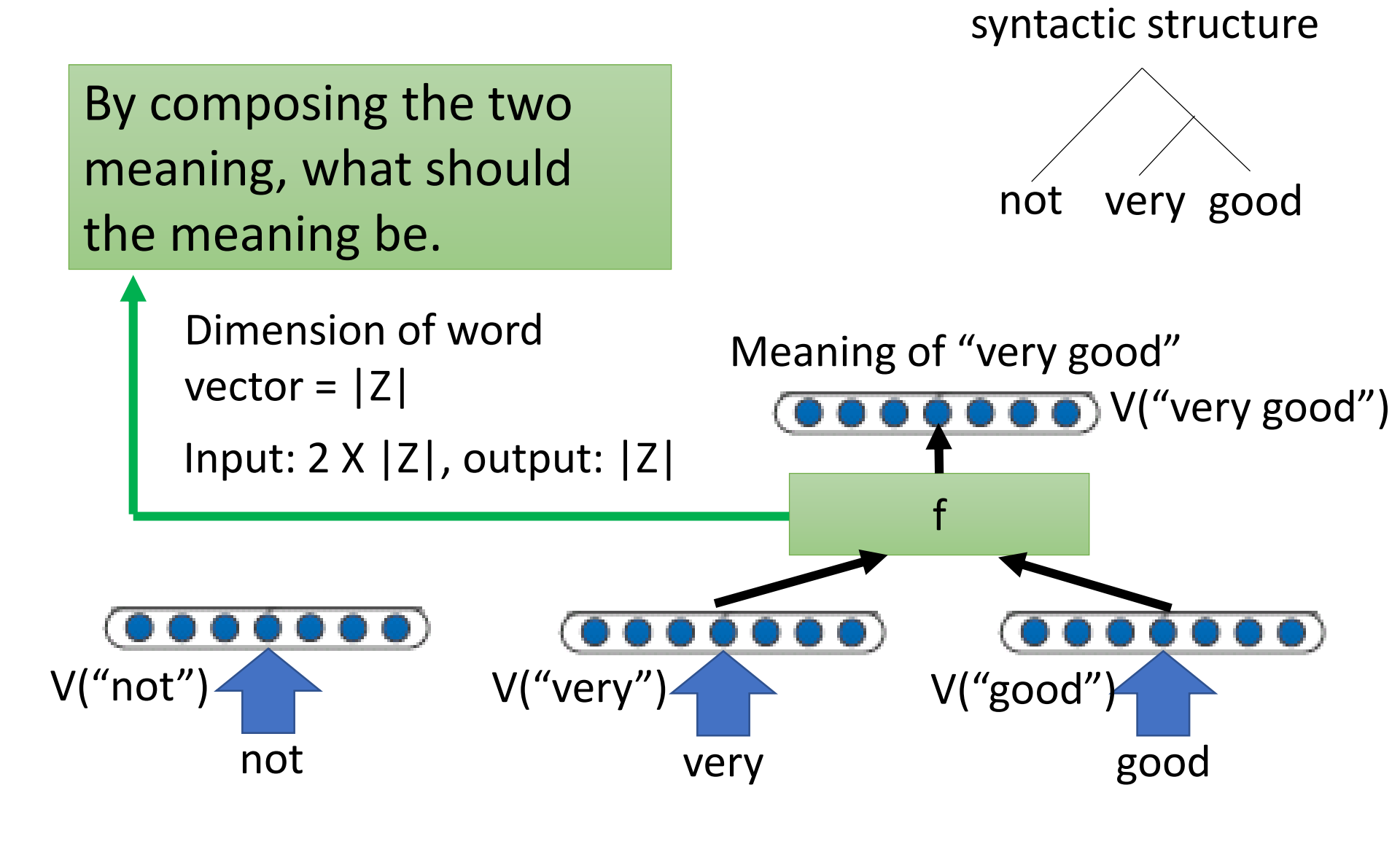


How to do it is out of the scope

word sequence:

