Natural Language Processing

AIGC 5501

PyTorch Tutorial

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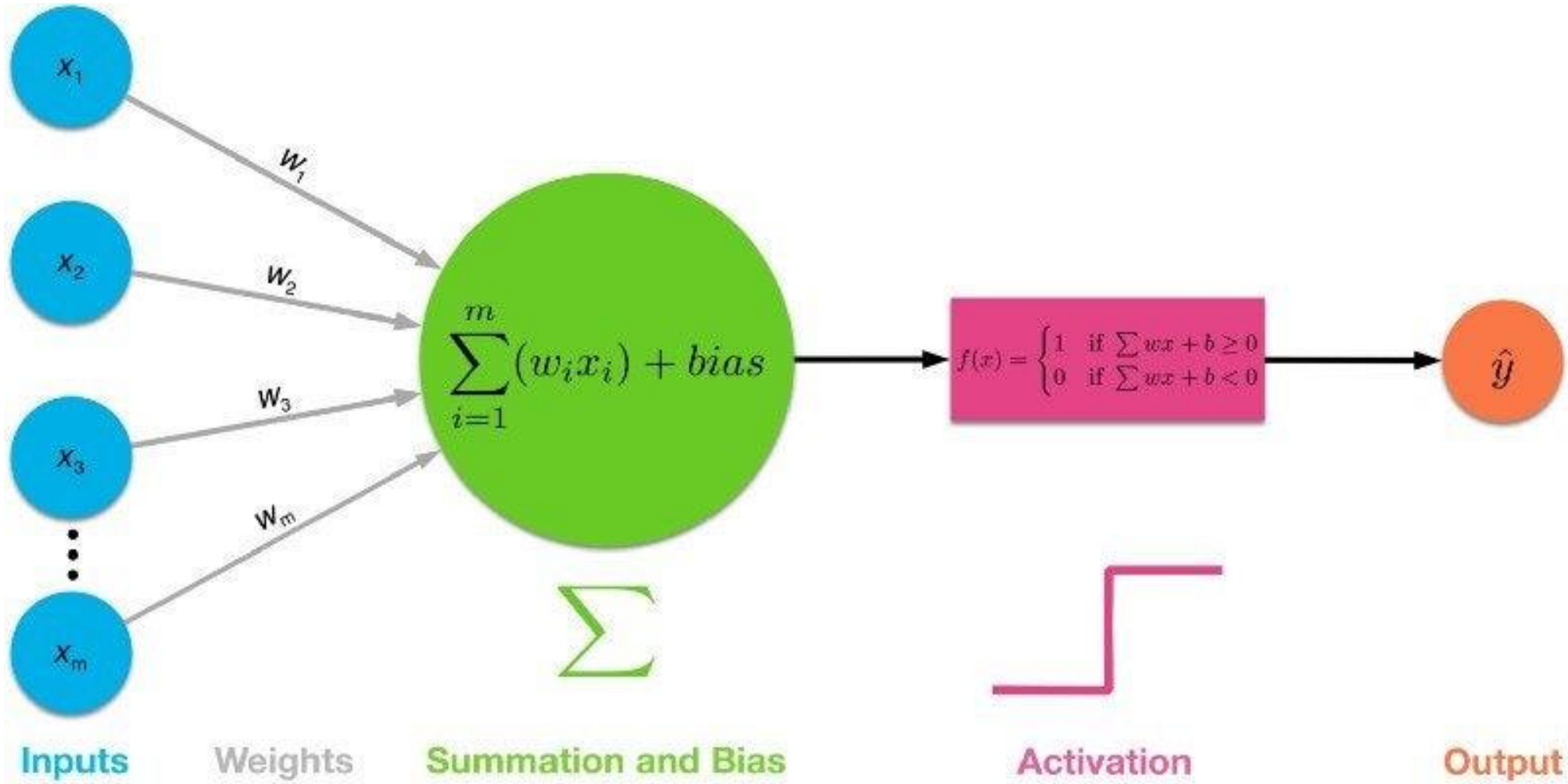
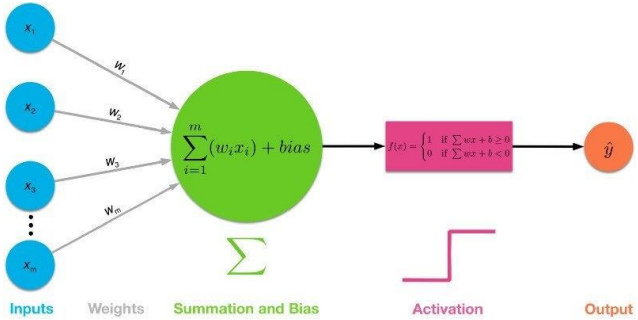
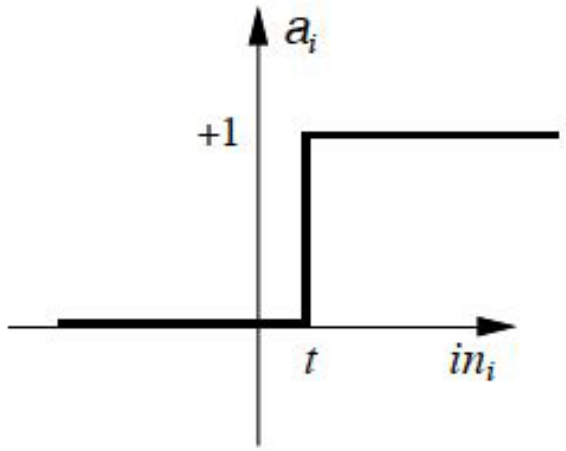
Last Class

