Neural Networks from scratch 2

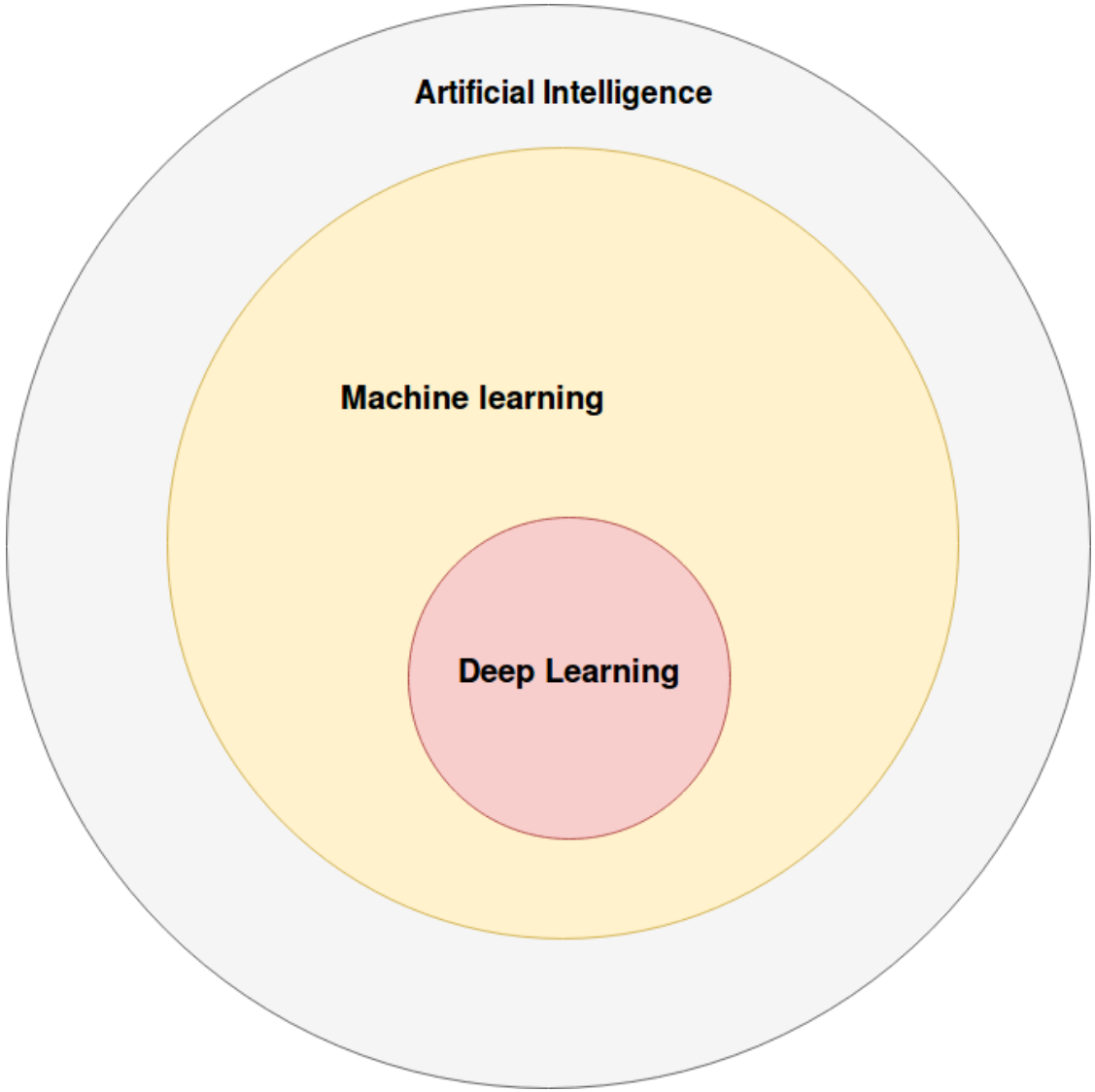
Workshop Tokyo Python Society Club

Yann LE GUILLY

Deep Learning

Artificial Intelligence? Machine learning?(1/3)

Both!



Artificial Intelligence? Machine learning? (2/3)

Definition

Machine learning is the **sub-field of computer science** that gives computers the ability to **learn without being explicitly programmed**. **Arthur Samuel** in 1959.

