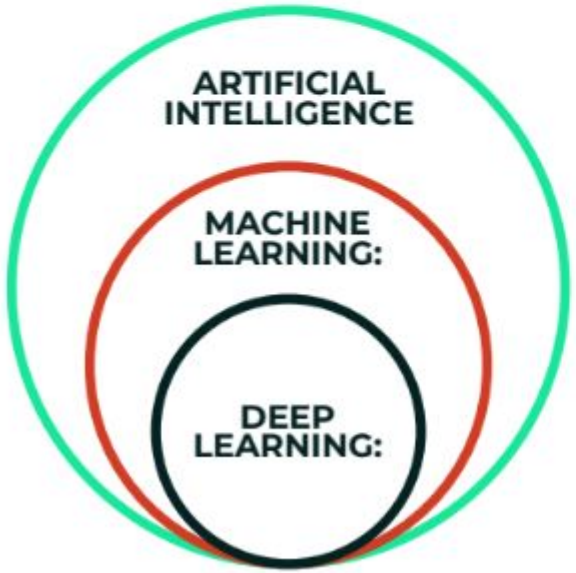
DIFFERENCES BETWEEN ML, DL AND AI

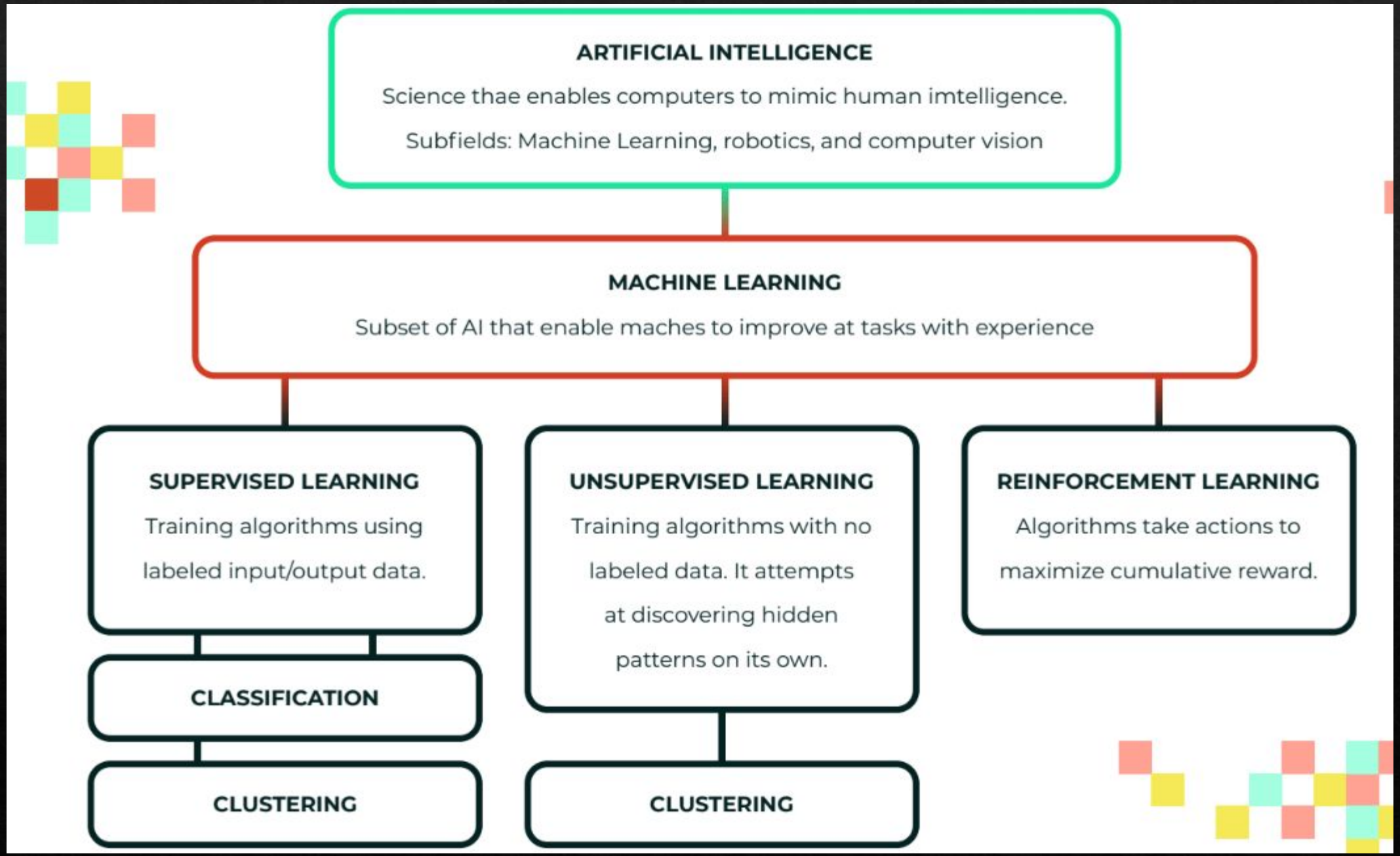


ARTIFICIAL INTELLIGENCE

Science that empowers computers to mimic human intelligence such as decision making, text processing, and visual perception. Ai is a broader field (i.e.: the big umbrella) that contains several subfield such as machine learning, robotics, and computer vision.

MACHINE LEARNING:

·Machine Learning is a subfield of Artificial Intelligence that enables machines to improve at a given task with experience. It is important to note that all machine learning techniques are classified as Artificial Intelligence ones. However, not all Artificial Intelligence could count as Machine Learning since some basic Rule-based engines could be classified as AI but they do not learn from experience therefore they do not belong to the machine learning category.


ARTIFICIAL INTELLIGENCE
Science thae enables computers to mimic human imtelligence.
Subfields: Machine Learning, robotics, and computer vision
MACHINE LEARNING
Subset of AI that enable maches to improve at tasks with experience
SUPERVISED LEARNING
Training algorithms using labeled input/output data.
CLASSIFICATION
CLUSTERING
UNSUPERVISED LEARNING
Training algorithms with no labeled data. It attempts at discovering hidden patterns on its own.
CLUSTERING
REINFORCEMENT LEARNING
Algorithms take actions to maximize cumulative reward.

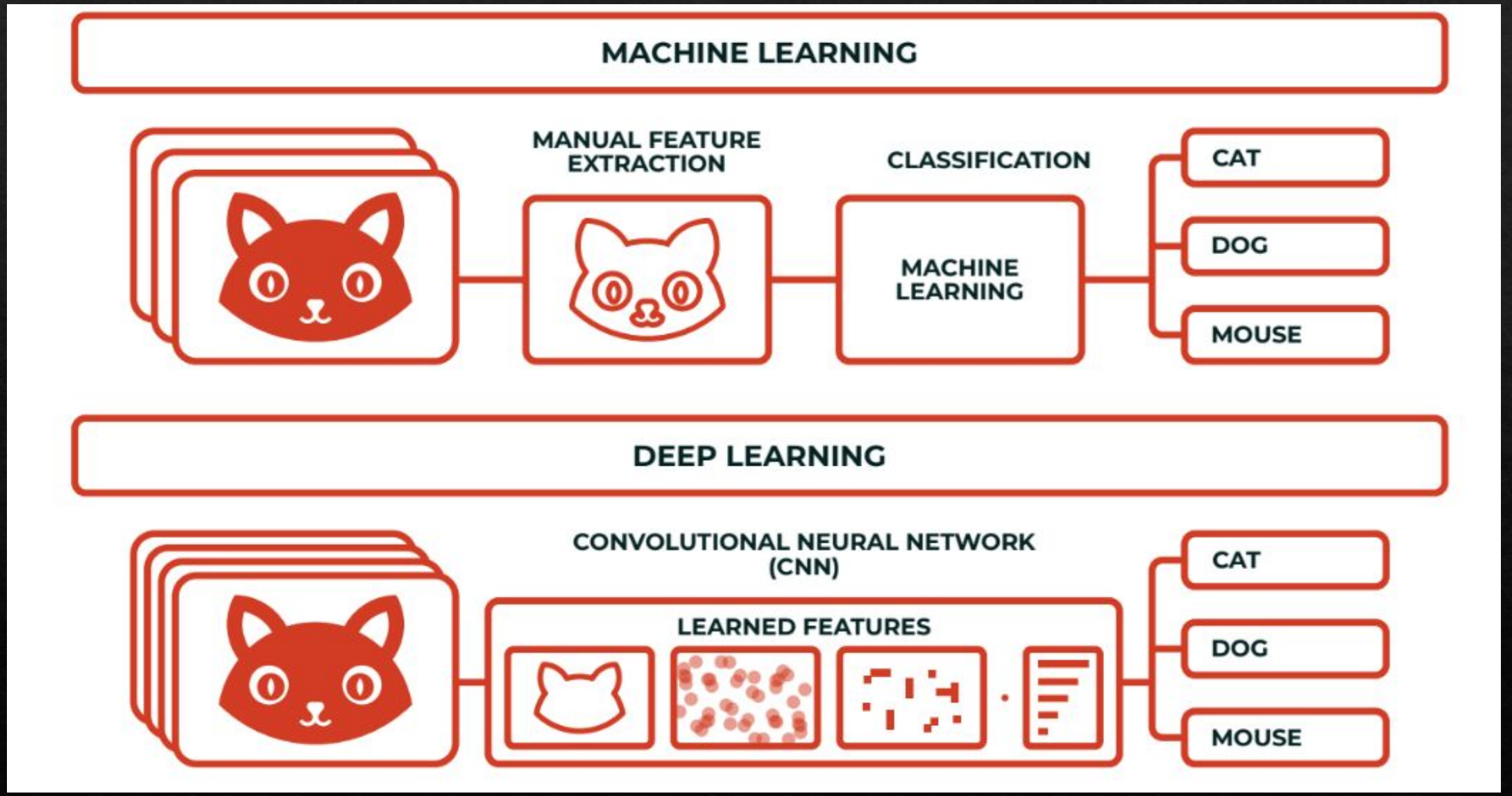
DEEP LEARNING:

Deep Learning is a specialized field of Machine Learning that relies on training of Deep Artificial Neural Networks (ANNs) using a large dataset such as images or texts. ANNs are information processing models inspired by the human brain. The human brain consists of billions of neurons that communicate to each other using electrical and chemical signals and enable humans to see, feel, and make decision. ANNs works by mathematically mimicking the human brain and connecting multiple “artificial” neurons in a multilayered fashion. The more hidden layers added to the network, the deeper the network gets.

What differentiates deep learning from machine learning techniques is in their ability to extract features automatically as illustrated in the following example:

– Machine learning Process: (1) selecting the model to train, (2) manually performing feature extraction.

– Deep Learning Process: (1) Select the architecture of the network, (2) features are automatically extracted by feeding in the training data (such as images) along with the target class (label).


MACHINE LEARNING
MANUAL FEATURE EXTRACTION
CLASSIFICATION
MACHINE LEARNING
CAT
DOG
MOUSE
DEEP LEARNING
CONVOLUTIONAL NEURAL NETWORK (CNN)
LEARNED FEATURES
CAT
DOG
MOUSE

Data Science

- Need of entire analytics universe
- Branch that deals with data
- Different operations related to data i.e.
  - Data Gathering
  - Data Cleaning
  - Data Subsetting
  - Data Manipulation
  - Data Insights [Data Mining]

Machine Learning

- Combination of Machine and Data Science
- Machines utilize Data Science techniques to learn about the data hence called as Machine Learning
- Model Building, Model Evaluation and Validation
- 3 Types:
  - Unsupervised Learning
  - Reinforcement Learning
  - Supervised Learning
- Most popular tools are Python, R and SAS

Deep Learning

- Specific branch of Machine Learning that deals with different flavours of Neural Network
- Examples
  - Simple Neural Network
  - Convolutional Neural Network
  - Recurrent Neural Network
  - Long Short Term Memory
- Mainly utilized in..
  - Object detection in Image and Video
  - Speech Recognition
  - Natural Language Processing and Understandings

Artificial Intelligence

- Big Umbrella
- Empowering machines to take decisions on their own
- As the name suggest imparting humans' natural intelligence in machines
- Thus machines have ability to understand and react according to the situation

Evolution

1962– John W Tukey (Future of Data Analysis)

