Deep Learning Made Easy

The Basics

Schedule

week	Date	Topic
1	02.11	Introduction
2	02.18	The basics: python, math, and AI development
3	02.25	AI history & Perceptron
4	03.04	Training: forward propagation & backpropagation
5	03.11	CNN
6	03.18	Metrics
7	03.25	Word embedding
8	04.01	RNN
9	04.08	Autoencoder & GAN
10	04.15	Project presentation

Today's Agenda

- Goals
- Concepts:
  - AI, Machine Learning, Deep Learning
  - Supervised, Unsupervised, and Reinforcement
  - Structured vs. Unstructured
  - Deep Learning vocabulary
- Setup
- Lab time

Goals

- Conceptual understanding of Deep Learning: to understand how an AI system works ‘under the hood’
  - Model, training, inference, etc.
- Knowledge about various Deep Learning algorithms
  - Regression, Artificial Neural Networks, CNN, RNN, GAN, etc.
- Basic technical skills for developing AI models
  - Python, Jupyter notebooks, TensorFlow

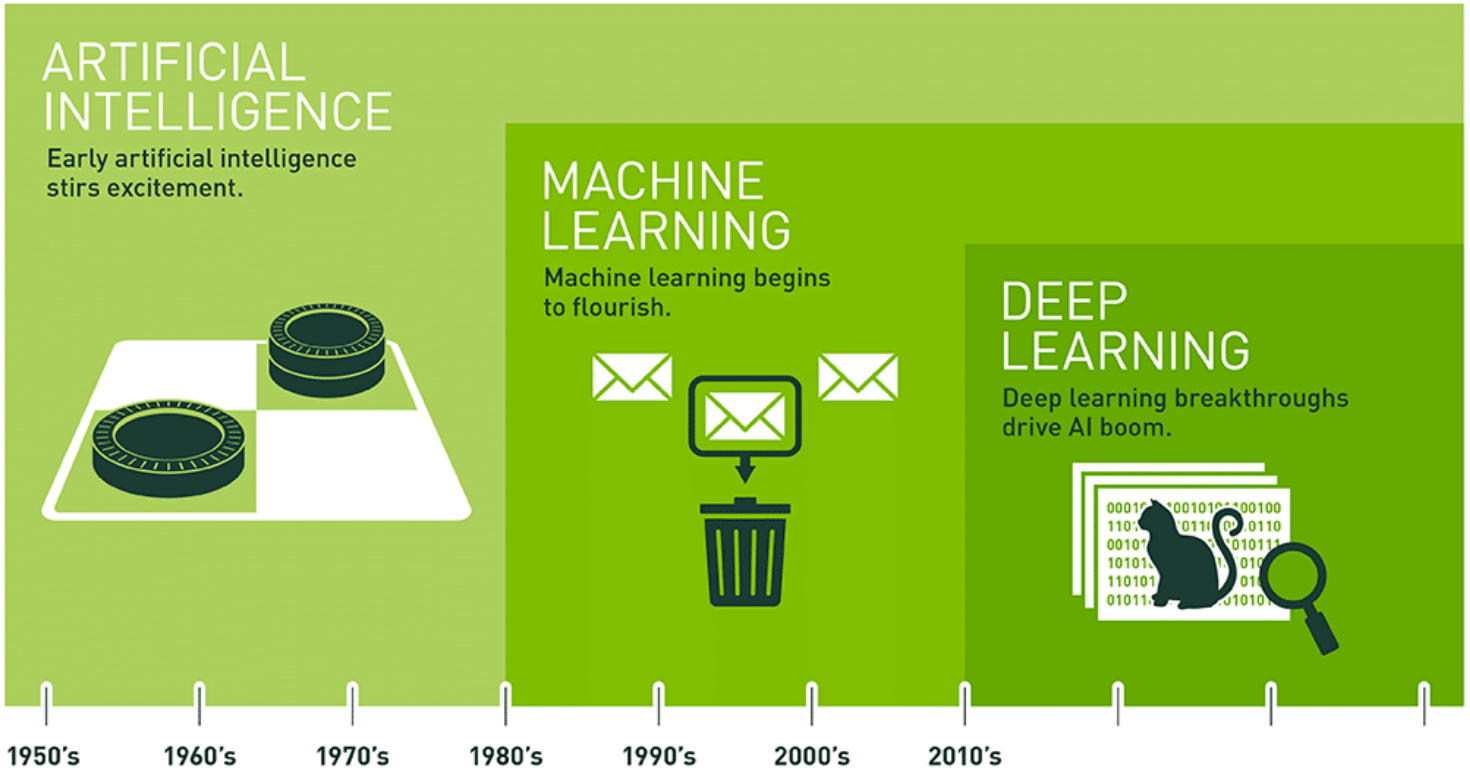
What is AI?

