Ml with Julia

Introduction:

Is ML the same as the AI, or is ML a subset of AI or the other way around. What is Deep Learning?

AL, ML, Deep Learning seemingly came out of no where during the psat few years, but these fields of study have been for decades.

For this series, we will focus on ML but till the end of the series, things will become clear.

AI - Intelligence demonstrated by machines, as opposed to natural intelligence displayed by animals including humans. ~ Wikipedia

The field of AI research started in 1956 at a summer workshop held at Darmouth College. The name of the workshop was, "The Darmouth Summer Research Project on AI."

ML - The study of Computer Algorithms that can improve automatically through experience and by the use of data. ~Wikipedia

In other words, rather than telling a programmer to write a code and tell the computer exactly what to do, it makes an algorithm available to the computer and the computer figures out by itself what it has to do.

A lot of ML is just math combined with numerical computing.

ML learns and predicts the based on passive obervations, whereas AI implies ana gent interacting with the enviroment to learn and take actions that maximize it's chance of successfully achieving it's goals. ~ Unknown Source

The term ML was coined by Arthur Samuel in 1959. He created a checkers playing program which was a self learning program.

In 1990's, work in ML shifted from a knowledge driven approach to a data driven approach, which let to program using computers use large data sets to learn. In 1997, IBM's SuperComputer Deep Blue, beat Garry Kasparov.

Milestones:

In 1998, MNIST dataset was released for hand-written digits.

In 2009, ImageNet was created containing more than 14million labelled image datasets.

Google Deep Brain Learning Project, key person "Andrew Ng".

ML Algorithms:

- Supervised Learning | Classification , Regression

Decision Trees, Ensembles (Bagging · Boosting · Random Forest), K-NN, Linear Regression, Naive Bayes, Artificial Neural Networks, Logistic Regression, Perceptron, Relevance Vector Machine(RVM), Support Vector Machine.

- Clustering

BIRCH, CURE, Heirarchical, k-means,Expectation-maximisation (EM), DBSCAN, OPTICS, Mean Shift

- Dimensionality Reduction

Factor analysis, CCA, ICA, LDA, NMF, PCA, PGD, t-SNE, SDL.

- Structured Prediction

Graphical Models (Bayes Net, Conditional Random Field, Hidden Markhov)

- Anomaly Detection

RANSAC, k-NN, Local outlier factor, Isolation forest

- Artificial NN

Autoencoder, Cognitive computing, Deep learning, DeepDream, Feedforward neural network, Recurrent neural network(LST · MGR · UESN · reservoir computing), Restricted Boltzmann machine, GAN, Diffusion model, SOM, Convolutional neural network(U-Net), Transformer(Vision), Spiking neural network, Memtransistor, Electrochemical RAM (ECRAM)

- Reinforcement Learning

Q-learning, SARSA, Temporal Difference(TD), Multi Agent(Self Play)

Supervised Learning

It is a learning task of learning function that maps an input to an output based on example input-output pairs. It infers a function from labeled training data consisting of a set of training examples.

In a traditional example, the program has a function *'f'* and the user provides an input 'x', then the computer program performs the calculation *f(x)* and outputs it.

In supervised learning, the user provides the input and output and it's the program's job to find the function. A question arises, Why?. Well, because the model which will be formed will be used for further calculations for datasets which do not have either output or input.

Eg: Handwriting Recognition, Computer Vision, Spam Detection, Speech Recognition etc

Among Supervised, Unsupervised, Reinforcement learning, Supervised learning has most commercial success.

Un-Supervised Learning

Relies on input data only. Un-Supervised learning, learns patterns from untagged data. It's the computer's job to find some pattern that perhaps maybe too complex for a human to see.

Re-inforcement Learning

Concerned with how intelligent learning agents ought to take actions in an environment in order to maximize the notion of cumulative award.

Deep Learning

Deep Structured Learning - a sub field of ML, DL can also be categorised as Supervised Learning, Un-supervised Learning, and Re-inforcement Learning

It is a part of a broader family of ML methods based on artificial NN.