Natural Language Processing

Lecture 20

Dirk Hovy

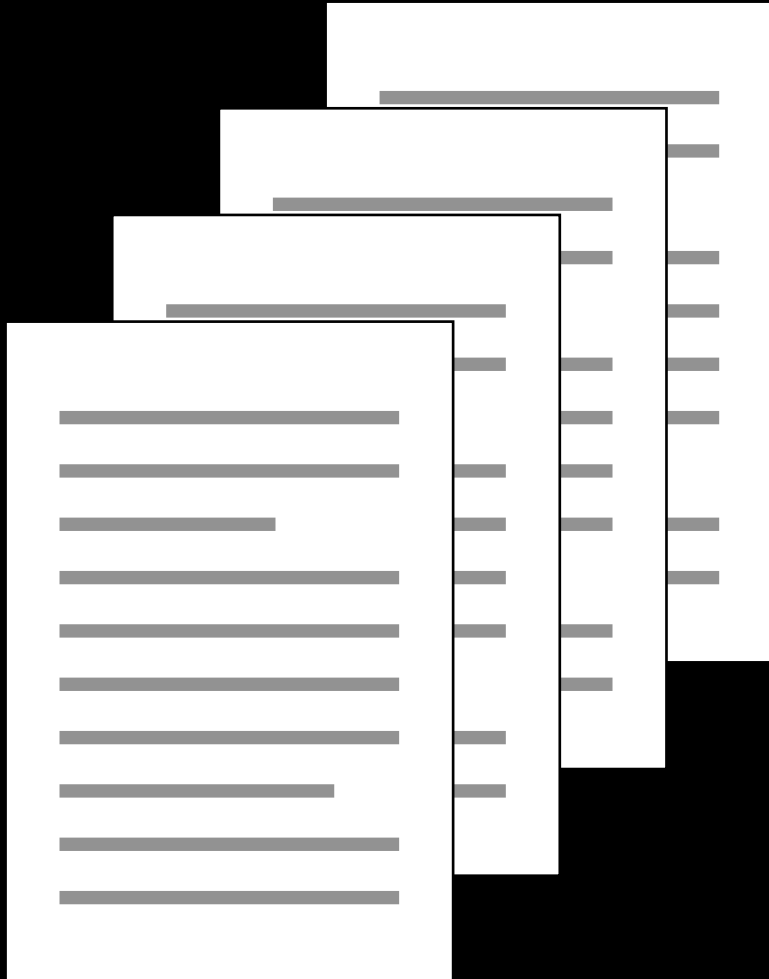dirk.hovy@unibocconi.it

@dirk_hovy

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Convoluted Matters
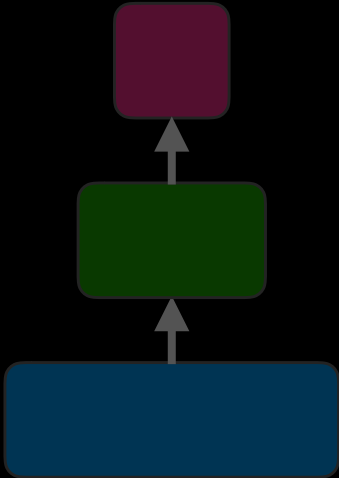
