TensorFlow

Machine learning Workshop

TensorFlow Introduction

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Agenda

- How the workshop is organize?
- ML & DL Introduction
- Getting familiar with neural networks
- What a DL framework should have?
- Deep Learning Frameworks
- TensorFlow API
- let's code it

Workshop

TensorFlow Intro

- Fundaments
- TF API architecture
- Essential Data structures
- Data loading and manipulation
- Keras API

TensorFlow.js

- Intro by **Jason Mayes (Senior Developer Advocate for Tensorflow.js at Google)**
- Training Models in the Browser
- Converting Models from python to tf.js

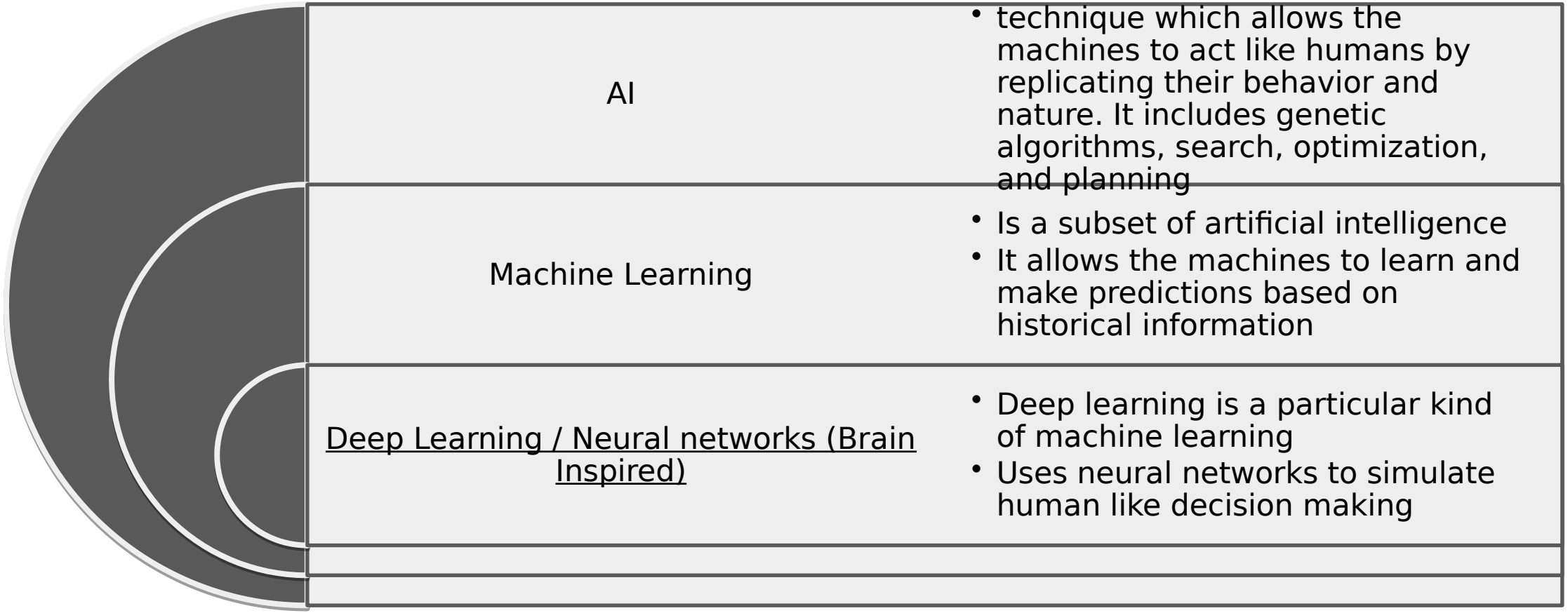
TensorFlow Hub

- Discussion session with **Alejandro Vergara (Research assistant at CIAT)**
- Transfer Learning with TF Hub
- TensorFlow Models Zoo

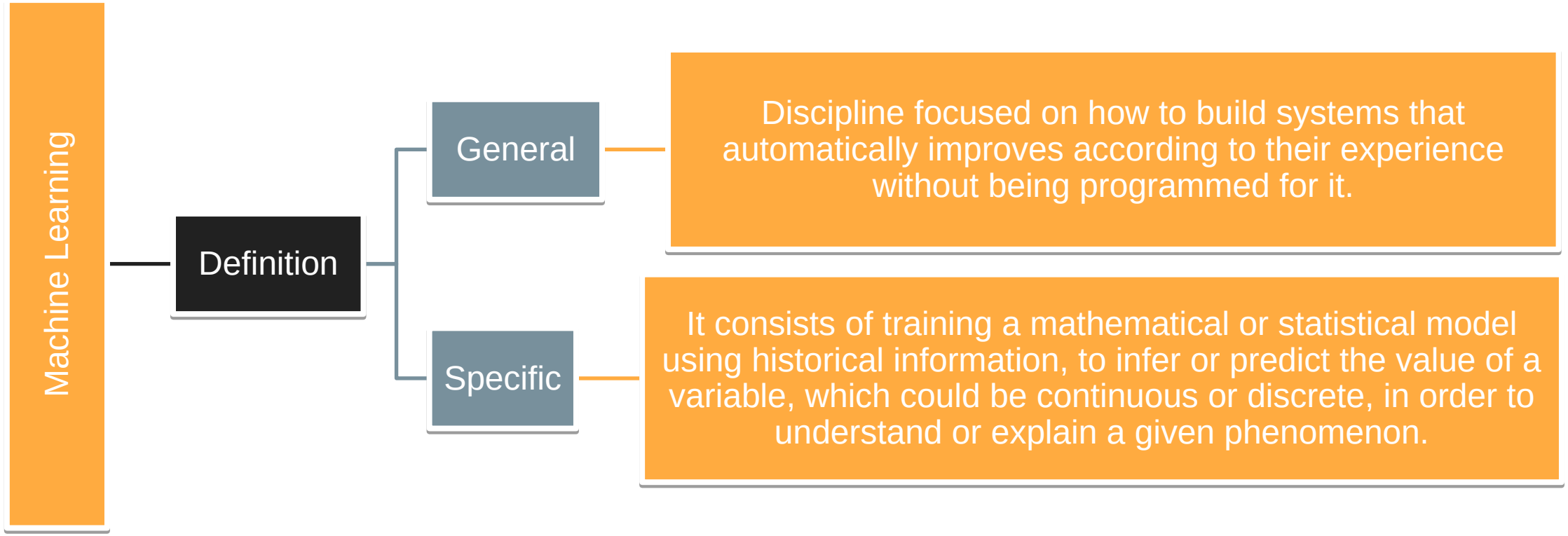
TensorFlow Lite

- Intro by **David Cardozo (ML GDE)**
- Developing a basic android app with TF lite
- Tf lite in raspberry Pi