Neural networks

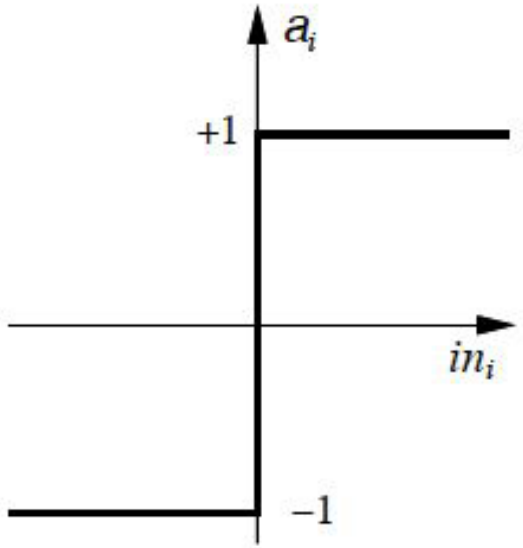


Activation functions

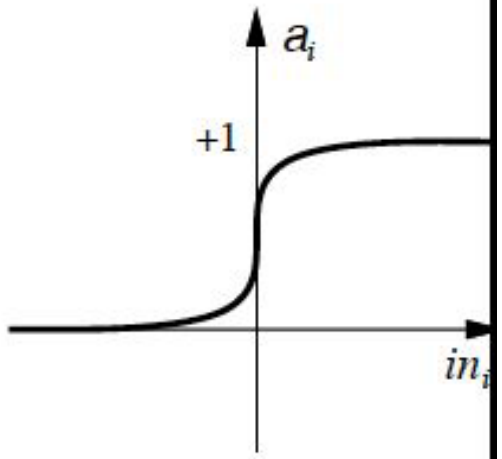




(a) Step function



(b) Sign function

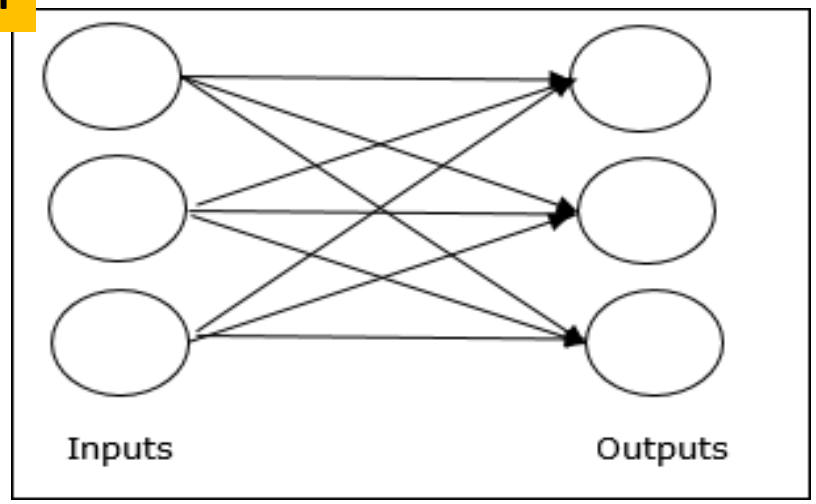


(c) Sigmoid function

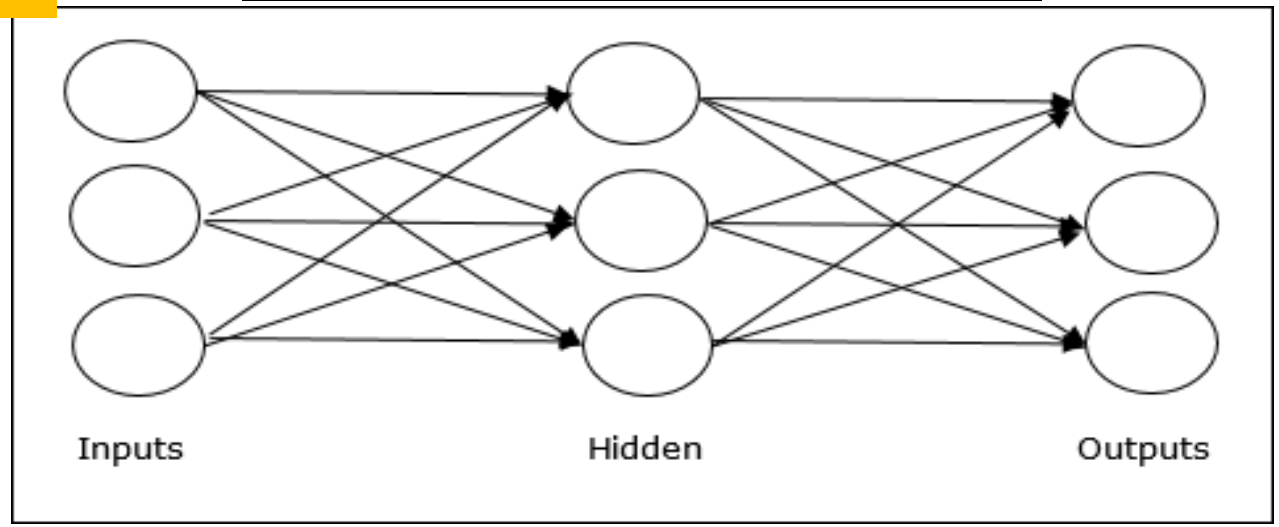
Perceptron units

NN Designs

Single layer

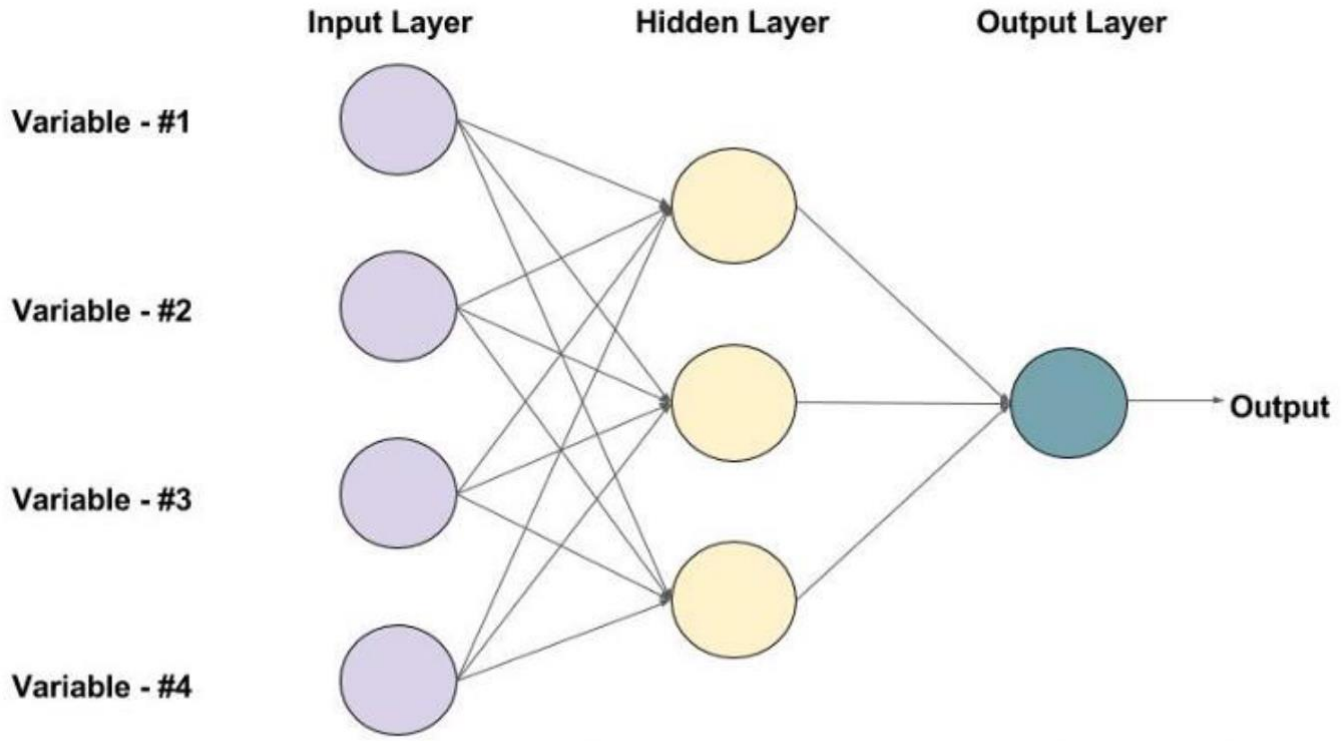