not very good

Recursive Model



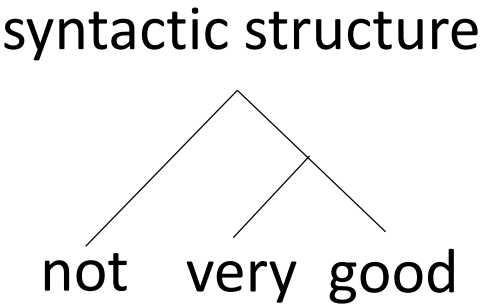
Recursive Model

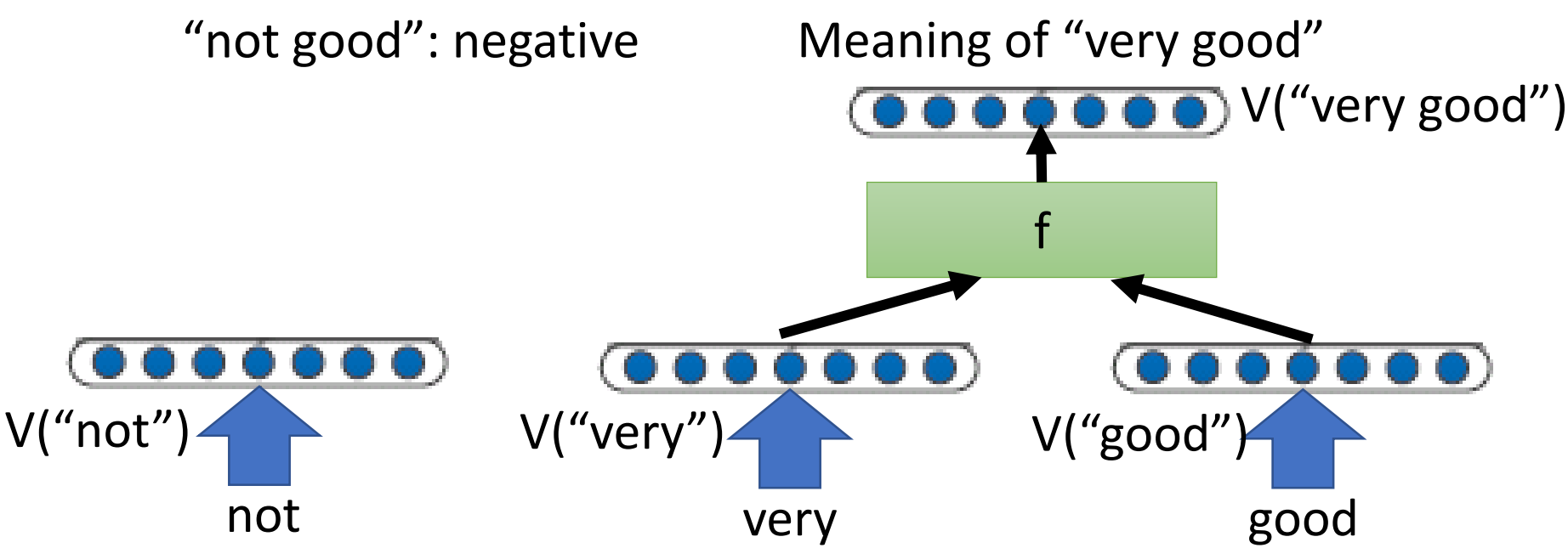
$V(w_A\, w_B) \neq V(w_A) + V(w_B)$

"not": neutral

"good": positive

"not good": negative





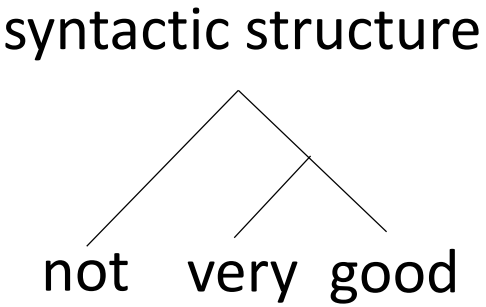
Recursive Model

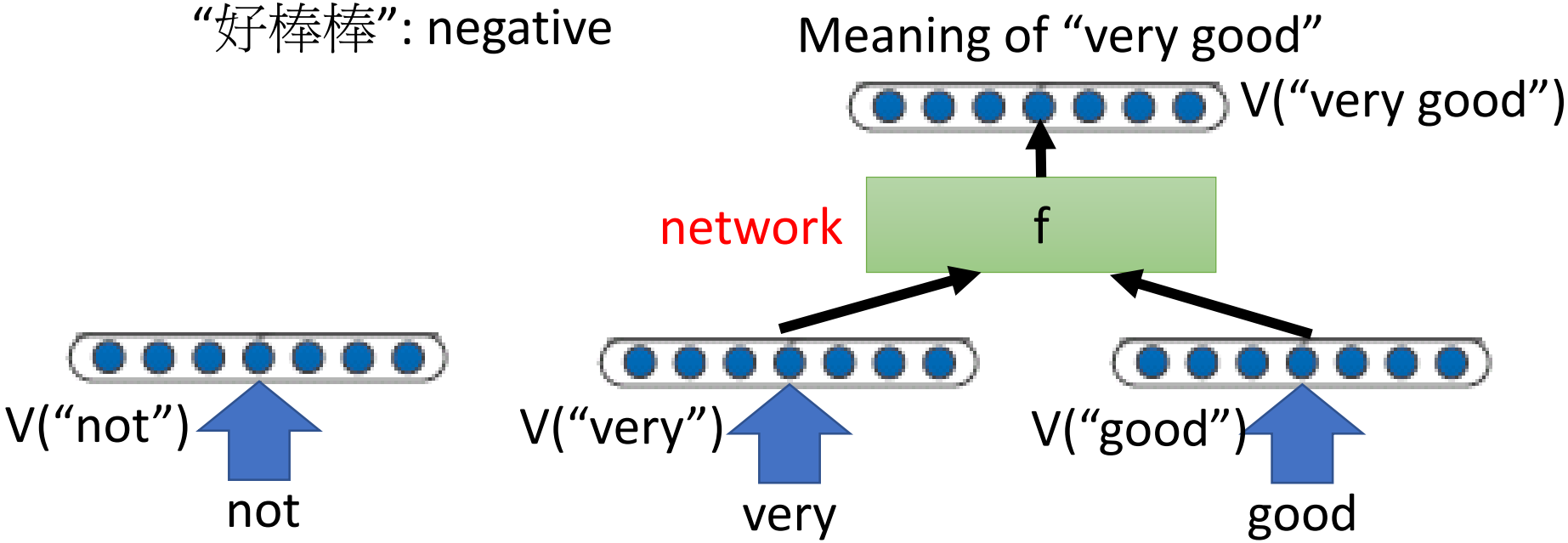
$V(w_A\, w_B) \neq V(w_A) + V(w_B)$

“棒”: positive

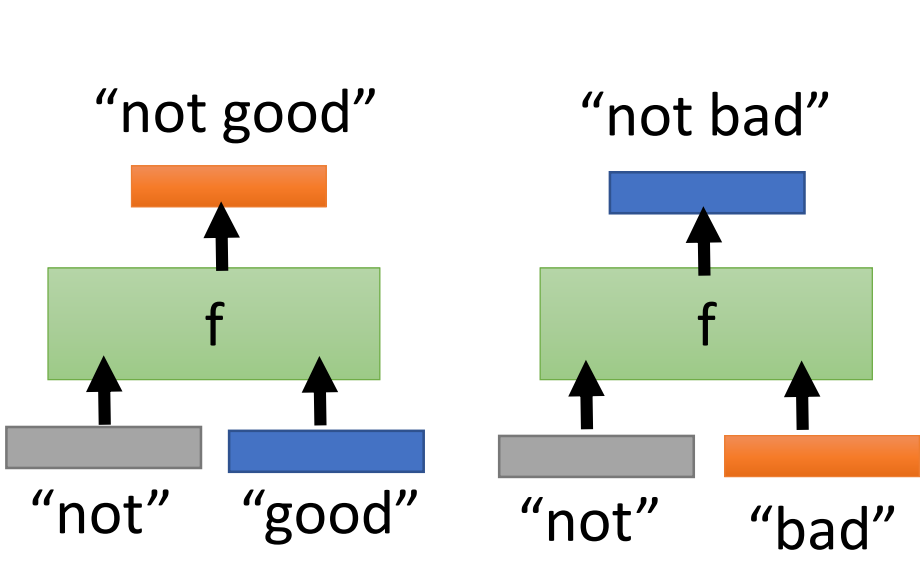
