2019 IAC Instructor Knowledge Program

Digital Revolution through Machine Learning and Artificial Intelligence

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October 4, 2019

NIA NATIONAL INFORMATION SOCIETY AGENCY

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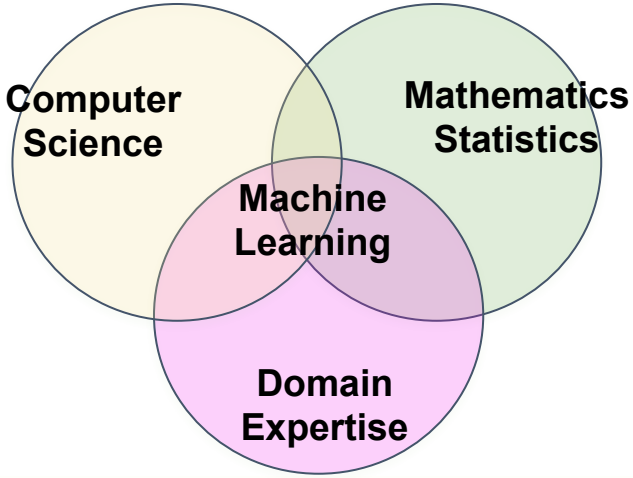
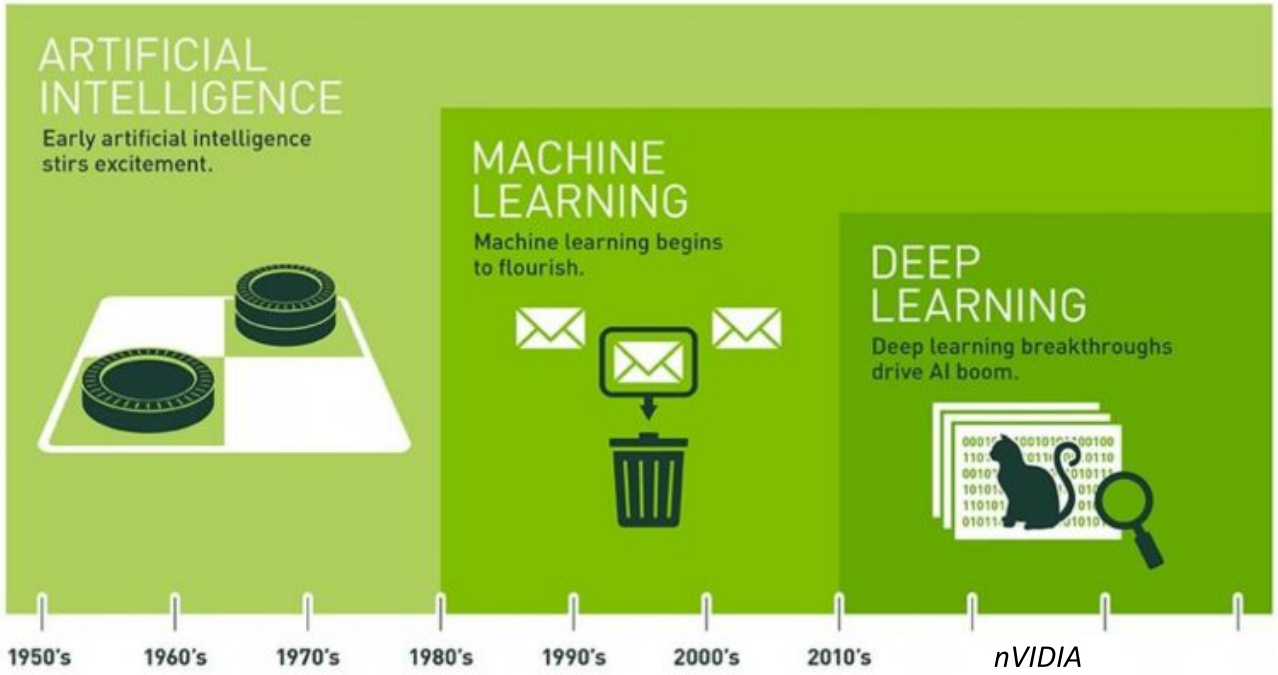
Contents