Multilayer



Feedforward network

- Computation proceeds iteratively from one layer of units to the next.
- A feedforward network is a **multilayer** feedforward network in which the units are connected with **no cycles**.
- I.e., the outputs from units in each layer are passed to units in the next higher layer, and no outputs are passed back to lower layers.
- Sometimes called **multi-layer perceptrons (MLPs)**; however, units in modern multilayer networks aren't perceptrons (linear). They are units with non-linear activation functions (e.g. tanh).



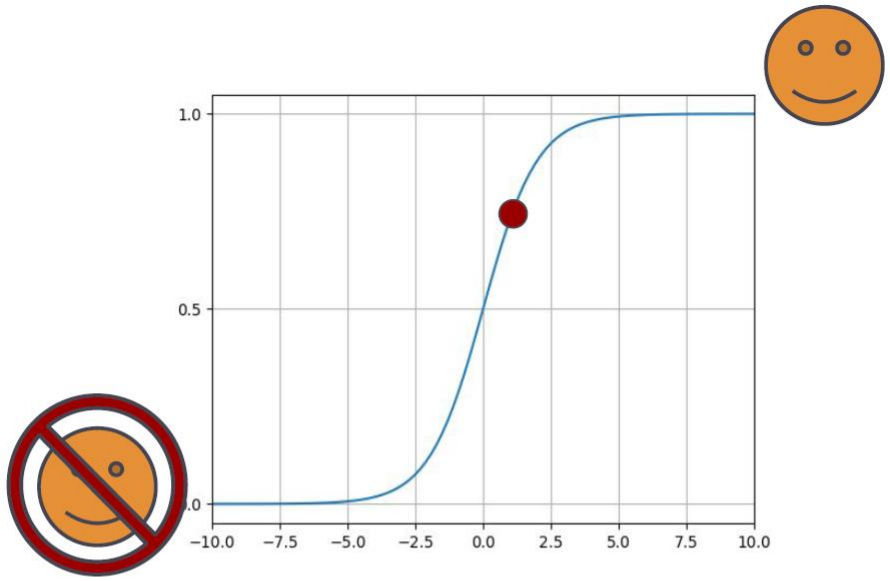
An example of a Feed-forward Neural Network with one hidden layer (with 3 neurons)