TEXT SORT CLASSIFICATION
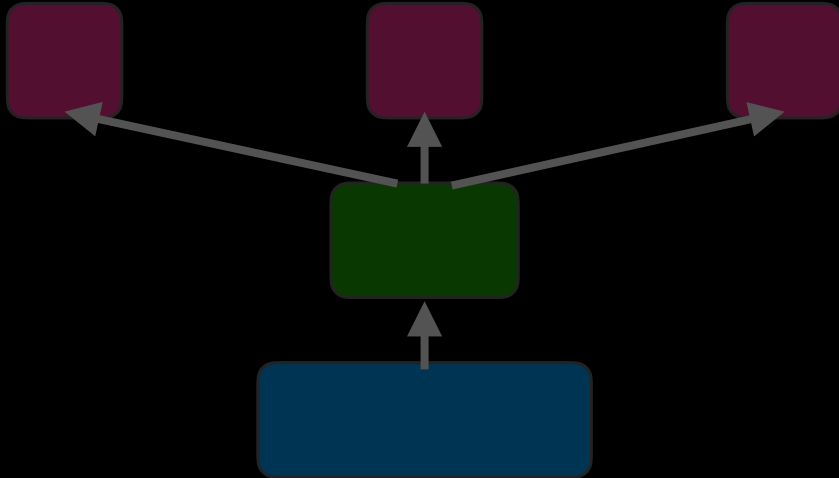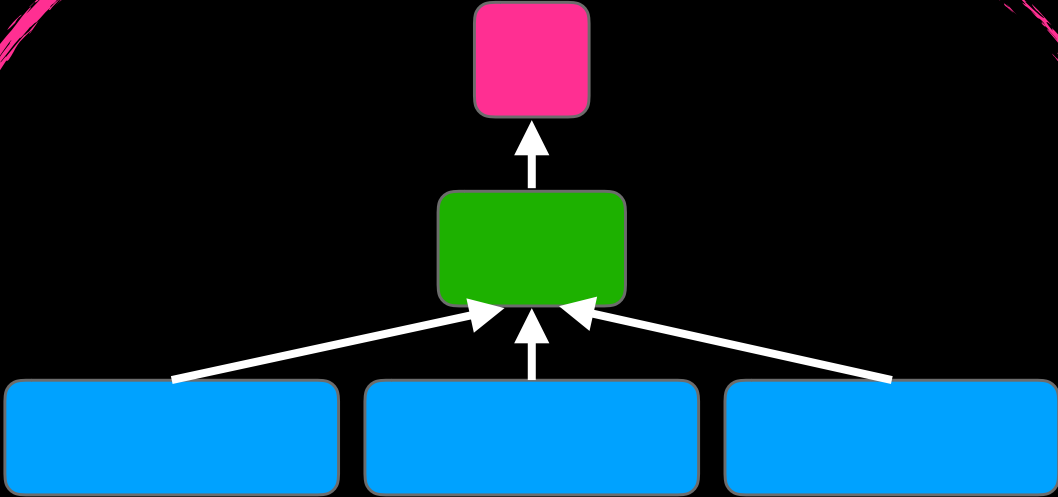
Retail

SENTIMENT ANALYSIS
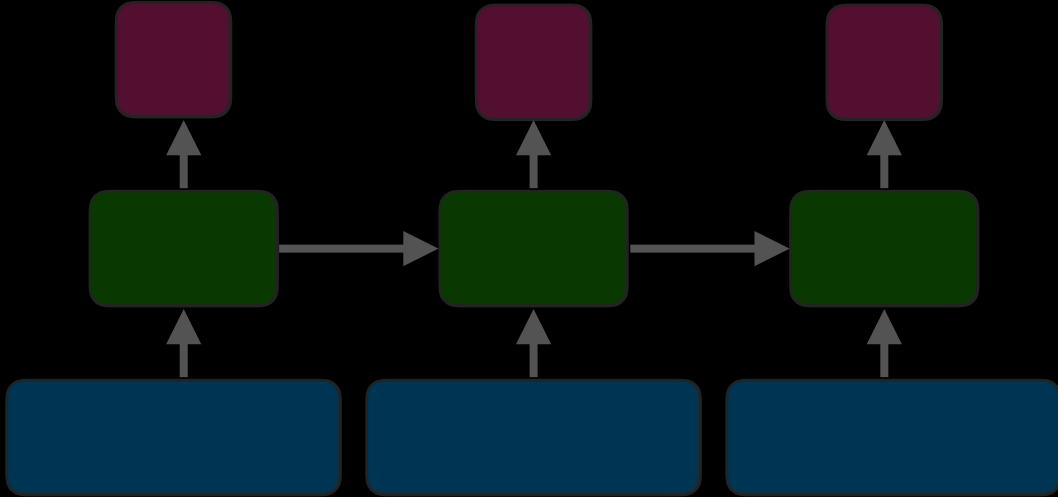
positive

RELATION EXTRACTION

founded_by(Amazon, Jeff Bezos)