“好棒”: positive

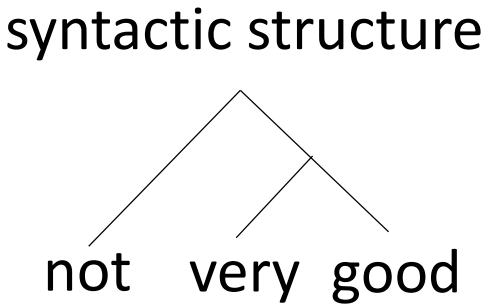
“好棒棒”: negative





Recursive Model

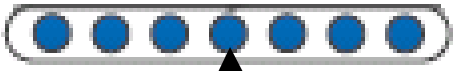





“not”

: “reverse” another input

Meaning of “very good”


V(“very good”)


f


V(“not”)

not

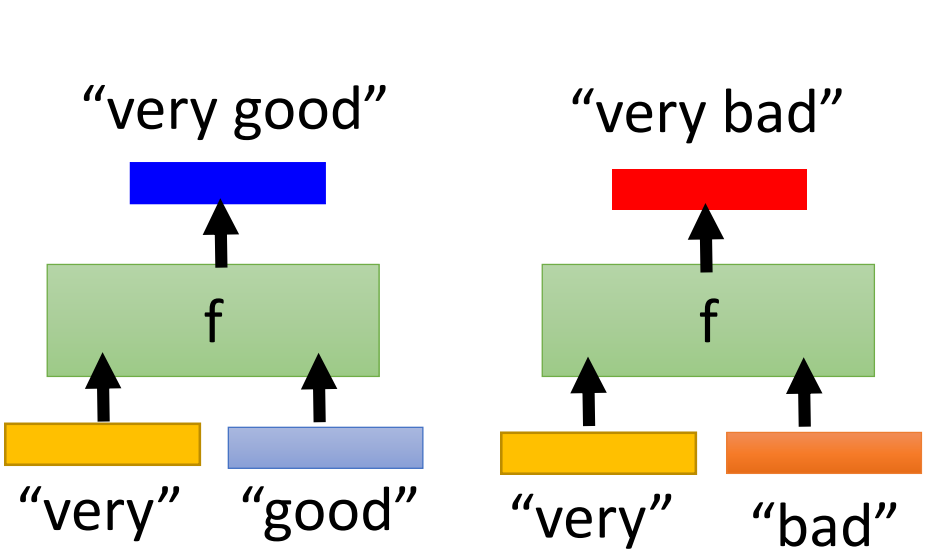

V(“very”)

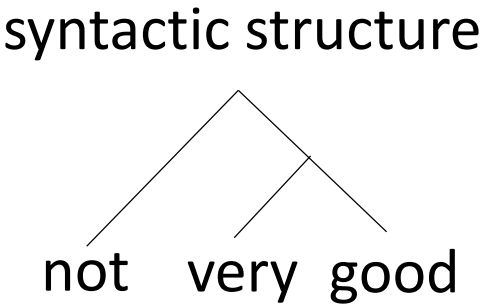
very

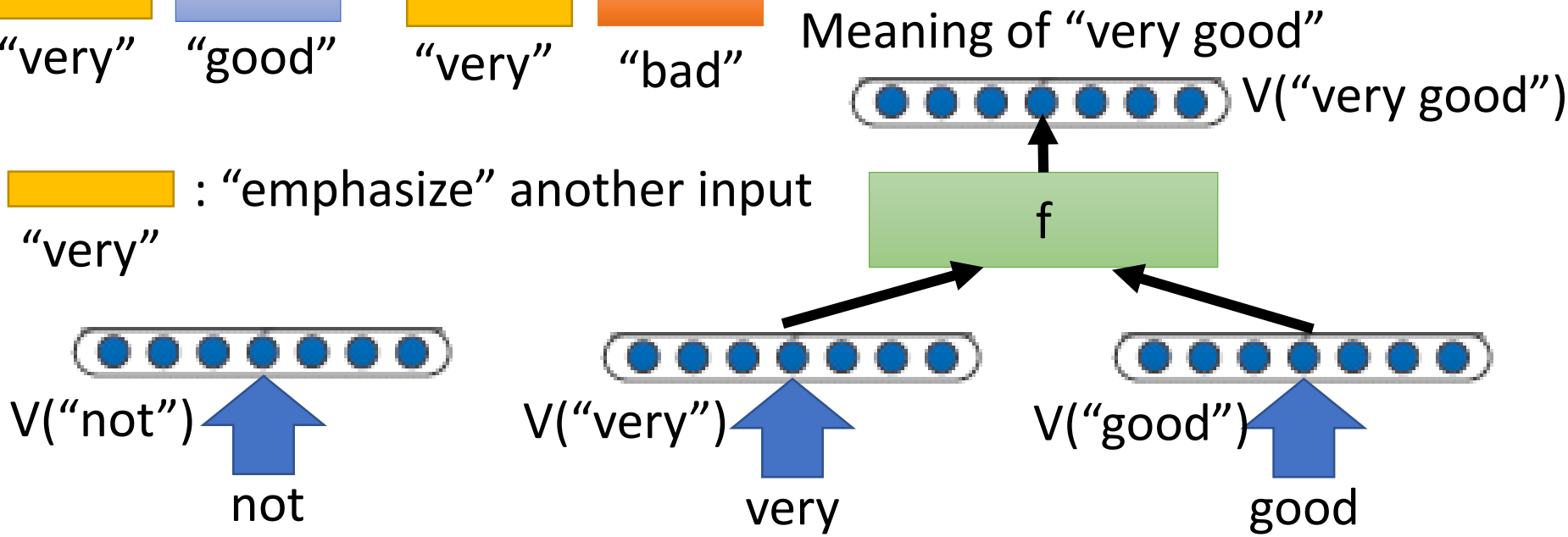

V(“good”)