Machine Learning vs. Artificial Intelligence



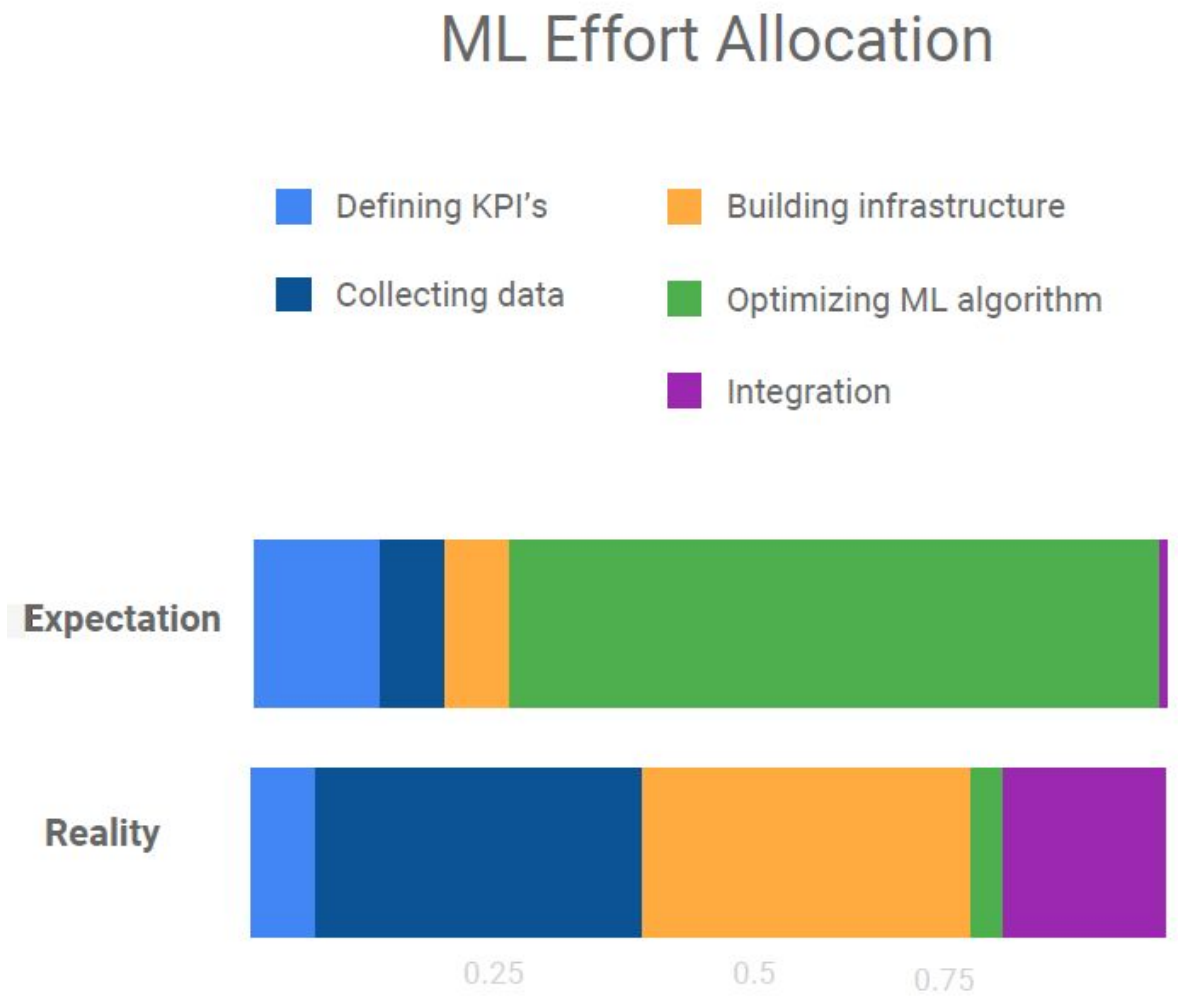


- **Machine Learning is great for :**

- Problems for which existing solutions require a lot of hand-tuning or long lists of rules: one Machine Learning algorithm can often simplify code and perform better.
- Complex problems for which there is no good solution at all using a traditional approach: the best Machine Learning techniques can find a solution.
- Fluctuating environments: a Machine Learning system can adapt to new data.
- Getting insights about complex problems and large amounts of data.

Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow", O'Reilly (2019)

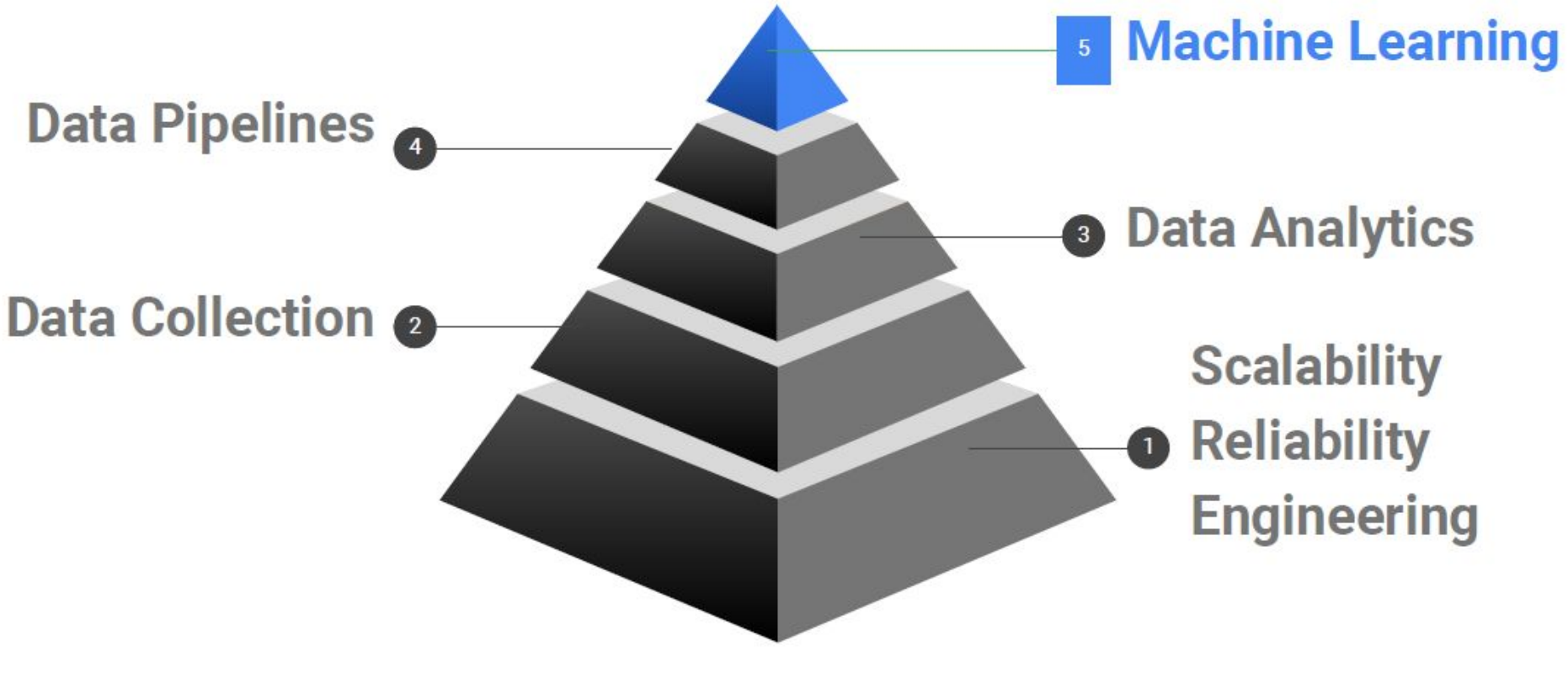
Data Collection & Machine Learning