1966-1977 -SAS University North Carolina

1991- Python Guido Van Rossum

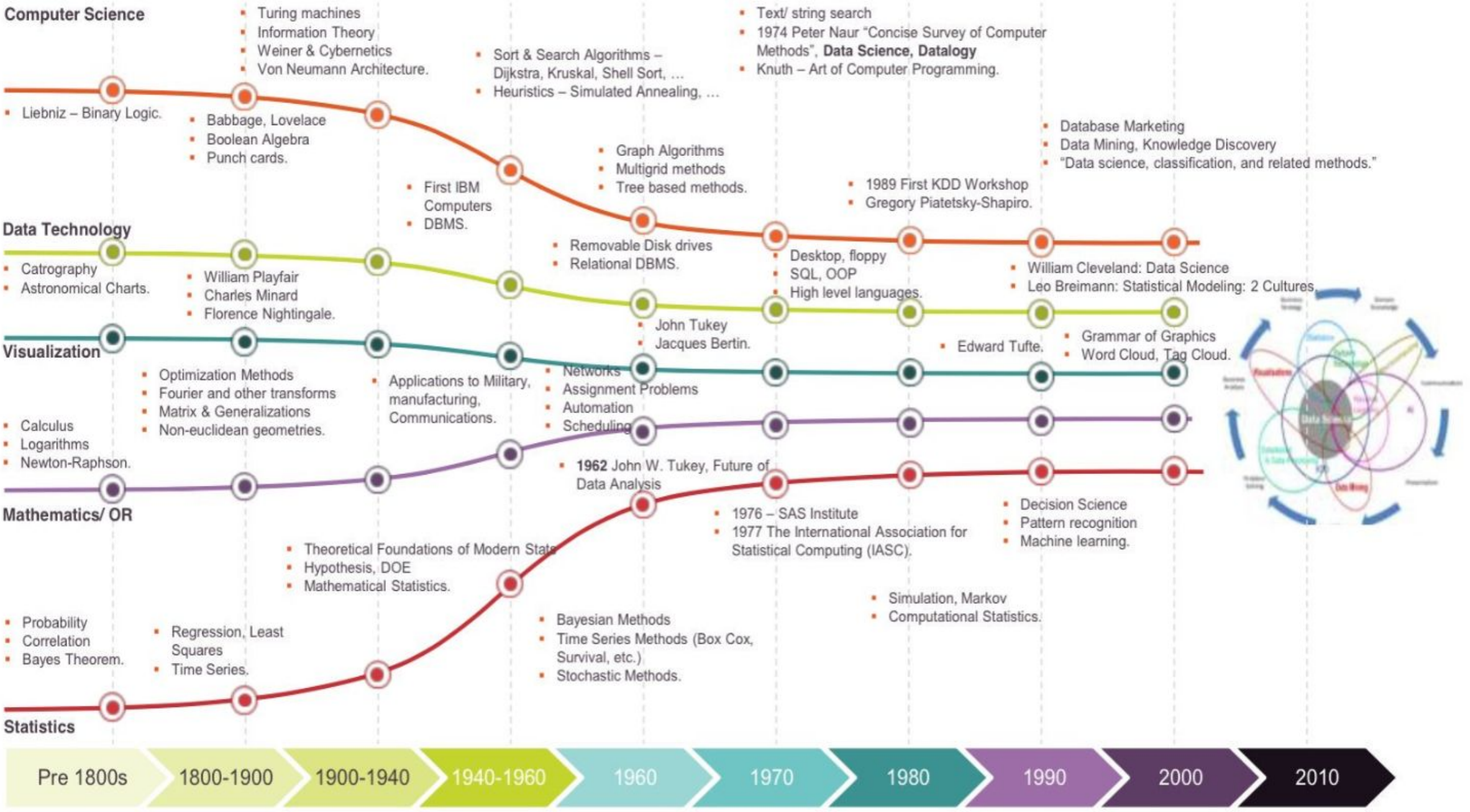
1991-1993 R Ross Ihaka, Robert Gentlemen

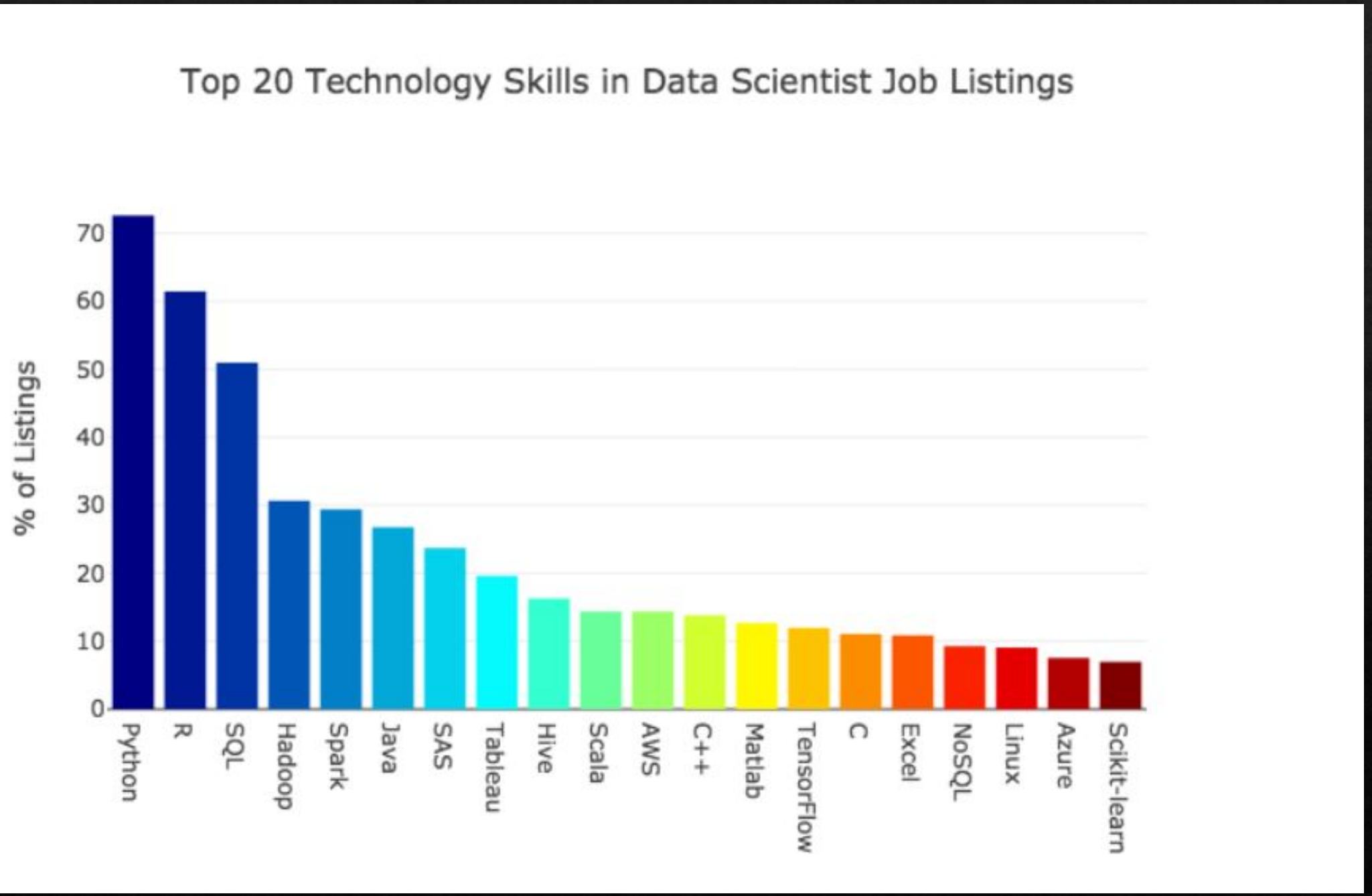
Early 2000 SAS –Social Media Analytics

2001 –William S Cleveland (Data Science: An action plan for Expanding the Technical Areas in the filed of Statistics)

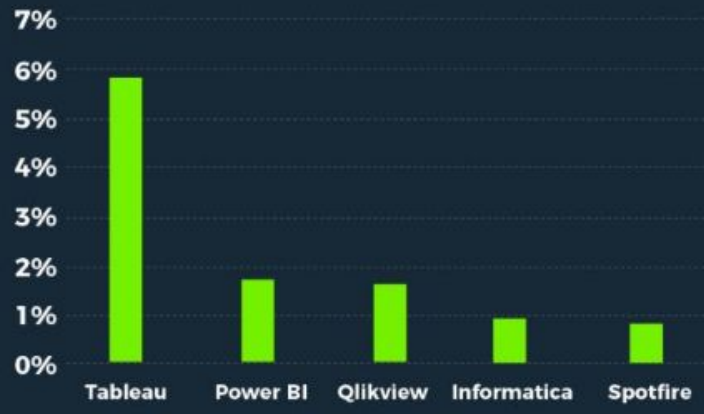
2007 – Scikits learn

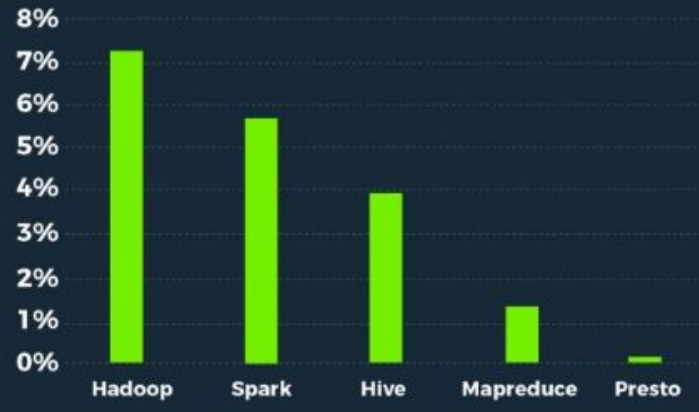
2010 – Mike Loukides (What is data science)

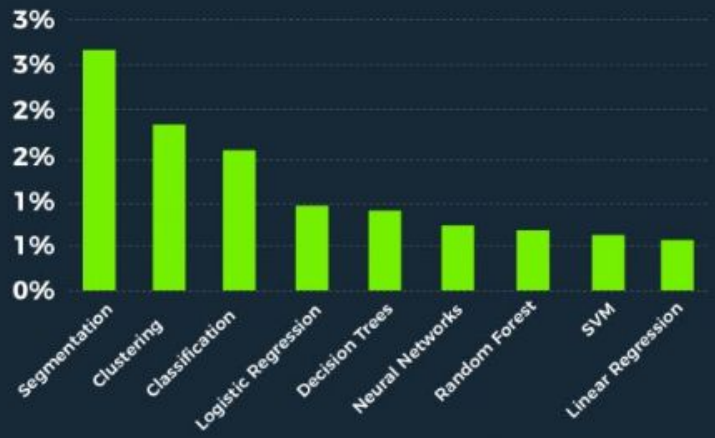

Computer Science
Turing machines
Information Theory
Weiner & Cybernetics
Von Neumann Architecture.
Sort & Search Algorithms – Dijkstra, Kruskal, Shell Sort, …
Heuristics – Simulated Annealing, …
Text/ string search
1974 Peter Naur "Concise Survey of Computer Methods", Data Science, Datalogy
Knuth – Art of Computer Programming.
Liebniz – Binary Logic.
Babbage, Lovelace
Boolean Algebra
Punch cards.
First IBM Computers
DBMS.
Graph Algorithms
Multigrid methods
Tree based methods.
1989 First KDD Workshop
Gregory Piatetsky-Shapiro.
Database Marketing
Data Mining, Knowledge Discovery
"Data science, classification, and related methods."
Data Technology
Catrography
Astronomical Charts.
William Playfair
Charles Minard
Florence Nightingale.
Removable Disk drives
Relational DBMS.
Desktop, floppy
SQL, OOP
High level languages.
William Cleveland: Data Science
Leo Breimann: Statistical Modeling: 2 Cultures
Visualization
John Tukey
Jacques Bertin.
Edward Tufte.
Grammar of Graphics
Word Cloud, Tag Cloud.
Optimization Methods
Fourier and other transforms
Matrix & Generalizations
Non-euclidean geometries.
Applications to Military, manufacturing, Communications.
Networks
Assignment Problems
Automation
Scheduling
Calculus
Logarithms
Newton-Raphson.
1962 John W. Tukey, Future of Data Analysis
Mathematics/ OR
1976 – SAS Institute
1977 The International Association for Statistical Computing (IASC).
Decision Science
Pattern recognition
Machine learning.
Theoretical Foundations of Modern Stats
Hypothesis, DOE
Mathematical Statistics.
Simulation, Markov
Computational Statistics.
Probability
Correlation
Bayes Theorem.
Regression, Least Squares
Time Series.
Bayesian Methods
Time Series Methods (Box Cox, Survival, etc.)
Stochastic Methods.
Statistics
Pre 1800s
1800-1900
1900-1940
1940-1960
1960
1970
1980
1990
2000
2010

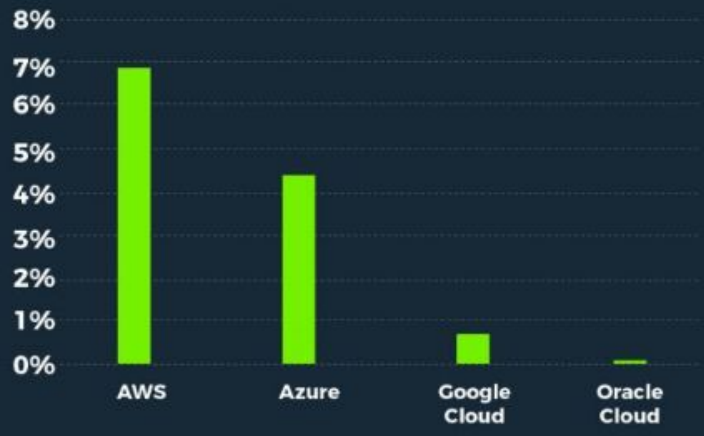

Top 20 Technology Skills in Data Scientist Job Listings
% of Listings
0
10
20
30
40
50
60
70
Python
R
SQL
Hadoop
Spark
Java
SAS
Tableau
Hive
Scala
AWS
C++
Matlab
TensorFlow
C
Excel
NoSQL
Linux
Azure
Scikit-learn

