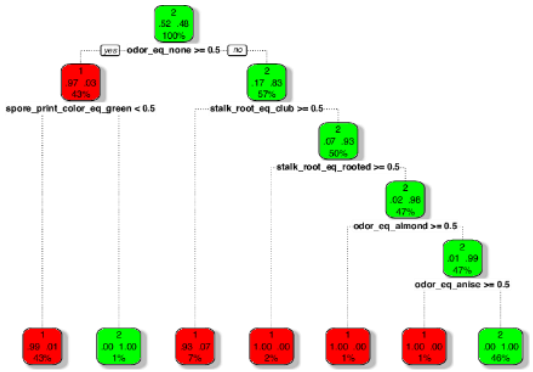
Topic 2D - Common Machine Learning Algorithms

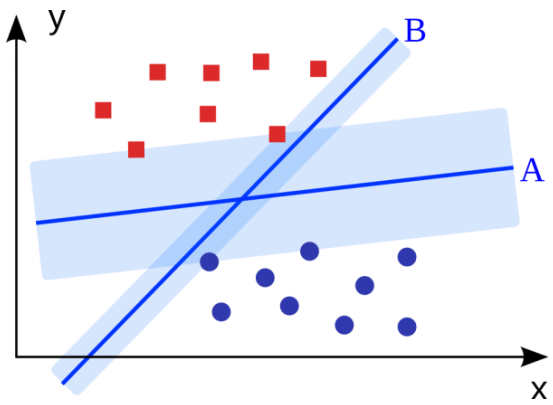
Slides from Nicolo Taggio, Planetek Italia