AI, ML vs. DL

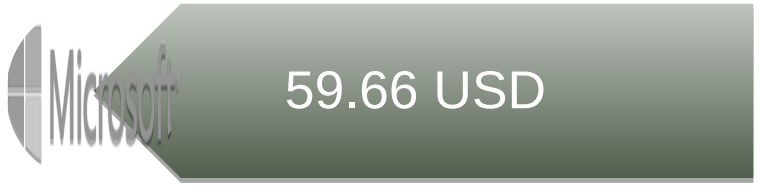

AI
technique which allows the machines to act like humans by replicating their behavior and nature. It includes genetic algorithms, search, optimization, and planning
Machine Learning
Is a subset of artificial intelligence
It allows the machines to learn and make predictions based on historical information
Deep Learning / Neural networks (Brain Inspired)
Deep learning is a particular kind of machine learning
Uses neural networks to simulate human like decision making

What is machine learning?



ML problems

Regression
What´s tomorrow´s stock price? (Continuous)



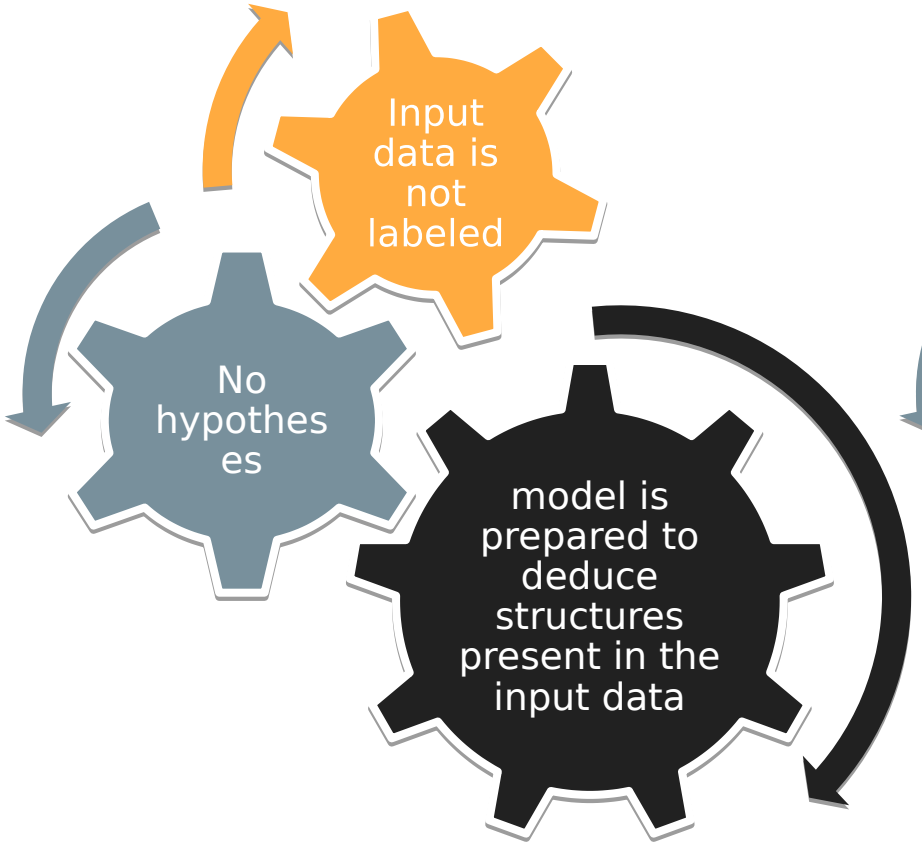
Classification
What´s in this picture? (Discrete)

How does the machine Learn?

Unsupervised Learning

Data driven

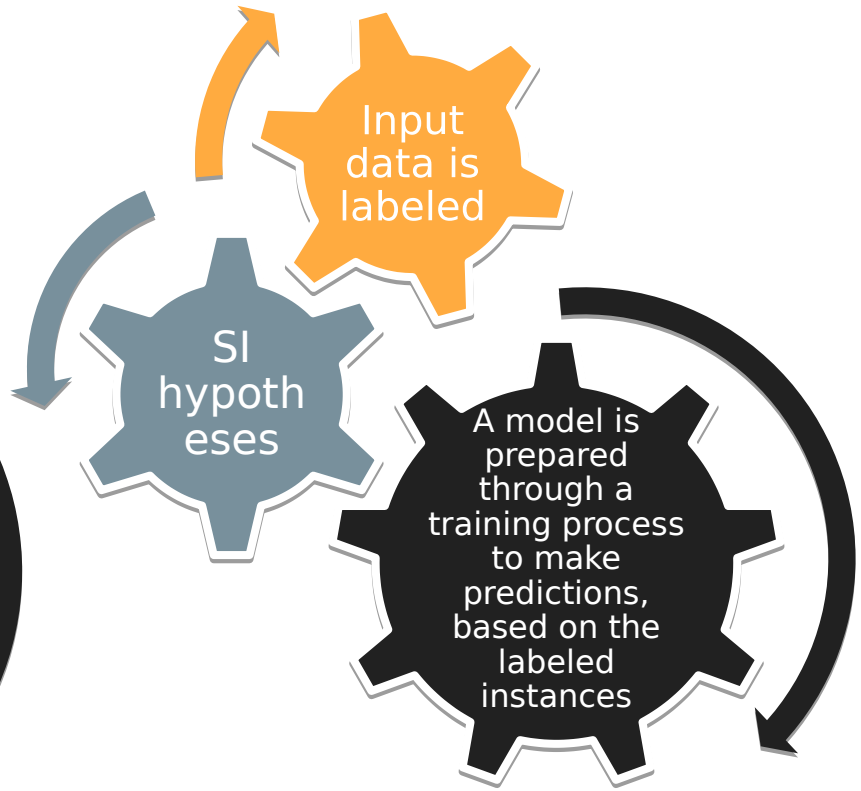
Learning a function that describe the structure of the unlabeled data.