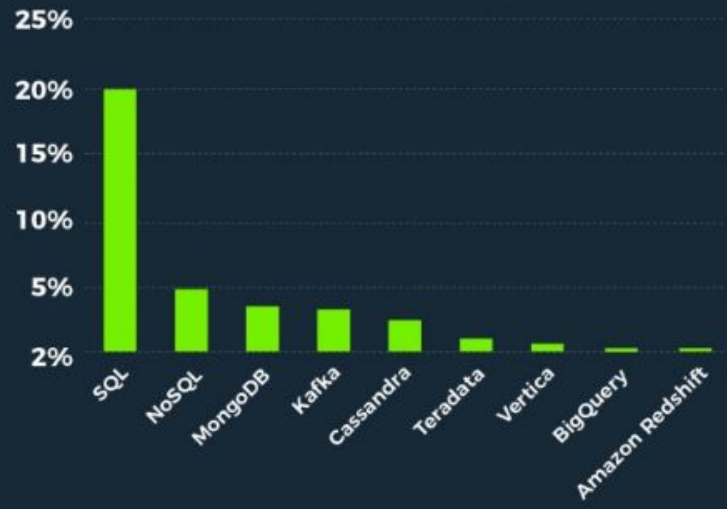
Skills in demand in 2019











ML Is the Future

ML Is the Future

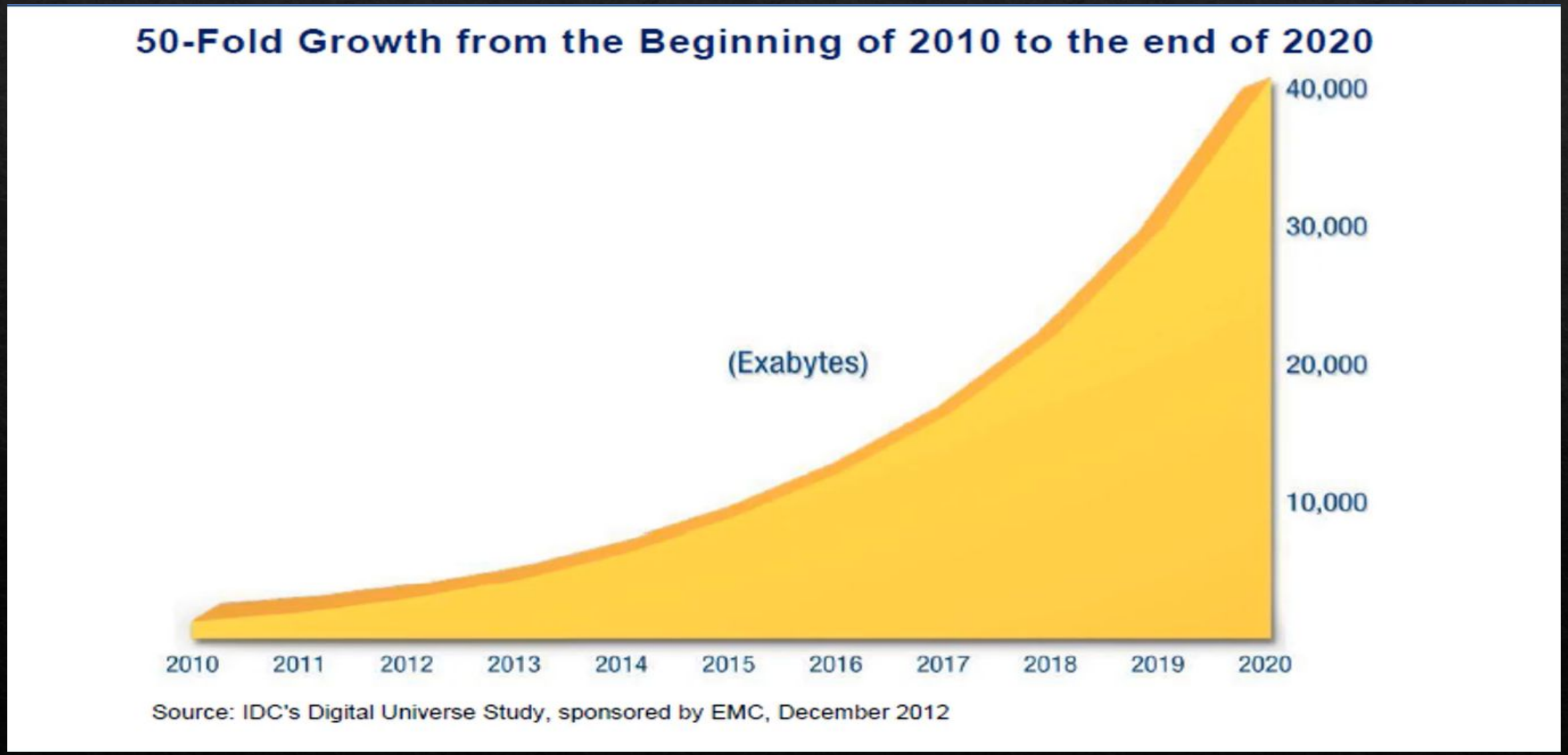
2005 – 130 EXABYTES

2010 – 1,200 EXABYTES

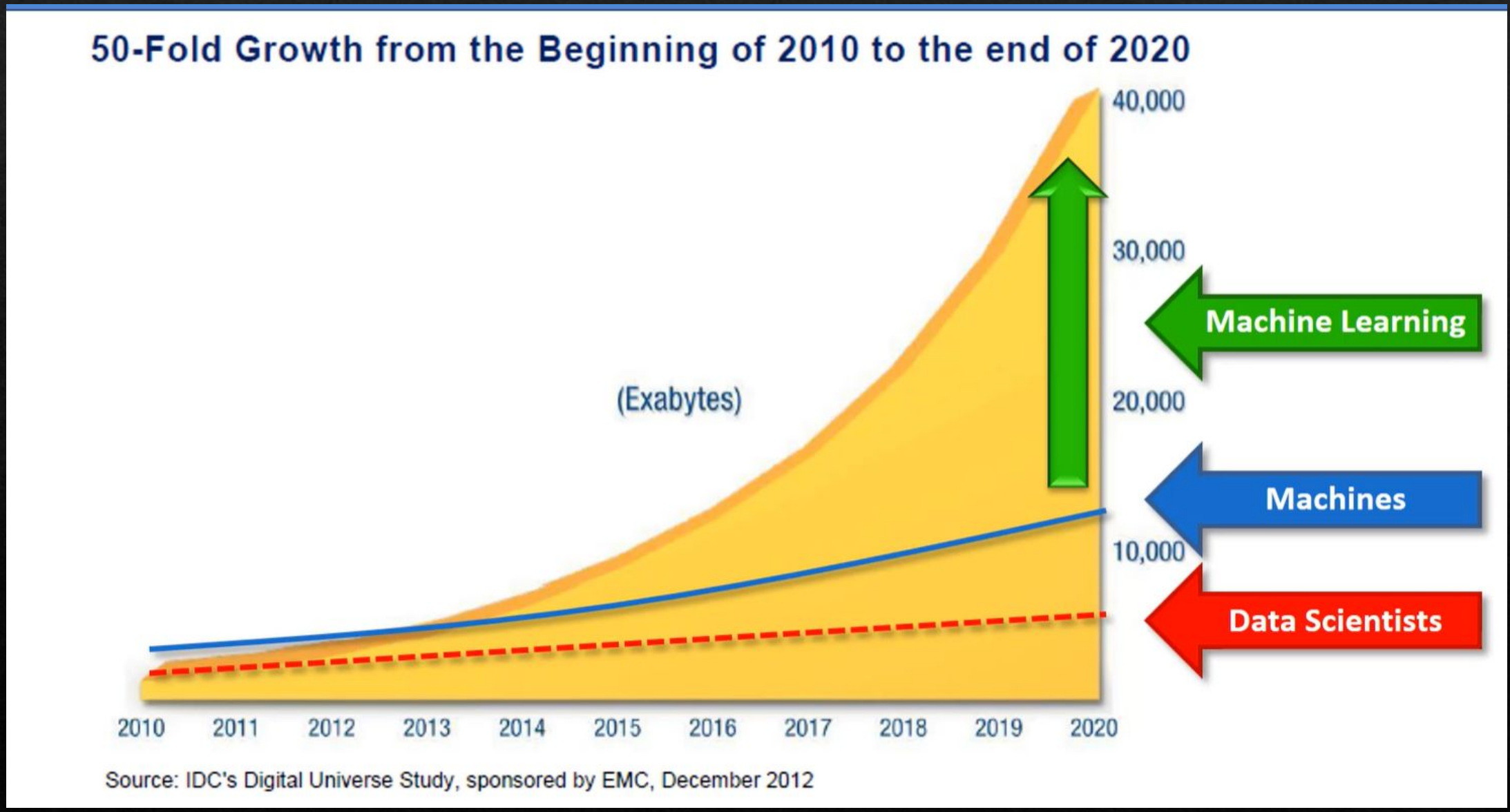
2015 – 7,900 EXABYTES

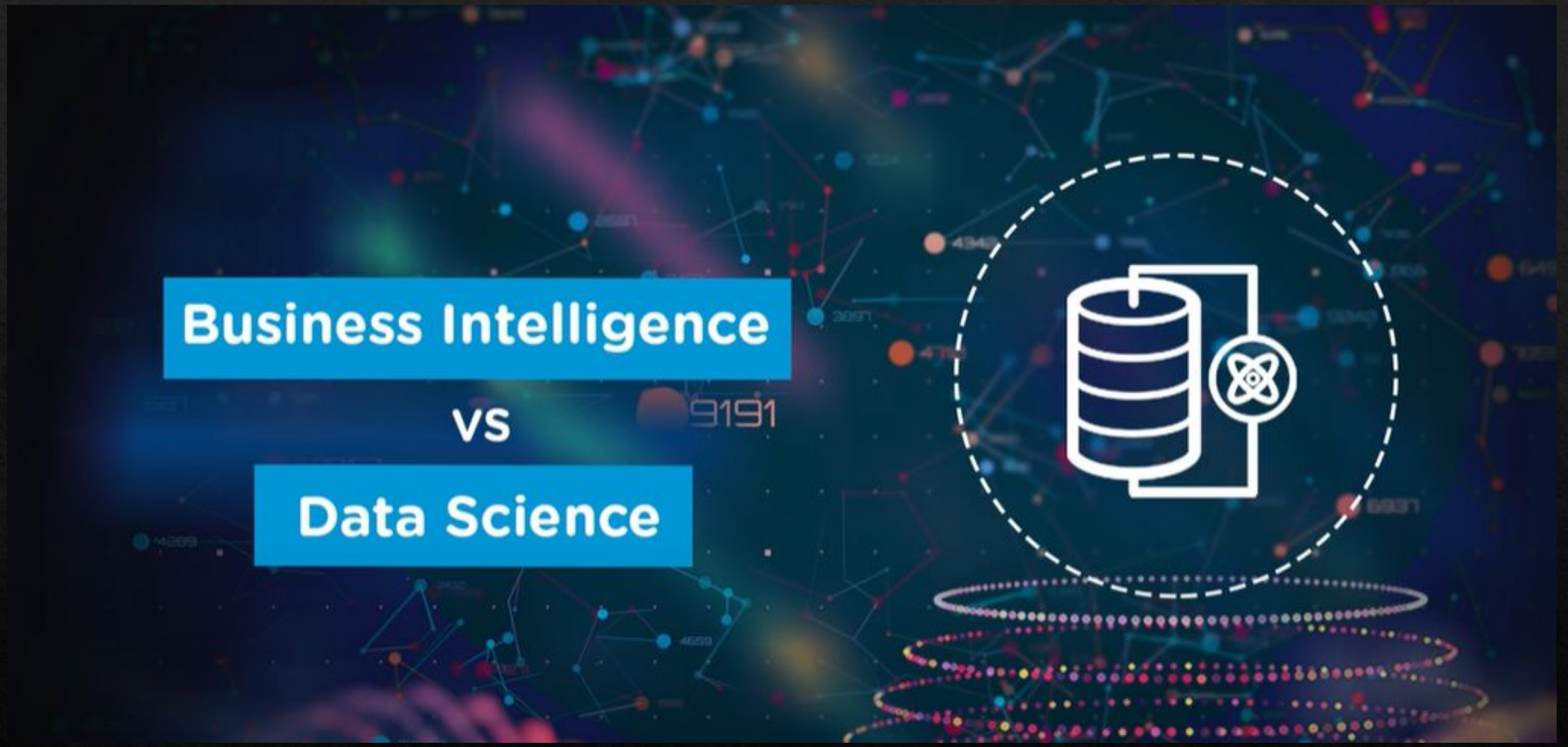
2020 – 40,900 EXABYTES

ML Is the Future



ML Is the Future




Business Intelligence
vs
Data Science

Business Intelligence vs Data Science

Criterion	Business Intelligence	Data Science
Data Source	Structured data e.g. Data Warehouse	Unstructured data e.g. web logs
Method	Analytical	Scientific
Skills	Statistics, Visualization	Statistics, Visualization, Machine Learning
Focus	Past and Present Data	Present Data and Future Predictions