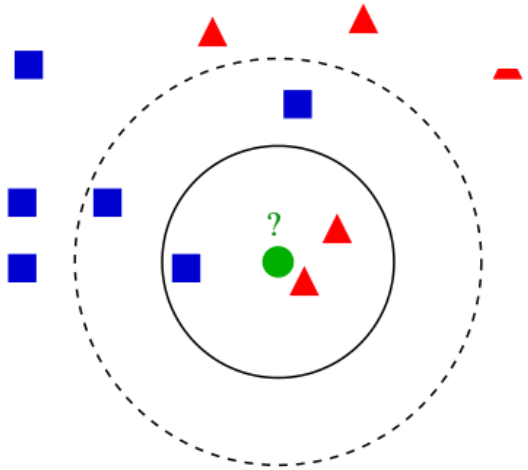
Machine Learning Methodologies



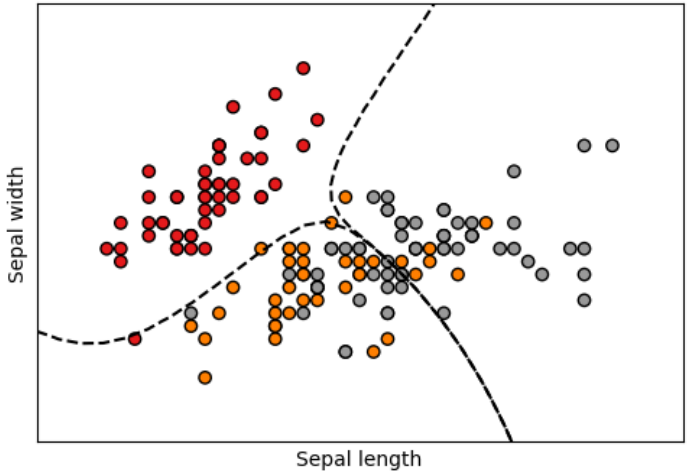
CART Decision Tree

Support Vector Machine

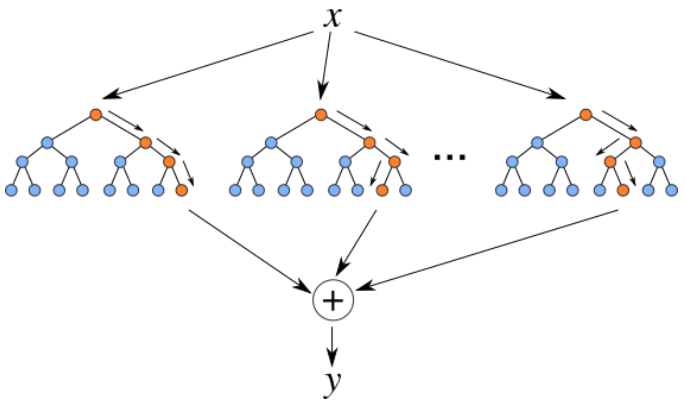




K-Nearest Neighbors

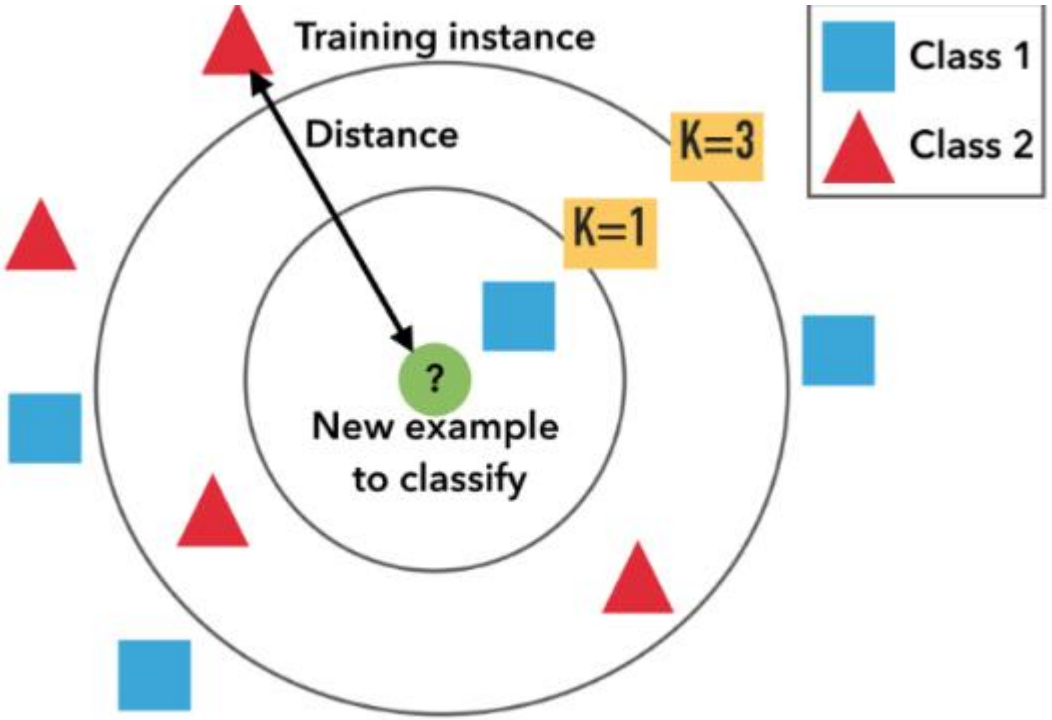


Naive Bayes



Random Forest

K-Nearest Neighbors

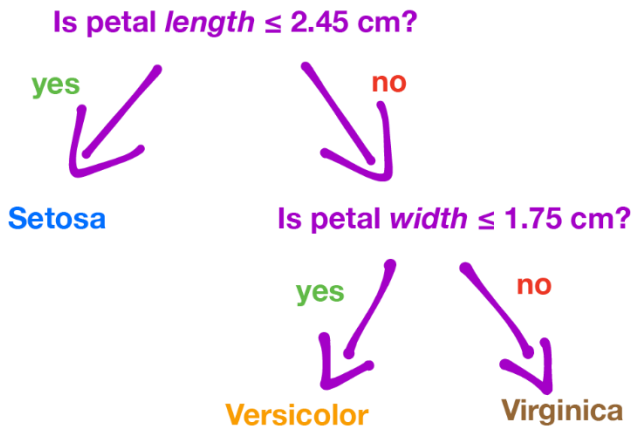


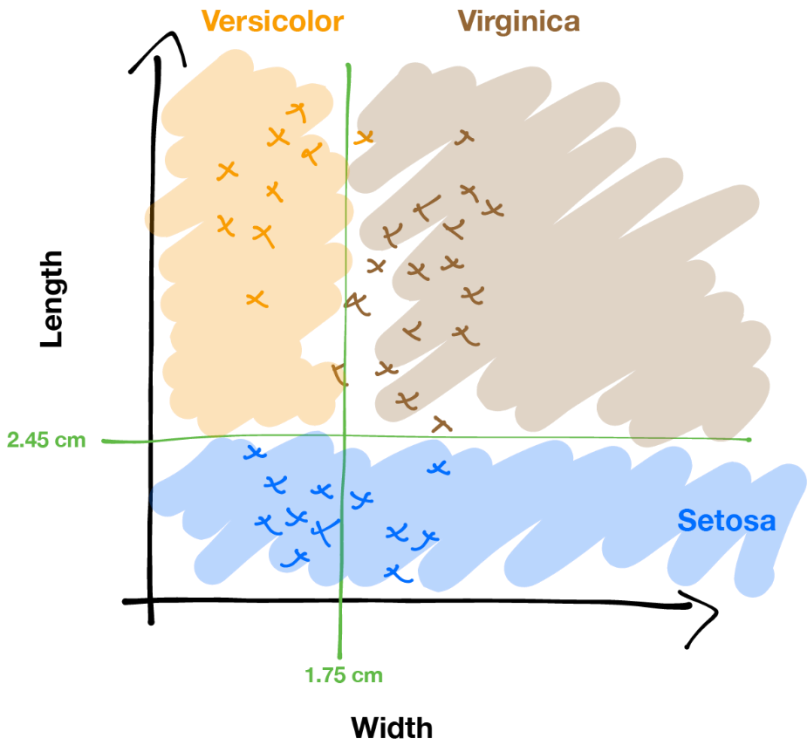
KNN algorithm is one of the simplest classification algorithm and it is one of the most used learning algorithms.

KNN Algorithm is based on **feature similarity**

Classification and **Regression**

DECISION TREE



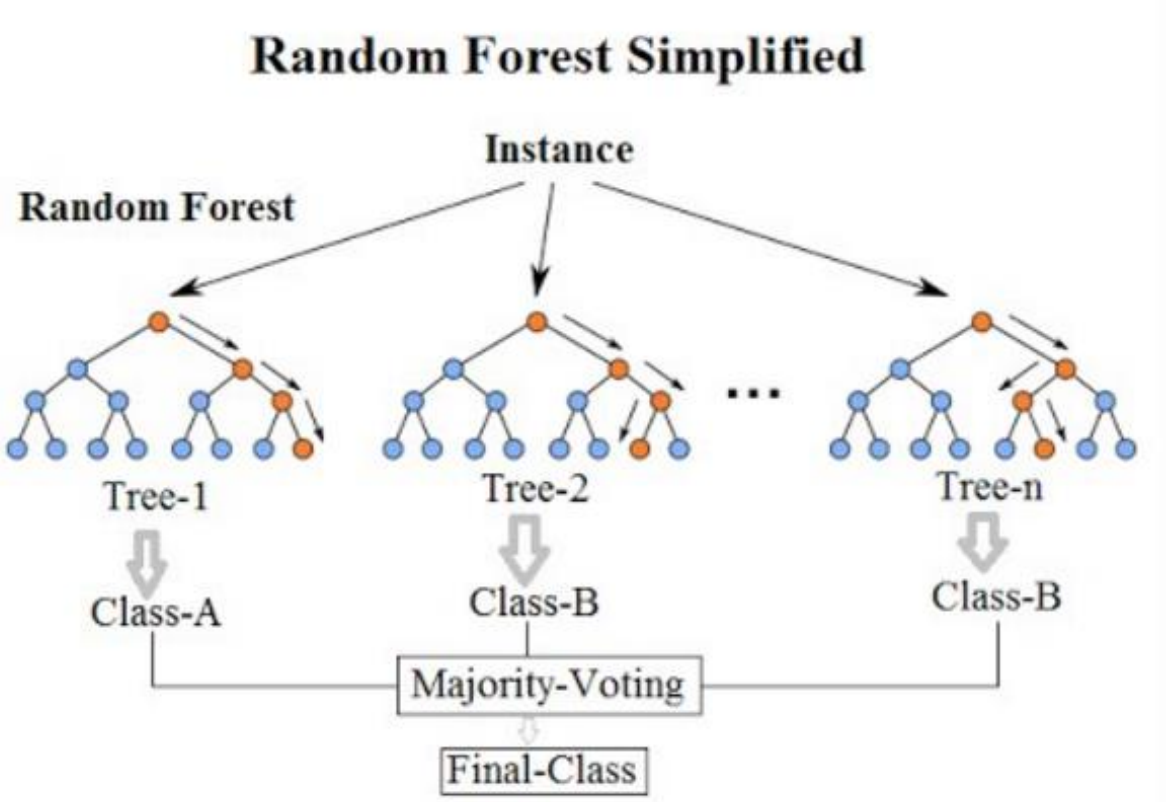


Decision Trees (DTs) are a non-parametric supervised learning method used for classification and regression.

If-then-else decision rules

Decision tree builds **classification** or **regression** models in the form of a tree structure

RANDOM FOREST



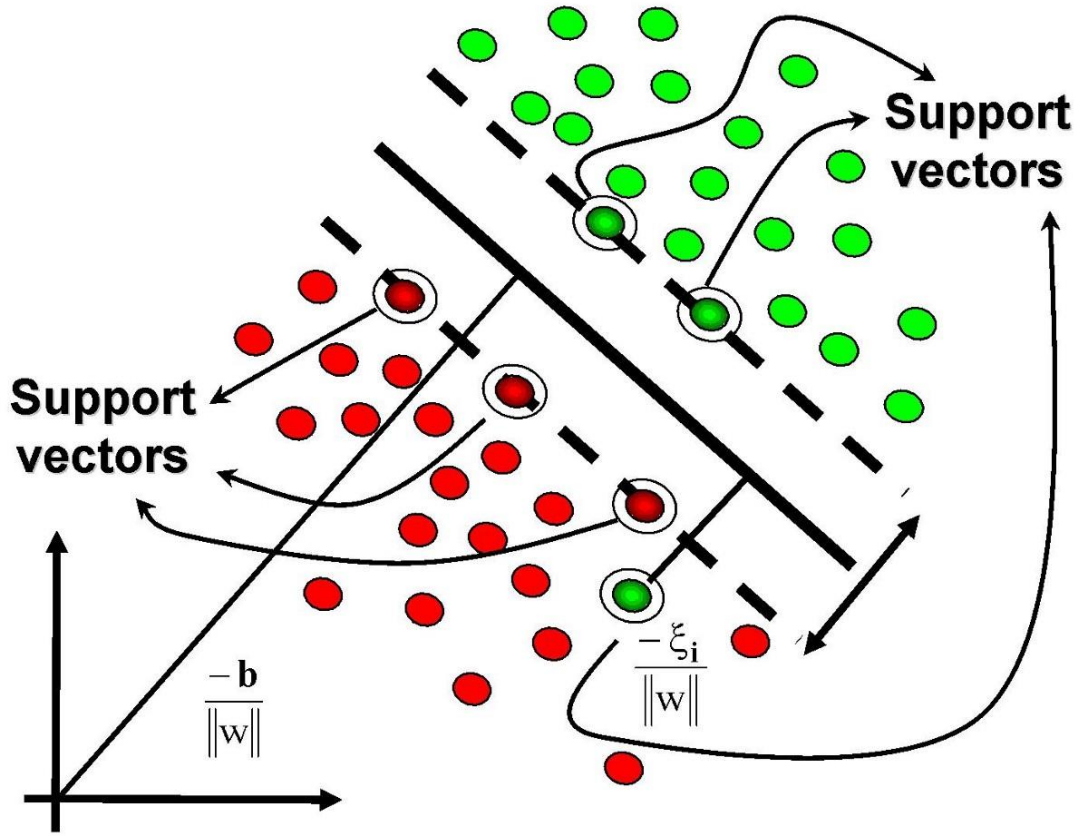
Random forest classifier creates a set of decision trees from randomly selected subset of training set. It then aggregates the votes from different decision trees to decide the final class of the test object.