Supervised Learning

Task driven

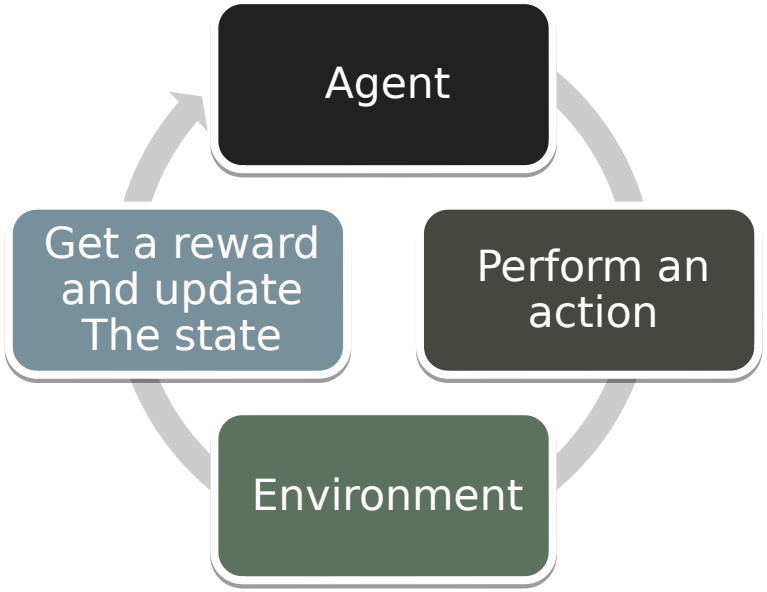
Learning a function that maps an input to an output based on example input-output parts