Prerequisites for Data Science

The following are the 3 essential traits of a Data Scientist:

CURIOSITY

Only when you ask questions, you will have a better understanding of the business problem

Prerequisites for Data Science

The following are the 3 essential traits of a Data Scientist:

CURIOSITY

COMMON SENSE

To identify new ways to solve a business problem and to detect priority problems

Simplilearn. All rights reserved

Prerequisites for Data Science

The following are the 3 essential traits of a Data Scientist:

CURIOSITY

COMMON SENSE

COMMUNICATION SKILLS

A Data Scientist needs to communicate their findings to business teams to act

Prerequisites for Data Science

1 MACHINE LEARNING

Machine learning is the backbone of Data Science. It is one of the many ways that Data Science uses to find solution to a problem

Prerequisites for Data Science

1. MACHINE LEARNING

2. MATHEMATICAL MODELLING

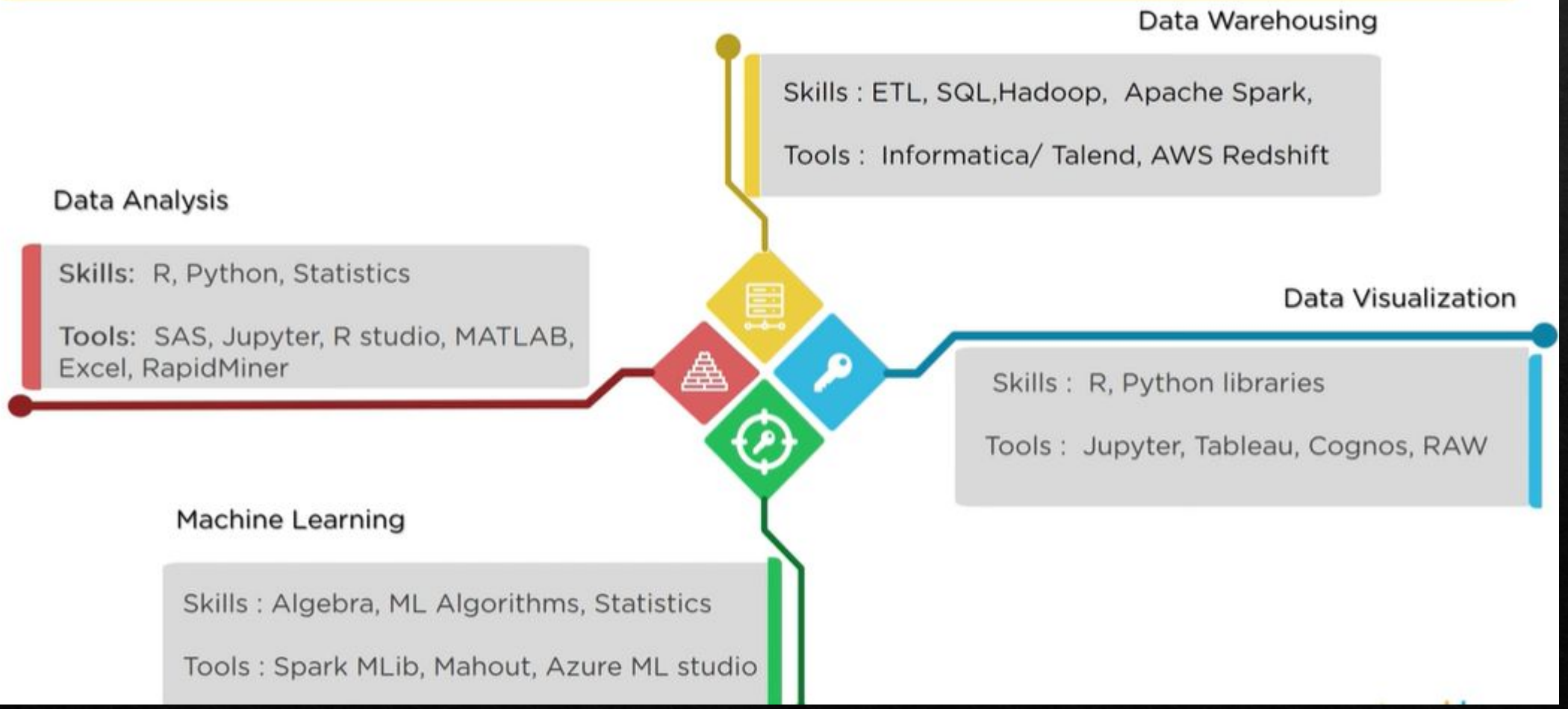
3. STATISTICS

4. COMPUTER PROGRAMMING

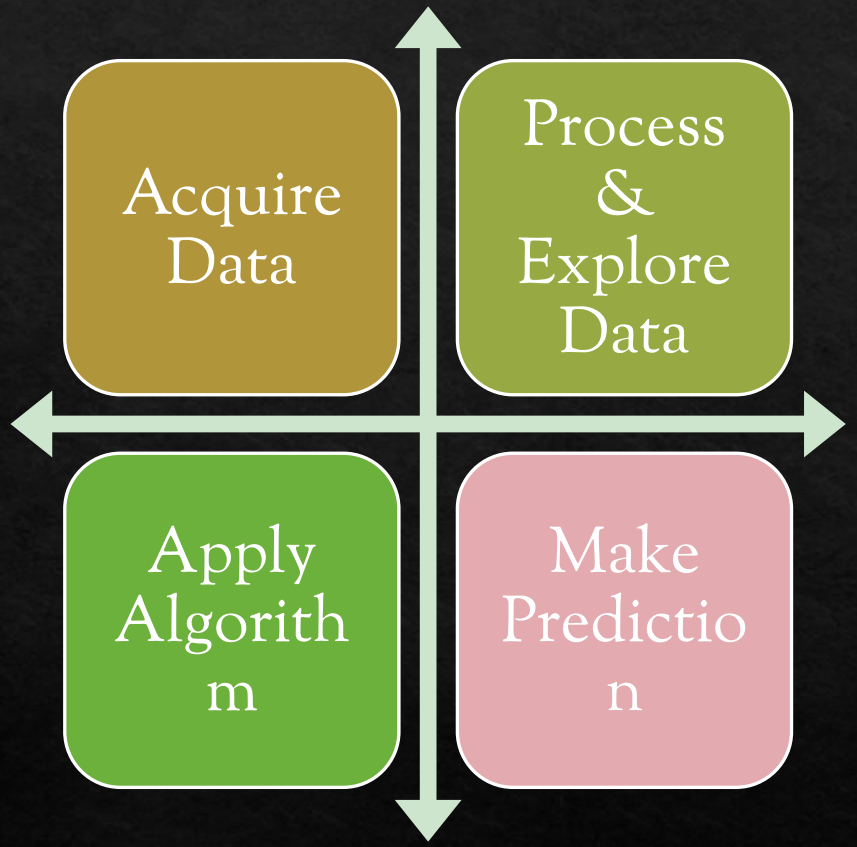
5. DATABASES

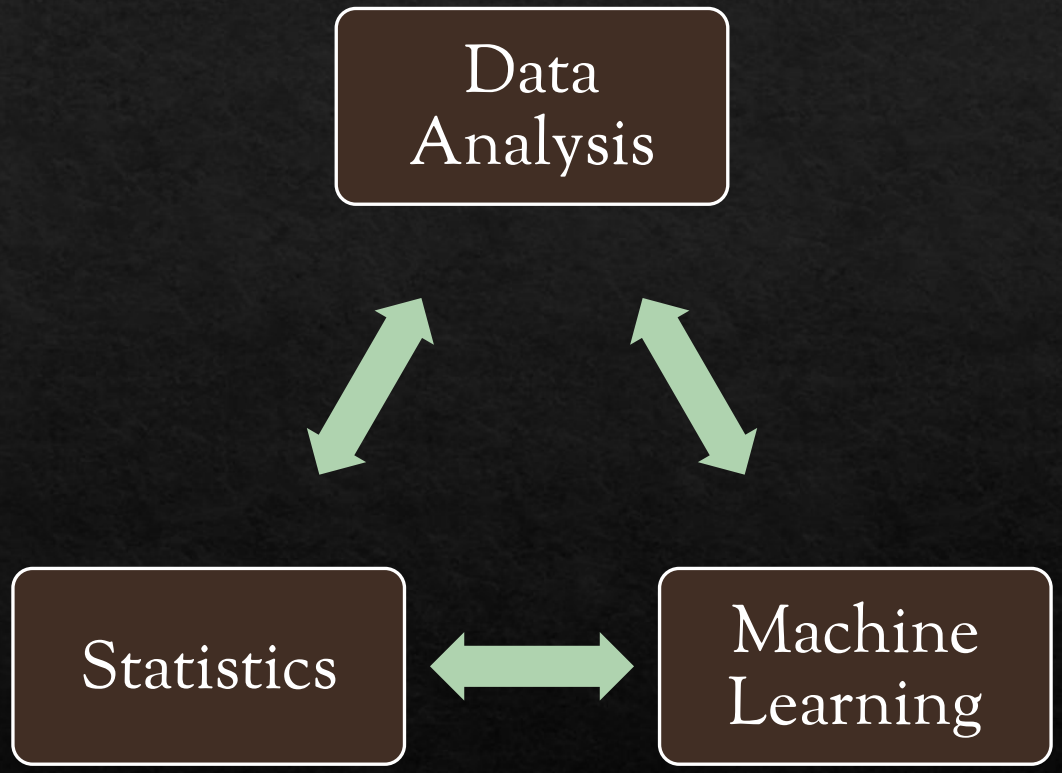
The discipline of querying databases teaches you to ask better questions as a Data Scientist

Tools/Skills used in Data Science

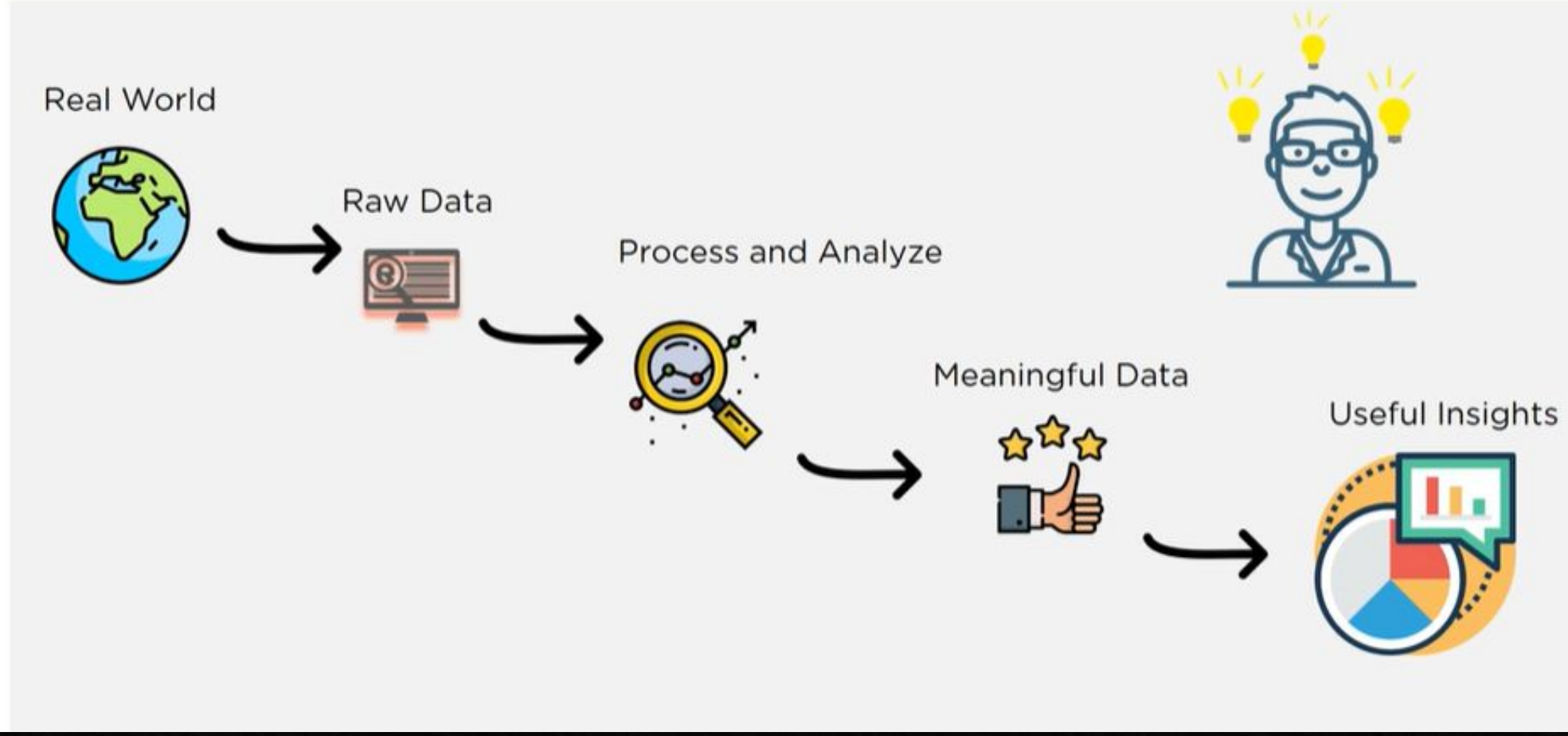


Data Science Process





What does a Data Scientist do?