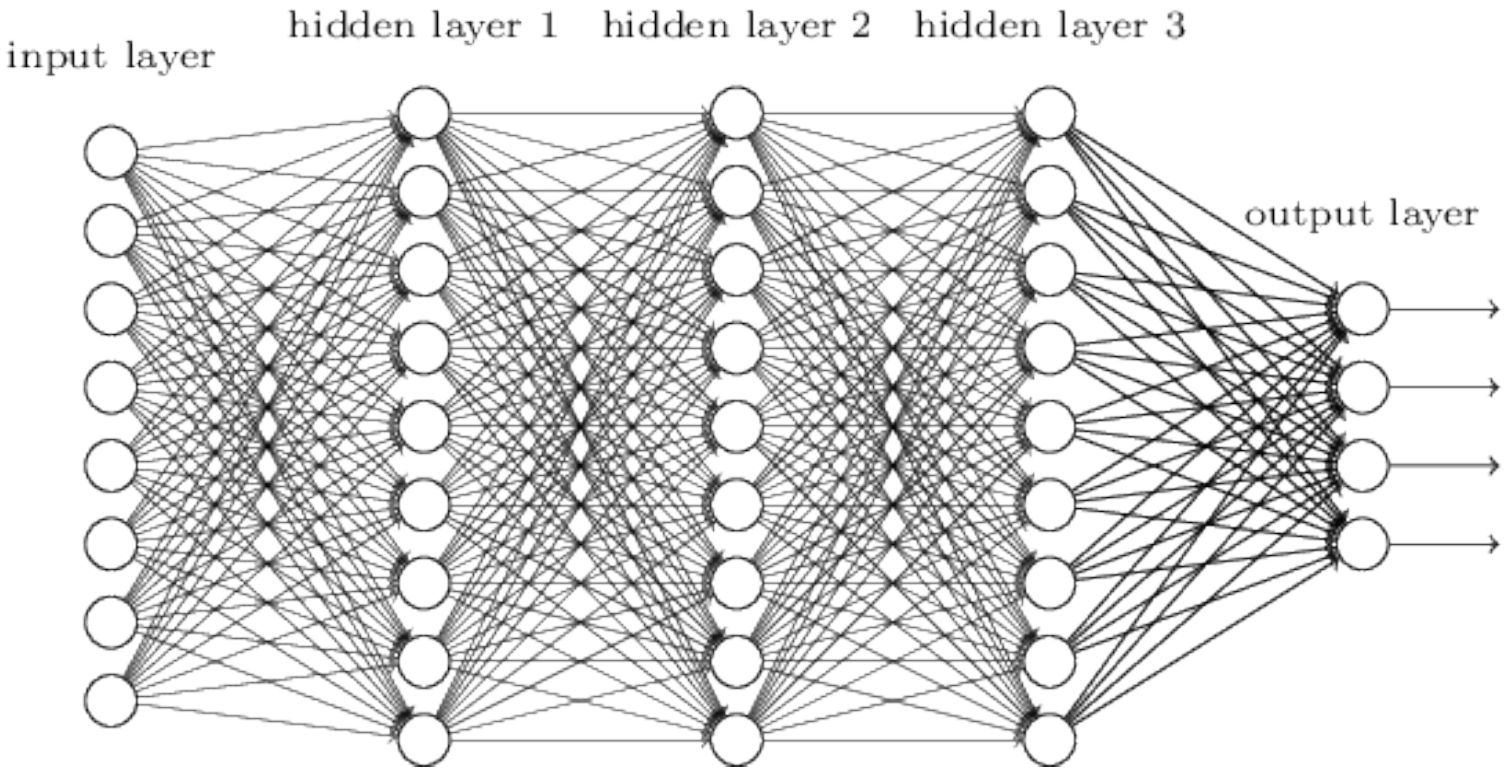
Artificial Intelligence? Machine learning? (2/3)

There is different categories of machine learning problems:

- **Supervised learning**: from labeled training data (our topic today!)
- Unsupervised learning: find a hidden structure from data
- Reinforcement learning: learn with trial and error (my research topic!)

Why deep? (1/2)

Because it's deep!



Why deep? (2/2)

Very very very deep!