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Types of Text Classification

|	Fixed length	Variable length
Fixed length	Logistic Regression, Perceptron, Feed-Forward Network, Random Forest, Naive Bayes, SVM, …	Multitask Learning, Decoder
Variable length	Convolutional Neural Networks (CNN)	Recurrent Neural Networks (RNN), Hidden Markov Models (HMM), Conditional Random Fields

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Goals for Today

- Learn about **convolutional neural network architectures**

- Understand the concept of **convolution** and **pooling**

- Understand advantages over feed-forward networks

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Problems with MLPs

Not bad, actually quite good ≠ Not good, actually quite bad
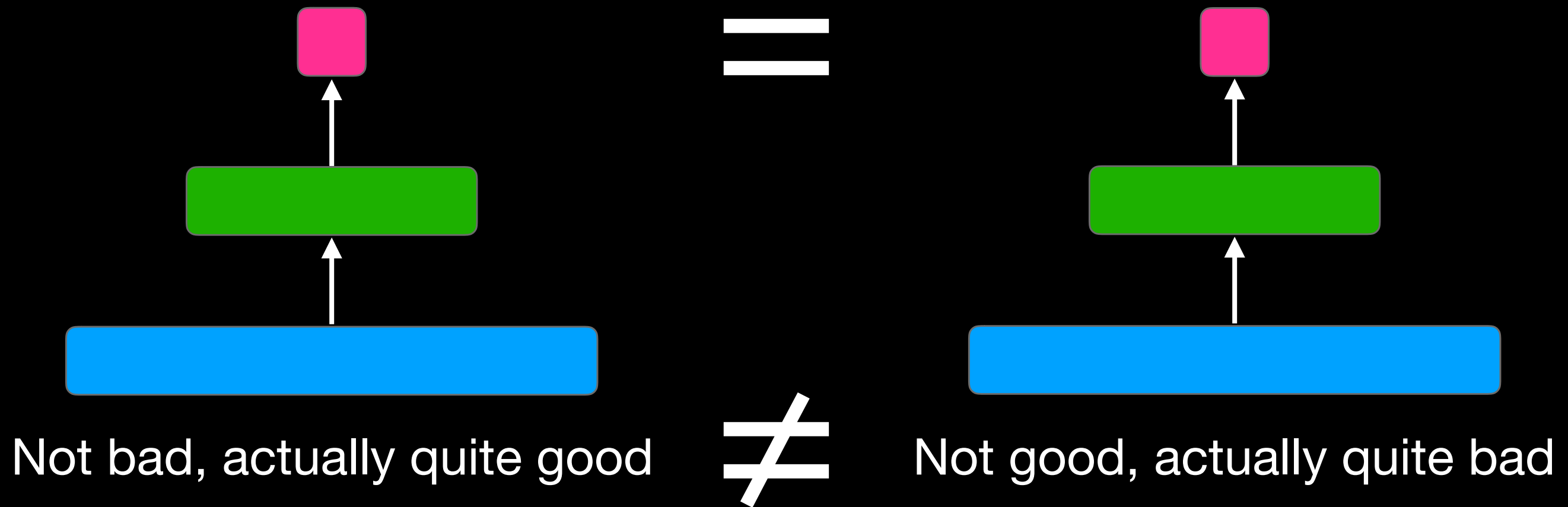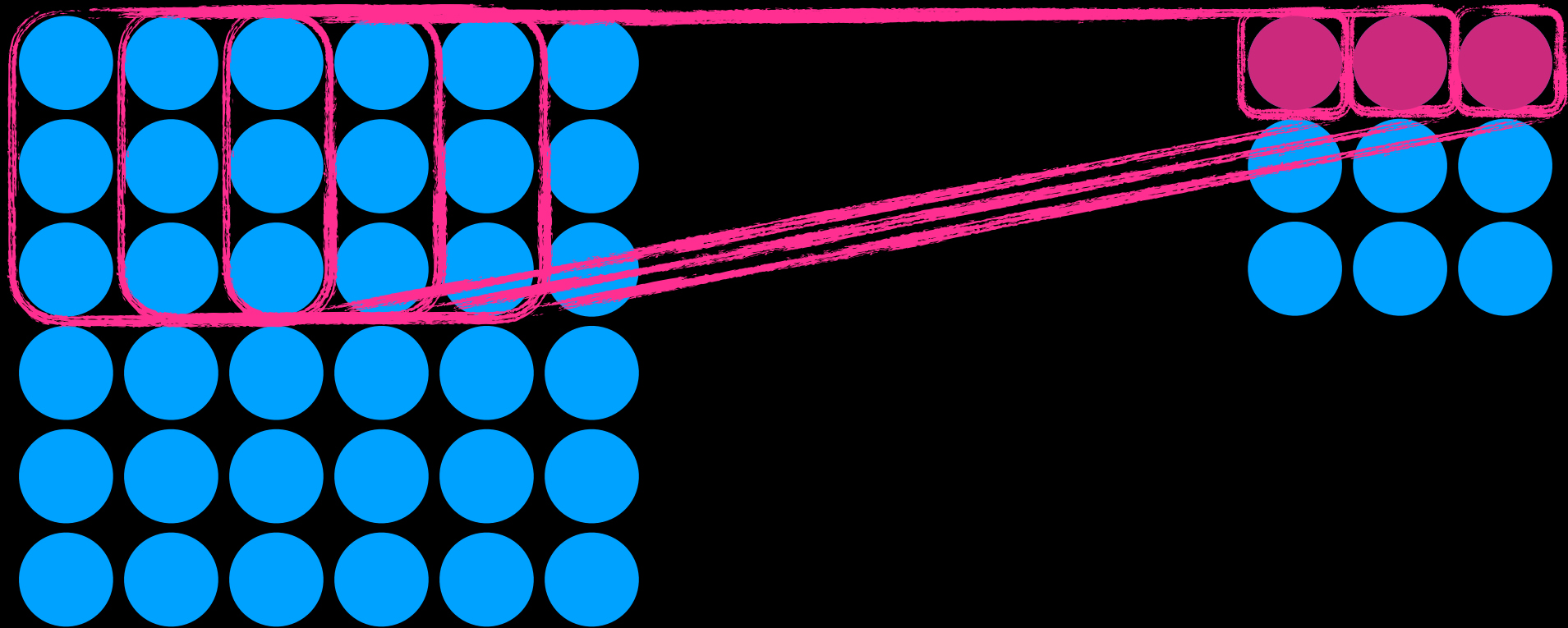
Problems with MLPs