MACHINE LEARNING STEPS

Collecting Data

Step 1

Step 2

Data Wrangling

Analyse Data

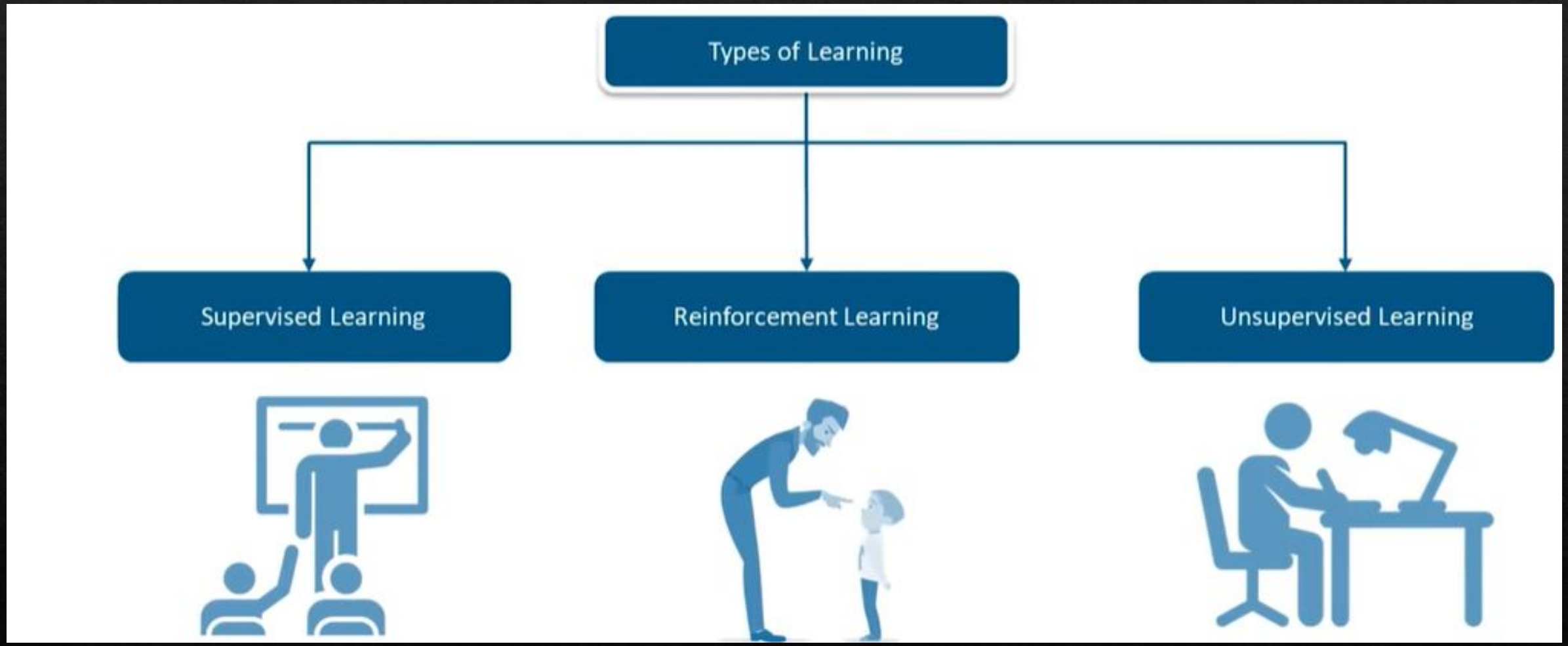
Step 3

Step 4

Train Algorithm

Test Algorithm

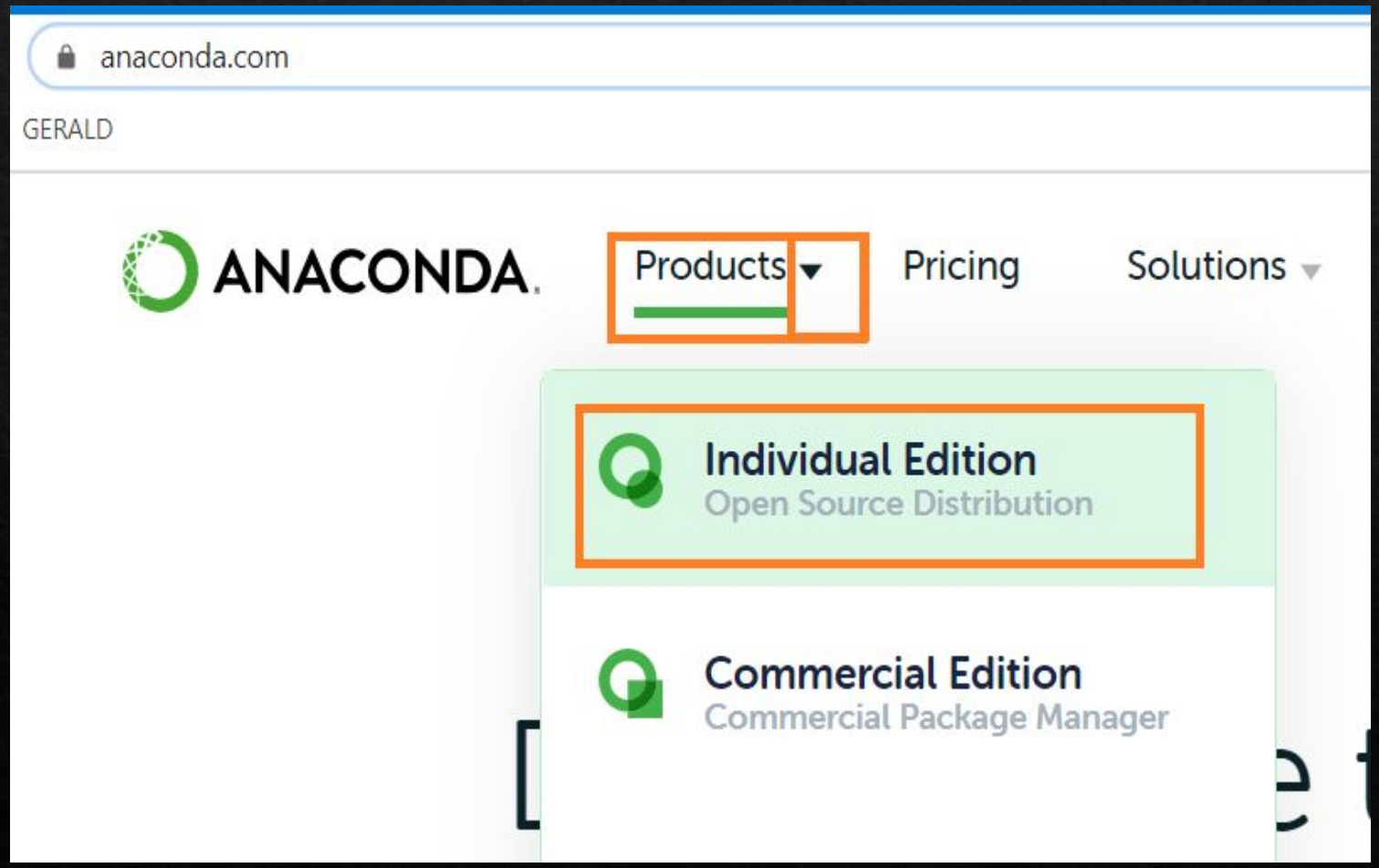
Step 5


Types of Learning
Supervised Learning
Reinforcement Learning
Unsupervised Learning

- Regression
  - Simple Linear Regression Algorithm
  - Multiple Linear Regression Algorithm
  - Polynomial Regression Algorithm
  - KNN (K Nearest Neighbor) Algorithm
  - Decision Tree Algorithm
  - Random Forest Algorithm
- Classification
  - Logistic Regression Algorithm
  - KNN (K Nearest Neighbor) Algorithm
  - Naïve Bayes Algorithm
  - Decision Tree Algorithm
  - Random Forest Algorithm
  - SVM (Support Vector Machine) Algorithm