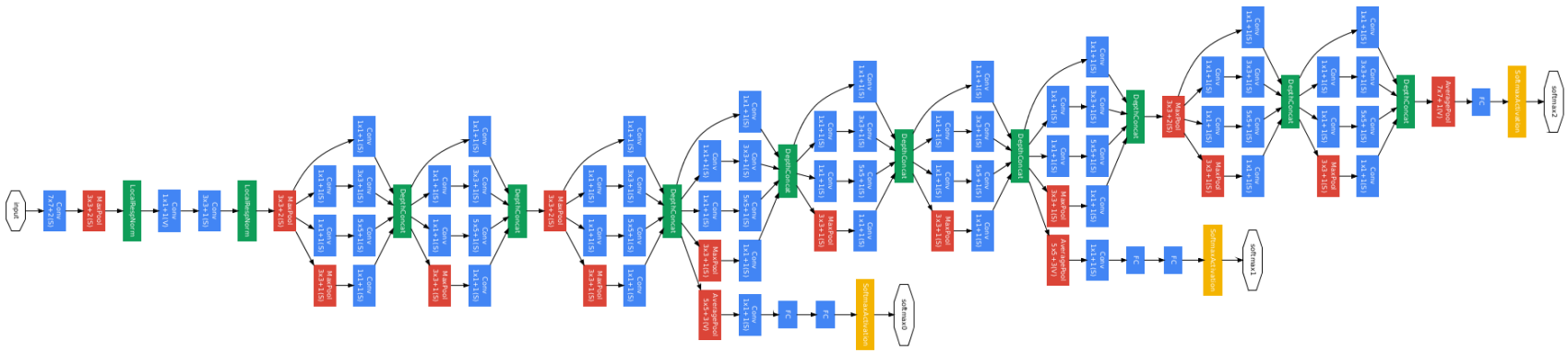
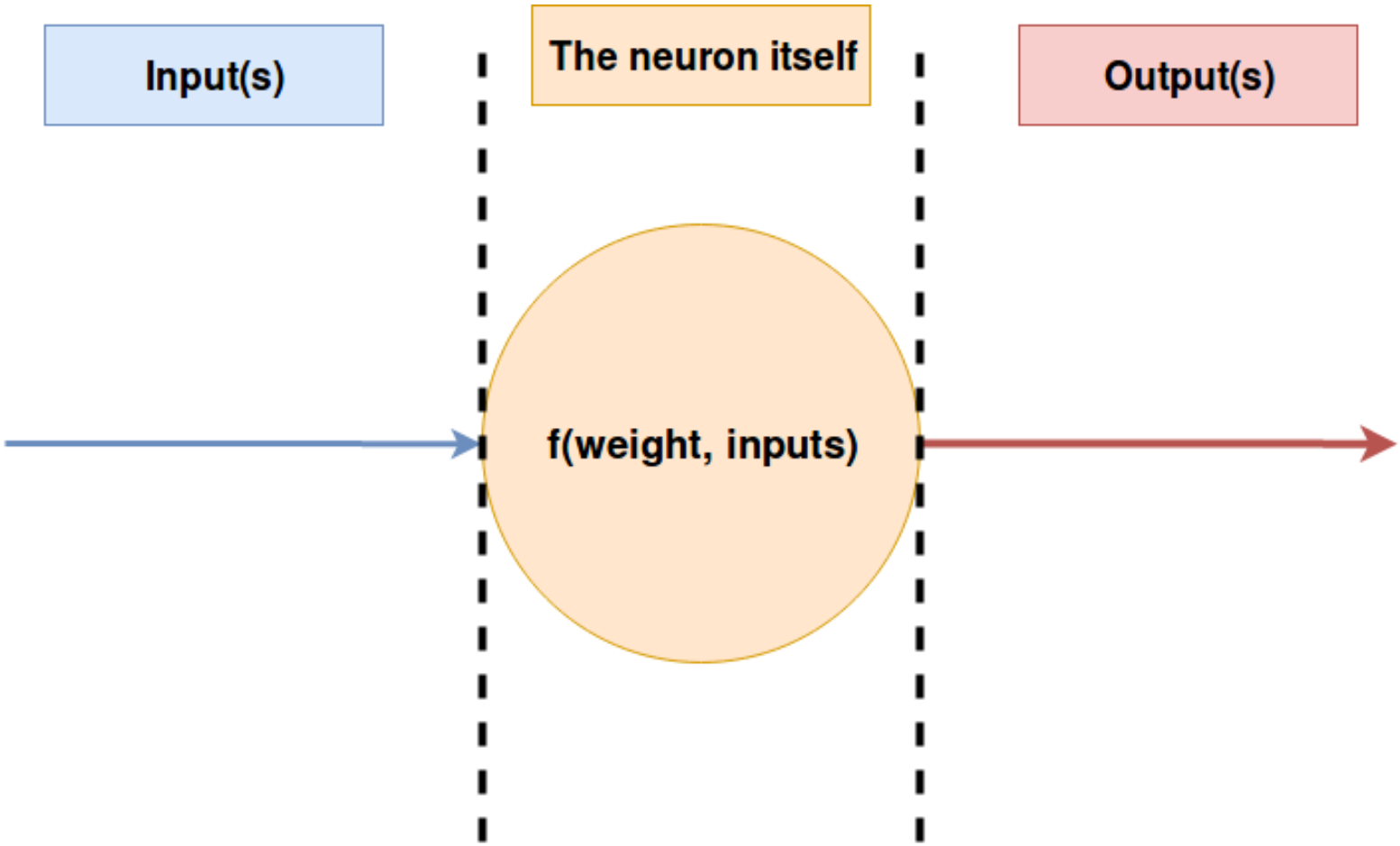