founded_by(Amazon, Jeff Bezos)
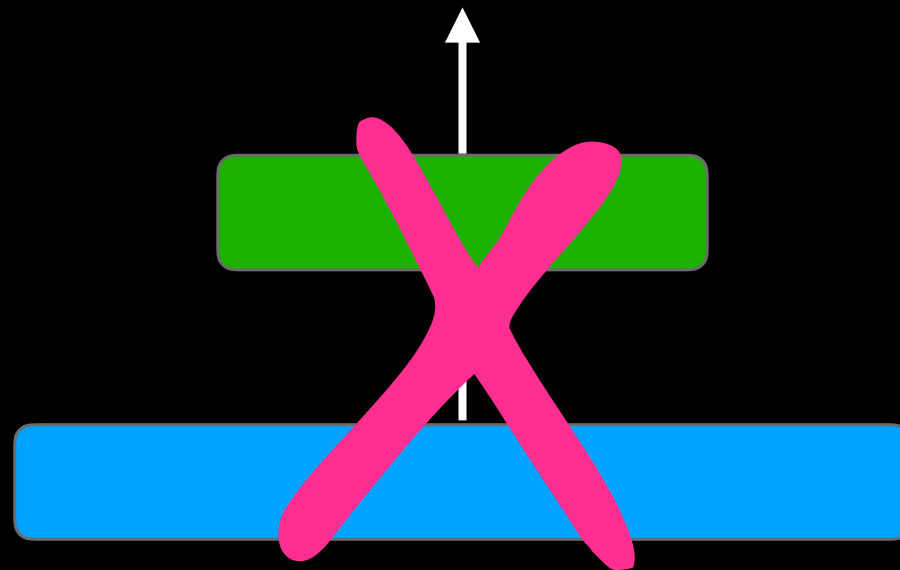
Jeff Bezos, or what Dr. Evil would look like on steroids, went from book seller to billionaire when he founded Amazon in 1994.