Only a subset of all the features are considered for splitting each node in each decision tree

The random forest combines hundreds or thousands of decision trees, trains each one on a slightly different set of the observations, splitting nodes in each tree considering a limited number of the features. The final predictions of the random forest are made by averaging the predictions of each individual tree.

Regression and Classification

Support Vector Machine



"Support Vector Machine" (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges.

Built to handle classification and regression problems, but mostly used in classification problems.

Compared to kNN, SVM is able to handle outliers pretty well. Basically, slack variables measures the distance between the outliers to the margin where they actually should be placed on the opposite side

NN architectures

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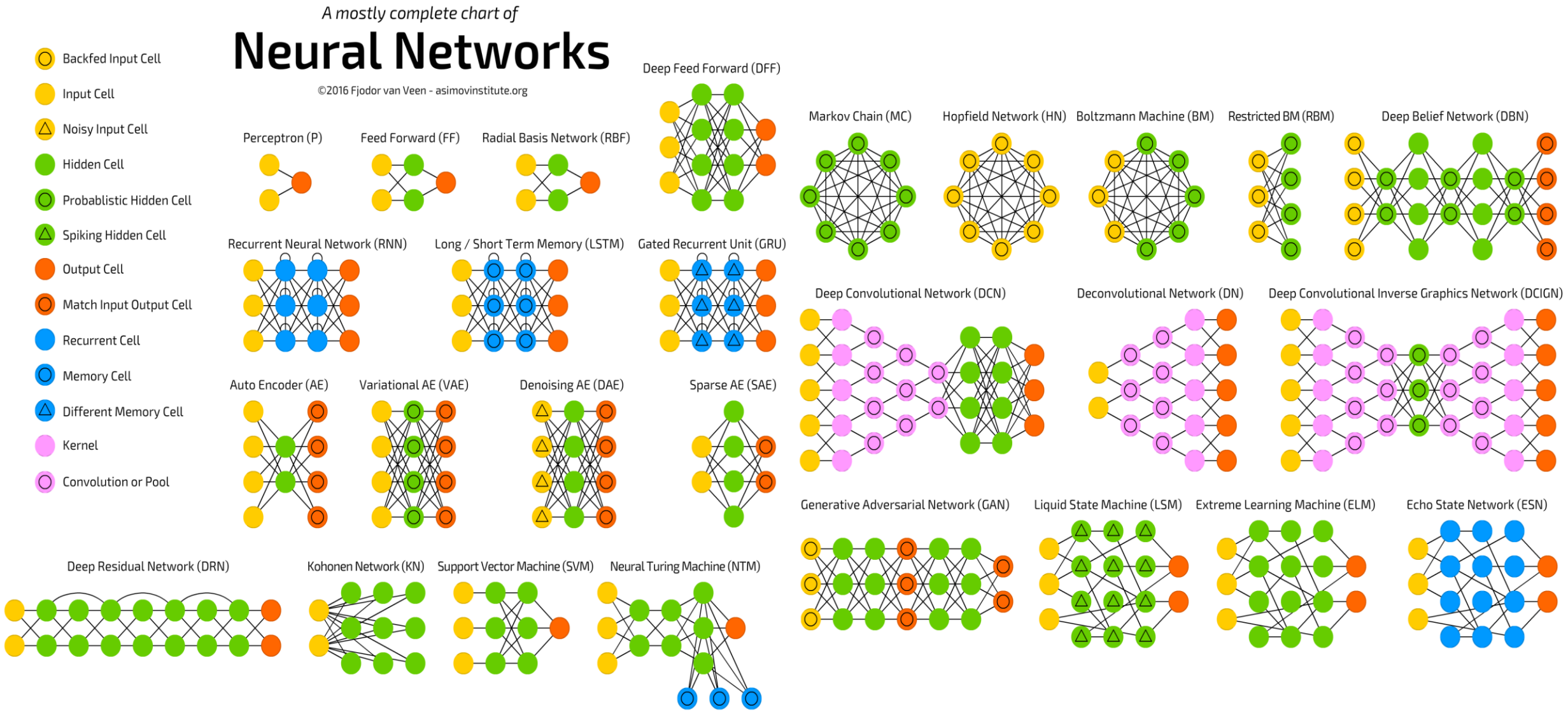

Artificial Neural Network architectures

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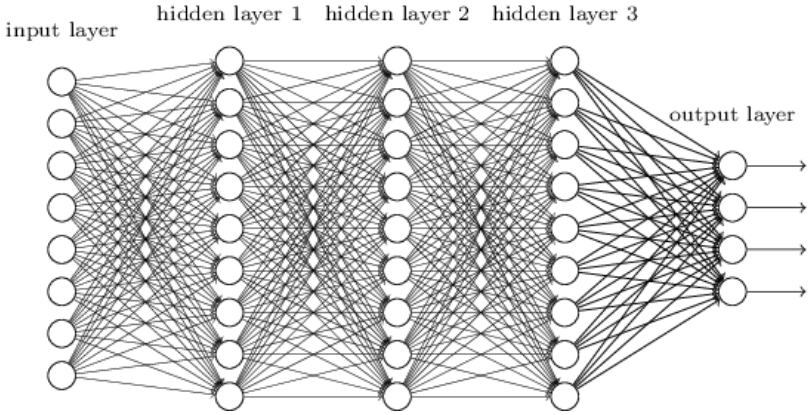
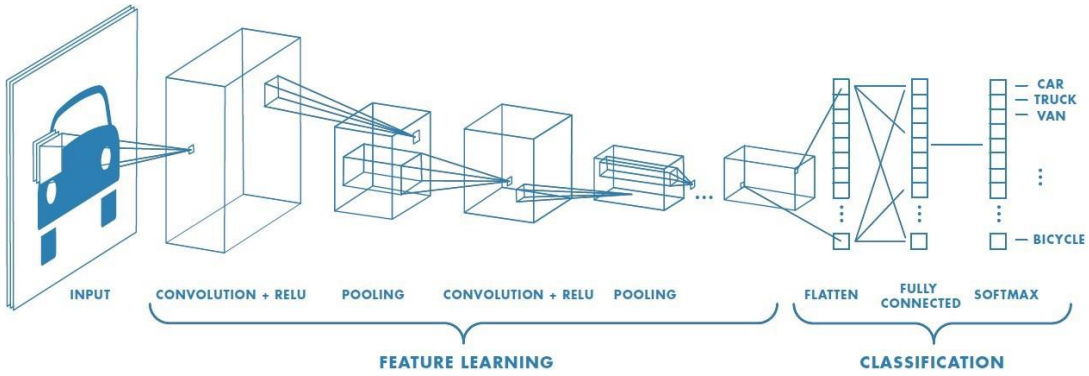
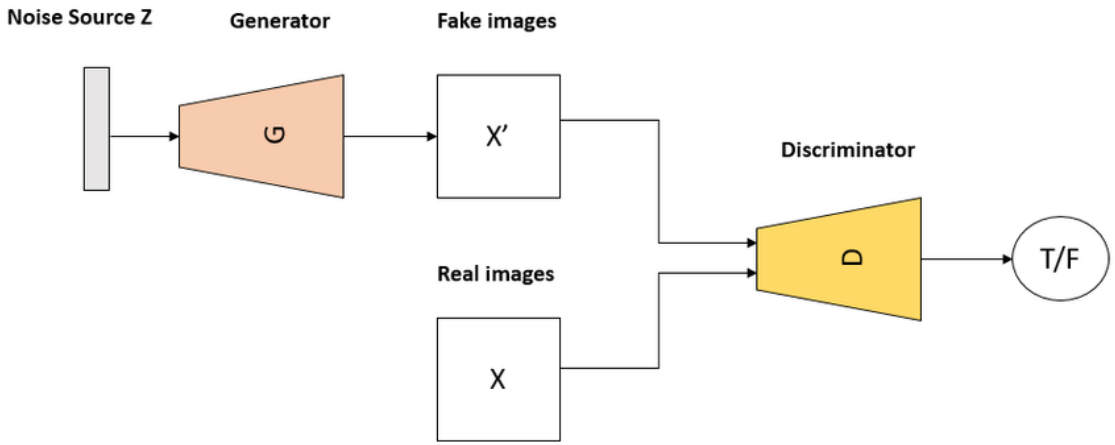
Multi Layer Perceptron