Google & Coursera

Data Science & Data Engineering

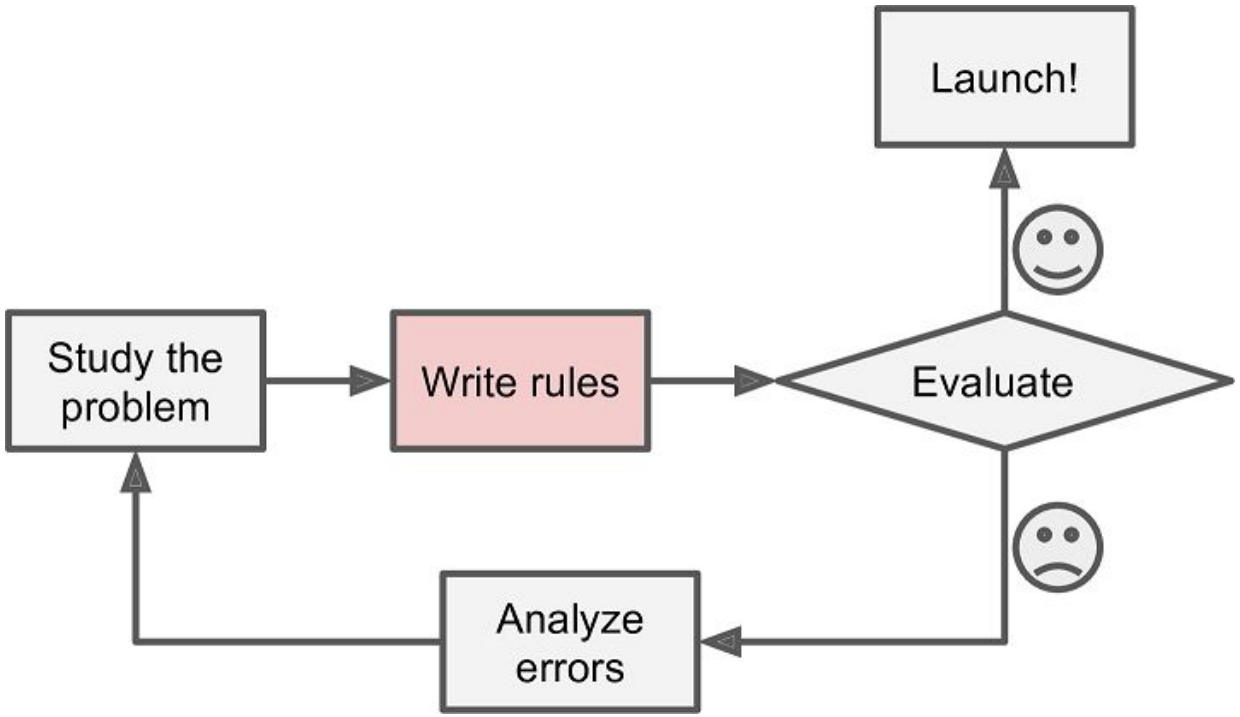
To be good at ML, you need to be good at data engineering