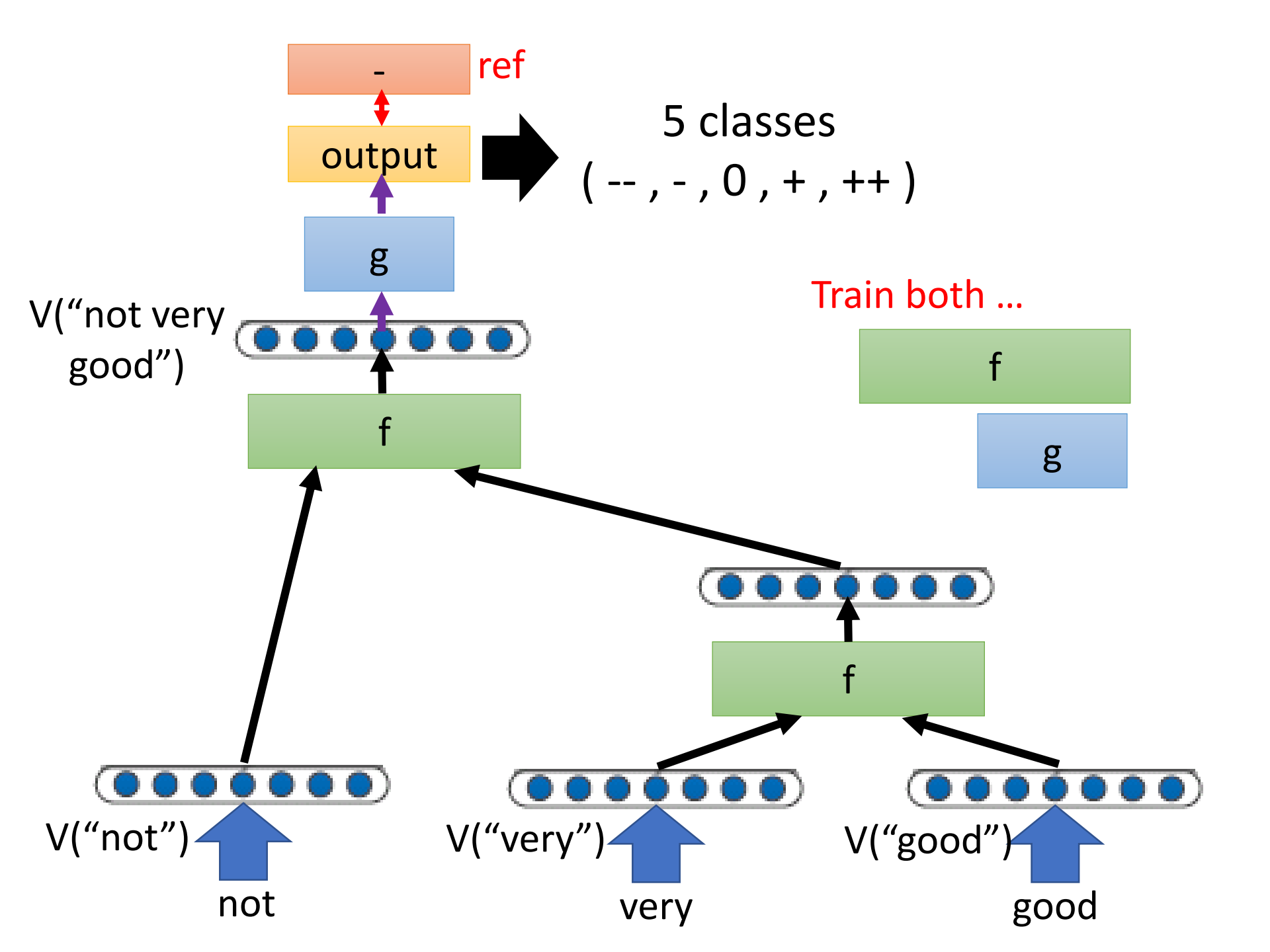
good

Recursive Model

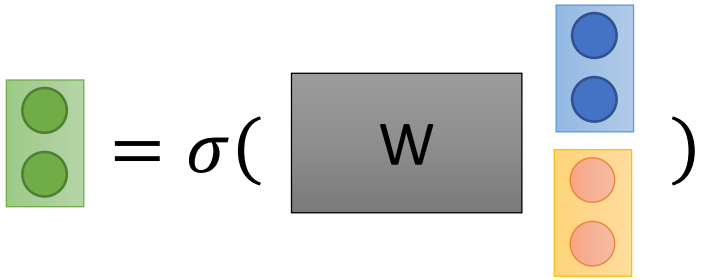




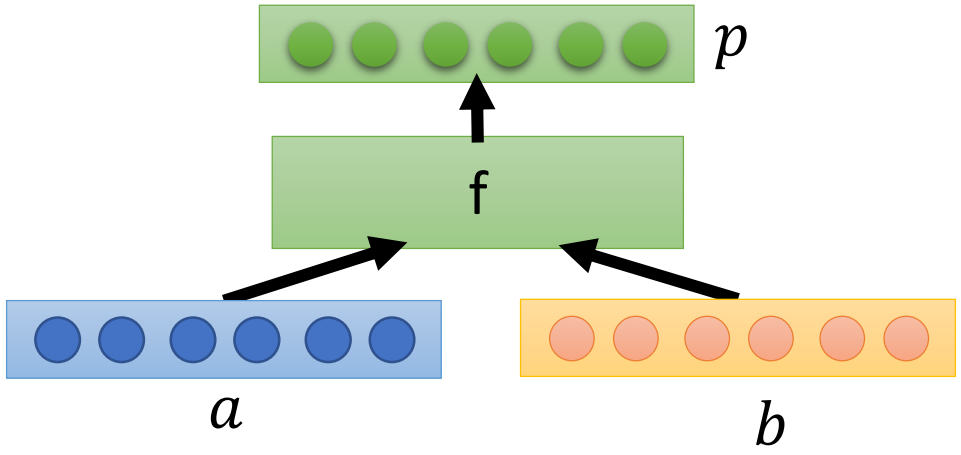