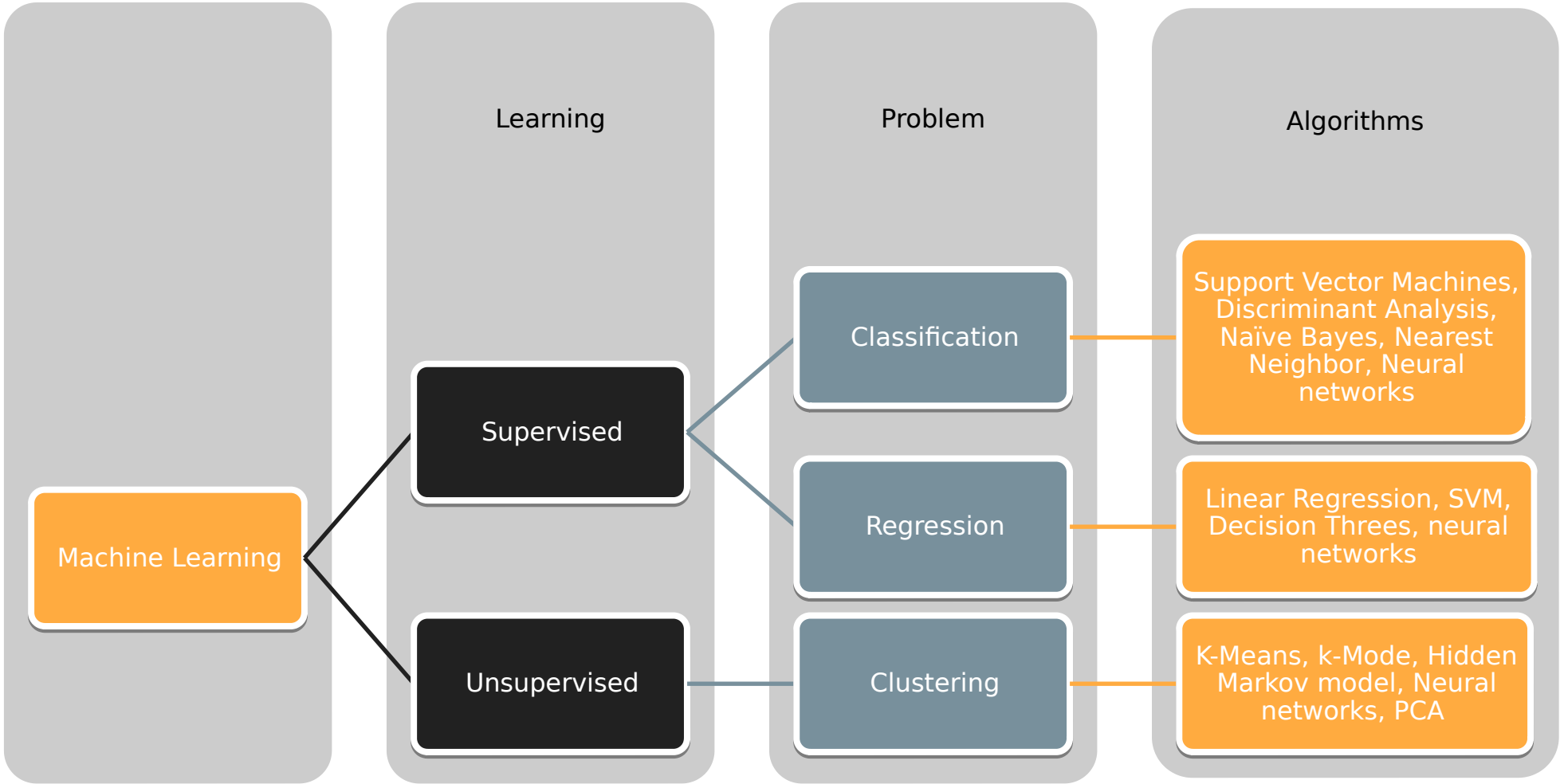
Reinforcement Learning

Learn from mistakes

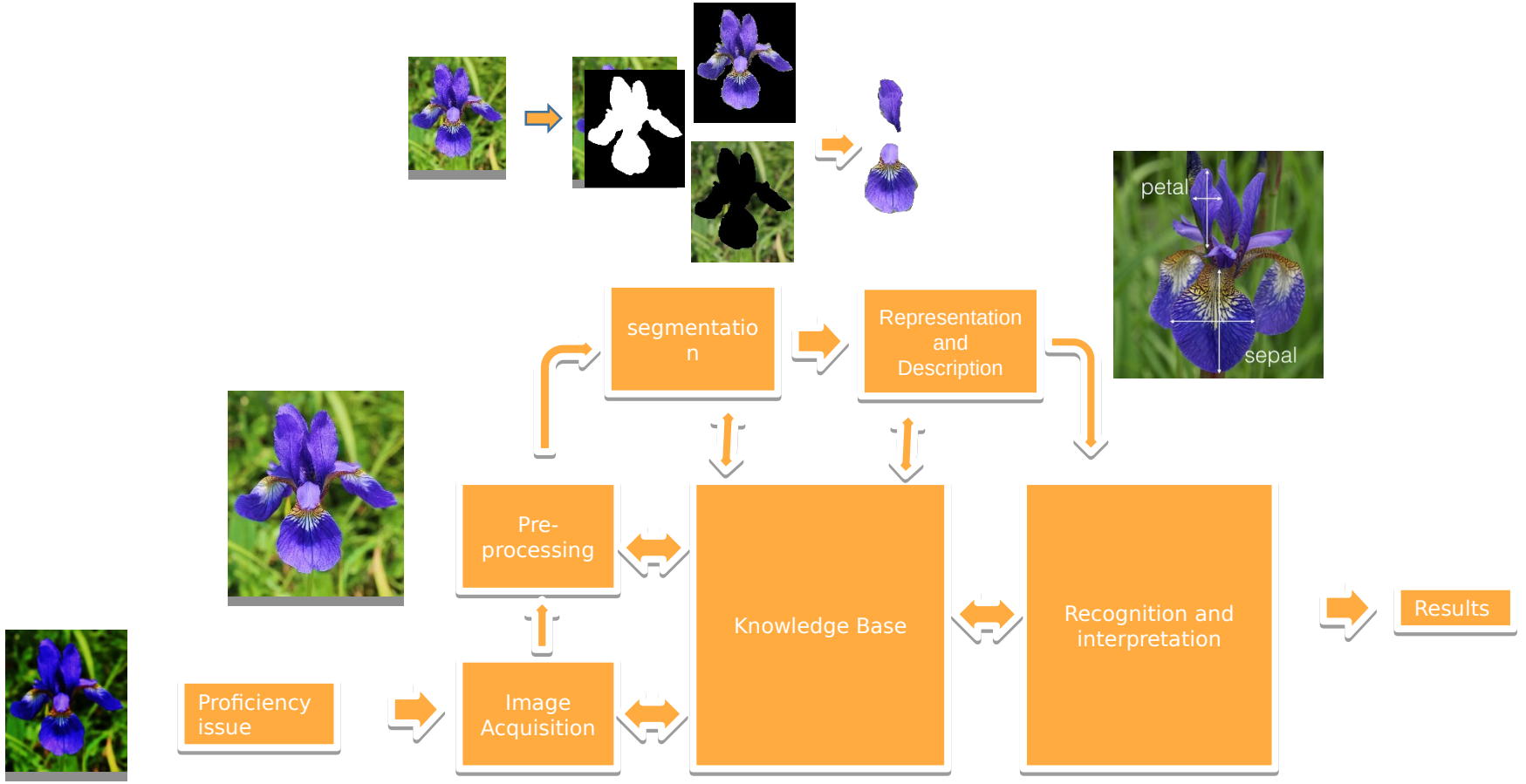
enables an **agent to learn** in an interactive environment by trial and error using feedback from its own actions and experiences.



Some algorithms

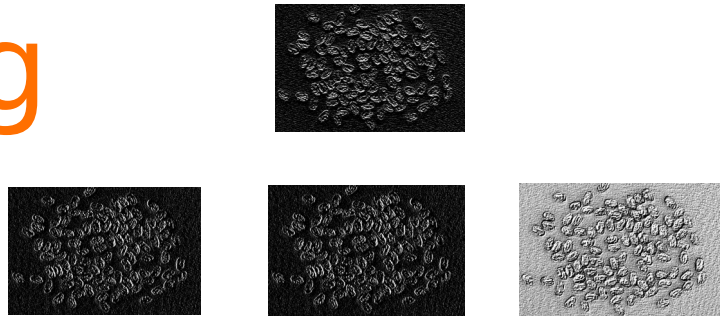


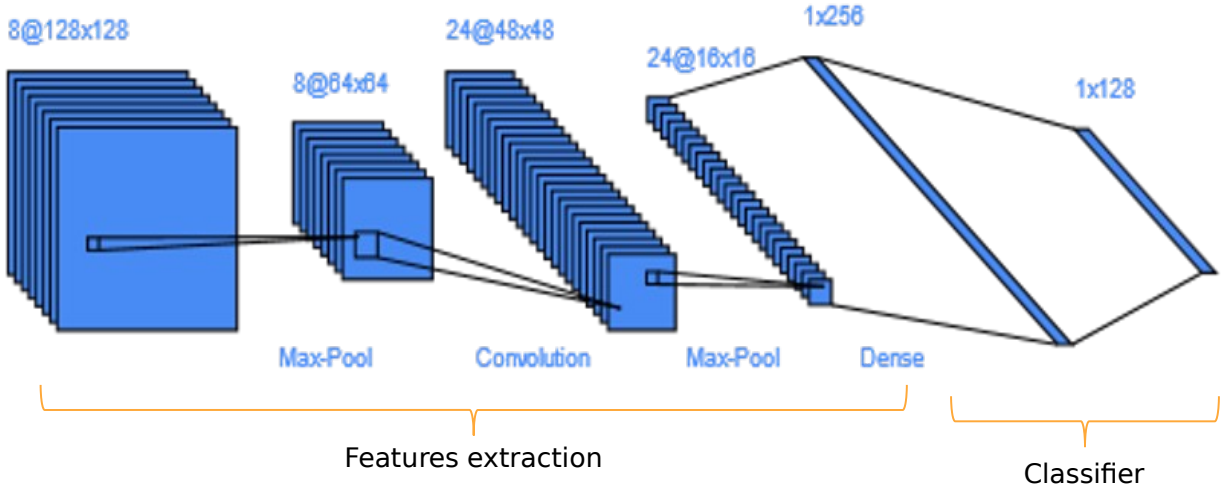
Feature engineering Approach



	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5.0	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa
7	4.6	3.4	1.4	0.3	setosa
8	5.0	3.4	1.5	0.2	setosa

Deep Learning Approach





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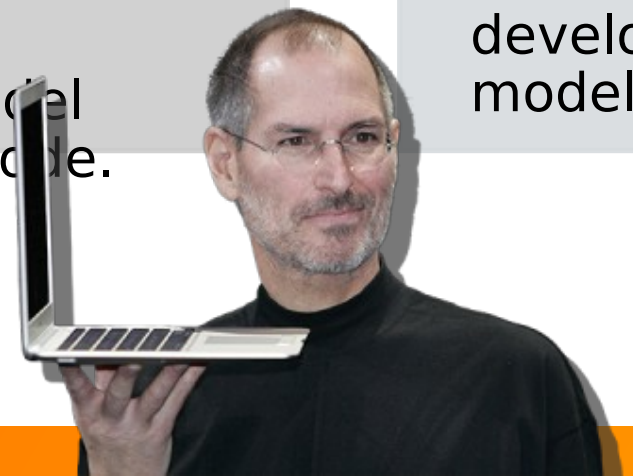
most of the ML/DL models are statistical or mathematical, so consequently, you are probably wondering :

if I need to be a mathematician or statistician to start using it.