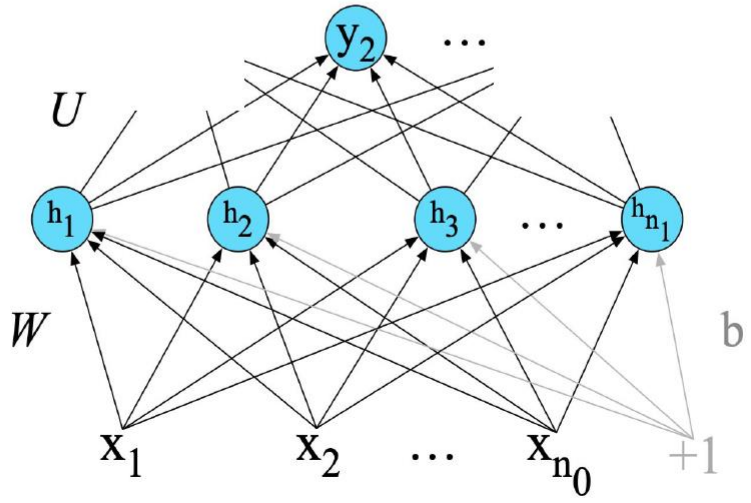
Simple FFNNs have three types of nodes:

- Input units,
- Hidden units, and
- Output units

Output nodes

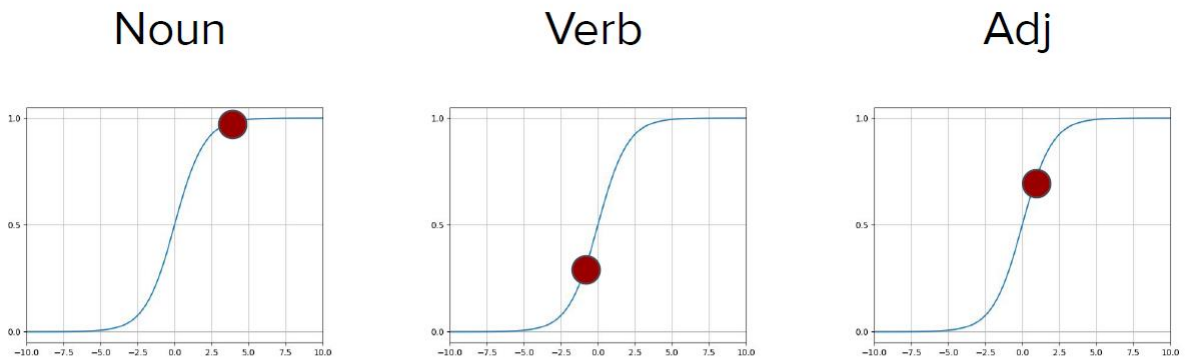
- Could have a single output node, e.g. binary classification (e.g. sentiment analysis).