- Artificial Intelligence: A practical and broad definition of AI is to build a system that behaves like a human being.

- Machine Learning: A sub-field of AI that involves learning.

- Deep Learning: A sub-field of Machine Learning to achieve learning through artificial neural networks.

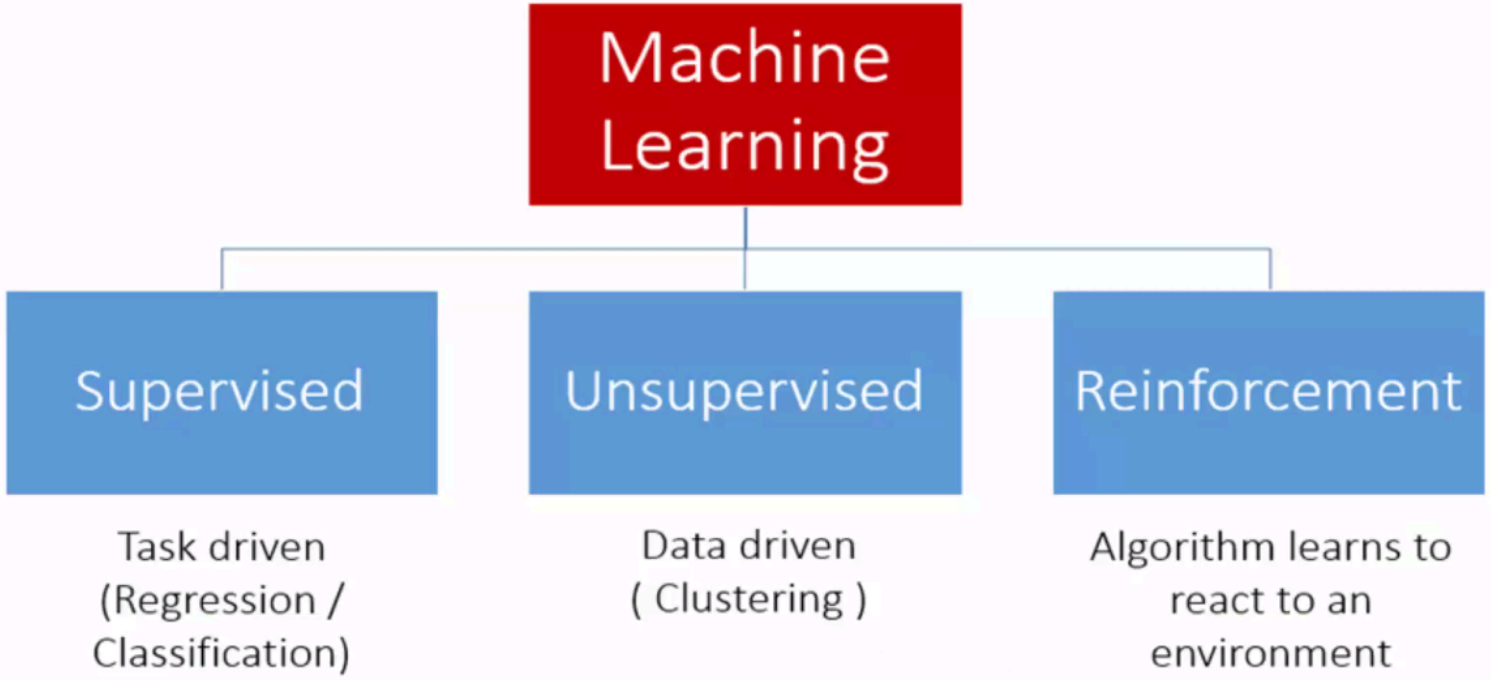
AI, Machine Learning, and Deep Learning



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

https://blogs.nvidia.com.tw/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/