Convolutional NN



Generative Adversarial NNs



Training MLP

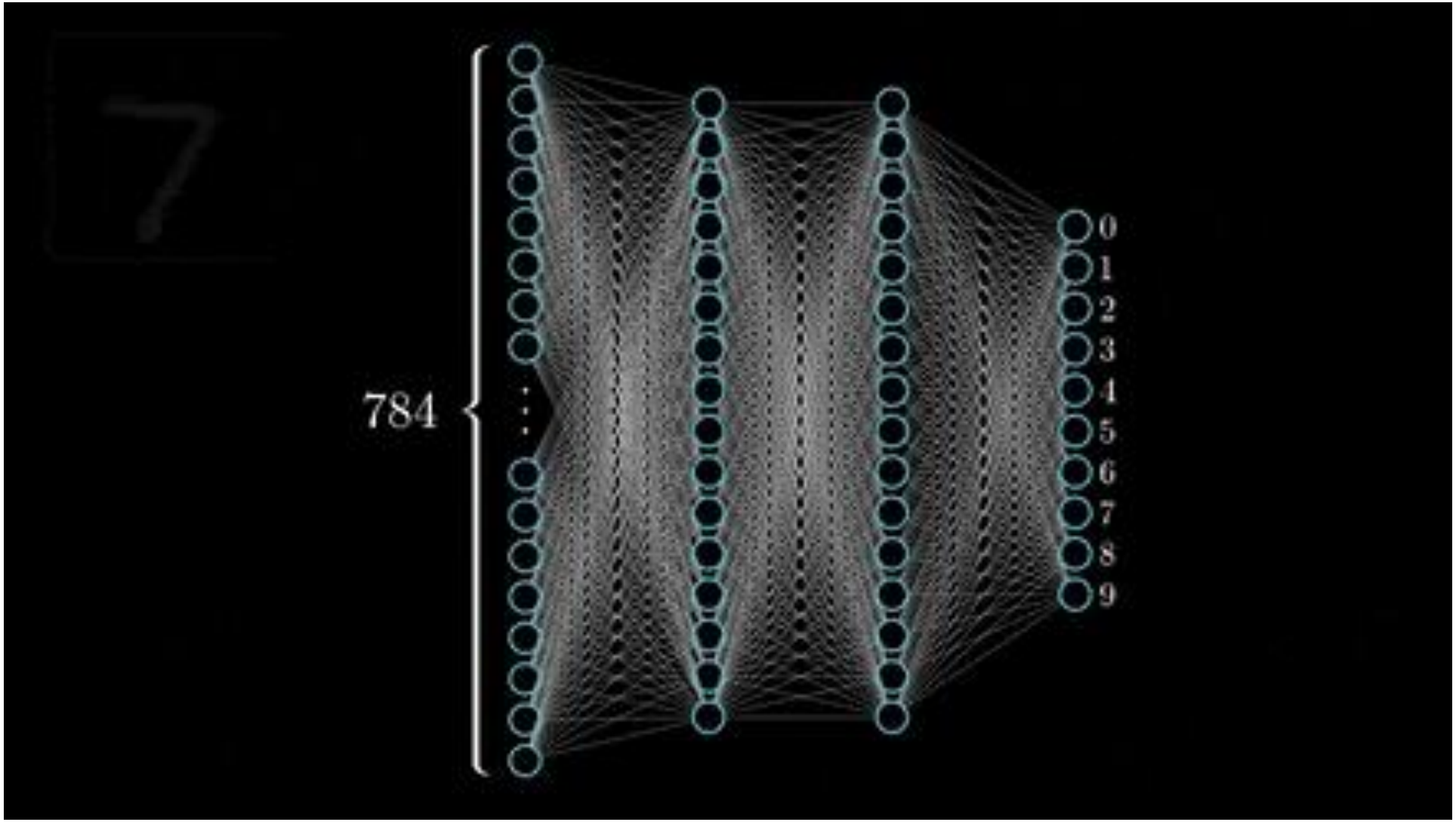


Image credits: Convolutional Neural Networks : More Dogs, cats, and frogs and cars. https://www.linkedin.com/pulse/convolutional-neural-networks-gaurav-jain/