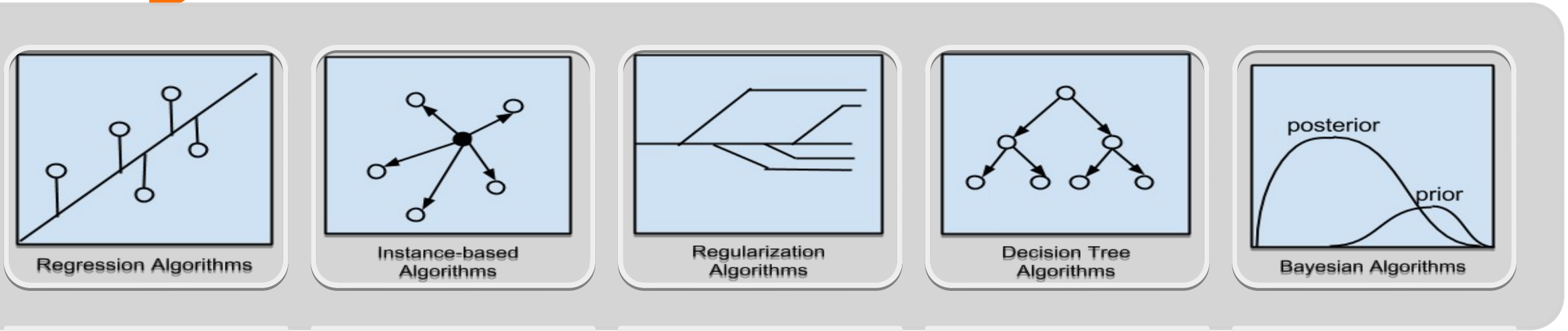
Levels of knowledge

Machine Learning practitioner	Machine Learning Research
• Tasks Oriented: • Queries databases. • Cleaning data. • Writing scripts to transform data and probe algorithms. • Play around with libraries. • Make all easy. • Find the best model writing custom code.	• Research Oriented: • Read papers. • Implement the algorithm from scratch. • Translate Math into code. • Reducing algorithms. • Use beauty math to develop their own models.



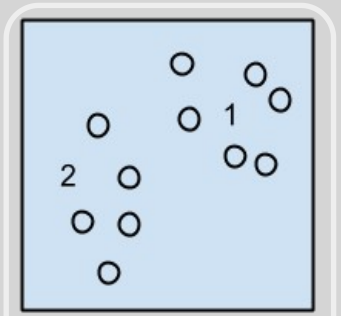
amazon web services™
Google Cloud Platform
Azure
FLOYD
H2O.ai
IBM Watson™
AutoKeras
fast.ai
scikit learn
mxnet
Keras
TensorFlow
RAPIDS
ONNX
PyTorch
NumPy
Pandas
DASK
Numba
OPTUNA
SciPy
OpenCV

Algorithms



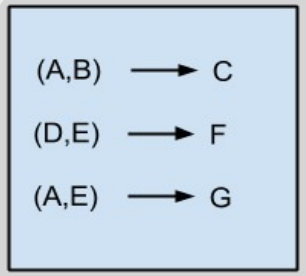
iteratively refined the error base on the predictions made by the model.	Compare new data entries with the database (Train samples) using a similarity measure, in order to find the best match and make a prediction.	An extension of regression methods, that penalizes models based on their complexity, favoring simpler models that are also better at generalizing (avoiding overfitting)	Decision tree methods construct a model of decisions made based on actual values of attributes in the data.	Bayesian methods are those that explicitly apply Bayes' Theorem for problems such as classification and regression.

Algorithms



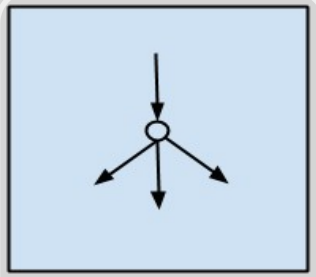
Clustering Algorithms

All methods are concerned with using the inherent structures in the data to best organize the data into groups of maximum commonality.



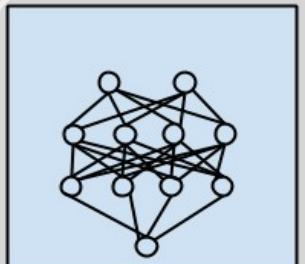
Association Rule Learning Algorithms

Association rule learning method s extract rules that best explain observed relationships between variables in data.



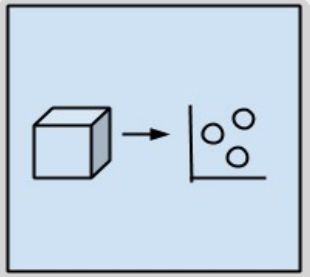
Artificial Neural Network Algorithms

Artificial Neural Networks are models that are inspired by the structure and/or function of biological neural networks.



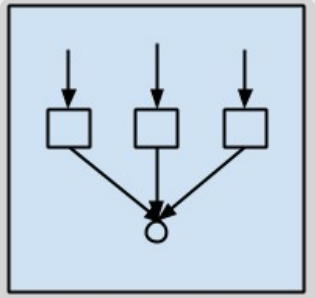
Deep Learning Algorithms

Deep Learning methods are a modern update to Artificial Neural Networks which take advantage of the current computation capabilities.



Dimensional Reduction Algorithms

Like clustering methods, dimensionality reduction seek and exploit the inherent structure in the data, but in this case in an unsupervised manner or order to summarize or describe data using less information.