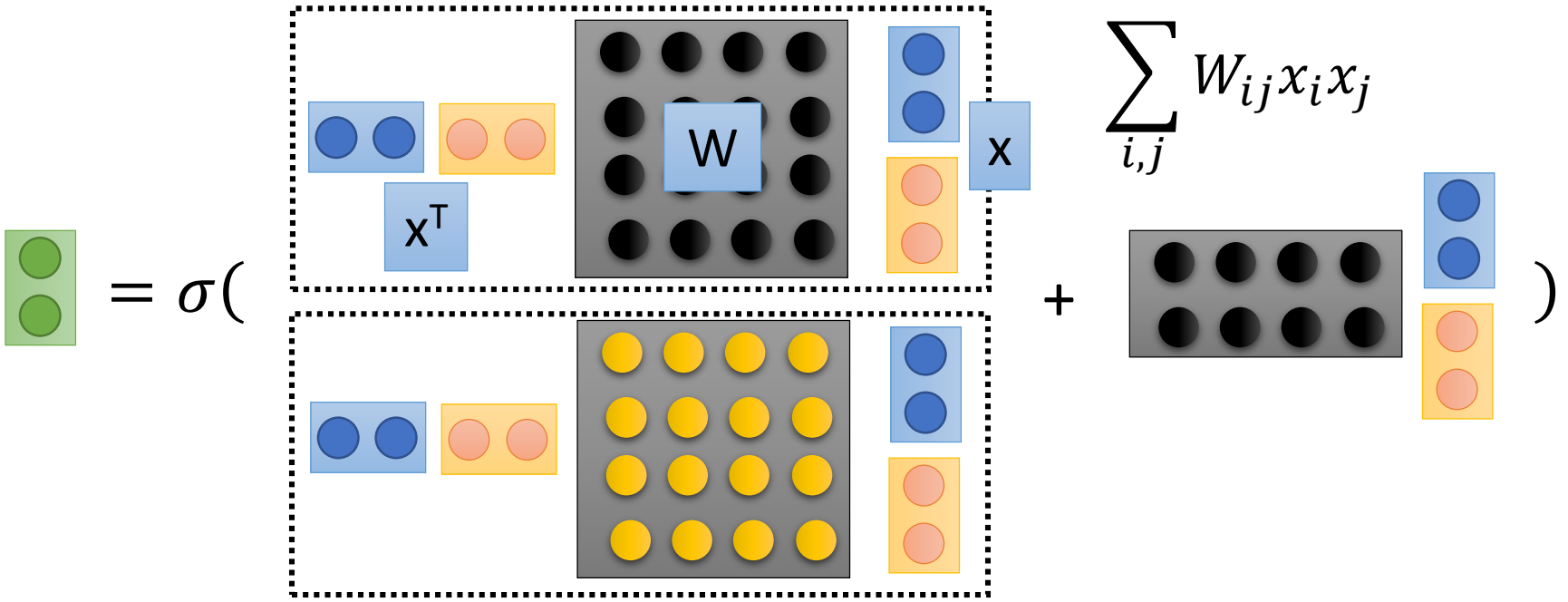

-
ref
output
5 classes
(-- , - , 0 , + , ++)
g
V(“not very good”)
Train both …
f
g
f
f
V(“not”)
V(“very”)
V(“good”)
not
very
good