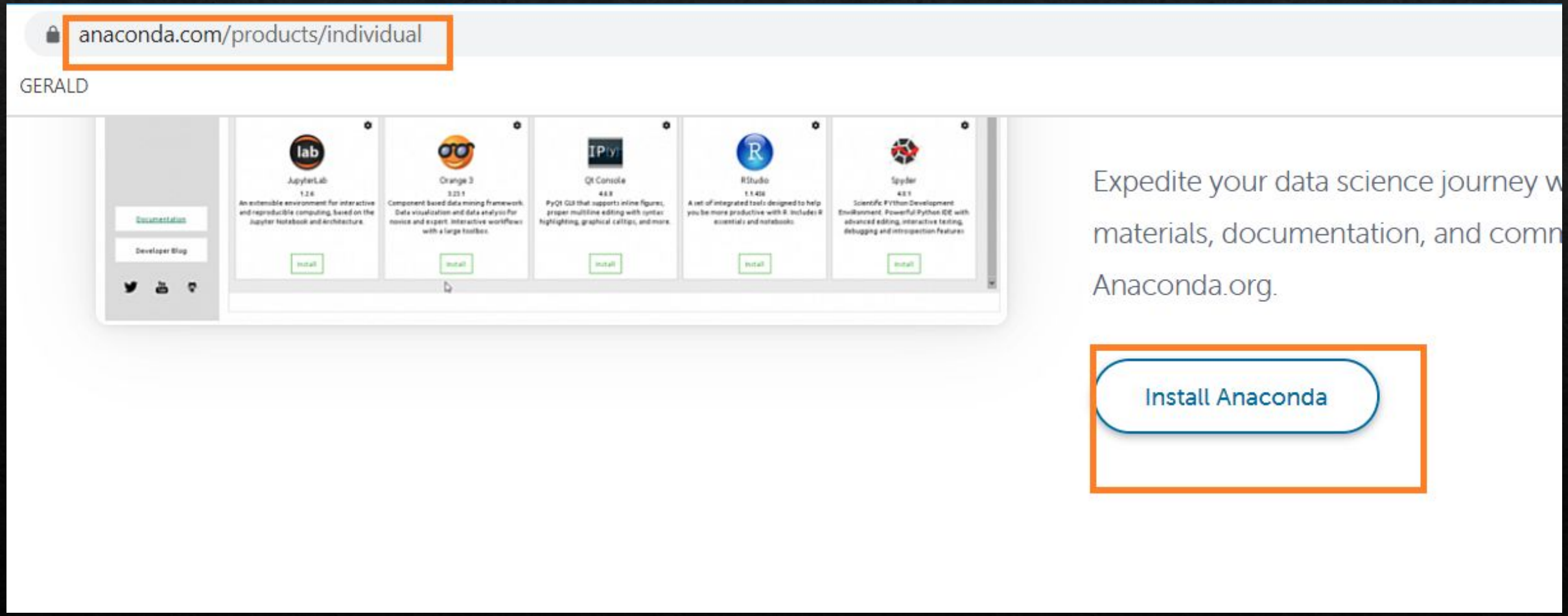
Software

https://www.anaconda.com/



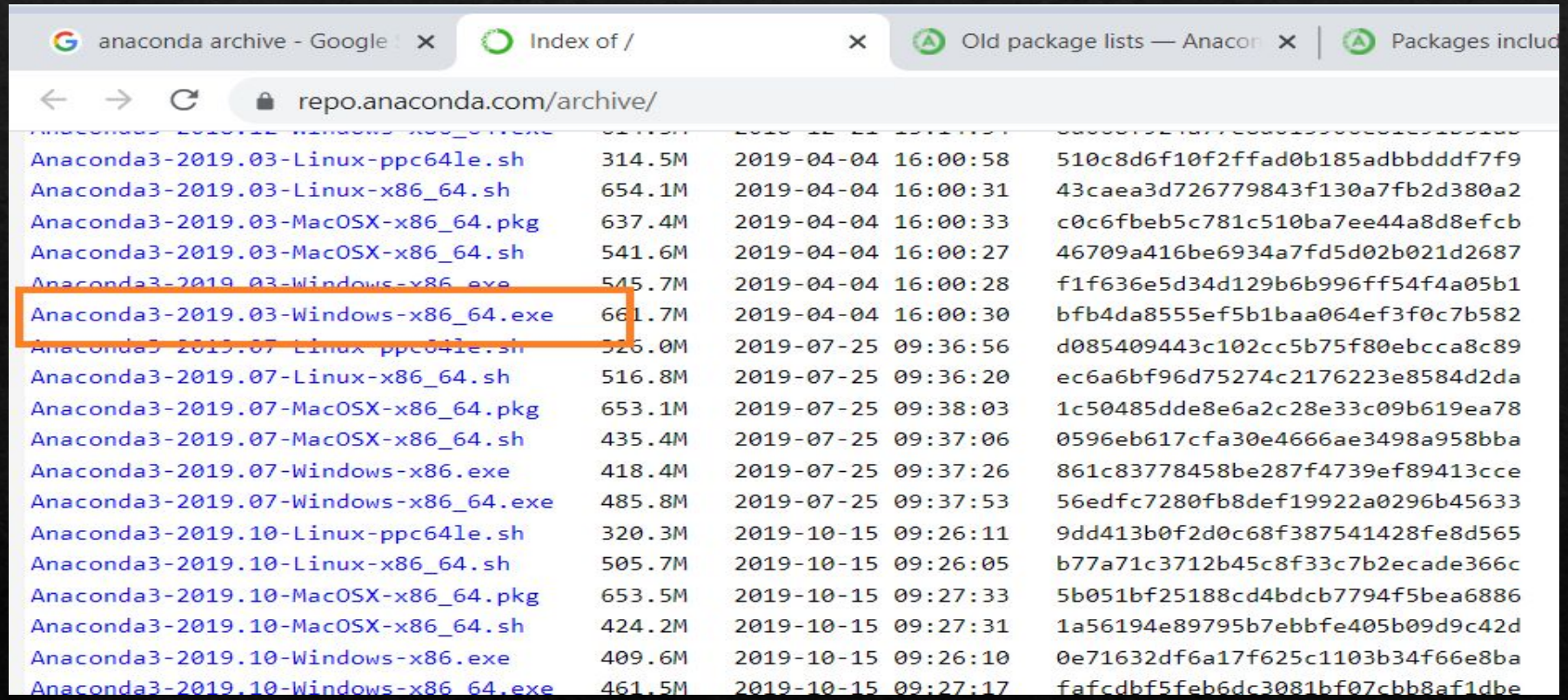
Software

https://www.anaconda.com/products/individual



Software –Previous Versions

https://repo.anaconda.com/archive/



Anaconda3-2019.03-Linux-ppc64le.sh	314.5M	2019-04-04 16:00:58	510c8d6f10f2ffad0b185adbbdddf7f9
Anaconda3-2019.03-Linux-x86_64.sh	654.1M	2019-04-04 16:00:31	43caea3d726779843f130a7fb2d380a2
Anaconda3-2019.03-MacOSX-x86_64.pkg	637.4M	2019-04-04 16:00:33	c0c6fbeb5c781c510ba7ee44a8d8efcb
Anaconda3-2019.03-MacOSX-x86_64.sh	541.6M	2019-04-04 16:00:27	46709a416be6934a7fd5d02b021d2687
Anaconda3-2019.03-Windows-x86.exe	545.7M	2019-04-04 16:00:28	f1f636e5d34d129b6b996ff54f4a05b1
Anaconda3-2019.03-Windows-x86_64.exe	661.7M	2019-04-04 16:00:30	bfb4da8555ef5b1baa064ef3f0c7b582
Anaconda3-2019.07-Linux-ppc64le.sh	526.0M	2019-07-25 09:36:56	d085409443c102cc5b75f80ebcca8c89
Anaconda3-2019.07-Linux-x86_64.sh	516.8M	2019-07-25 09:36:20	ec6a6bf96d75274c2176223e8584d2da
Anaconda3-2019.07-MacOSX-x86_64.pkg	653.1M	2019-07-25 09:38:03	1c50485dde8e6a2c28e33c09b619ea78
Anaconda3-2019.07-MacOSX-x86_64.sh	435.4M	2019-07-25 09:37:06	0596eb617cfa30e4666ae3498a958bba
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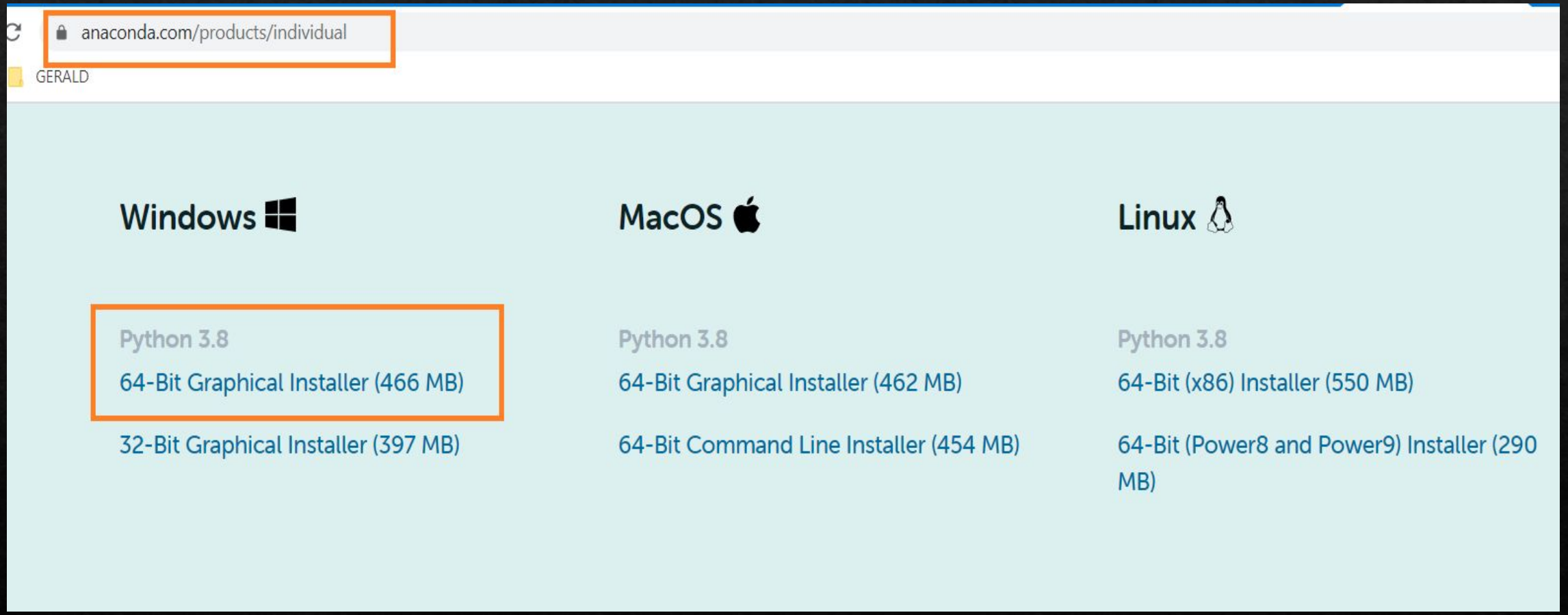
Anaconda3-2019.07-Windows-x86_64.exe	485.8M	2019-07-25 09:37:53	56edfc7280fb8def19922a0296b45633
Anaconda3-2019.10-Linux-ppc64le.sh	320.3M	2019-10-15 09:26:11	9dd413b0f2d0c68f387541428fe8d565
Anaconda3-2019.10-Linux-x86_64.sh	505.7M	2019-10-15 09:26:05	b77a71c3712b45c8f33c7b2ecade366c
Anaconda3-2019.10-MacOSX-x86_64.pkg	653.5M	2019-10-15 09:27:33	5b051bf25188cd4bdcb7794f5bea6886
Anaconda3-2019.10-MacOSX-x86_64.sh	424.2M	2019-10-15 09:27:31	1a56194e89795b7ebbfe405b09d9c42d
Anaconda3-2019.10-Windows-x86.exe	409.6M	2019-10-15 09:26:10	0e71632df6a17f625c1103b34f66e8ba
Anaconda3-2019.10-Windows-x86_64.exe	461.5M	2019-10-15 09:27:17	fafcdbf5feb6dc3081bf07cbb8af1dbe

Installation related videos

https://www.youtube.com/watch?v=BNaHpvQhE10

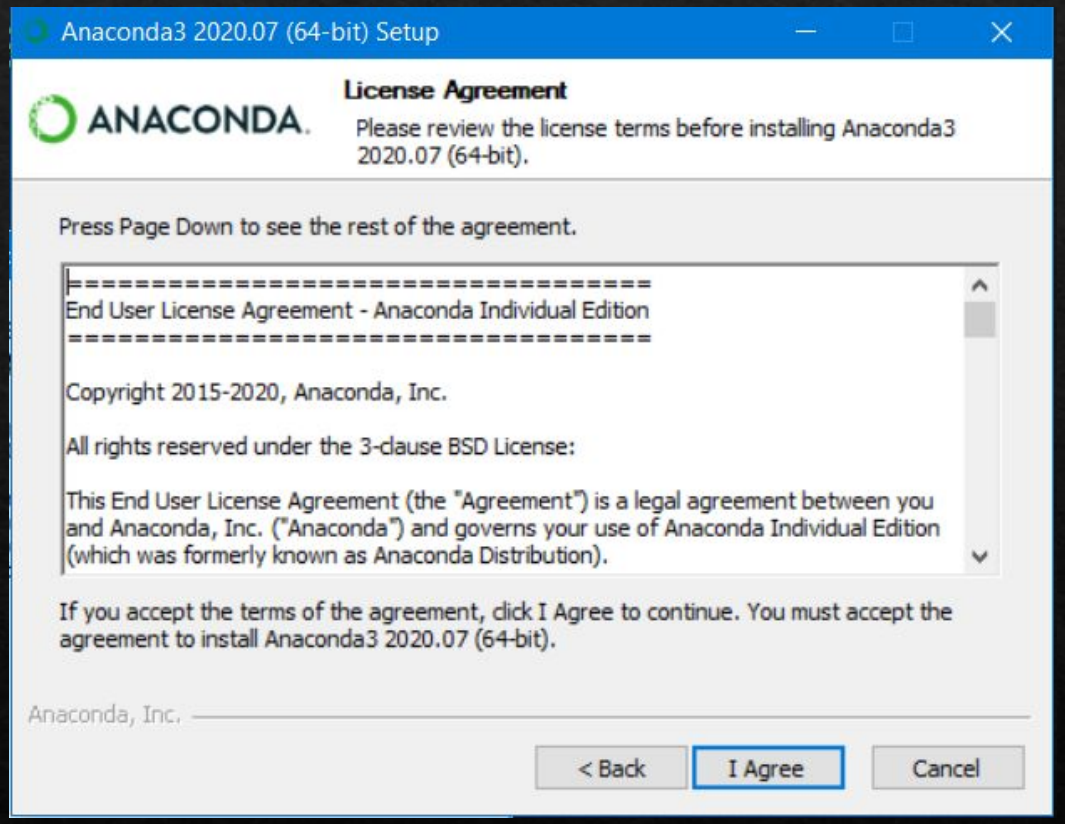
https://www.youtube.com/watch?v=TNMf8rYB7eU

Software

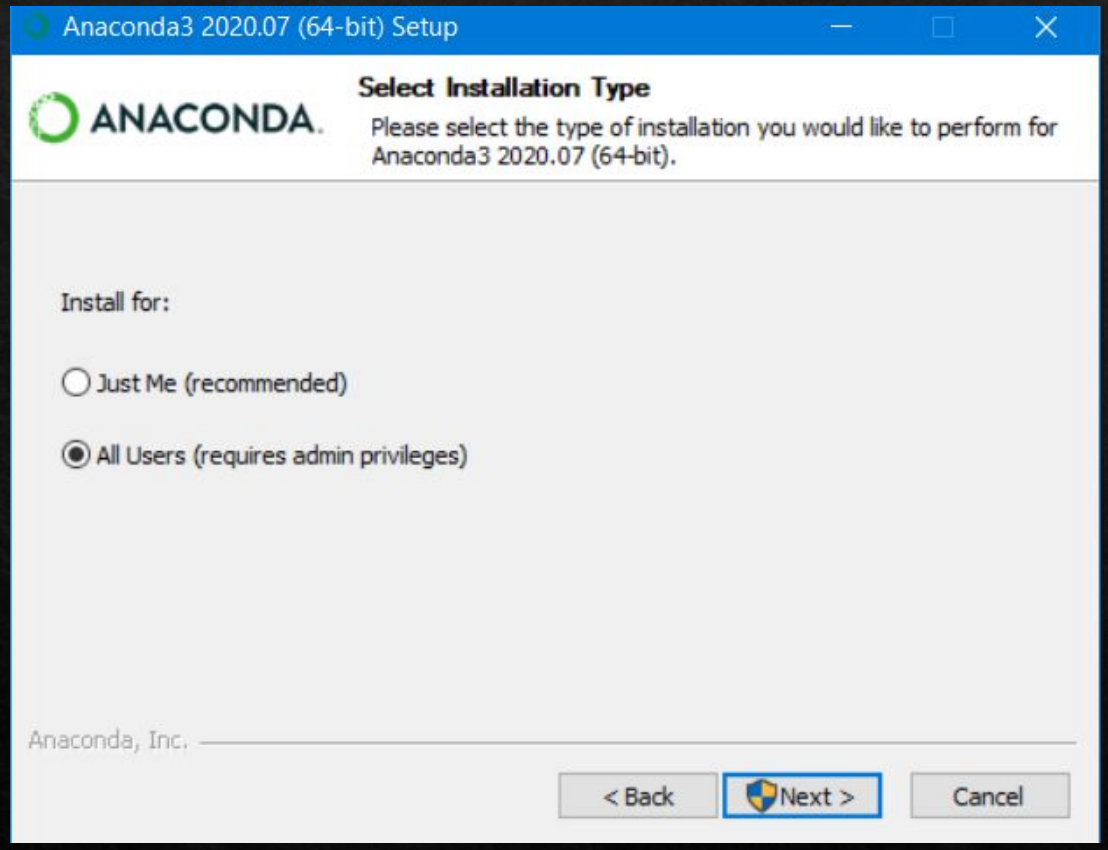

anaconda.com/products/individual
GERALD
Windows
Python 3.8
64-Bit Graphical Installer (466 MB)
32-Bit Graphical Installer (397 MB)
MacOS
Python 3.8
64-Bit Graphical Installer (462 MB)
64-Bit Command Line Installer (454 MB)
Linux
Python 3.8
64-Bit (x86) Installer (550 MB)
64-Bit (Power8 and Power9) Installer (290 MB)