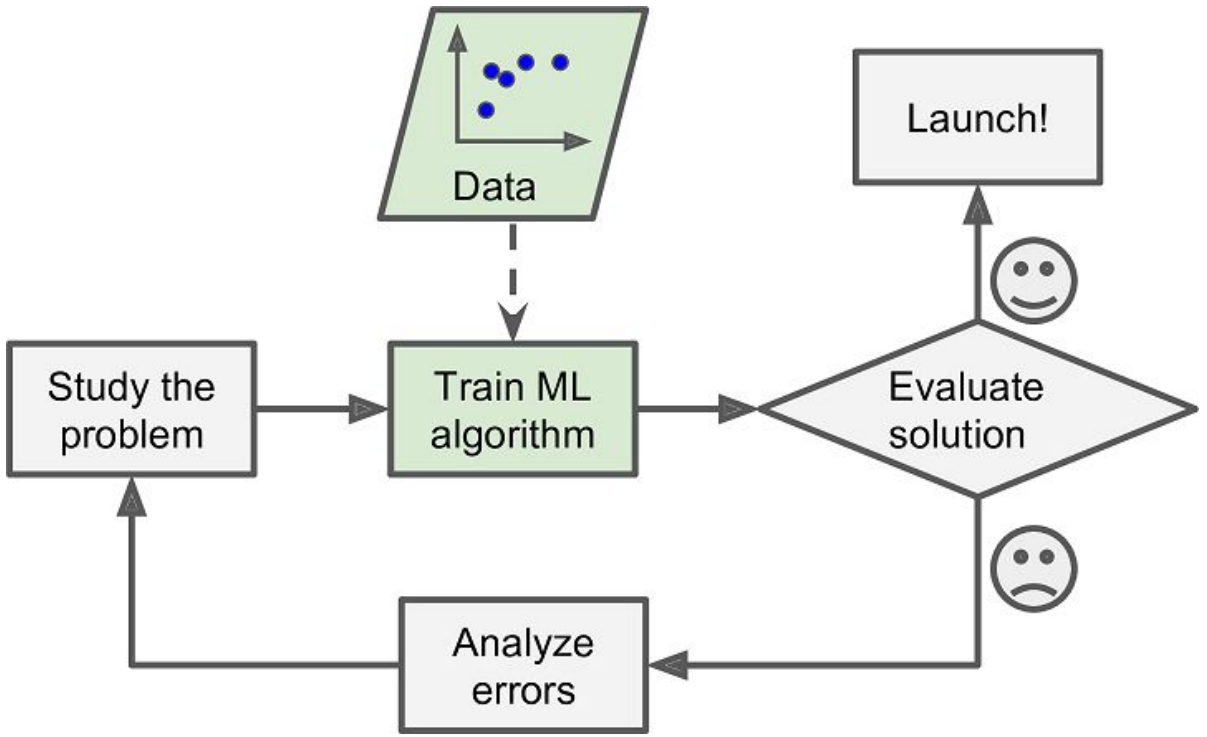
Google & Coursera

Traditional vs. Machine Learning Development

- **Traditional Approach**



- **Machine Learning Approach**



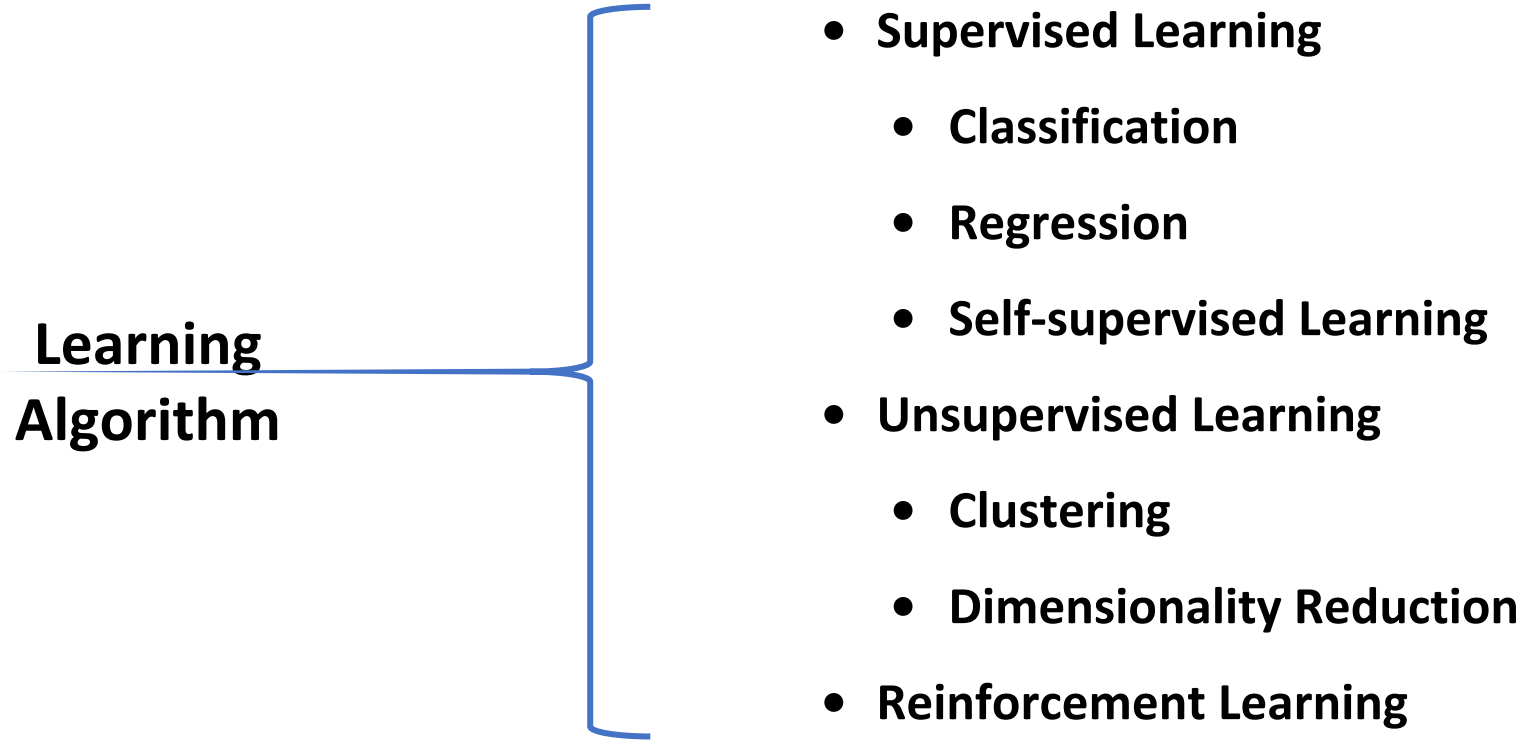
https://www.oreilly.com/library/view/hands-on-machine-learning/9781491962282/ch01.html

Future of the Programming with AI

"Machine learning. This is the next transformation... the programming paradigm is changing. Instead of programming a computer, you teach a computer to learn something and it does what you want."

Eric Schmidt, Google Chairman of the Board

Classification of Machine Learning



Demo Practice : Unsupervised Learning / Clustering

- **Visualizing K-Means Clustering**
  - https://www.naftaliharris.com/blog/visualizing-k-means-clustering/