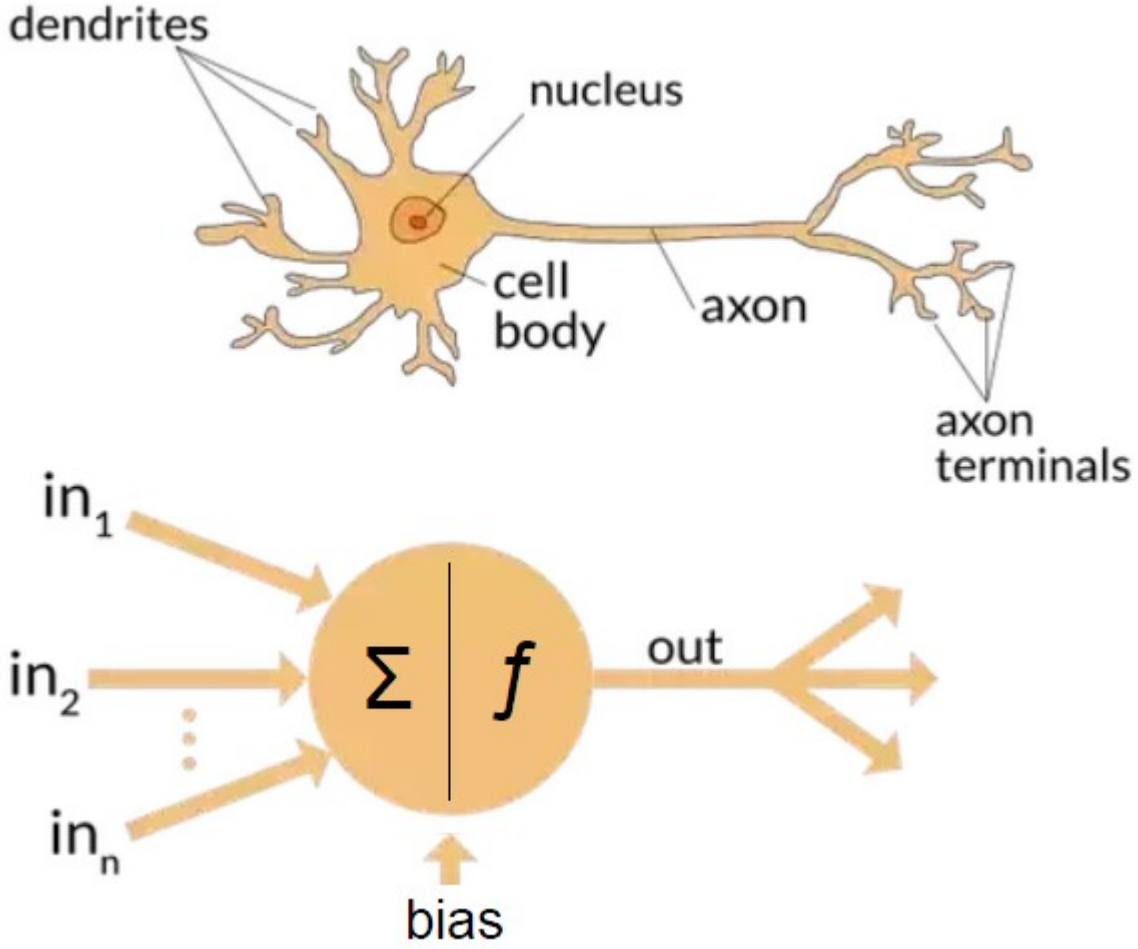
Ensemble Algorithms

Ensemble methods are models composed of multiple weaker models that are independently trained and whose predictions are combined in some way to make the overall prediction.

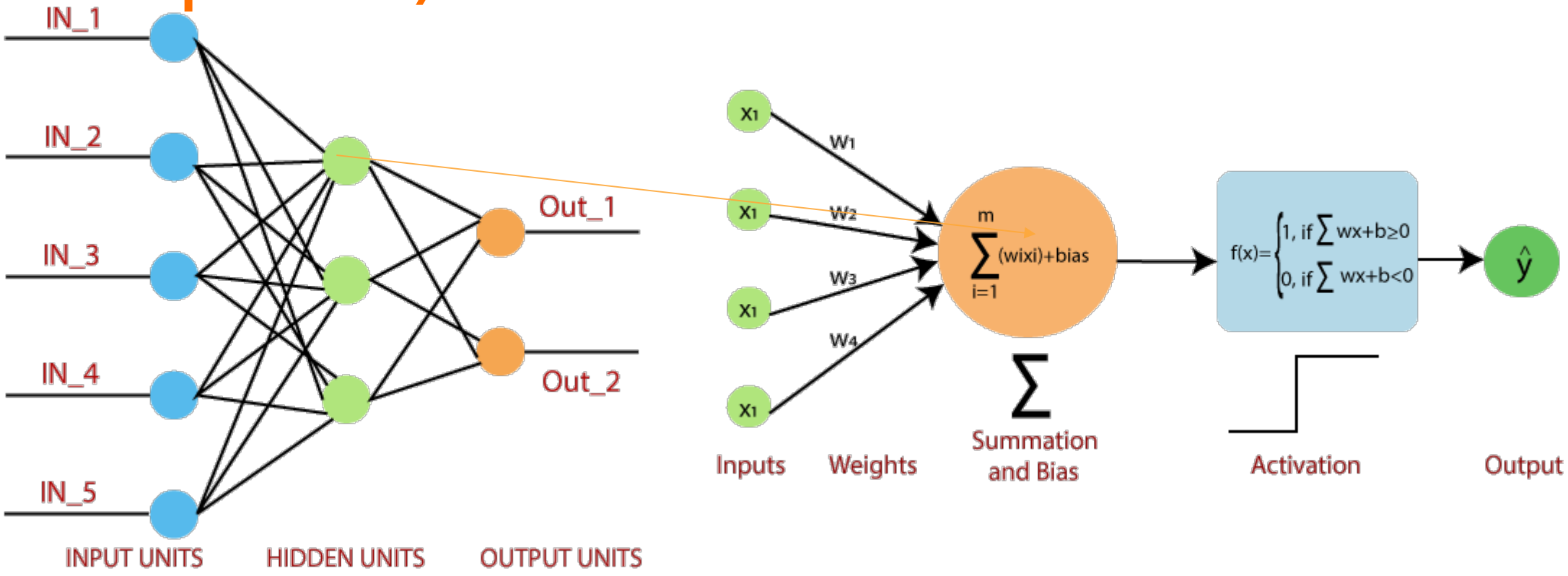
Parameterized Learning

Data	Scoring Function	Loss Function	Weights and Biases	Optimization Algorithm
• data that we are going to learn from	• Accepts our data as an input and maps the data to class labels. Returns the predicted class labels	• Quantifies how well our predicted class labels agree with our ground-truth labels.	• Parameters that our model will learn	• Optimization algorithms are the engines that power neural networks and enable them to learn patterns from data