Types of Machine Learning



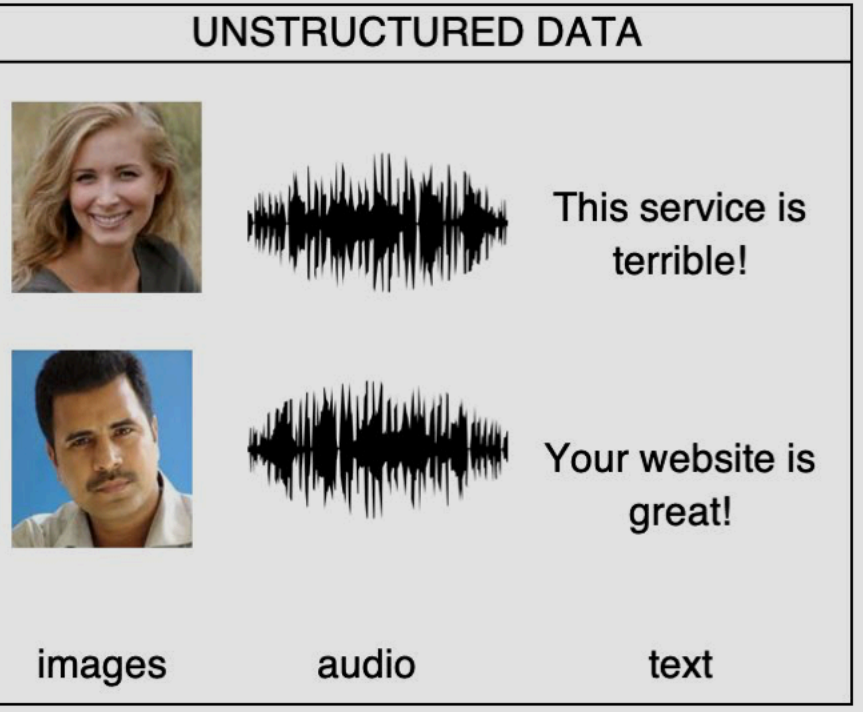
https://medium.com/deep-math-machine-learning-ai/different-types-of-machine-learning-and-their-types-34760b9128a2

Structured vs. Unstructured

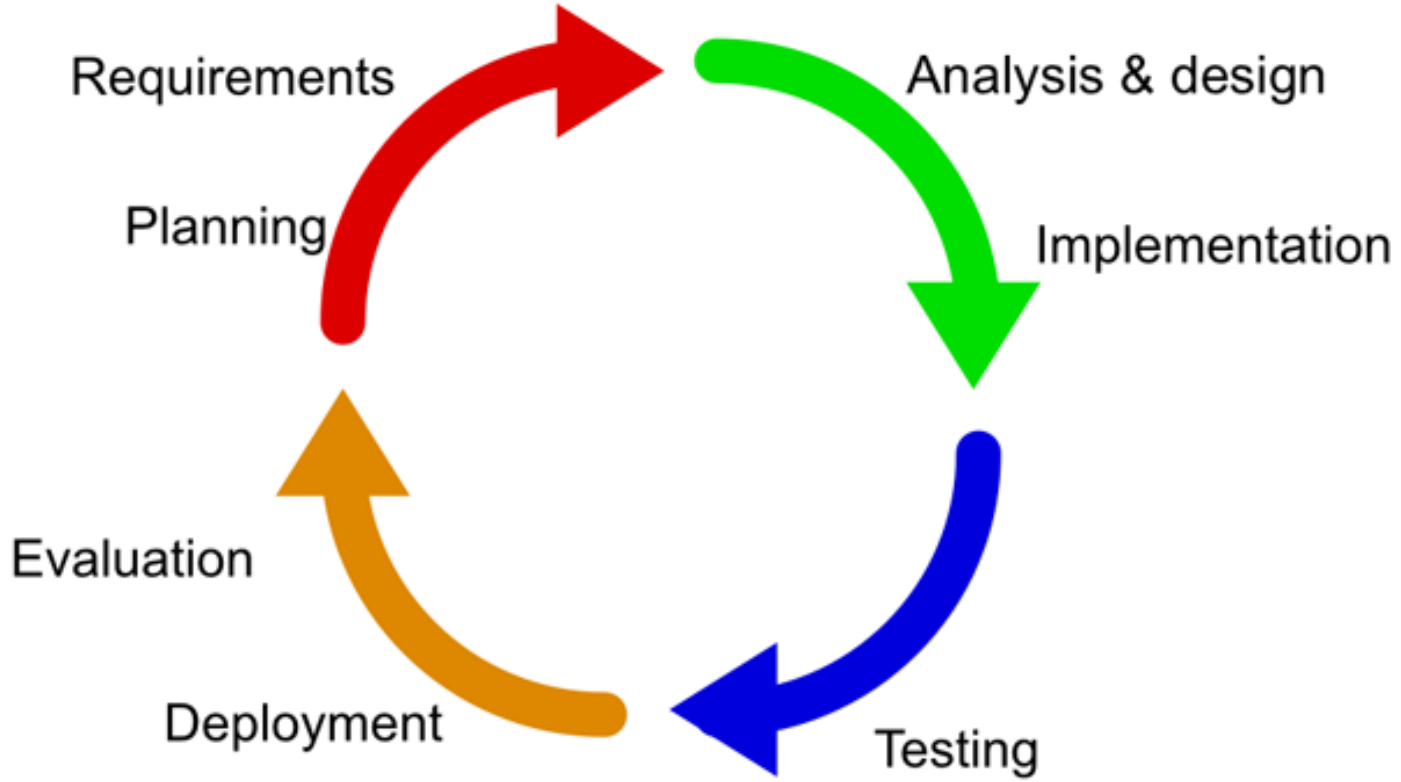
- Structured: Arranged in columns of features
- Unstructured: no structure