Recursive Neural Tensor Network



Little interaction between a and b

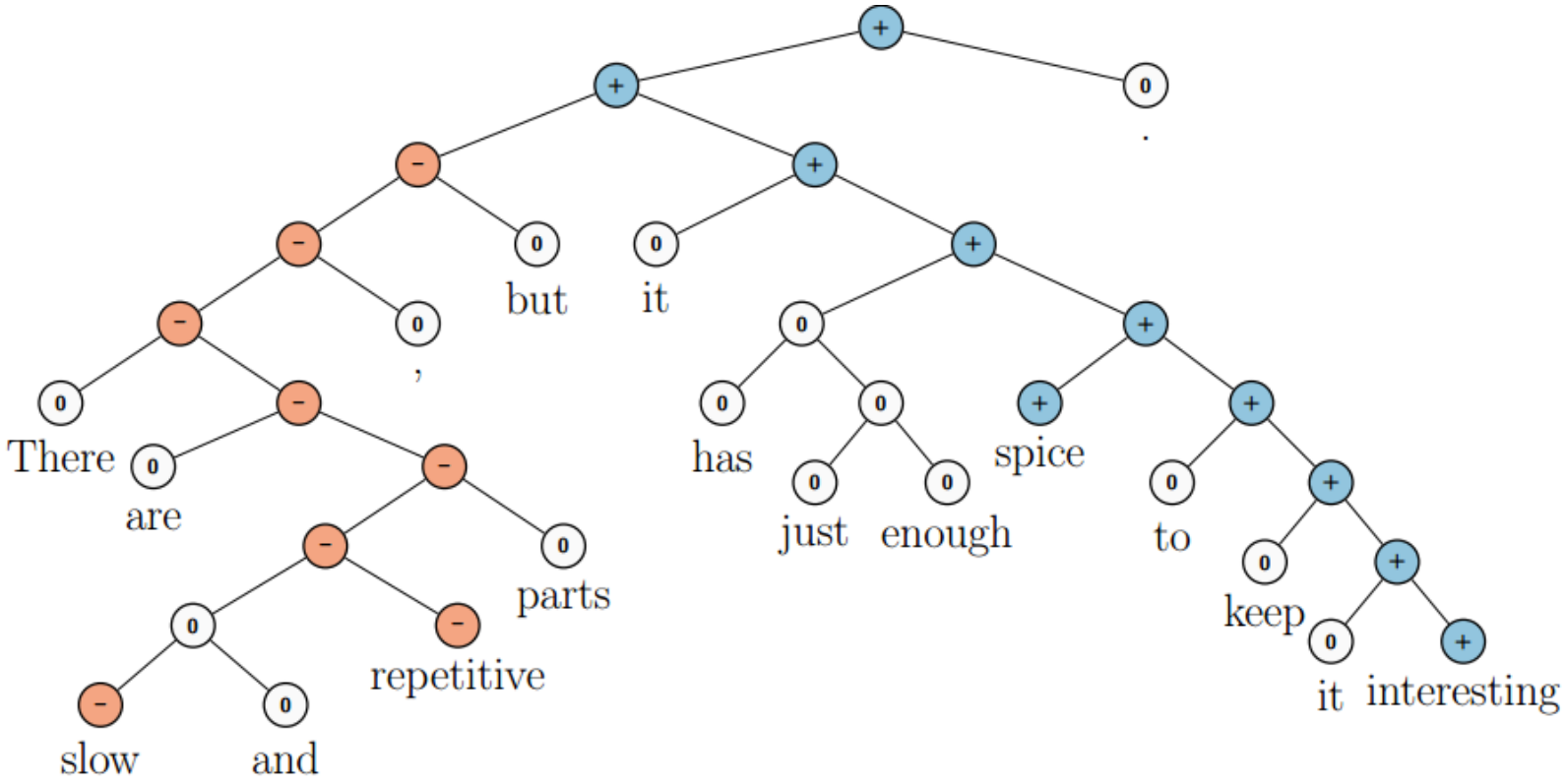




$$\sum_{i,j} W_{ij} x_i x_j$$

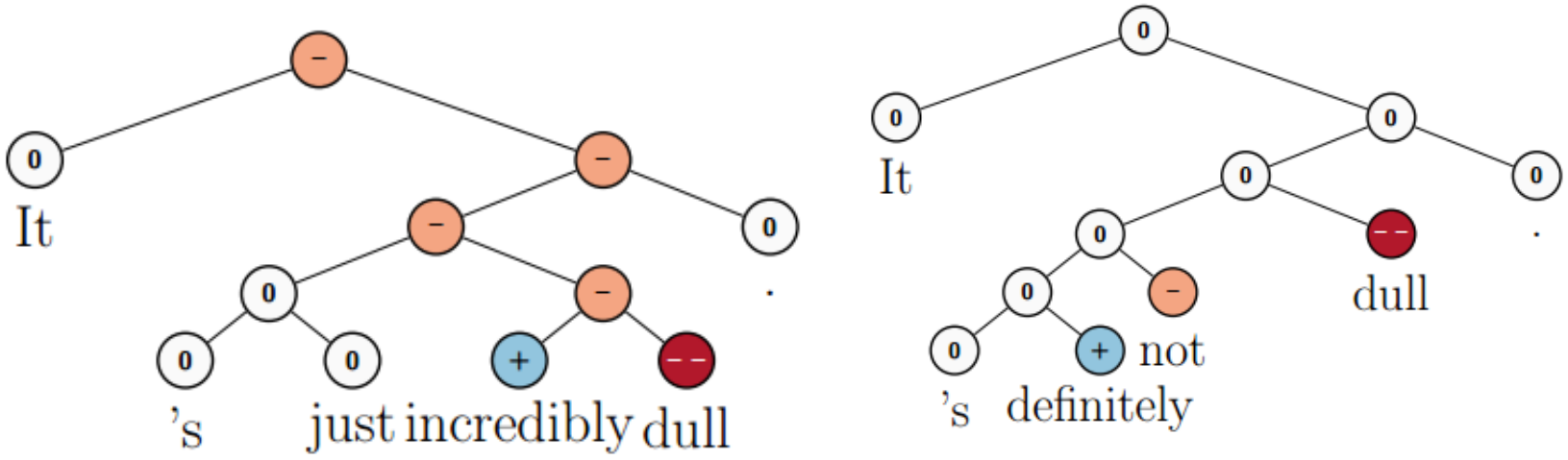
Experiments

5-class sentiment classification (-- , - , 0 , + , ++)