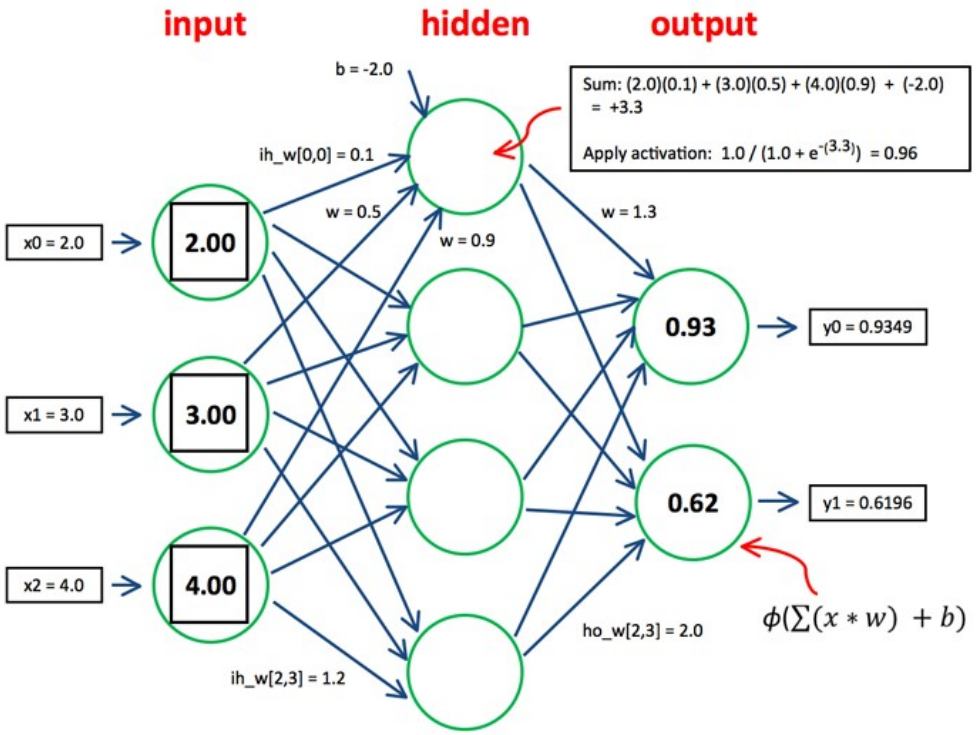
Bio-inspired models



Neural Networks (The perceptron)



Perceptron pseudo-code



Input value or One input layer: The input layer of the perceptron is made of artificial input neurons and takes the initial data into the system for further processing.

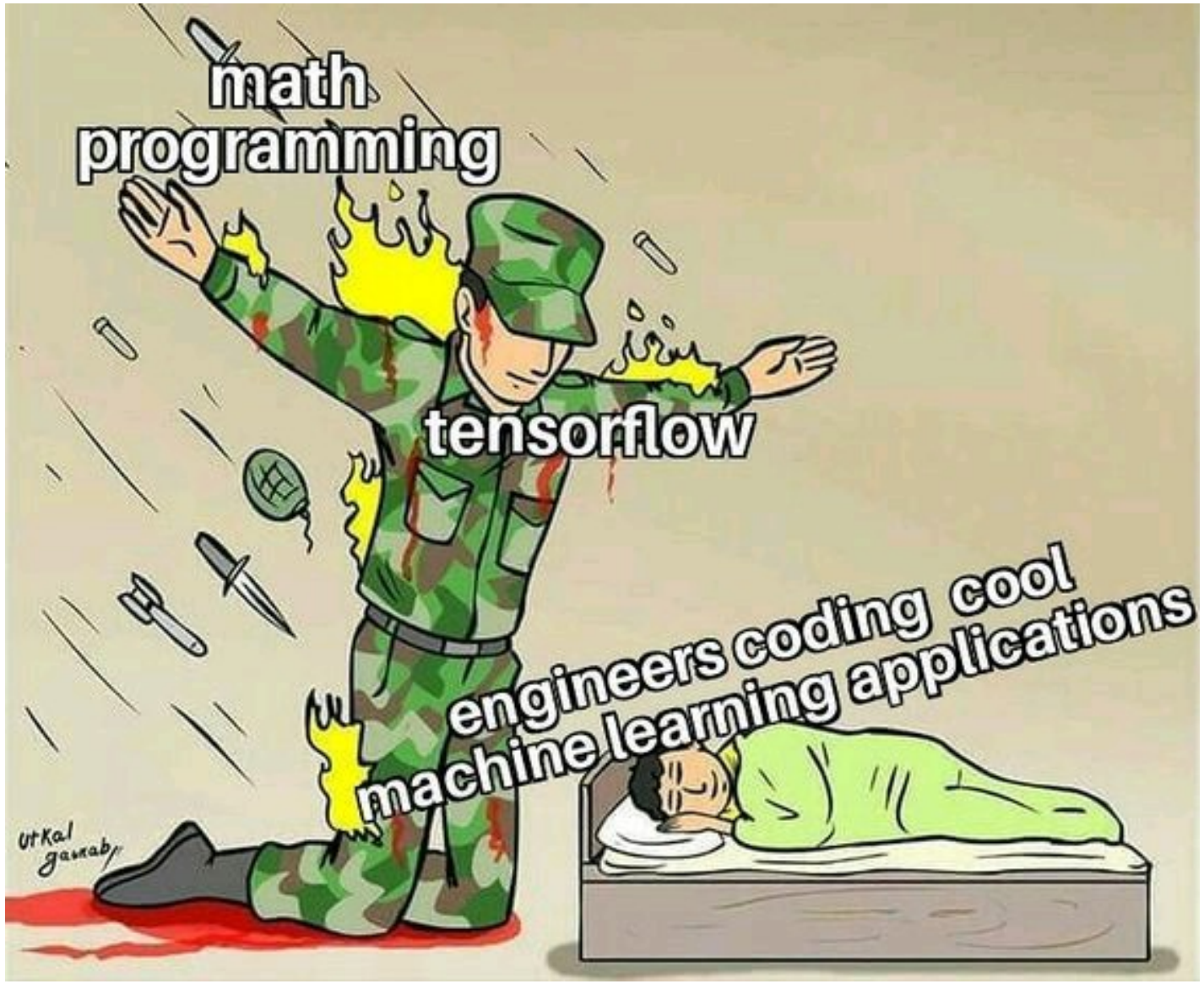
Weight: The strength of the connection between units. If the weight to node 1 to node 2 has a higher quantity, then neuron 1 has a more considerable influence on the neuron.

Bias: It is the same as the intercept added in a linear equation.

Activation Function: A neuron can be activated or not, is determined by an activation function. The activation function calculates a weighted sum and further adding bias with it to give the result.

What a Deep learning Framework should have?