Training MLP

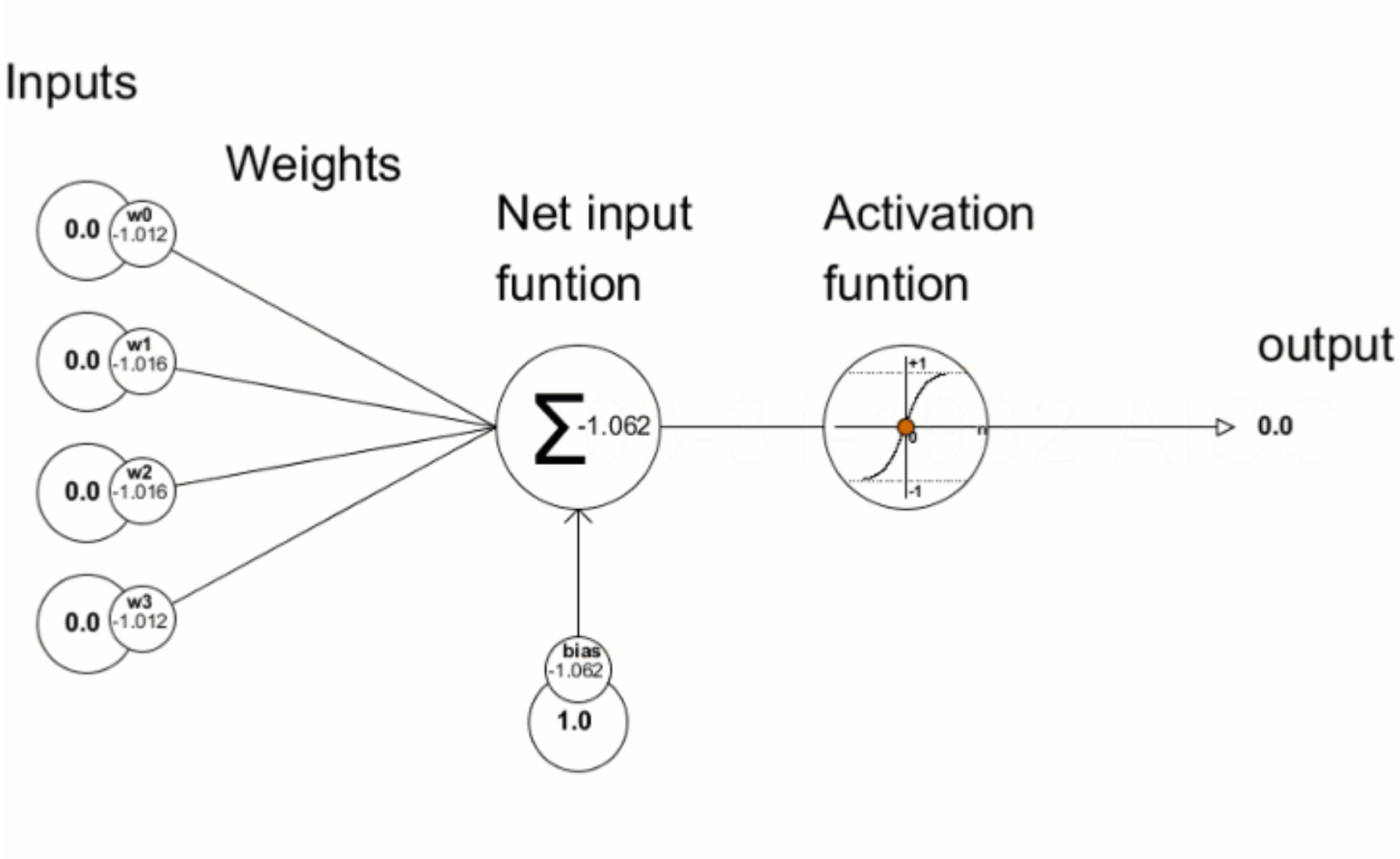
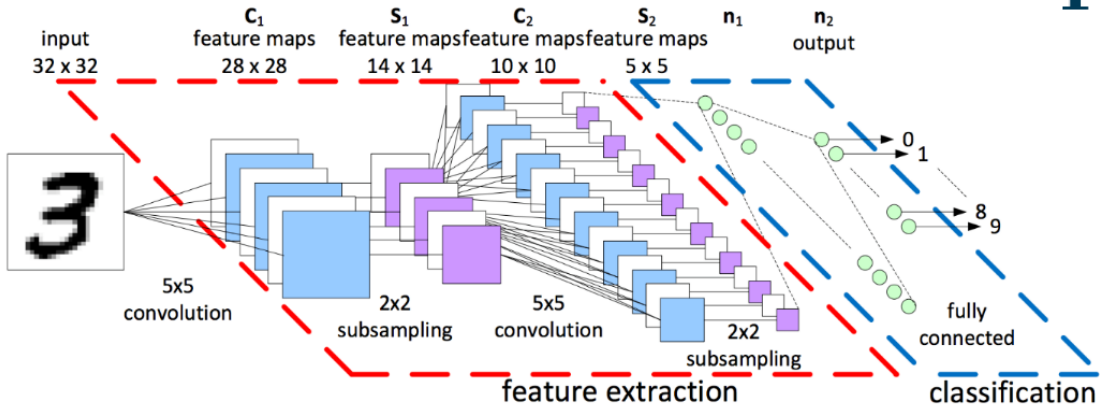
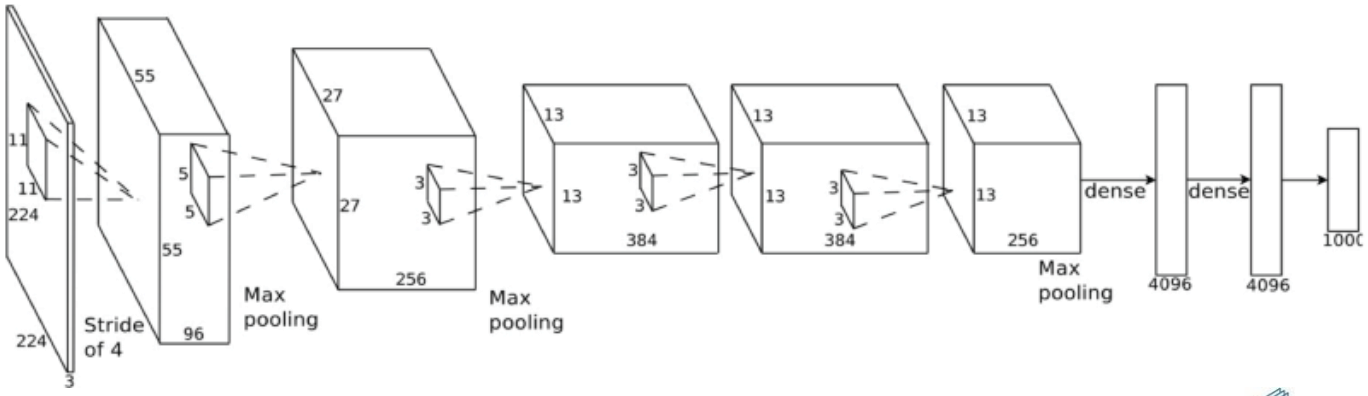
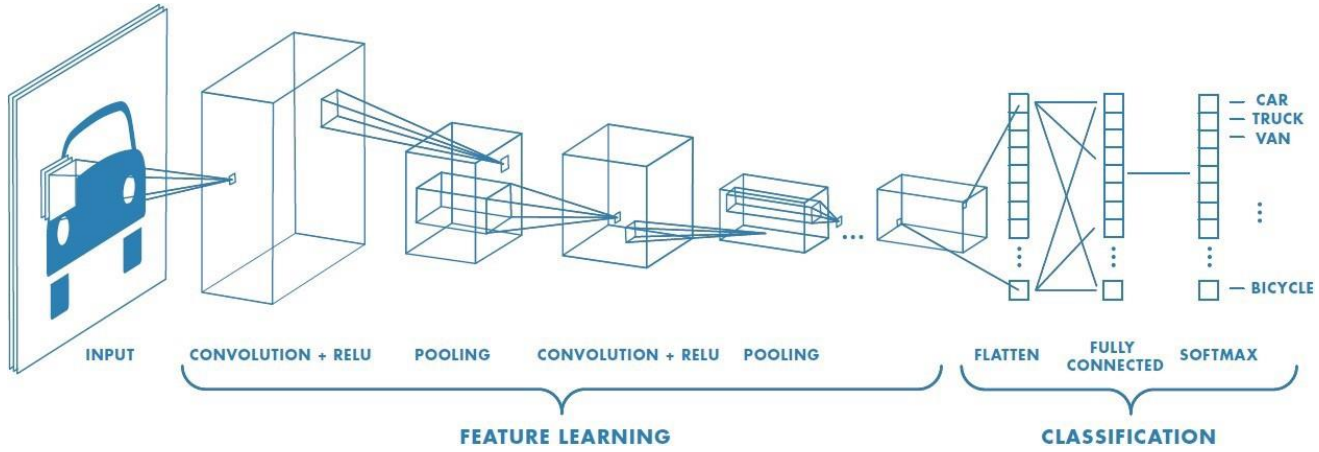


Image credits: Programming a deep neural network from scratch using mql language : https://www.mql5.com/en/blogs/post/724245