STRUCTURED DATA

id	age	gender	height (cm)	location
0001	54	M	186	London
0002	35	F	166	New York
0003	62	F	170	Amsterdam
0004	23	M	164	London
0005	25	M	180	Cairo
0006	29	F	181	Beijing
0007	46	M	172	Chicago

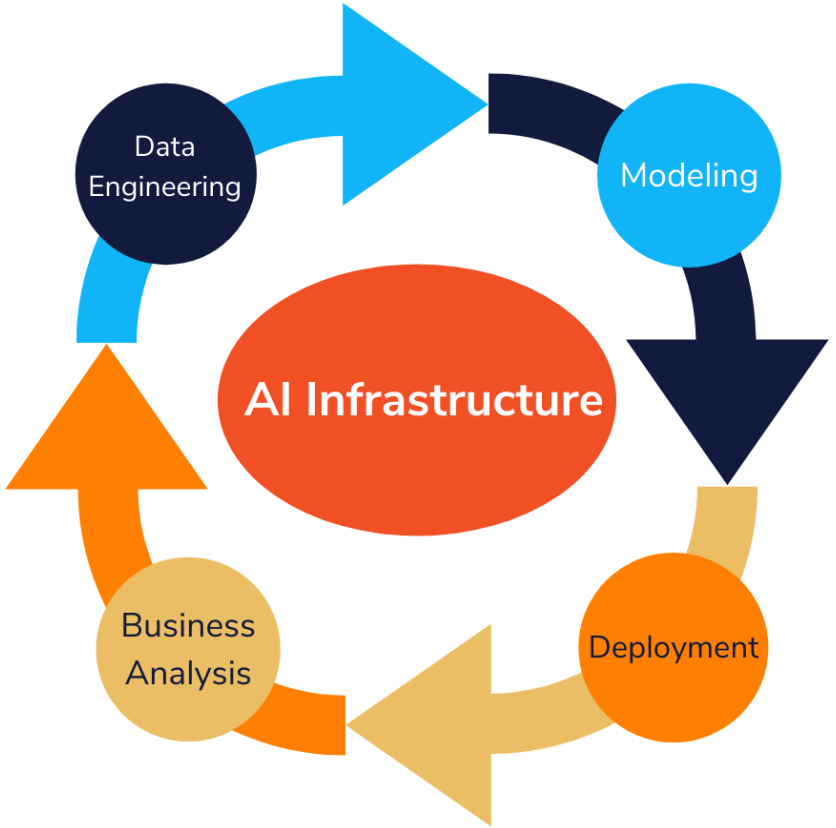


Software Development Lifecycle



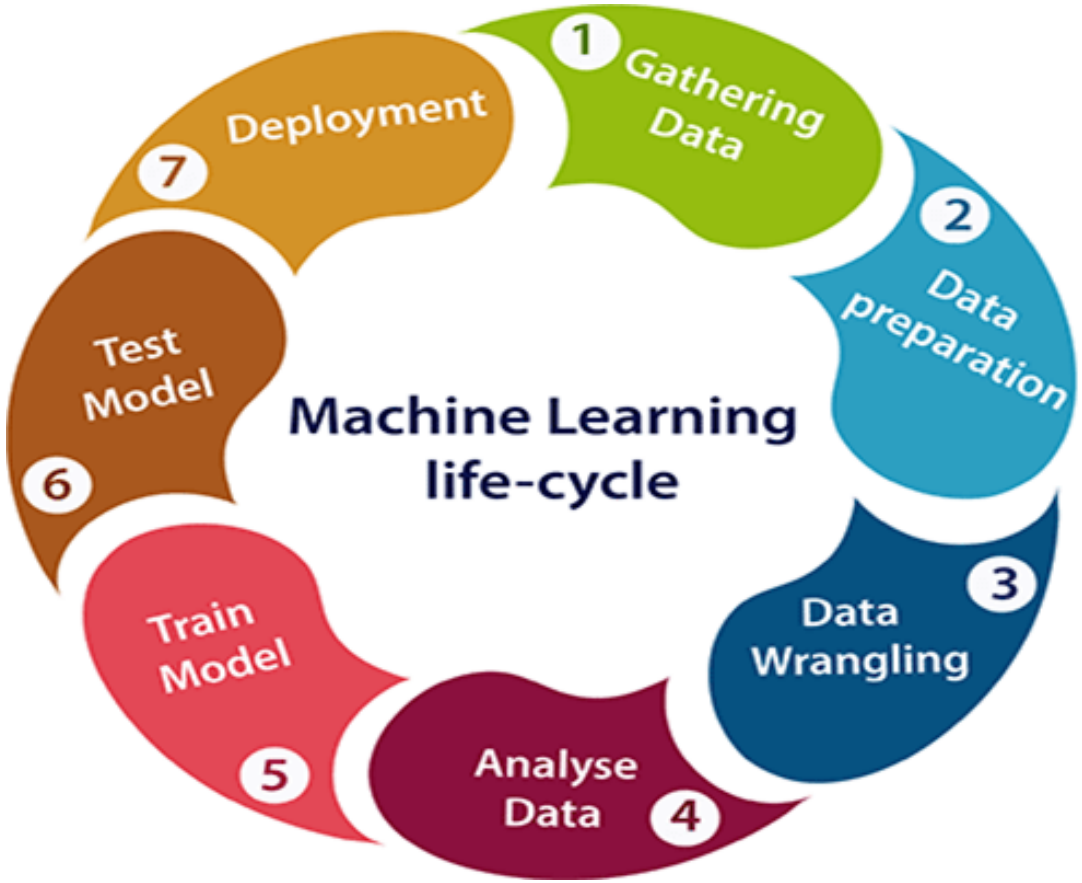
https://developer.ibm.com/technologies/artificial-intelligence/articles/cc-cognitive-big-brained-data-pt2/