Figure: This is GoogleNet.

Neural networks you said? (1/2)

Yes! Full of neurons! Like this one:



Neural networks you said? (2/2)

f is called the activation function.

Examples:

- logistic function $f(x) = \frac{1}{1+e^{-x}}$
- tanh $f(x) = \frac{2}{1+e^{-2x}} - 1$
- Gaussian $f(x) = e^{-x^2}$
- and many more...

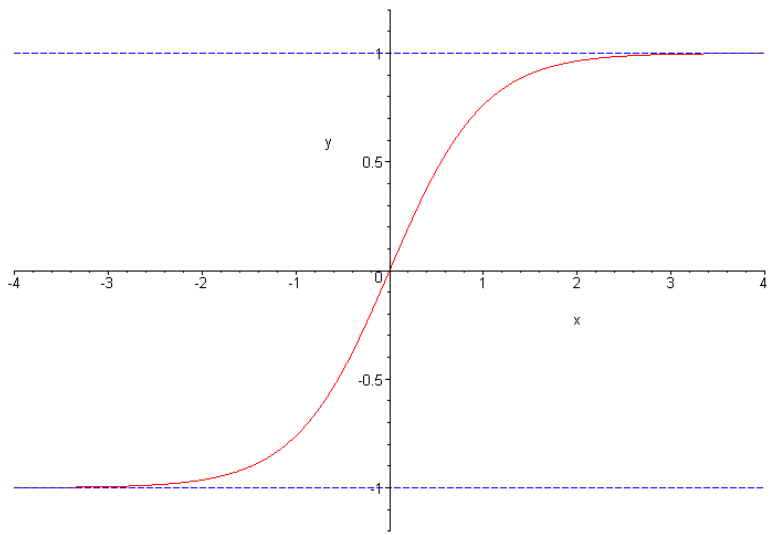


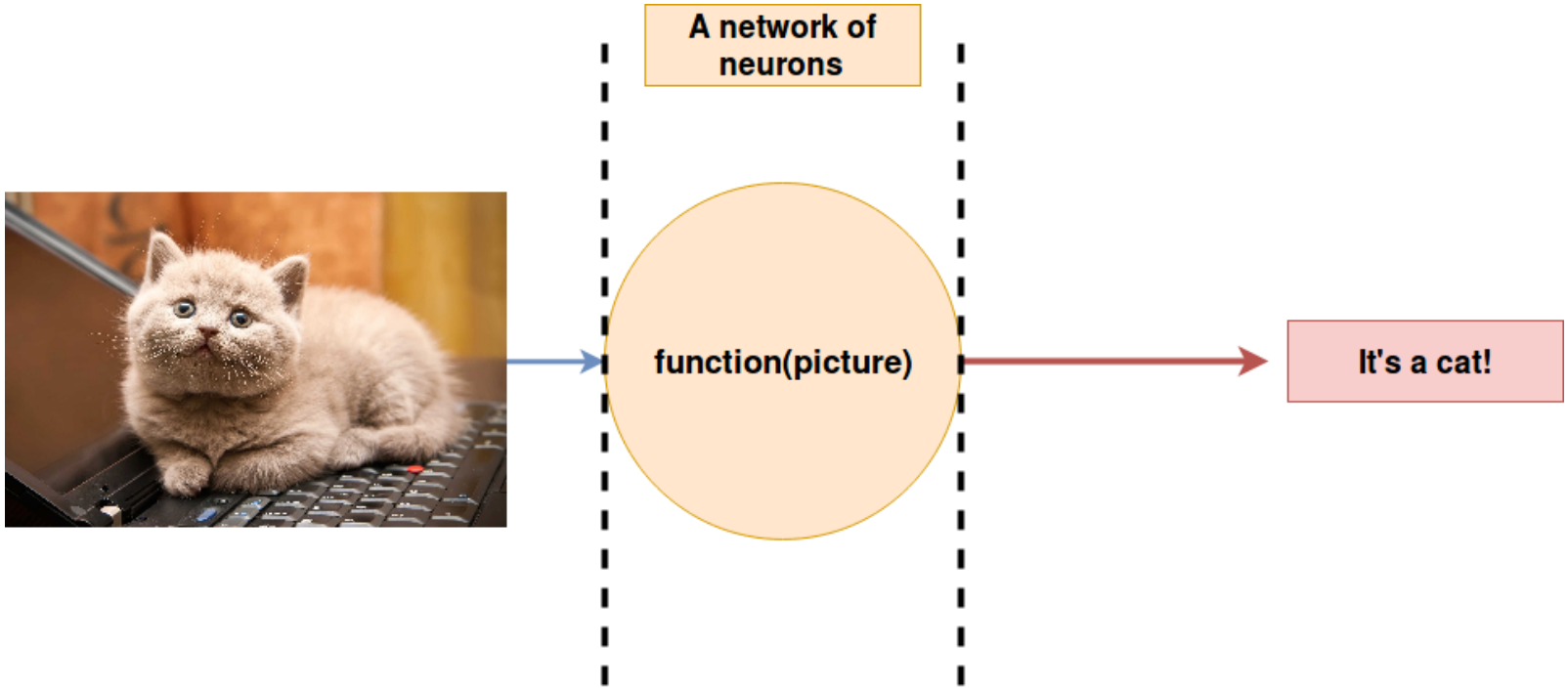
Figure: This is tanh.