Different architectures of CNN







Convolutional NNs

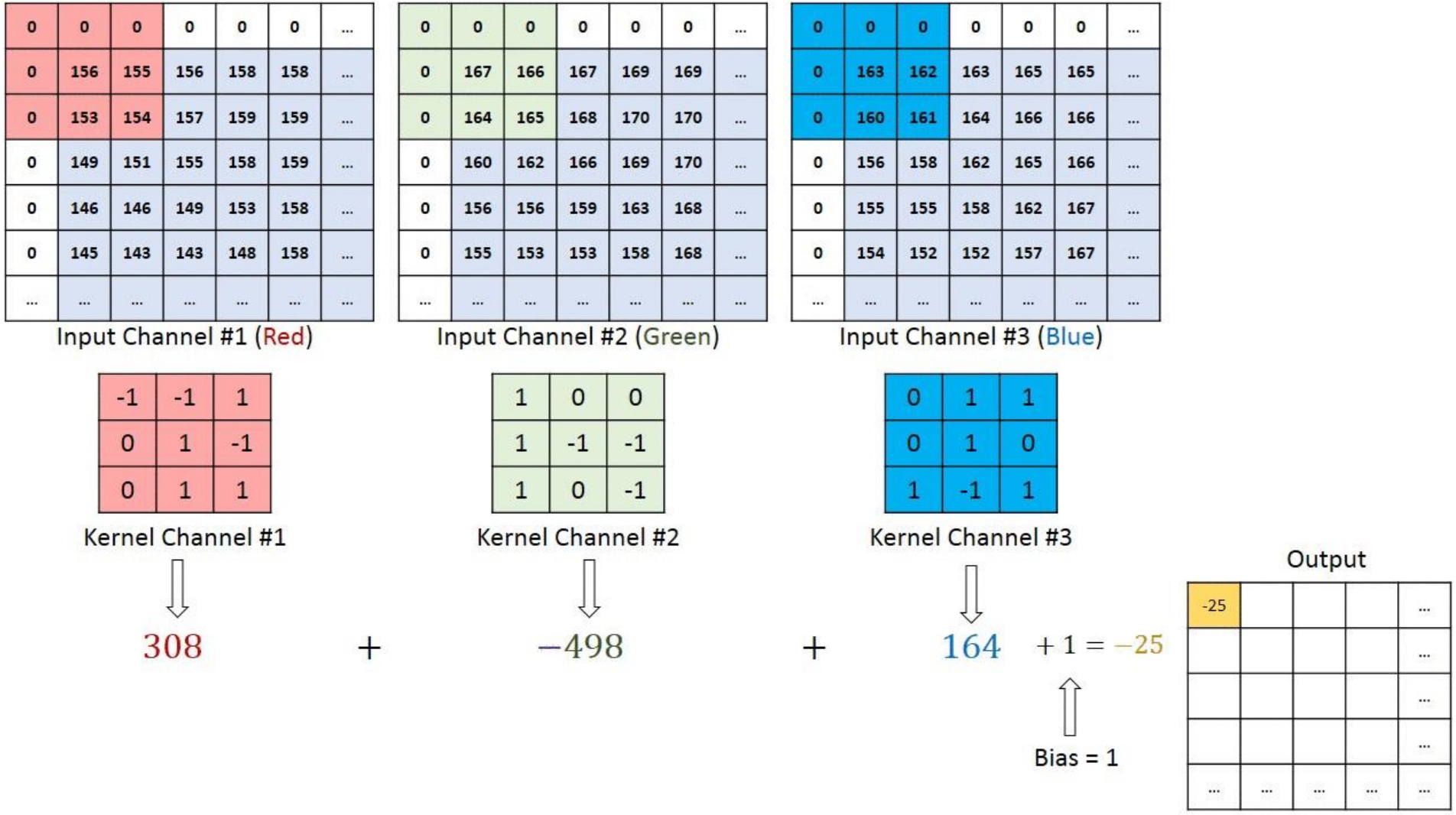


image credits: A Comprehensive Guide to Convolutional Neural Networks –https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53

Convolutional NNs

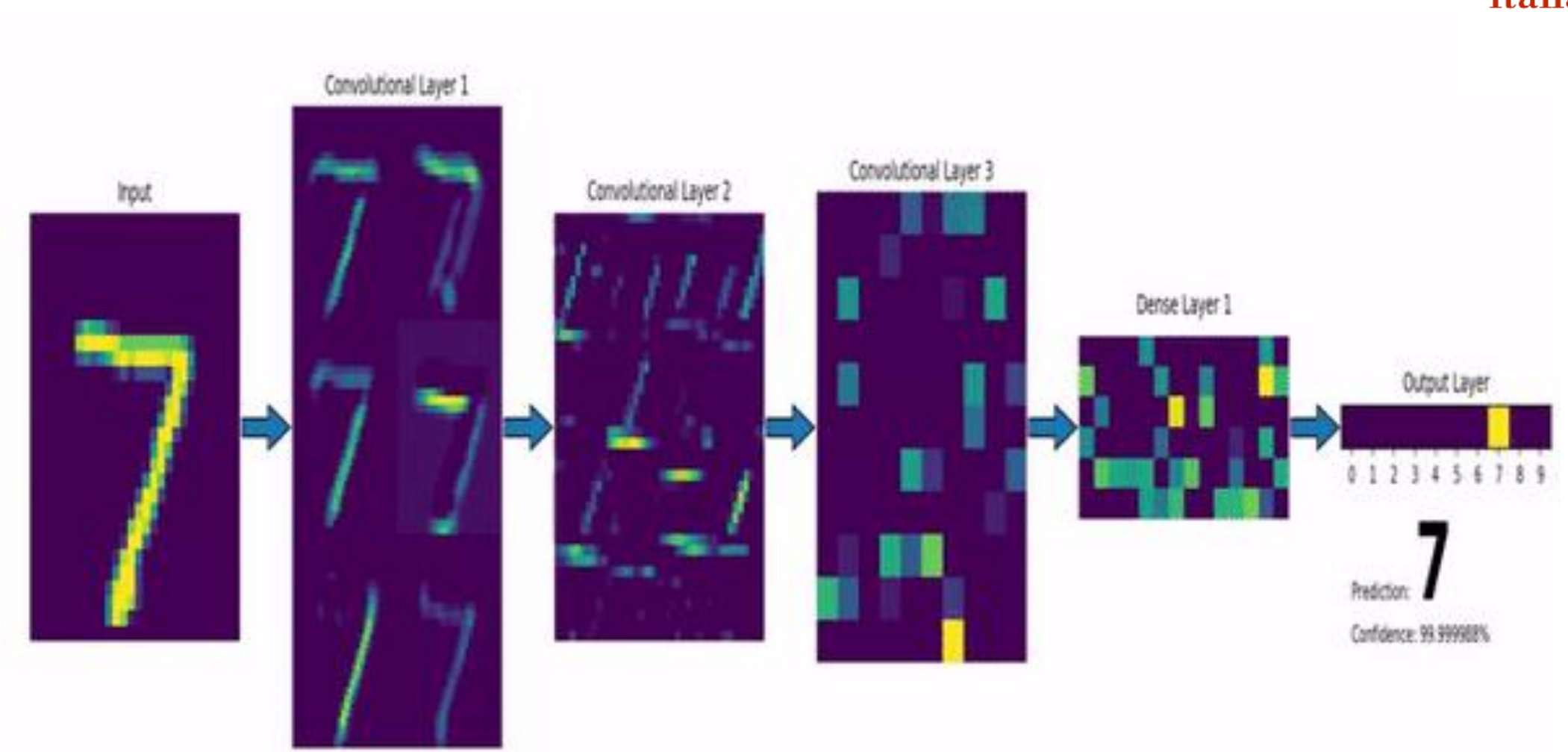


Image credits: State-of-the-Art Convolutional Neural Networks Explained — DenseNets