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Convolution

Convolution

Convolution Extraction

Image

Convolved Feature

Pooling

Max Pooling

0.3	0.5
-0.2	0.1
0.4	-0.1
0.3	0.5
0.8	0.2

| 0.8 | 0.5 |

| -0.2 | -0.1 |

Min Pooling

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CNNs in Images

CNNs in Text

Convolution window = 4

I
will
not
buy
this
record
it
is
scratched

$$y = W_2 \cdot m + b_2$$

pos
neut
neg

$$m = max(h_i)$$

$$c_i = concat(x_{i-i+3})$$ $$h_i = relu(W_1 \cdot c_i + b_1)$$

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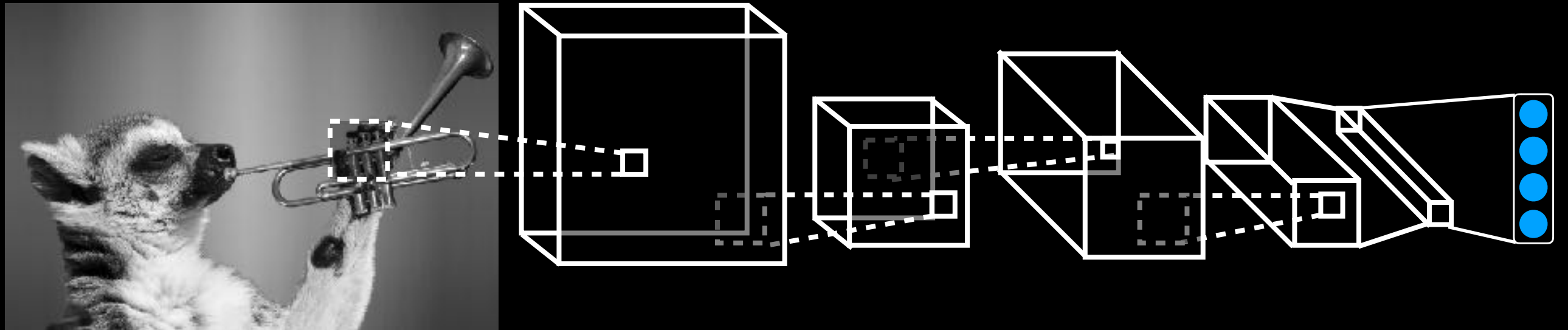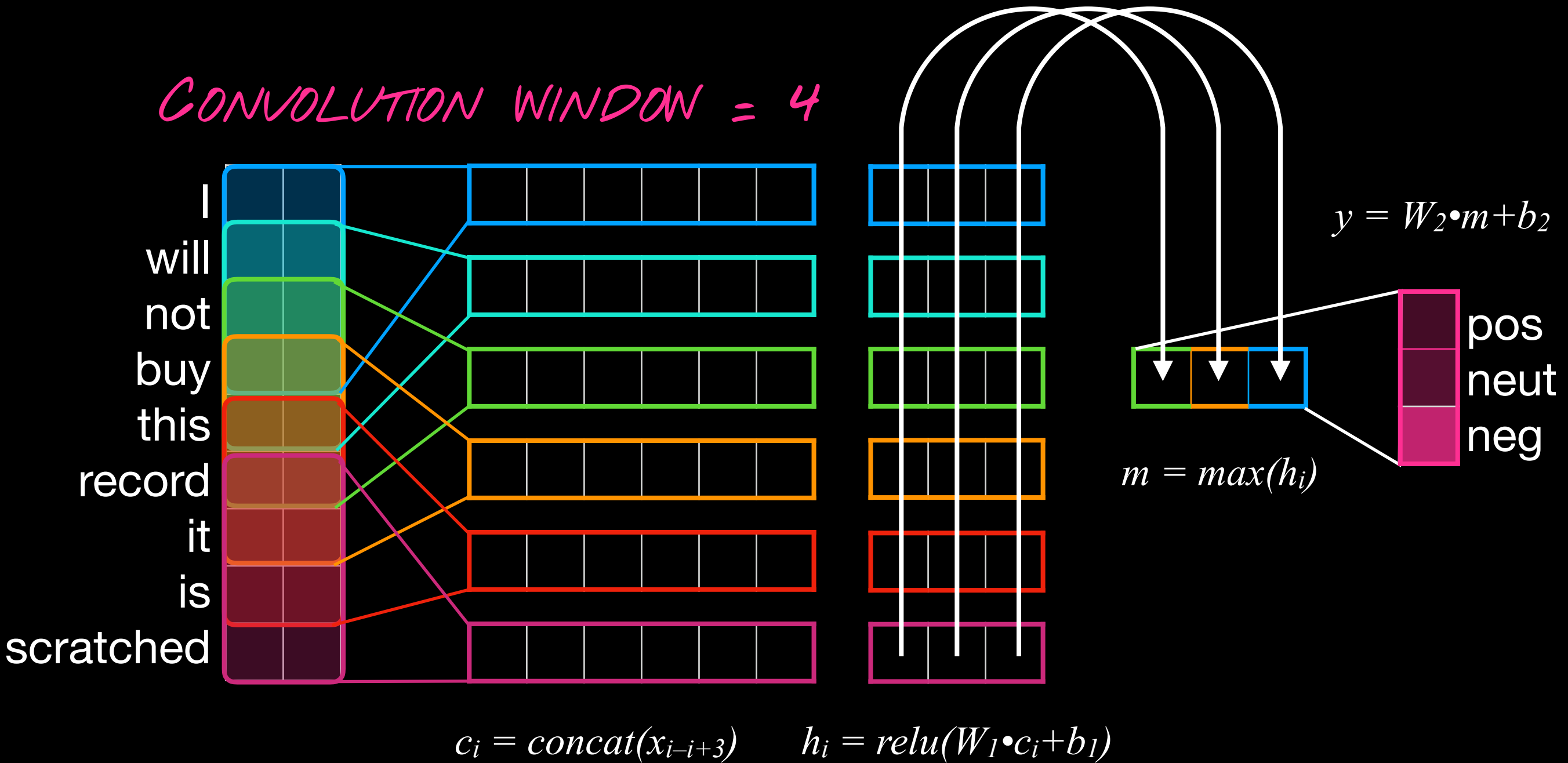
Wrapping up

Take Home Points

- Feed-forward NNs cannot capture **sequence info**

- **Convolution windows** captures **different views**

- **Pooling** reduces dimensionality

- CNNs are often **better for text classification** than feedforward NNs

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