



vitoriapacela/Neural_net_tira

Neural network

Vitória Barin Pacela

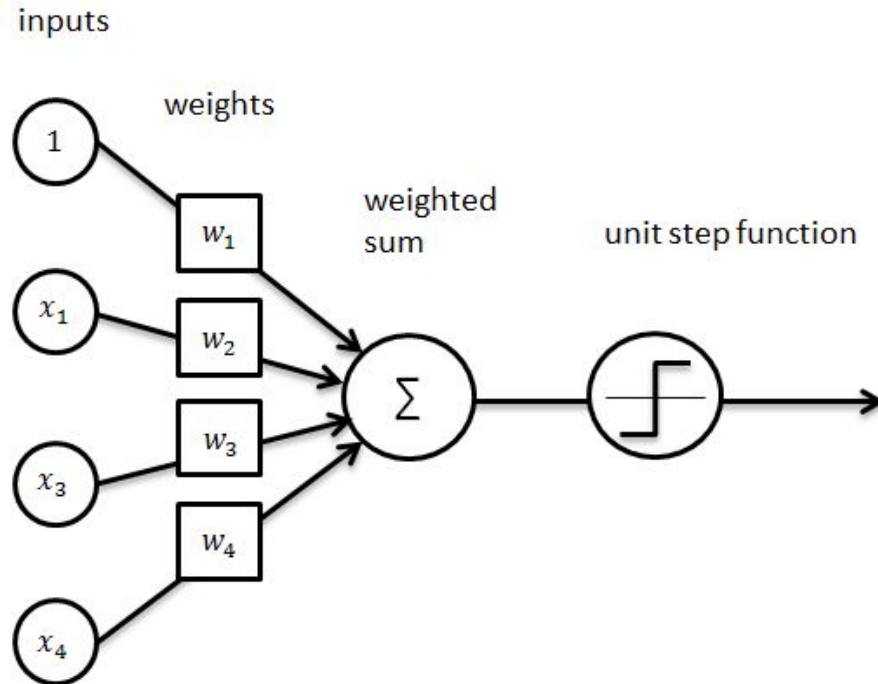
Data structures and algorithms project

17/10/18

What is a neural network?

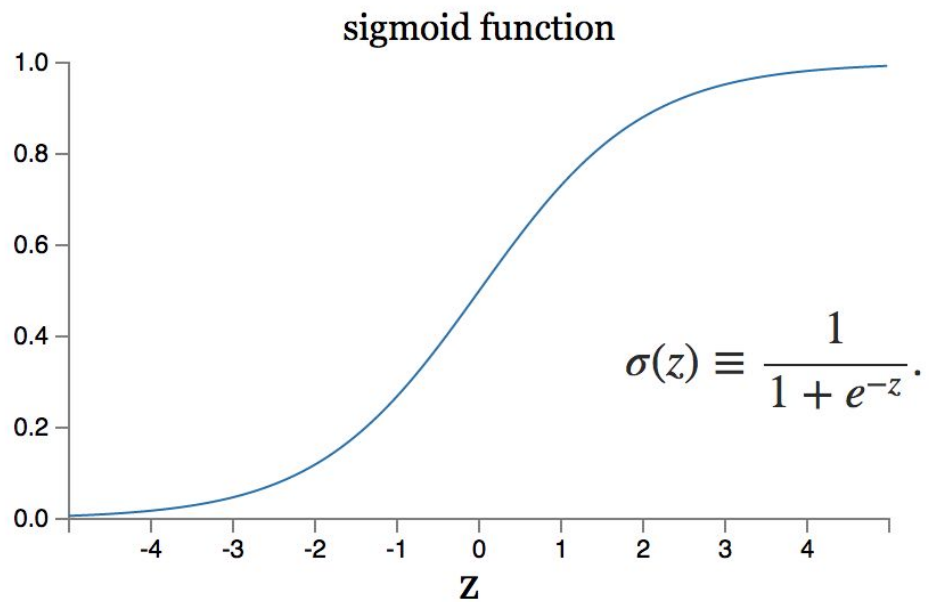
Everything starts
with a **perceptron**
(neuron)