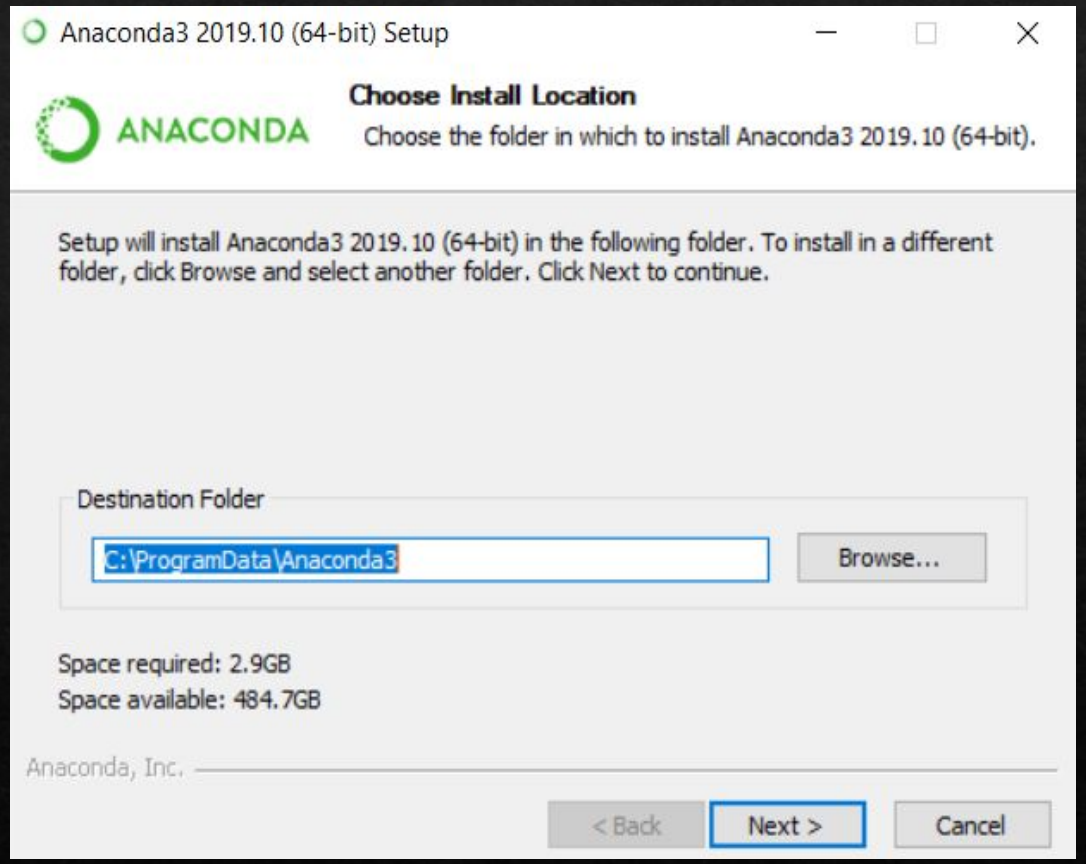
Software

Anaconda3 2020.07 (64-bit) Setup
ANACONDA.
Welcome to Anaconda3 2020.07 (64-bit) Setup
Setup will guide you through the installation of Anaconda3 2020.07 (64-bit).
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
Next >
Cancel

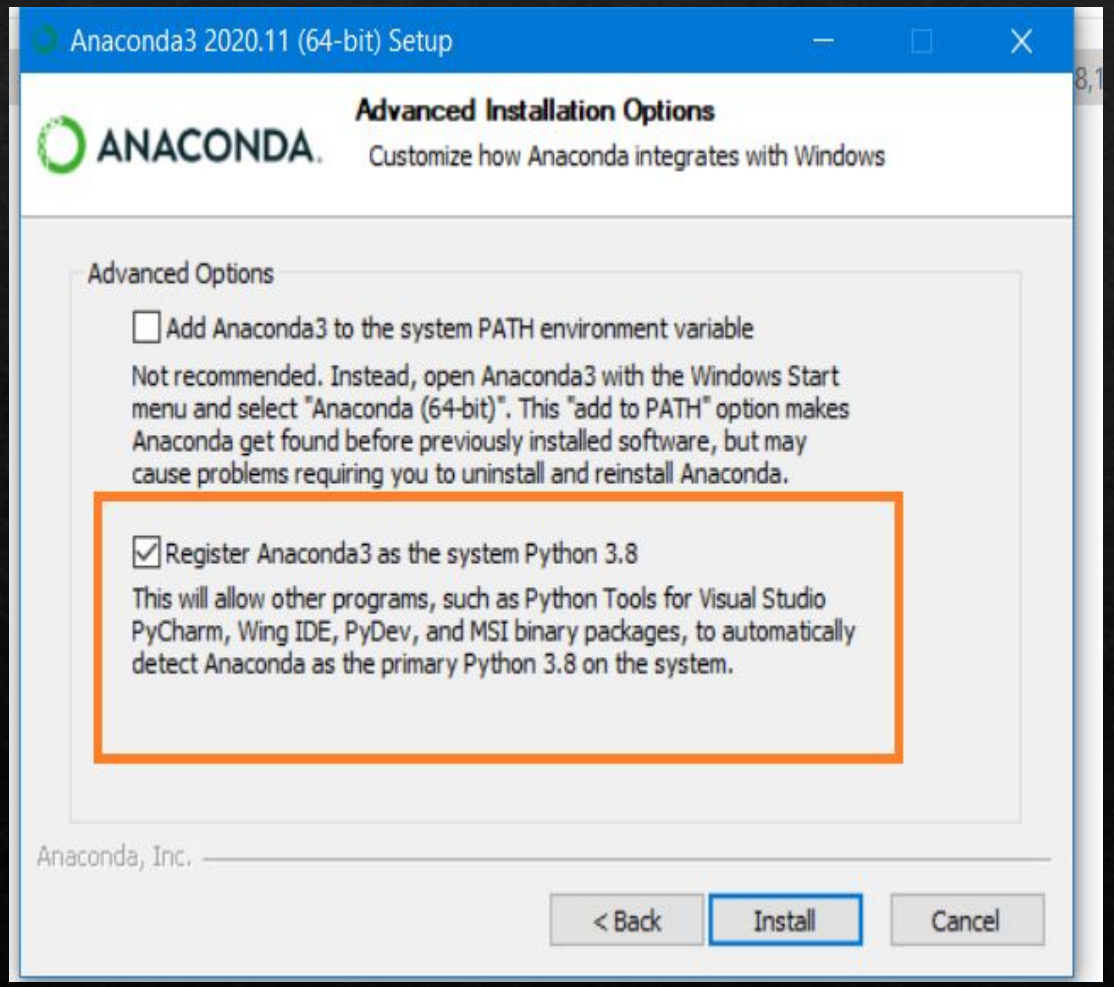

Anaconda3 2020.07 (64-bit) Setup
ANACONDA.
License Agreement
Please review the license terms before installing Anaconda3 2020.07 (64-bit).
Press Page Down to see the rest of the agreement.
End User License Agreement - Anaconda Individual Edition
Copyright 2015-2020, Anaconda, Inc.
All rights reserved under the 3-clause BSD License:
This End User License Agreement (the "Agreement") is a legal agreement between you and Anaconda, Inc. ("Anaconda") and governs your use of Anaconda Individual Edition (which was formerly known as Anaconda Distribution).
If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install Anaconda3 2020.07 (64-bit).
Anaconda, Inc.
< Back
I Agree
Cancel

Software

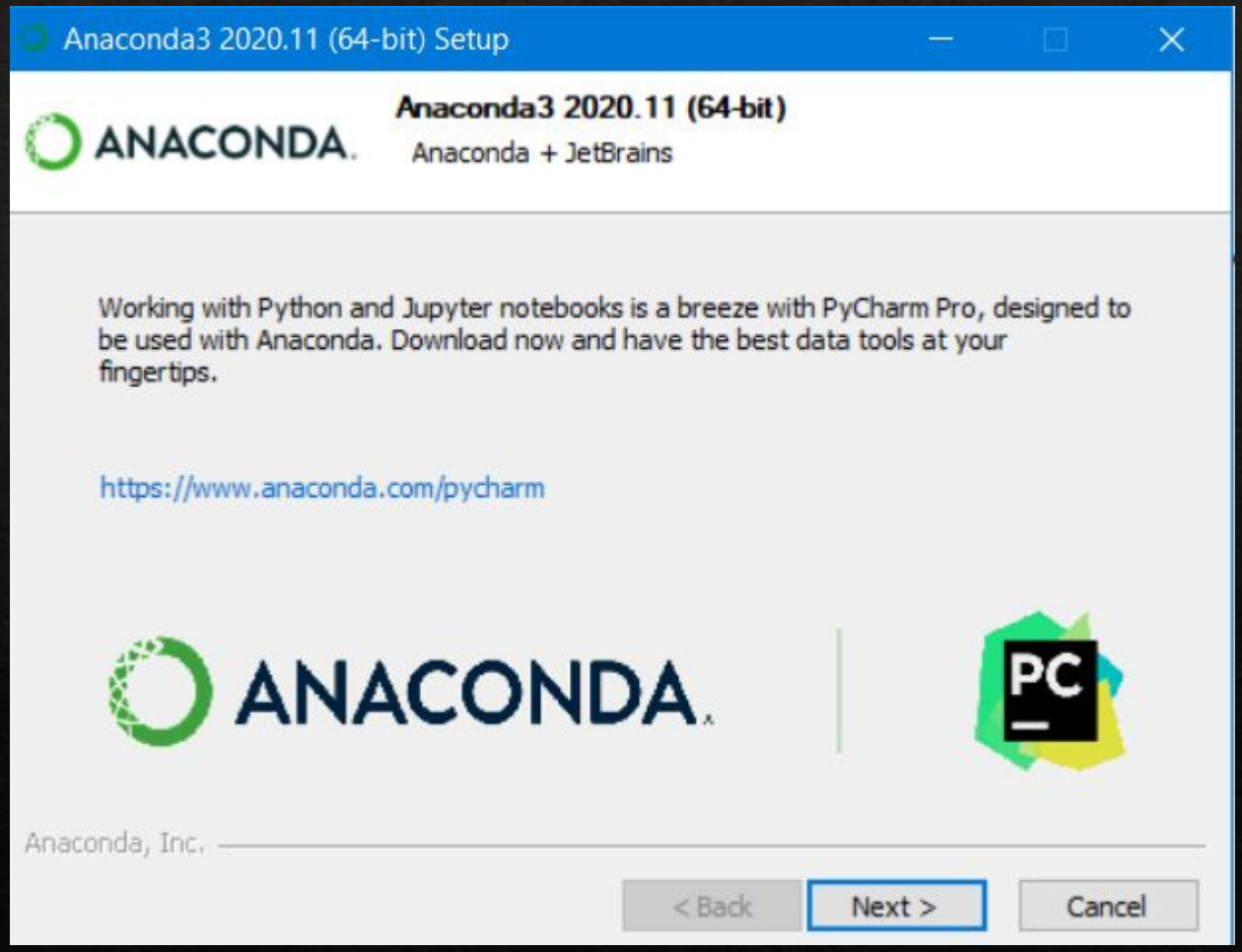

Anaconda3 2020.07 (64-bit) Setup
ANACONDA.
Select Installation Type
Please select the type of installation you would like to perform for Anaconda3 2020.07 (64-bit).
Install for:
Just Me (recommended)
All Users (requires admin privileges)
Anaconda, Inc.
< Back
Next >
Cancel