AI Development Lifecycle



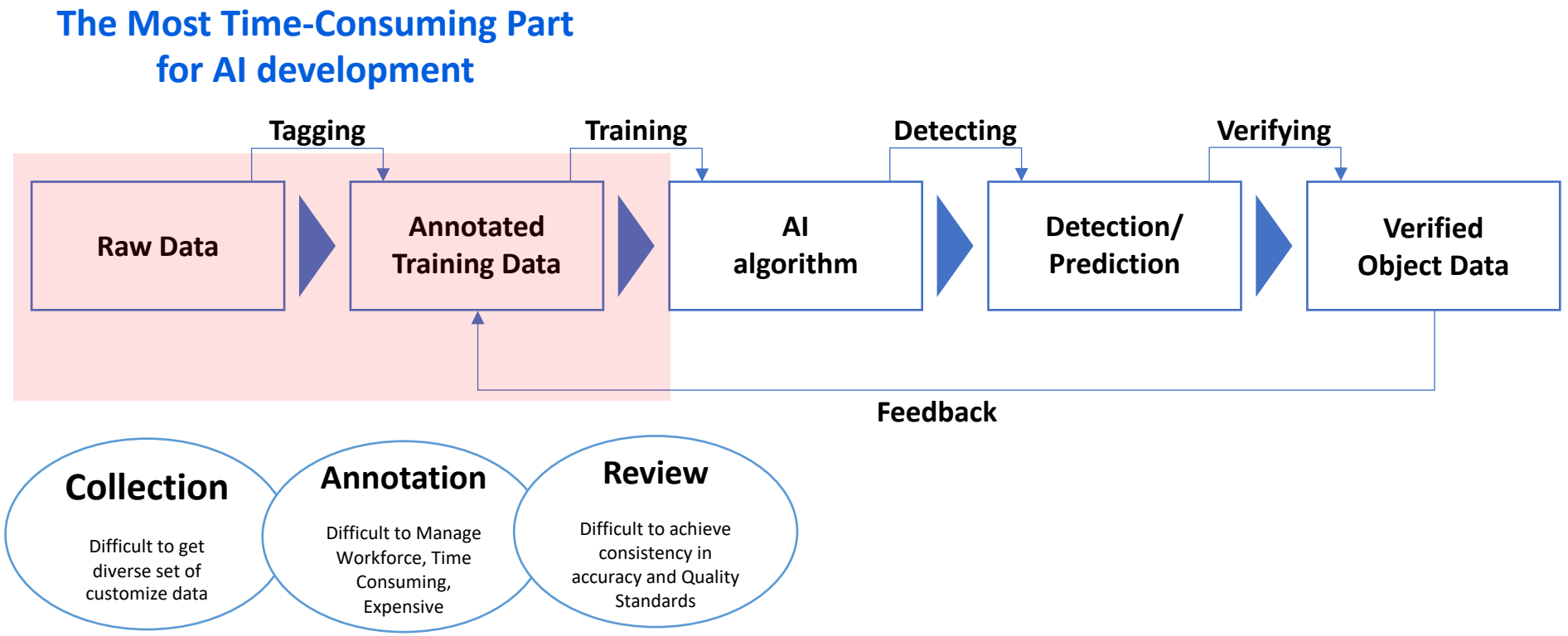
https://zindi.medium.com/data-science-careers-skills-of-the-ai-development-lifecycle-85a419ba6495

AI Development Lifecycle (Details)



https://www.javatpoint.com/machine-learning-life-cycle

AI Development Lifecycle (Data view)



Scalar, Vector, Matrix, & Tensor

- Scalar: a single number
  - 7, -2.4
- Vector: a list of numbers
- Matrix: a 2-dimensional array of numbers
- Tensor: an n-dimensional array of objects

* These are practical definitions.

Tensors, TensorFlow, and Keras

- Tensor: multi-dimensional arrays with a uniform type (called a dtype)
- TensorFlow: an open-source Python library for machine learning
  - Manipulates tensors
- Keras: high level API for machine learning libraries
  - Supports TensorFlow, Microsoft Cognitive Toolkit, R, Theano, and PlaidML
- Reference: https://www.tensorflow.org

Rank, dimension, axes, and shape

- Rank: number of dimensions
- Dimension: 2D, 3D, etc.
- Axes: indices of a dimension
- Shape: number of elements in each dimension
  - a scalar has a rank 0 and an empty shape ()
  - a vector has rank 1 and a shape of (D0)
  - a matrix has rank 2 and a shape of (D0, D1) and so on

What is Keras?

- Keras is an open source library that provides python interface for machine learning libraries
  - TensorFlow is one of the libraries supported by Keras
  - Easier and simpler to use than TensorFlow
  - Will learn both
- Sequential:
  - One layer follows immediately from the previous without any branching
- Functional API:
  - To create a model with multiple input and output layers

Setup

- Chrome browser
- PyCharm
- (optional) Google account: to run the code in colab

Development Environment

- Programming Language: Python

- Editor: IDE (Integrated Development Environment)
  - PyCharm Community Version
  - Jupyter notebook
- https://github.com/changsin/DeepLearningMadeEasy

Assignment

- Research and write up a notebook for the ”flag classification” problem outlined in:
  - https://github.com/changsin/DeepLearningMadeEasy/blob/main/flag_classification/Problem-Definition.ipynb
  - Part I is due by next week
  - This is an individual assignment, but you are welcome to discuss in the forum and among your classmates.

Resources

- AI with Python tutorial:
  - https://www.tutorialspoint.com/artificial_intelligence_with_python/index.htm
- Project GitBook:
  - https://changsin.gitbook.io/deep-learning-made-easy
- And many more…

Lab time

- To clone: from your terminal
  - >git clone https://github.com/changsin/DeepLearningMadeEasy.git
- Or use google colab to open the git hub repository
- Git is an open source version control system
  - Github is a host service using git.