$$o = f\left(\sum_{k=1}^n i_k \cdot W_k\right)$$



Sigmoid function

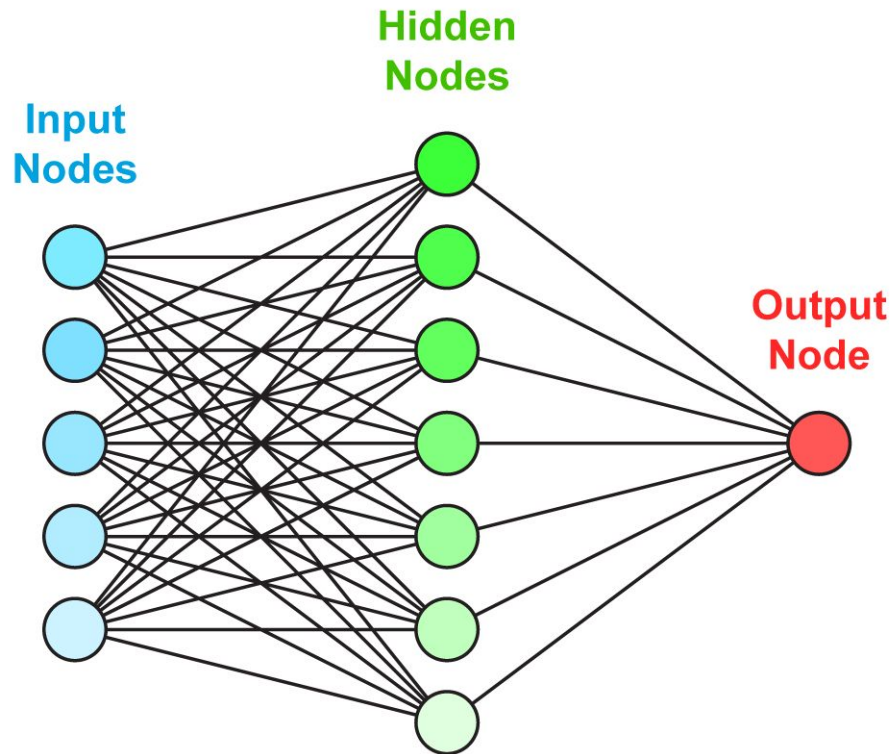
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But what is a neural network?

Multilayer perceptron

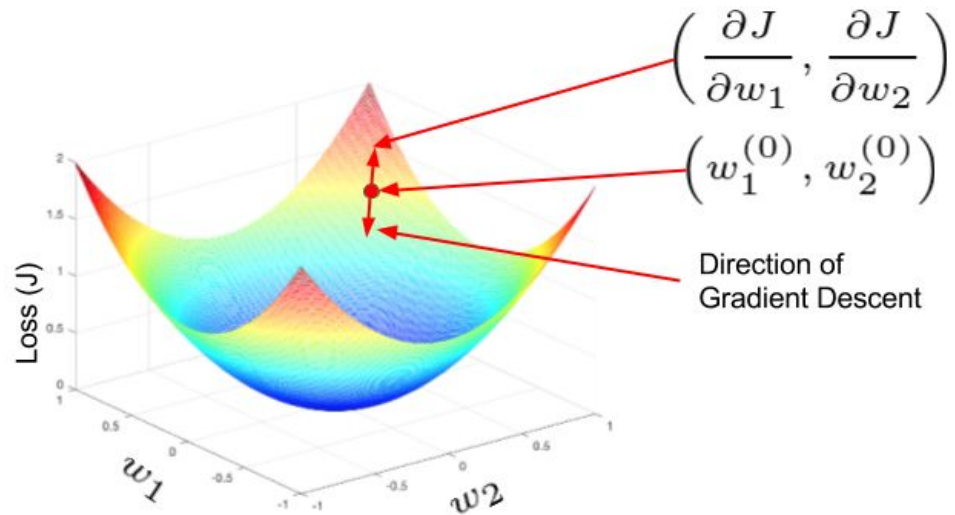
Organize the neurons in layers in order to predict a set of inputs