Anaconda3 2019.10 (64-bit) Setup
ANACONDA
Choose Install Location
Choose the folder in which to install Anaconda3 2019.10 (64-bit).
Setup will install Anaconda3 2019.10 (64-bit) in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\ProgramData\Anaconda3
Browse...
Space required: 2.9GB
Space available: 484.7GB
Anaconda, Inc.
< Back
Next >
Cancel

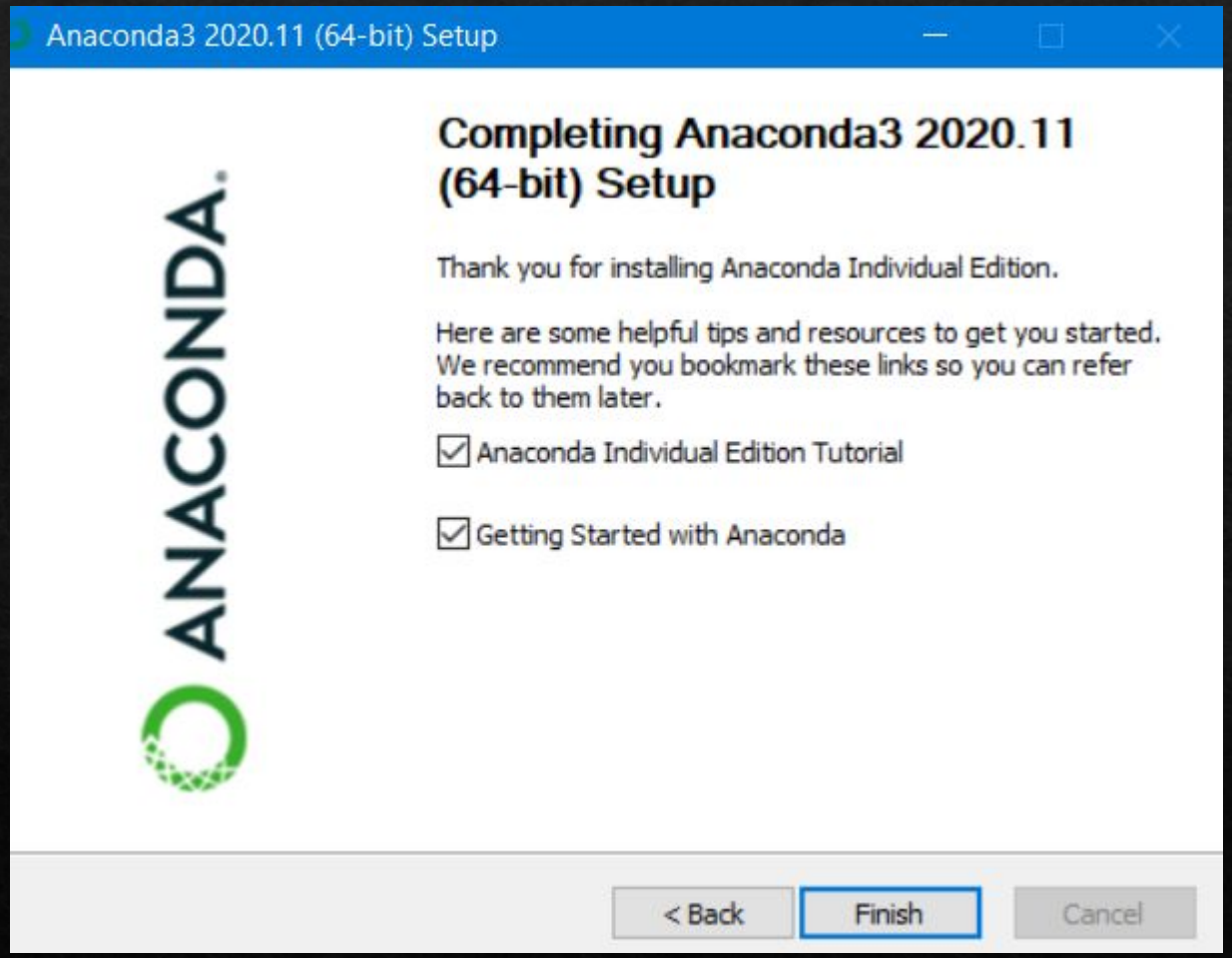
Software



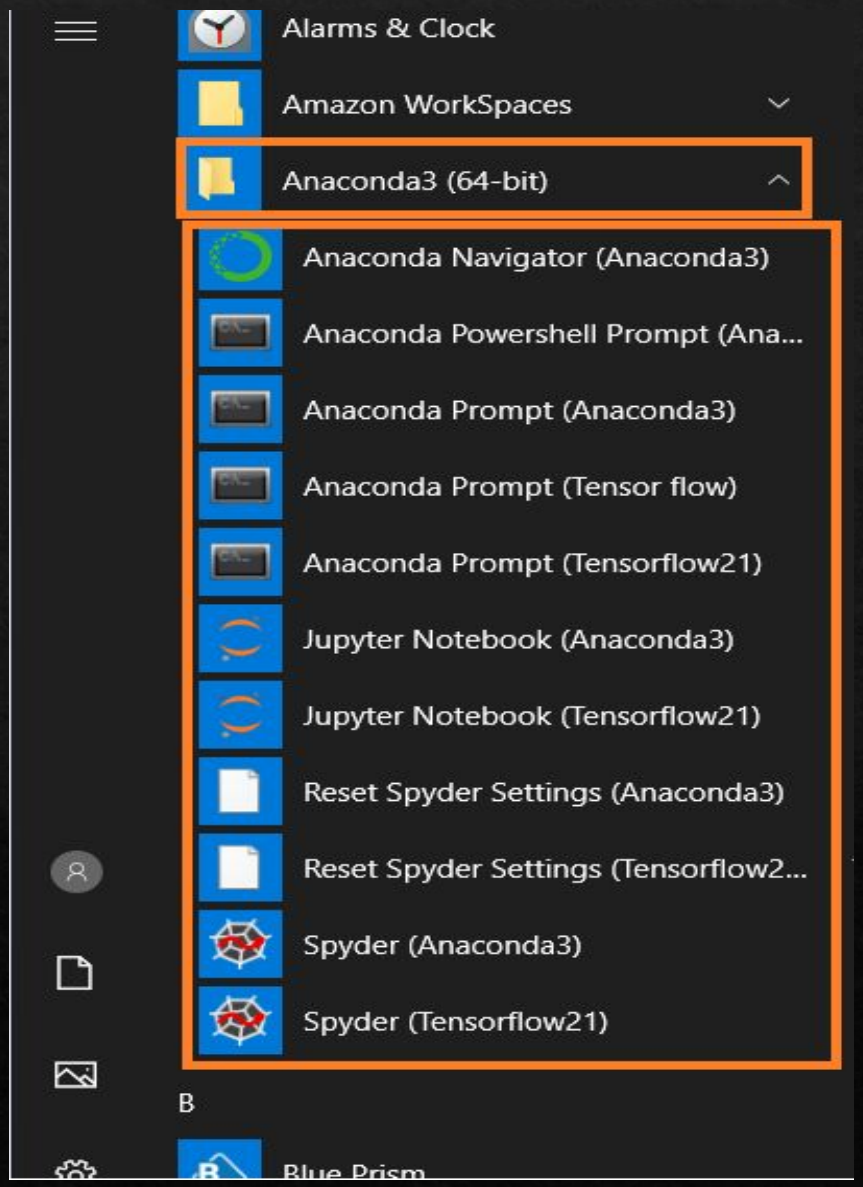
After complete installation



Software


Anaconda3 2020.11 (64-bit) Setup
ANACONDA.
Completing Anaconda3 2020.11 (64-bit) Setup
Thank you for installing Anaconda Individual Edition.
Here are some helpful tips and resources to get you started. We recommend you bookmark these links so you can refer back to them later.
Anaconda Individual Edition Tutorial
Getting Started with Anaconda
< Back
Finish
Cancel

Software


Alarms & Clock
Amazon WorkSpaces
Anaconda3 (64-bit)
Anaconda Navigator (Anaconda3)
Anaconda Powershell Prompt (Ana...
Anaconda Prompt (Anaconda3)
Anaconda Prompt (Tensor flow)
Anaconda Prompt (Tensorflow21)
Jupyter Notebook (Anaconda3)
Jupyter Notebook (Tensorflow21)
Reset Spyder Settings (Anaconda3)
Reset Spyder Settings (Tensorflow2...
Spyder (Anaconda3)
Spyder (Tensorflow21)
B
Blue Prism

Jupyter Notebook Short cuts (Command Mode)

Command Mode (press Esc to enable) — Edit Shortcuts

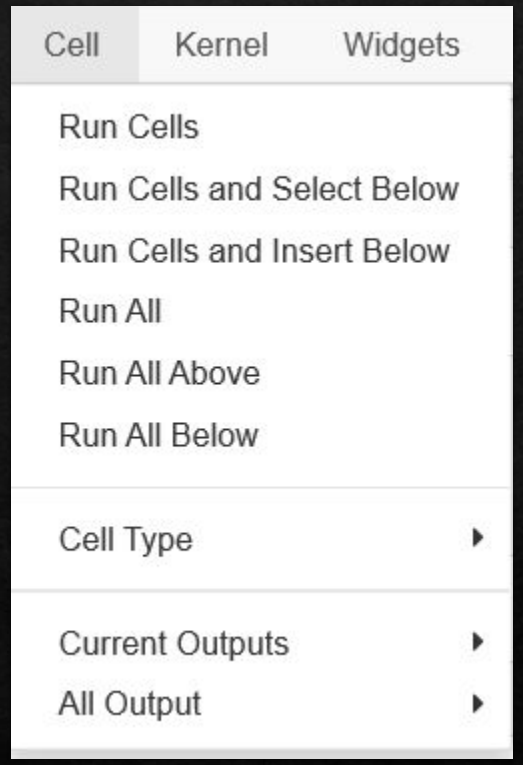
- F : find and replace
- Ctrl-Shift-F : open the command palette
- Ctrl-Shift-P : open the command palette
- Enter : enter edit mode
- P : open the command palette
- Shift-Enter : run cell, select below
- Ctrl-Enter : run selected cells
- Alt-Enter : run cell and insert below
- Y : change cell to code
- M : change cell to markdown
- R : change cell to raw
- 1 : change cell to heading 1
- 2 : change cell to heading 2
- 3 : change cell to heading 3
- 4 : change cell to heading 4
- 5 : change cell to heading 5
- 6 : change cell to heading 6
- K : select cell above
- Up : select cell above
- Down : select cell below
- Shift-Down : extend selected cells below
- Shift-J : extend selected cells below
- A : insert cell above
- B : insert cell below
- X : cut selected cells
- C : copy selected cells
- Shift-V : paste cells above
- V : paste cells below
- Z : undo cell deletion
- D , D : delete selected cells
- Shift-M : merge selected cells, or current cell with cell below if only one cell is selected
- Ctrl-S : Save and Checkpoint
- S : Save and Checkpoint
- L : toggle line numbers
- O : toggle output of selected cells
- Shift-O : toggle output scrolling of selected cells
- H : show keyboard shortcuts

Jupyter Notebook Short cuts (Command Mode)

Down : select cell below	H : show keyboard shortcuts
J : select cell below	I , I : interrupt the kernel
Shift-K : extend selected cells above	0 , 0 : restart the kernel (with dialog)
Shift-Up : extend selected cells above	Esc : close the pager
	Q : close the pager
	Shift-L : toggles line numbers in all cells, and persist the setting
	Shift-Space : scroll notebook up
	Space : scroll notebook down

Jupyter Notebook Short cuts (Edit Mode)

Edit Mode (press `Enter` to enable)

`Tab` : code completion or indent	`Ctrl-Right` : go one word right
`Shift-Tab` : tooltip	`Ctrl-Backspace` : delete word before
`Ctrl-]` : indent	`Ctrl-Delete` : delete word after
`Ctrl-[` : dedent	`Ctrl-Y` : redo
`Ctrl-A` : select all	`Alt-U` : redo selection
`Ctrl-Z` : undo	`Ctrl-M` : enter command mode
`Ctrl-/` : comment	`Ctrl-Shift-F` : open the command palette
`Ctrl-D` : delete whole line	`Ctrl-Shift-P` : open the command palette
`Ctrl-U` : undo selection	`Esc` : enter command mode
`Insert` : toggle overwrite flag	`Shift-Enter` : run cell, select below
`Ctrl-Home` : go to cell start	`Ctrl-Enter` : run selected cells
`Ctrl-Up` : go to cell start	`Alt-Enter` : run cell and insert below
`Ctrl-End` : go to cell end	`Ctrl-Shift-Minus` : split cell at cursor
`Ctrl-Down` : go to cell end	`Ctrl-S` : Save and Checkpoint
`Ctrl-Left` : go one word left	`Down` : move cursor down
	`Up` : move cursor up

Cell Operations