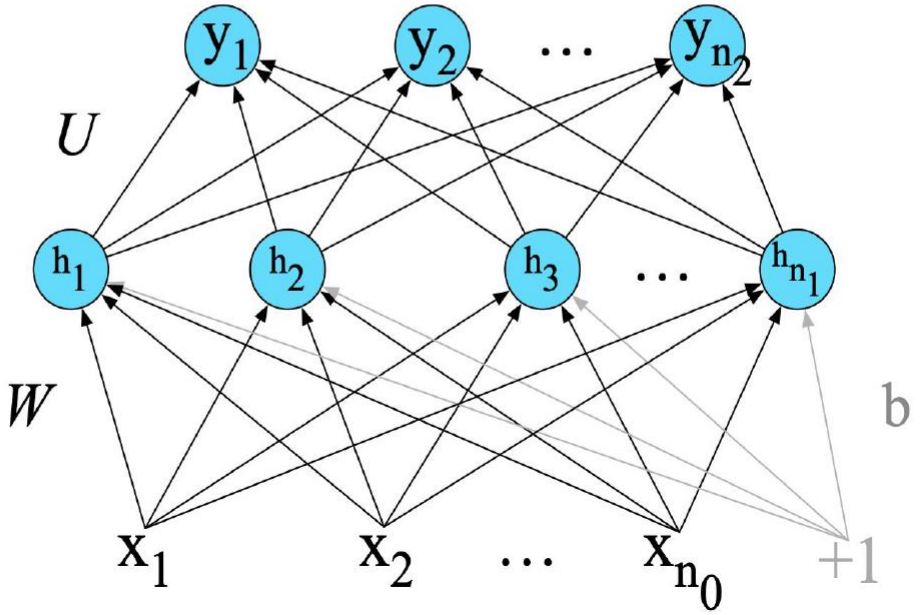




Output nodes

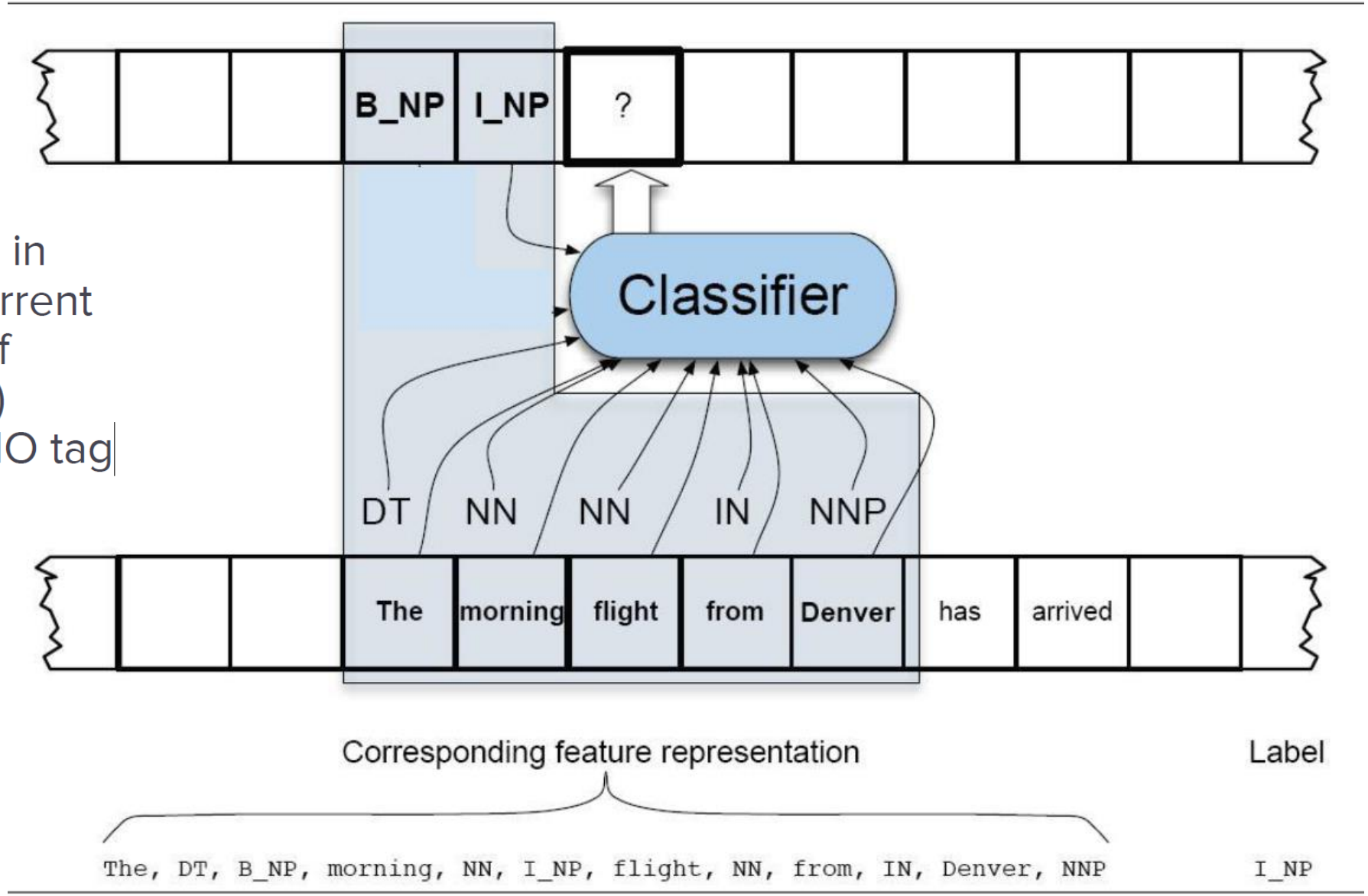
- Could use one output node per class, e.g. multinomial classification (e.g. POS-tagging).