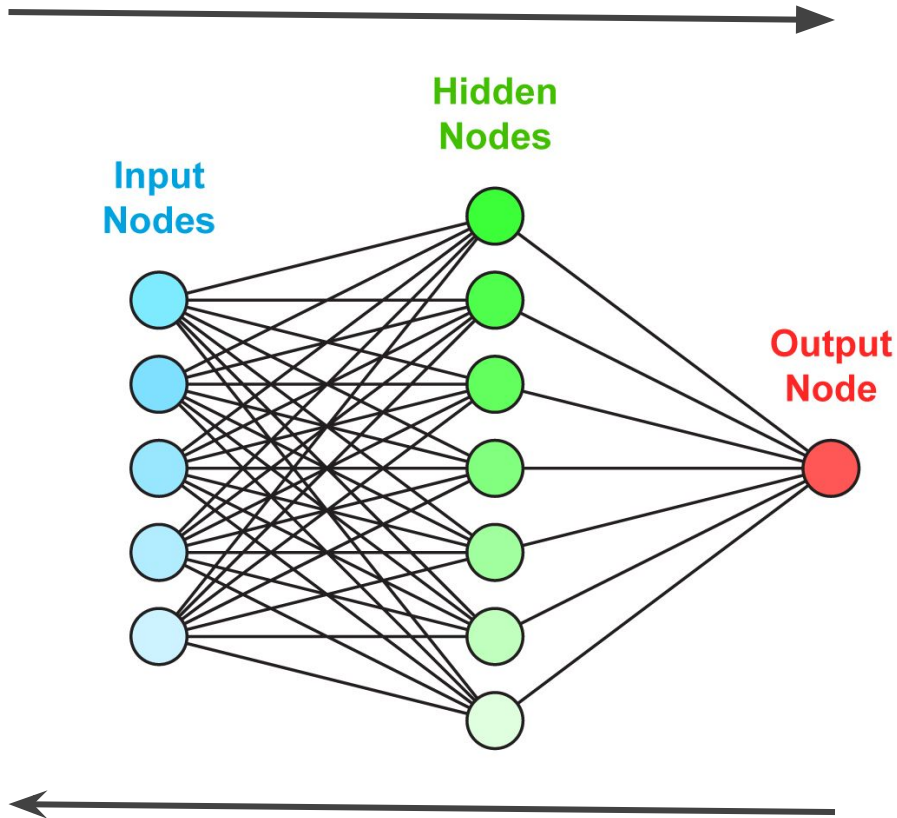
How does it train?

We need an **optimization algorithm** to minimize the **cost function** that adjusts the **weights** of the **neurons** according to the outputs.