Ok, but what is it for? (1/2)

Finding which is the cat and which is the dog!

Ok, but what is it for? (2/2)

In other words: it **approximates the function** that distinguish any dog to any cat on any picture.



Approximating function you said? Let's see on Jupyter

Check this notebook via Jupyter:

`worshop_nn/notebooks/1_fct_approx.ipynb`

If you don't know how, please refer to the pdf 1, slide 10 specially.

Let's sum up!

1. a neuron is an entity that takes an input, put it into a function and gives an output
2. it has an activation function and weights that we can train
3. the job of a neural network is to approximate a function
4. what is a loss function
5. what is optimizing (I will talk more about this later)

Deep Learning

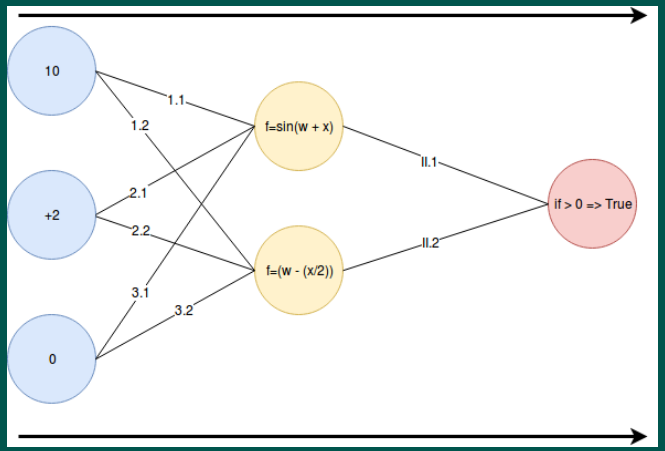
1. What is it?
    - 1.1 Artificial Intelligence? Machine learning?
    - 1.2 Why deep?
    - 1.3 Neural networks you said?
    - 1.4 Ok, but what is it for?
    - 1.5 Approximating the function you said?
    - 1.6 Let's sum up!

2. How it's working: overview
    - 2.1 Dataset
    - 2.2 Inference
    - 2.3 Training
    - 2.4 Let's start!

Dataset

Before using any kind of deep learning solutions, you need data. Your data decides which kind of network you will use. Deep learning is not the solution for everything. It is sometimes too much for the problem you want to solve. Accuracy should also be considered since 95% of accuracy is sometimes too low.

Inference also called "Forward Propagation"



Nothing special here, it’s regular operations, depends on your activation functions and weights. This is the "stationary" mode of your neural network.

Training

This is the complicated part. In order to approximate the function as much as we can, we have to use optimization adjust your neural network parameters (weights, bias). We will see this part in detail after.

Let’s start!

Now, let’s start by generating our dataset and and choosing our neural network parameters.