Convolutional NNs

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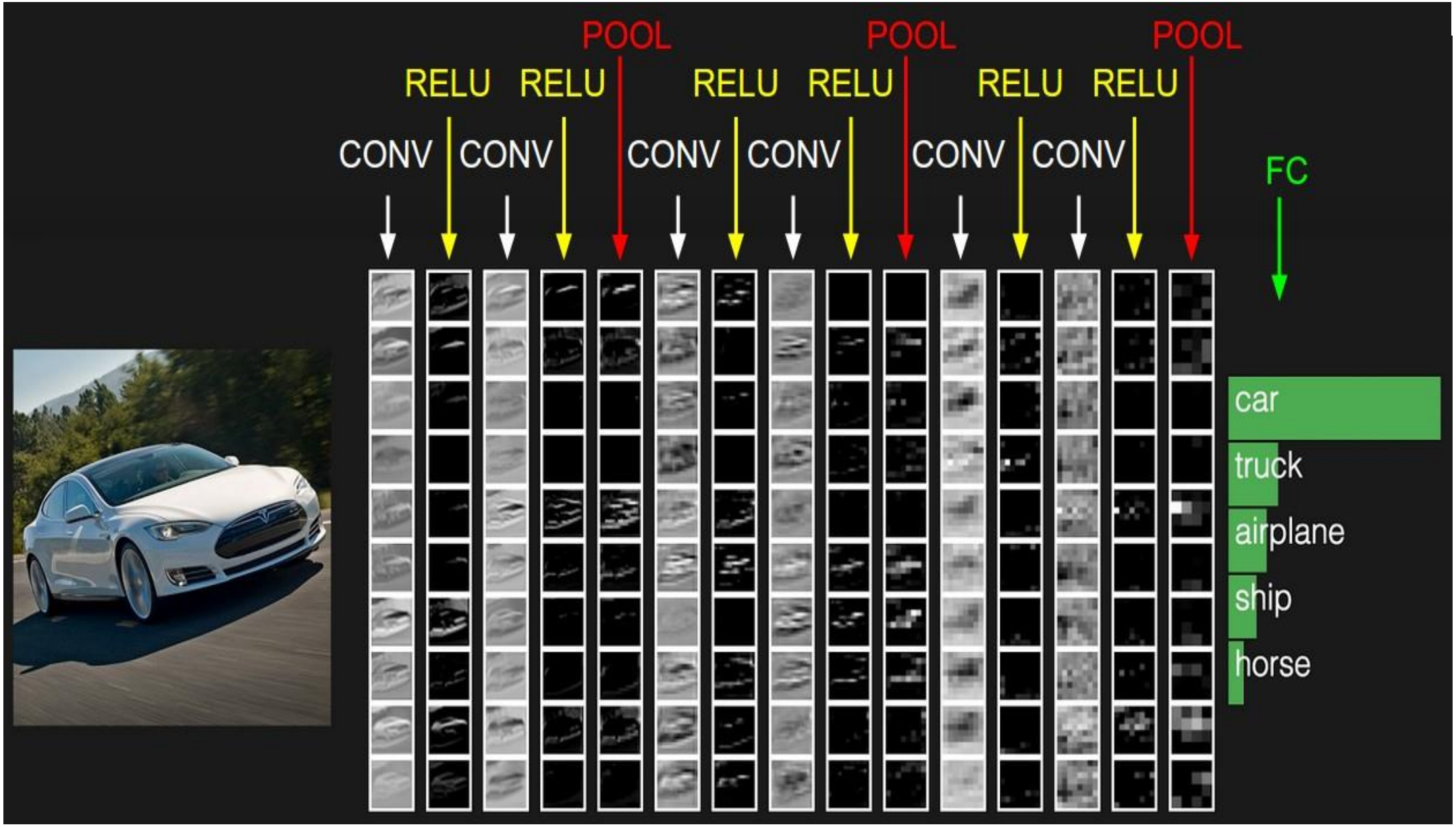

Most Famous CNN Architectures

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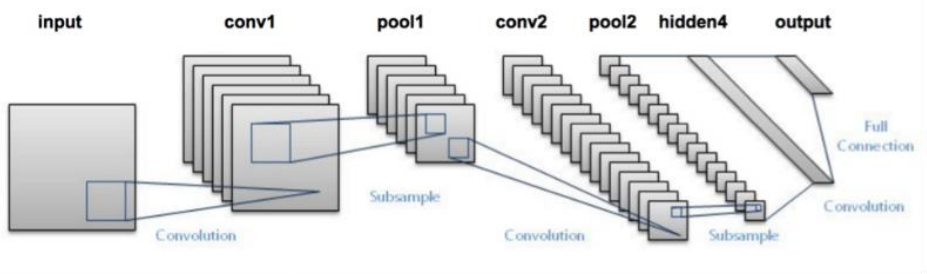
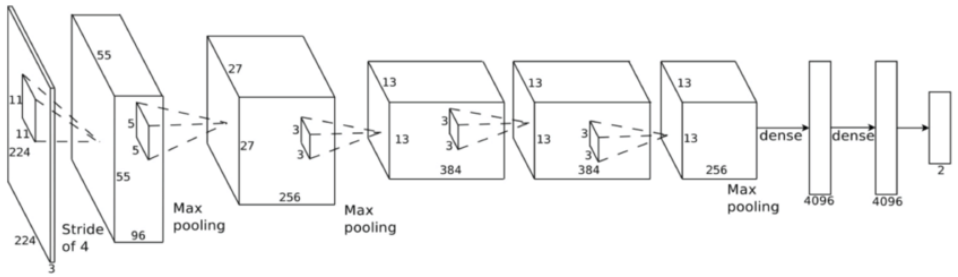
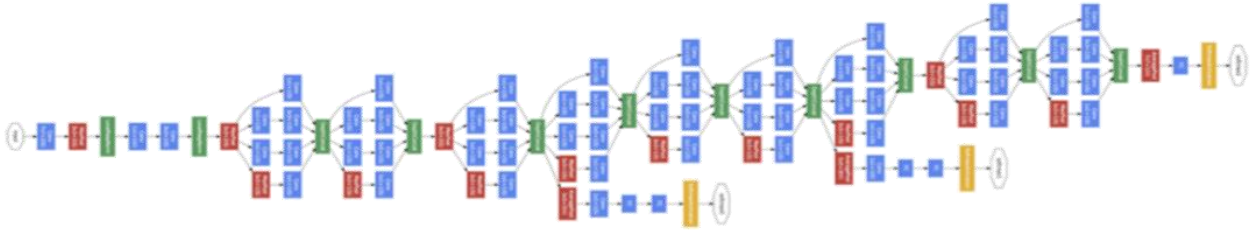
LeNet-5 (1998)



AlexNet (2012)

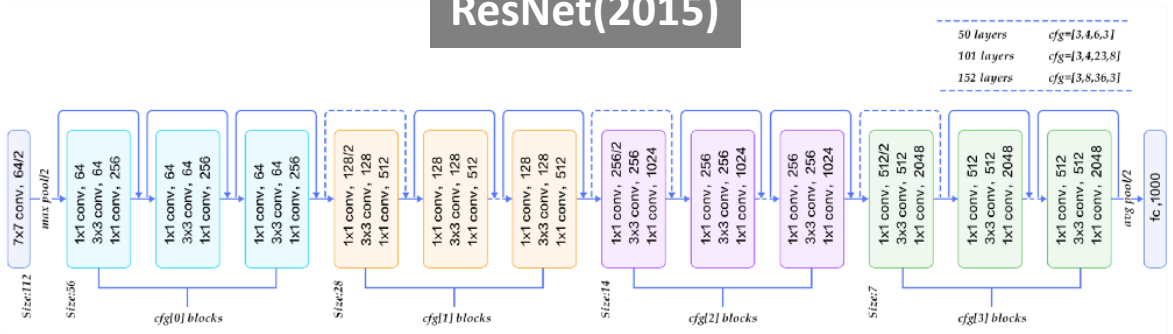


GoogleNet/Inception(2014)



VGGNet (2014)

ResNet(2015)