Training Neural Nets

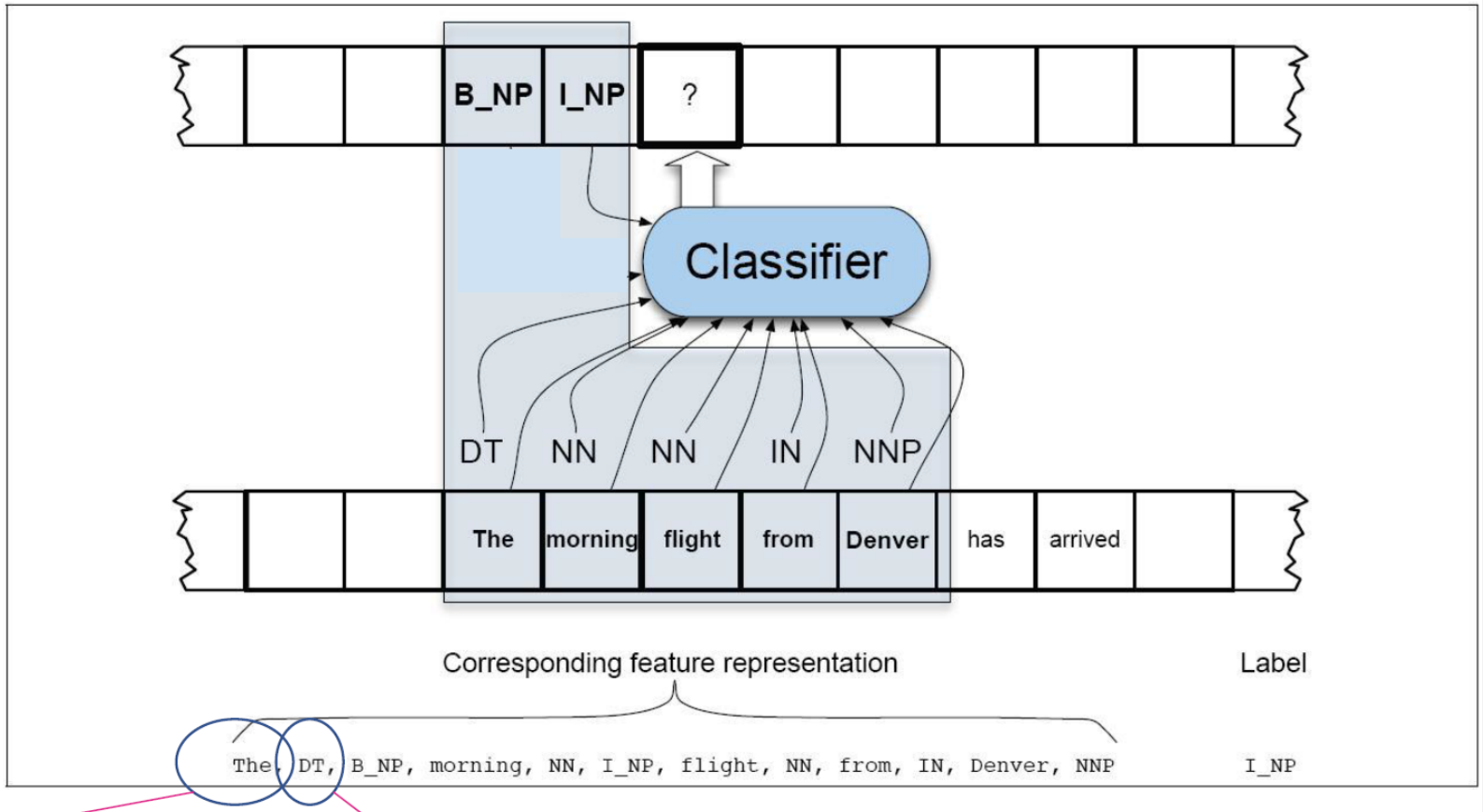
- We are interested in **classifying** the current token (at center of moving "window") according to its BIO tag