Gradient descent



Feed-forward



Back-propagation

The problem: MNIST dataset

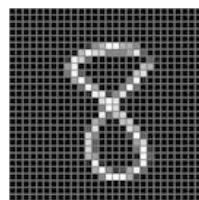


PROC. OF THE IEEE, NOVEMBER 1998

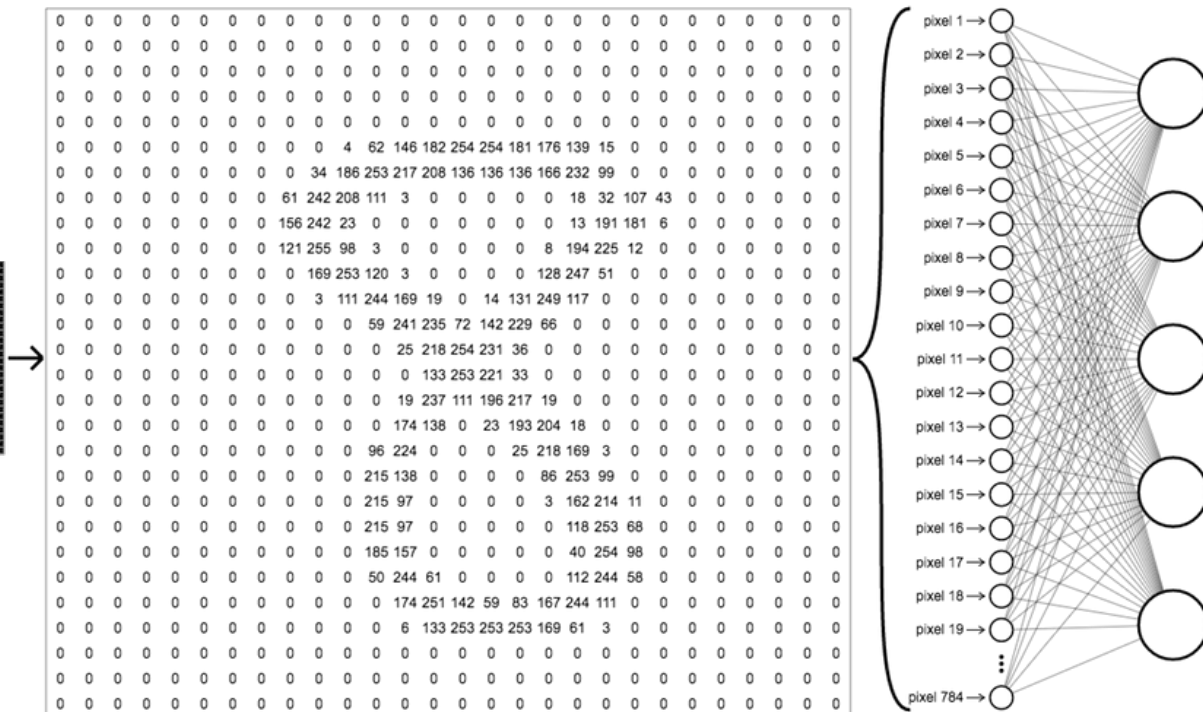
Gradient-Based Learning Applied to Document Recognition

Yann LeCun, Léon Bottou, Yoshua Bengio, and Patrick Haffner

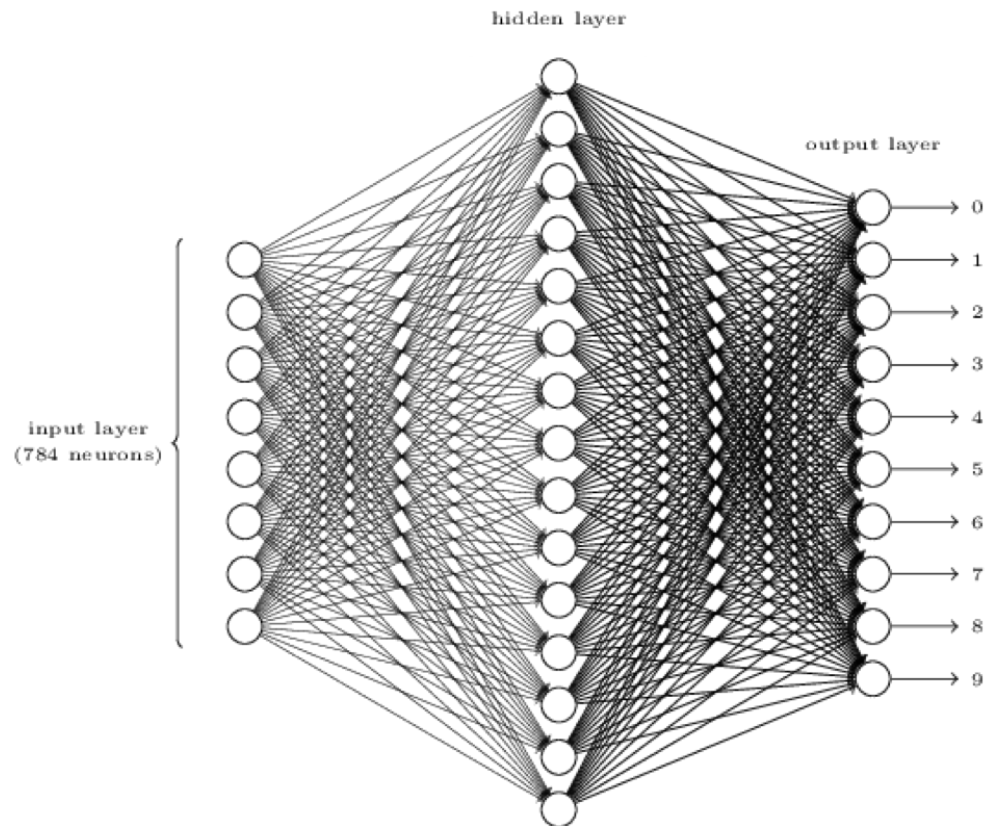
Set each pixel as a feature to the input