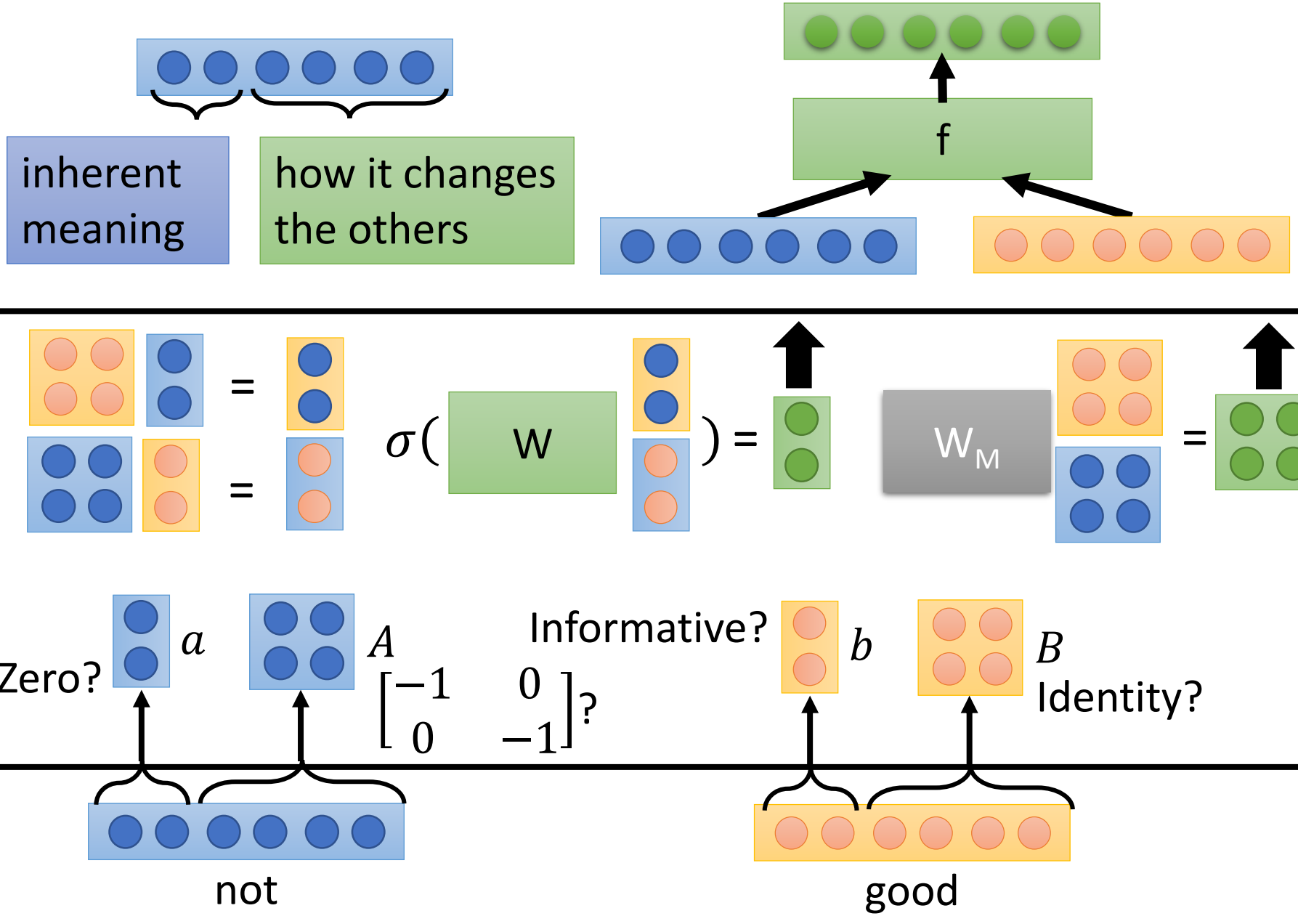
Demo: http://nlp.stanford.edu:8080/sentiment/rntnDemo.html

Experiments



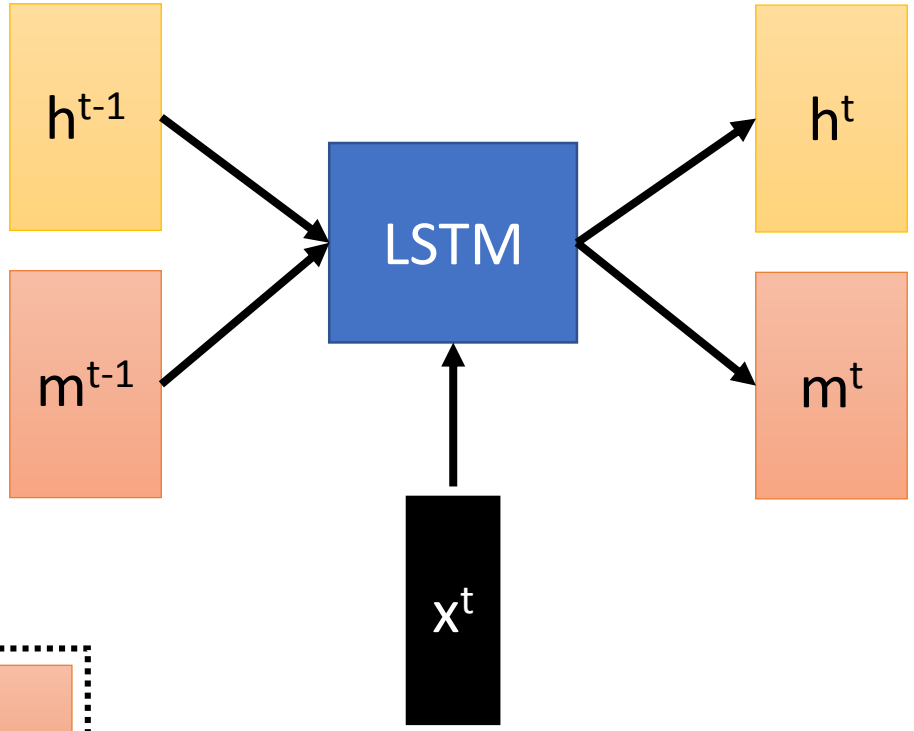
Socher, Richard, et al. "Recursive deep models for semantic compositionality over a sentiment treebank." *Proceedings of the conference on empirical methods in natural language processing (EMNLP)*. Vol. 1631. 2013.