Designing Neural Nets

Converting features to integer/real values

- Binarize each feature
- And then concatenate



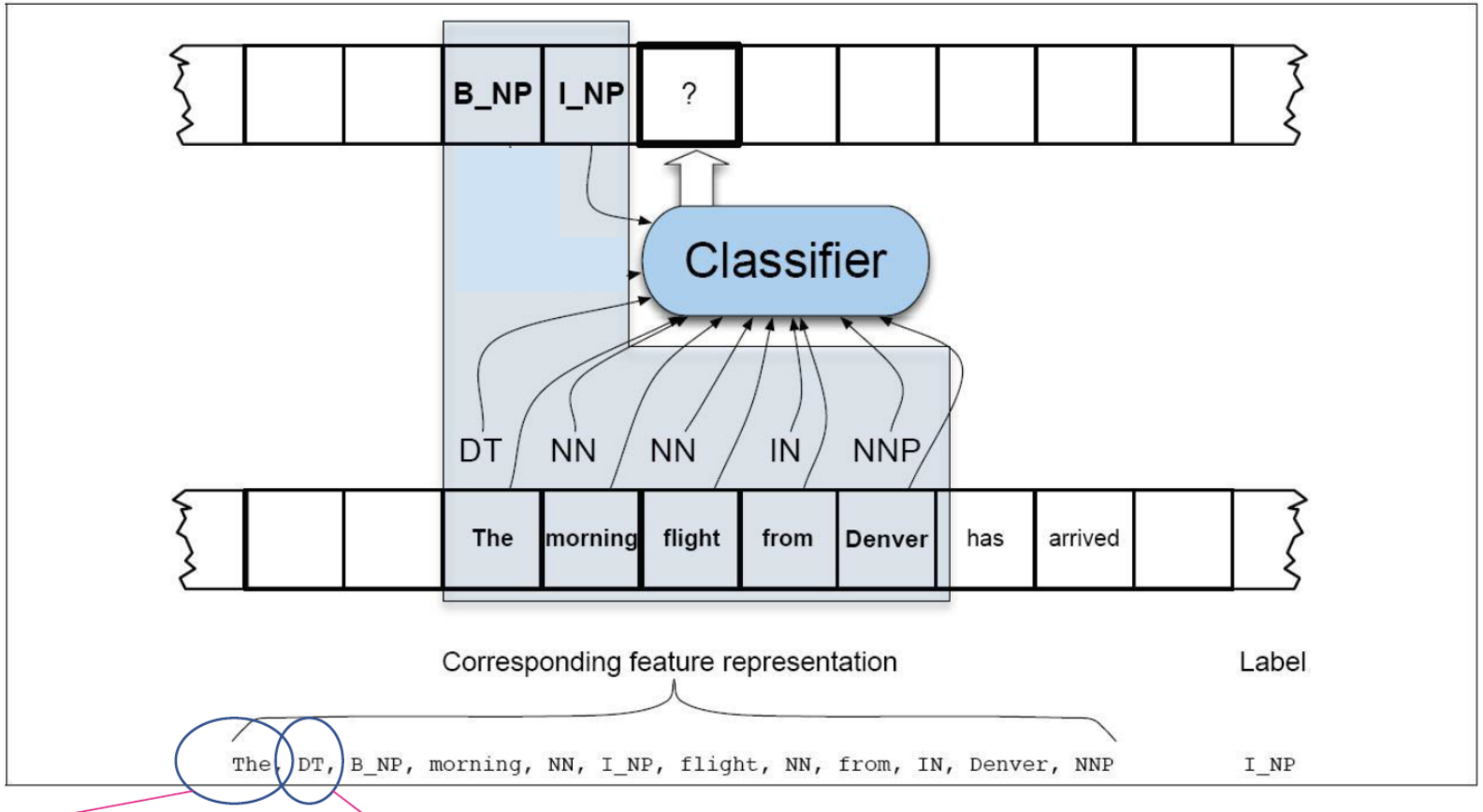
[a? apple? … dog? eat? …. the? … zipper?]
[0 0 … 0 0 … 1 … 0]

[NN? NNS? … DT? IN? …. VB? … VBN?]
[0 0 … 1 0 … 0 … 0]

Designing Neural Nets

Converting features to integer/real values

- Binarize each feature
  - Or convert to dense embeddings
- And then concatenate



E.g. Word2vec representation

[0.22 -0.8 … 0.55 … -0.35]

[NN? NNS? … DT? IN? …. VB? … VBN?]

[0 0 … 1 0 … 0 … 0]

Class Demo

https://pytorch.org/

Lab -7

Complete the Tutorial