28 x 28
784 pixels

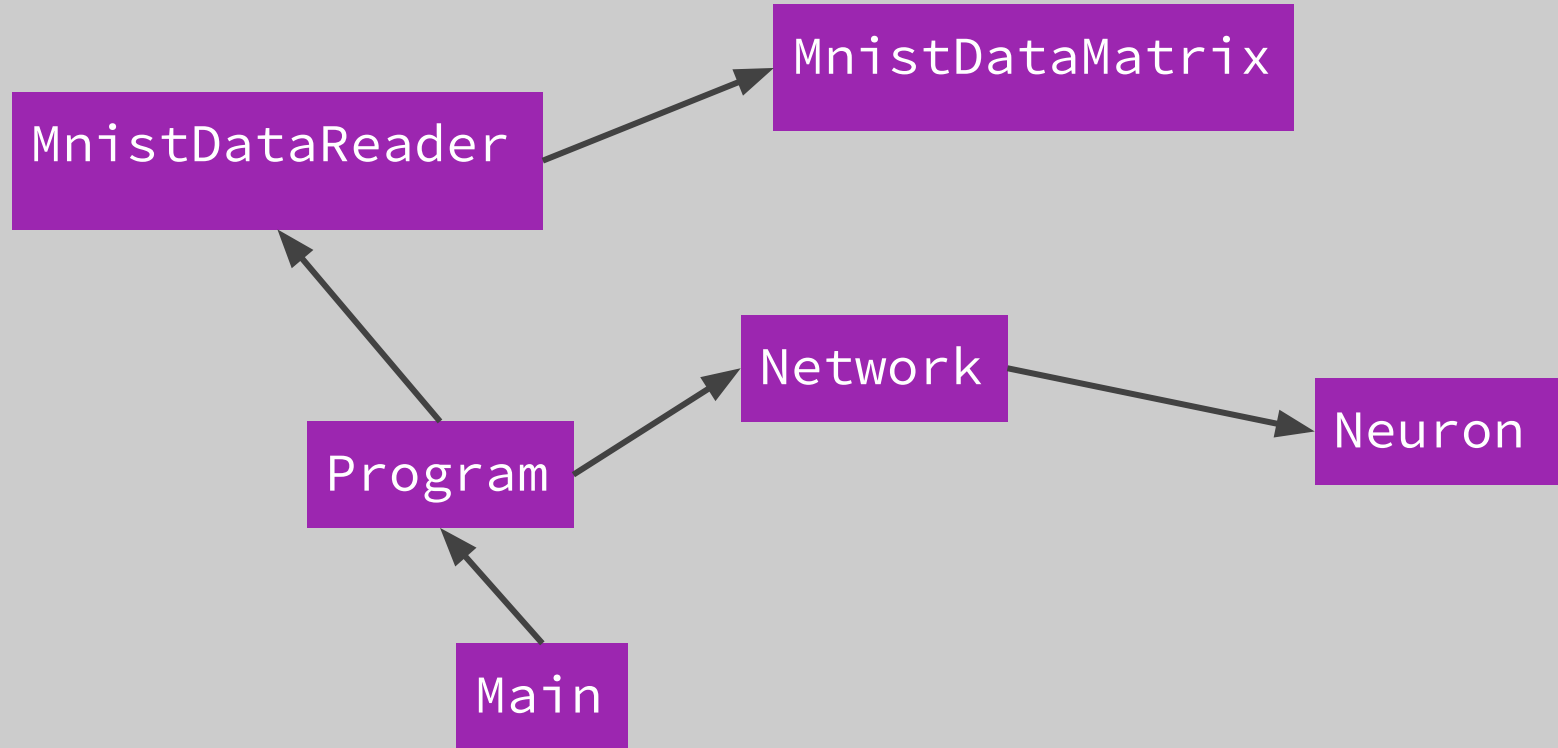


How to classify digits

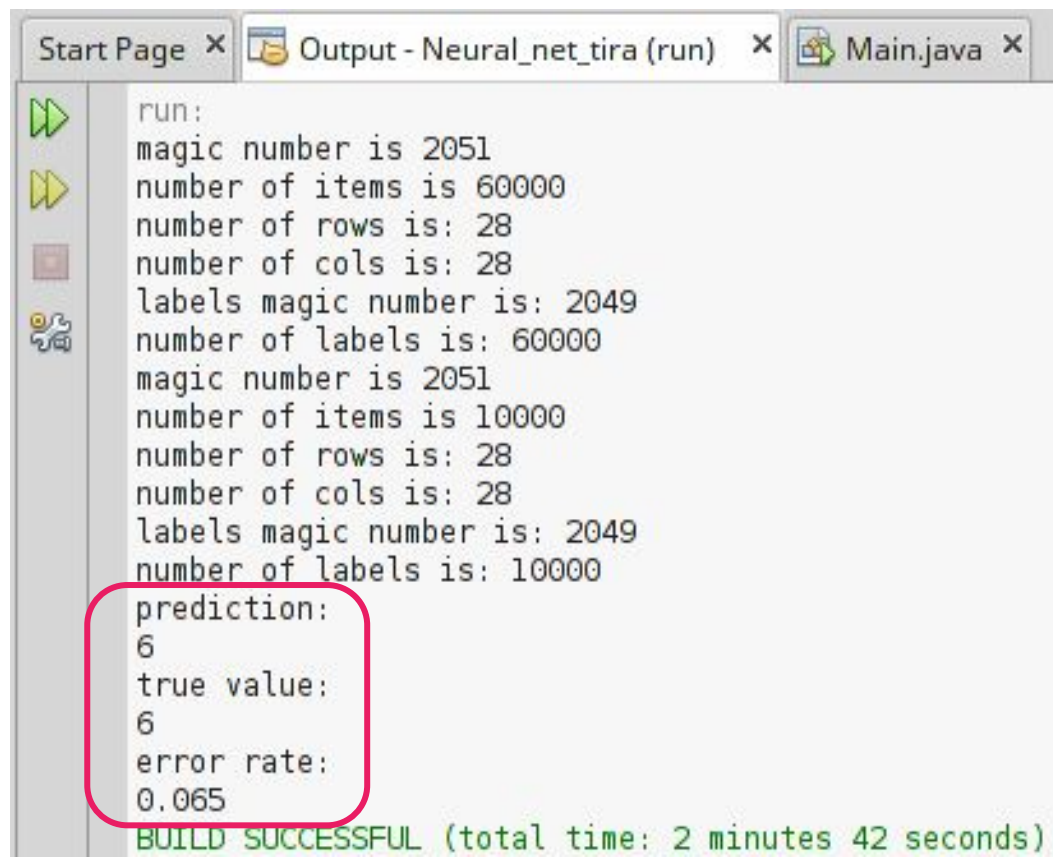


Structure of the program

Classes



Results



The screenshot shows an IDE window with three tabs: 'Start Page', 'Output - Neural_net_tira (run)', and 'Main.java'. The 'Output' tab is active, displaying the following text:

```
run:
magic number is 2051
number of items is 60000
number of rows is: 28
number of cols is: 28
labels magic number is: 2049
number of labels is: 60000
magic number is 2051
number of items is 10000
number of rows is: 28
number of cols is: 28
labels magic number is: 2049
number of labels is: 10000
prediction:
6
true value:
6
error rate:
0.065
BUILD SUCCESSFUL (total time: 2 minutes 42 seconds)
```

A red rounded rectangle highlights the prediction results: 'prediction: 6', 'true value: 6', and 'error rate: 0.065'.

Conclusion

- Lower error rate than in the original paper (6.5% X 12%)
- Short training time
- Short inference time

Thank you

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