Generative Adversarial Neural Networks

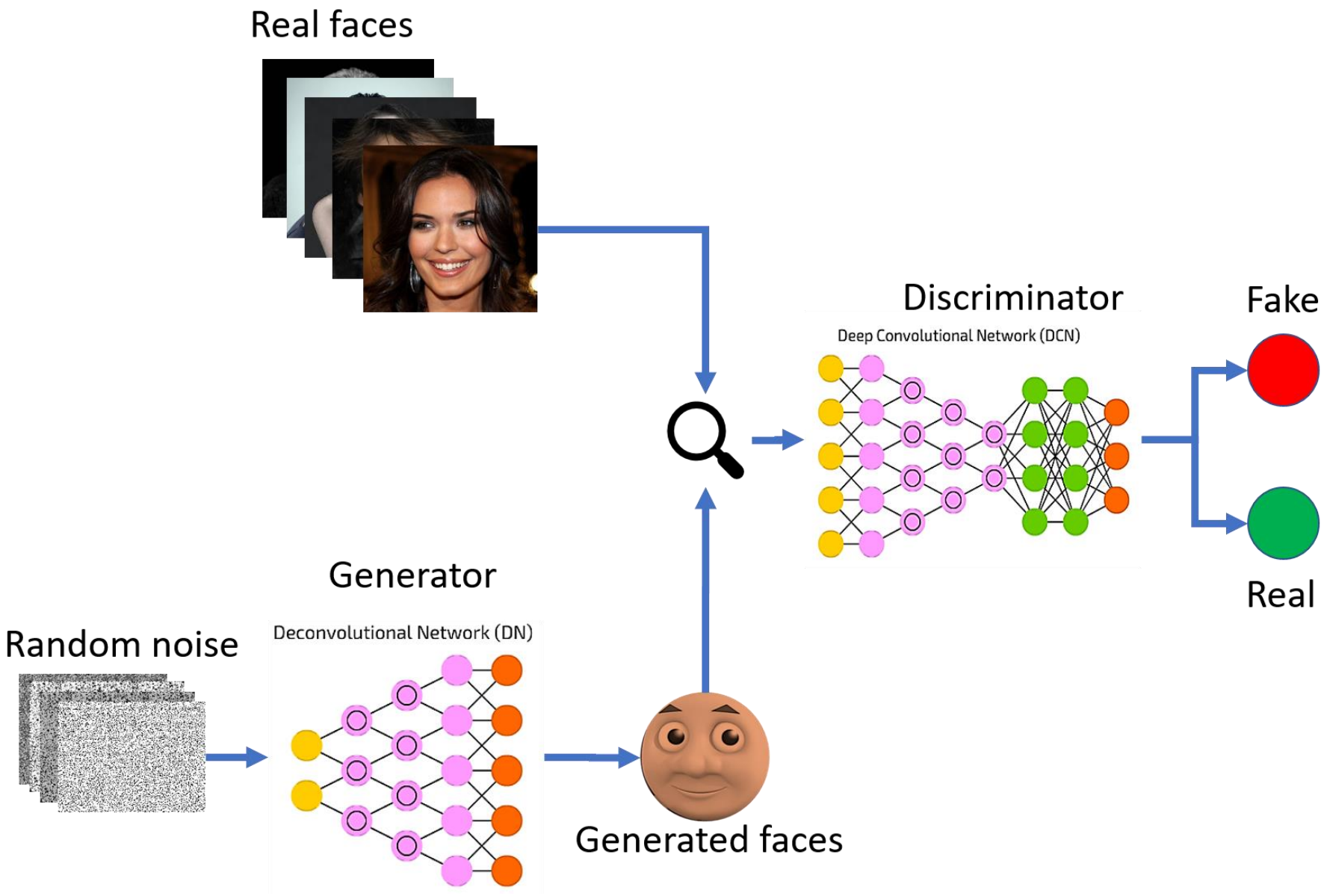


Image credits: https://www.spindox.it/en/blog/generative-adversarial-neural-networks/

Generative Adversarial Neural Networks

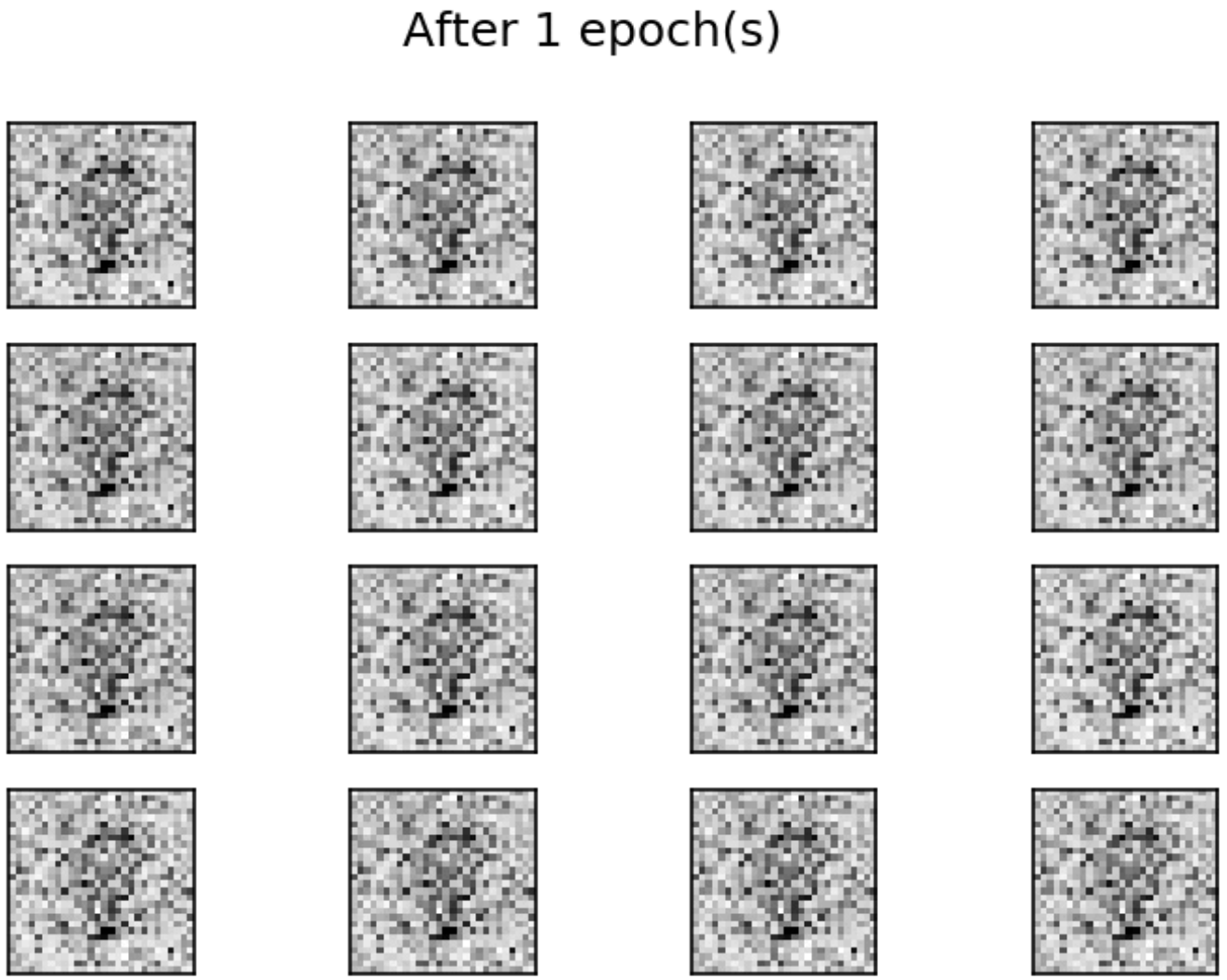


Image credits: Write your first Generative Adversarial Network Model on PyTorch