Matrix-Vector Recursive Network

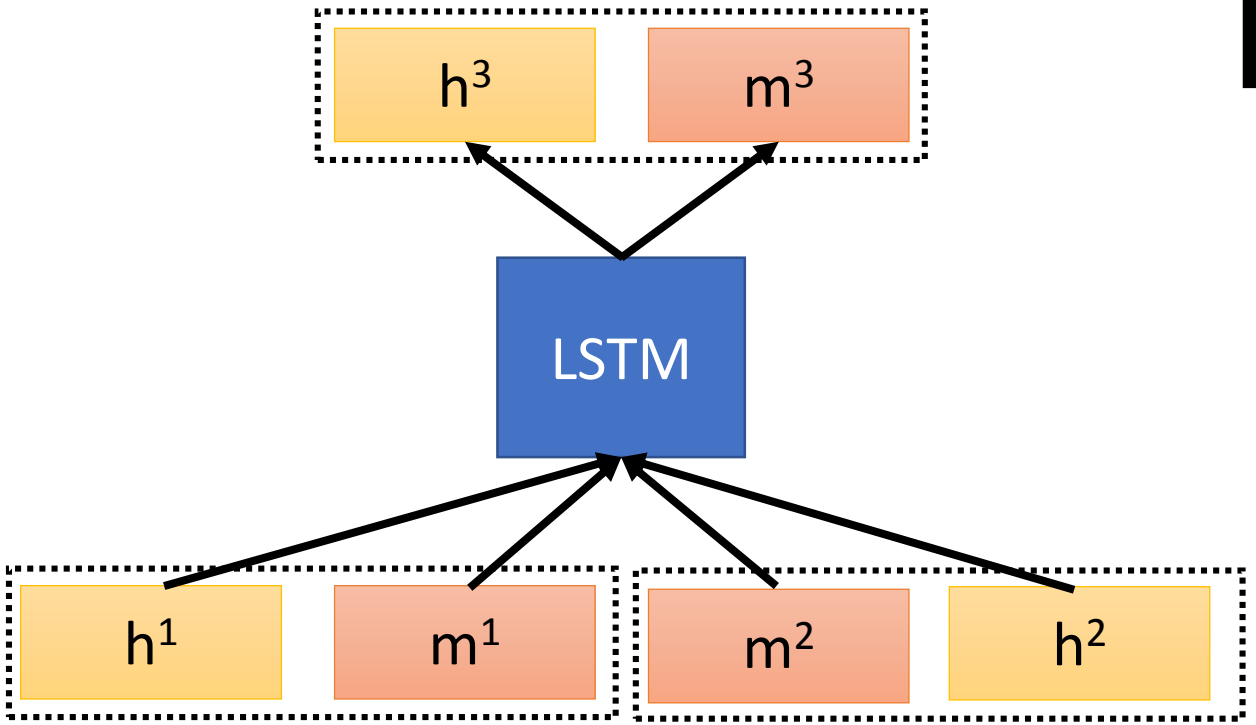


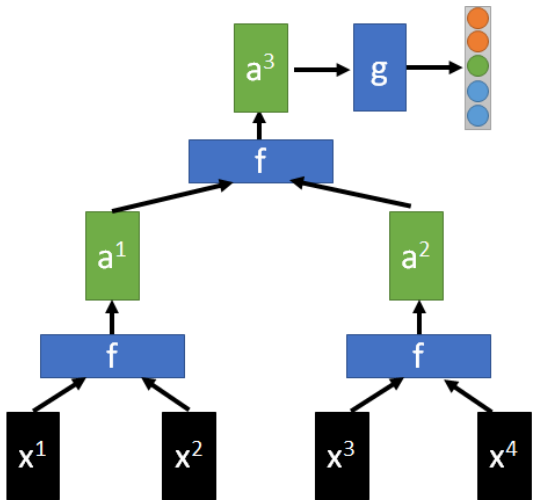
Tree LSTM

Typical LSTM



Tree LSTM





More Applications

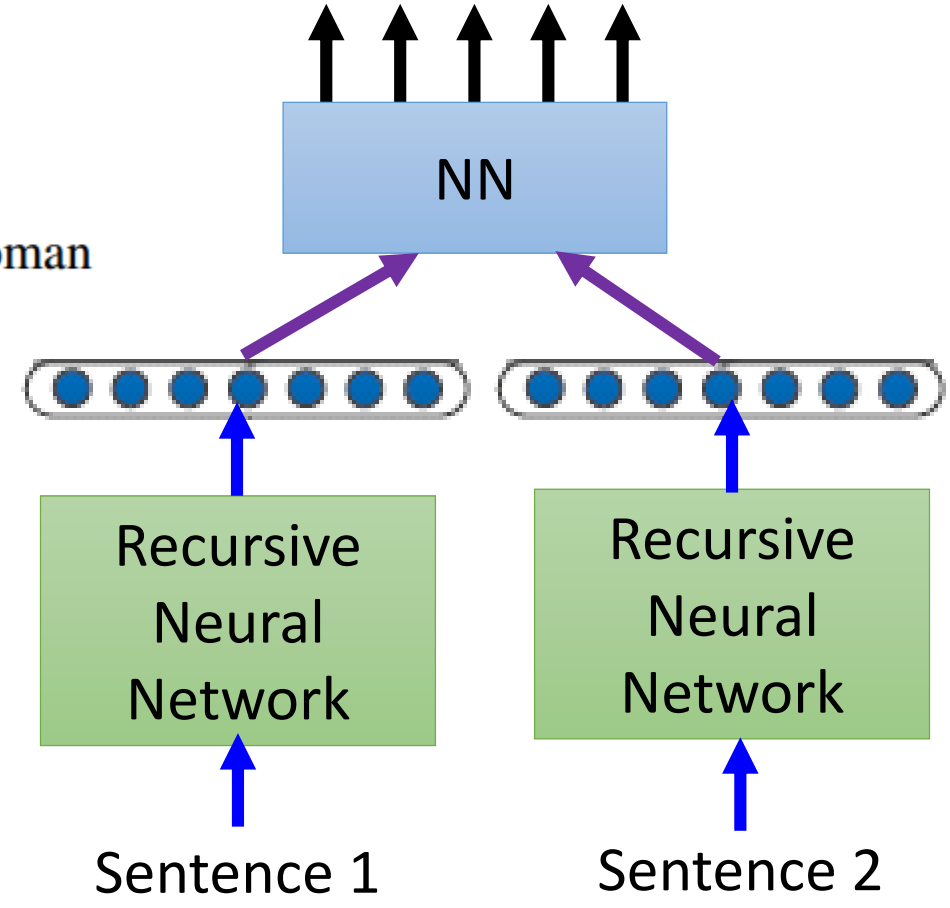
- Sentence relatedness

a woman is slicing potatoes

4.82 a woman is cutting potatoes

4.70 potatoes are being sliced by a woman

4.39 tofu is being sliced by a woman



Tai, Kai Sheng, Richard Socher, and Christopher D. Manning. "Improved semantic representations from tree-structured long short-term memory networks." *arXiv preprint arXiv:1503.00075* (2015).