- Models Infrastructure (Building Blocks)
- Automatic Differentiation (Compute gradients)
- Highly efficient and scalable for multiple machines
- Good community
- Provides a cleaner interface, easy to use
- Maximizes performance across hardware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engineers coding cool
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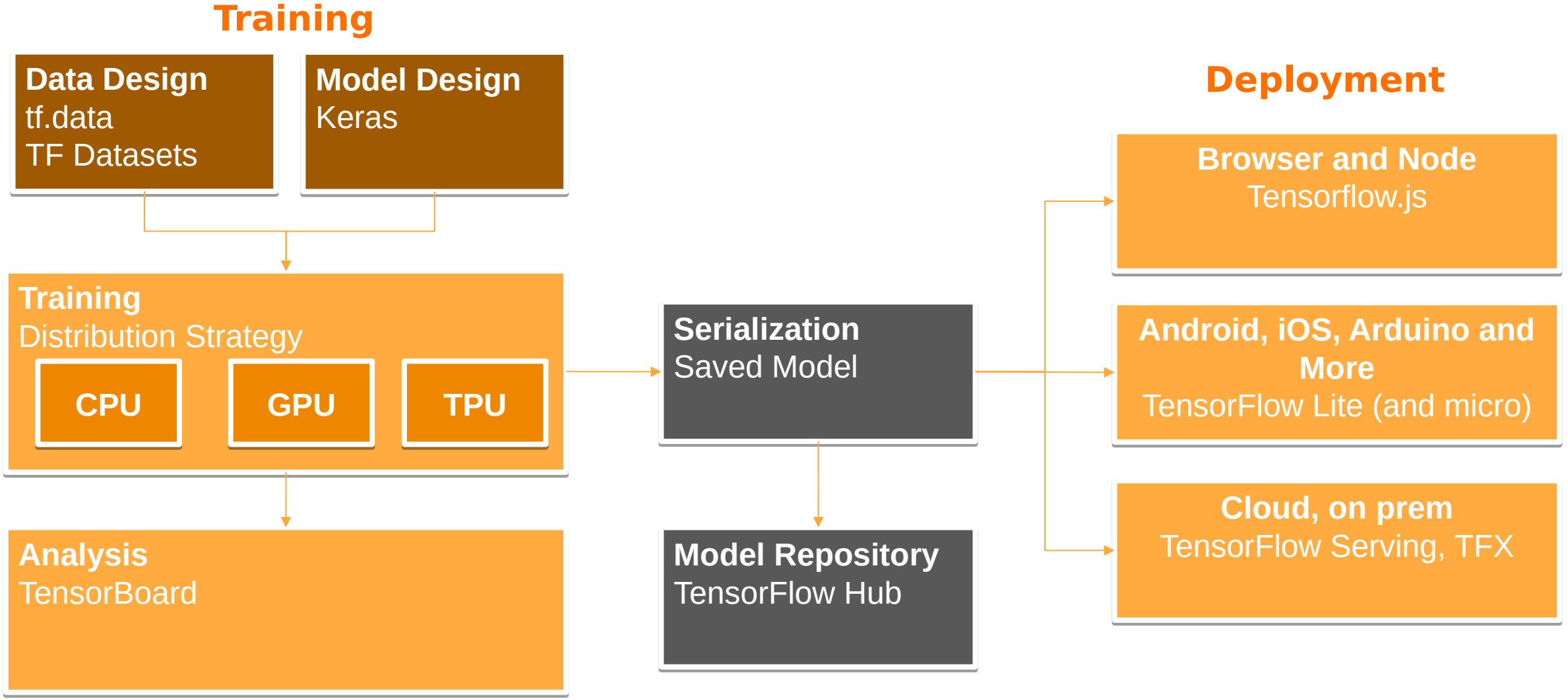
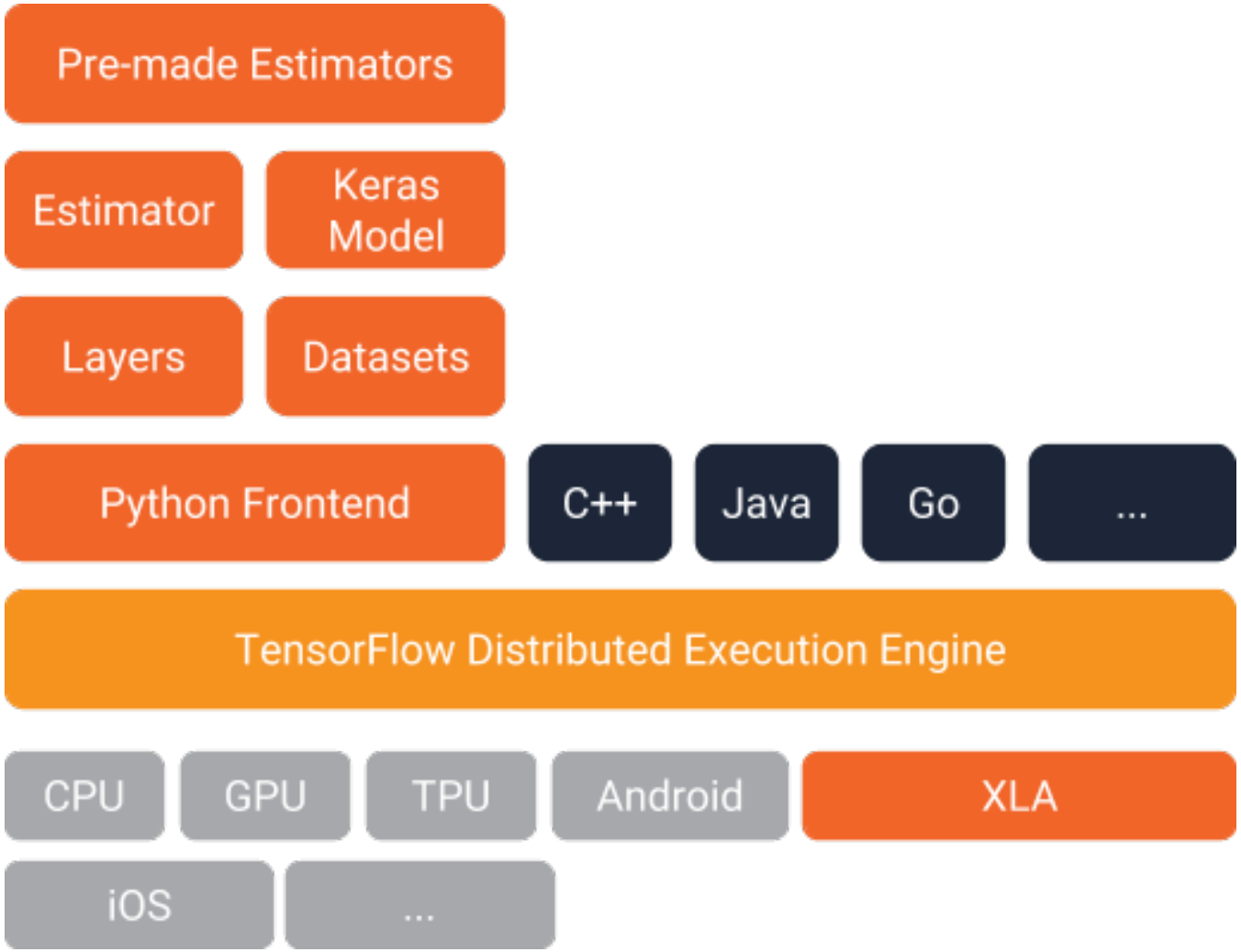
TensorFlow API



TensorFlow API



Model Diversity

Text

- Classification
- Embeddings
- Generation
- Question Answering
- ... your new model

Audio

- Classification
- Embeddings / Features

Image

- Classification
- Object detection
- Semantic segmentation
- Generators
- Style transfer
- Embeddings / feature vectors
- Augmentation
- Pose detection

Video

- Classification
- Generation

Thanks!

TensorFlow