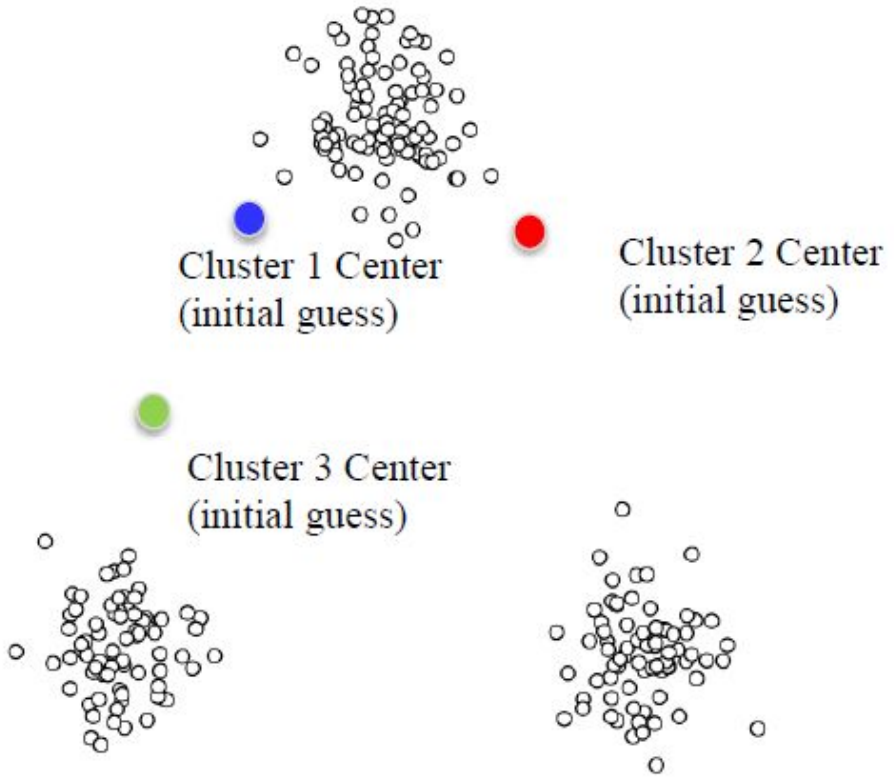
The k-means algorithm

Initialization Pick the number of clusters *k* you want to find. Then pick *k random* points to serve as an initial guess for the cluster centers.

Step A Assign each data point to the nearest cluster center.

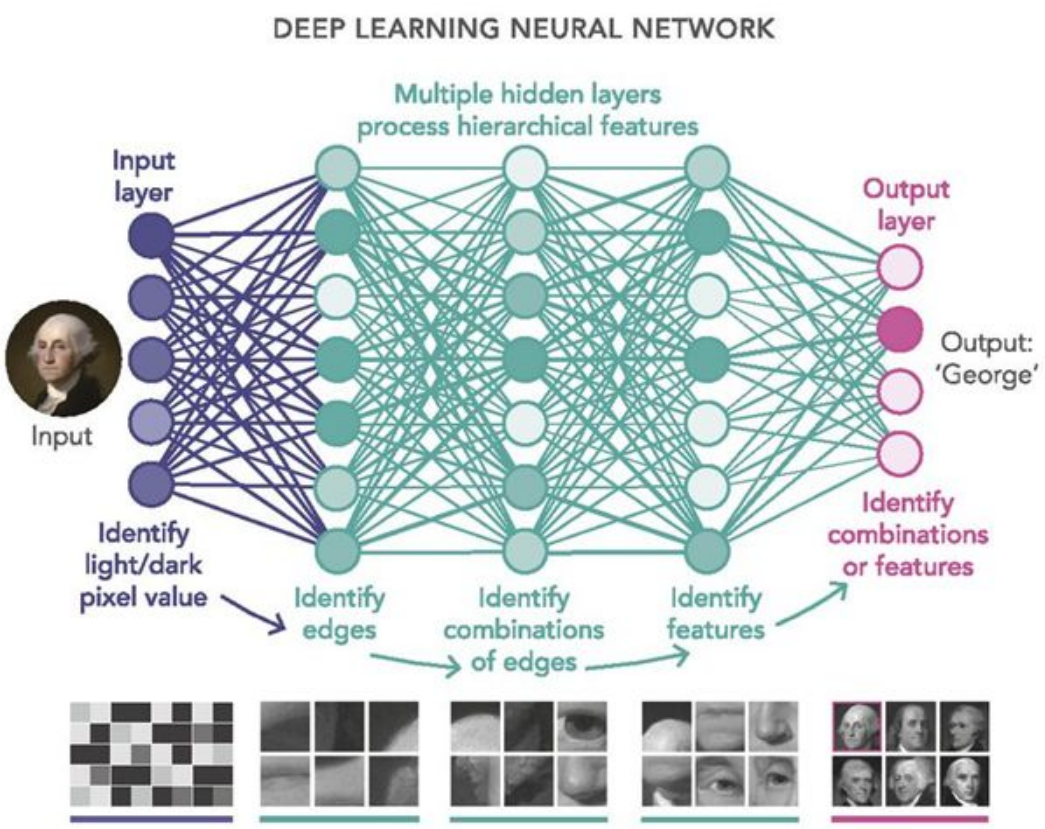
Step B Update each cluster center by replacing it with the mean of all points assigned to that cluster (in step A).

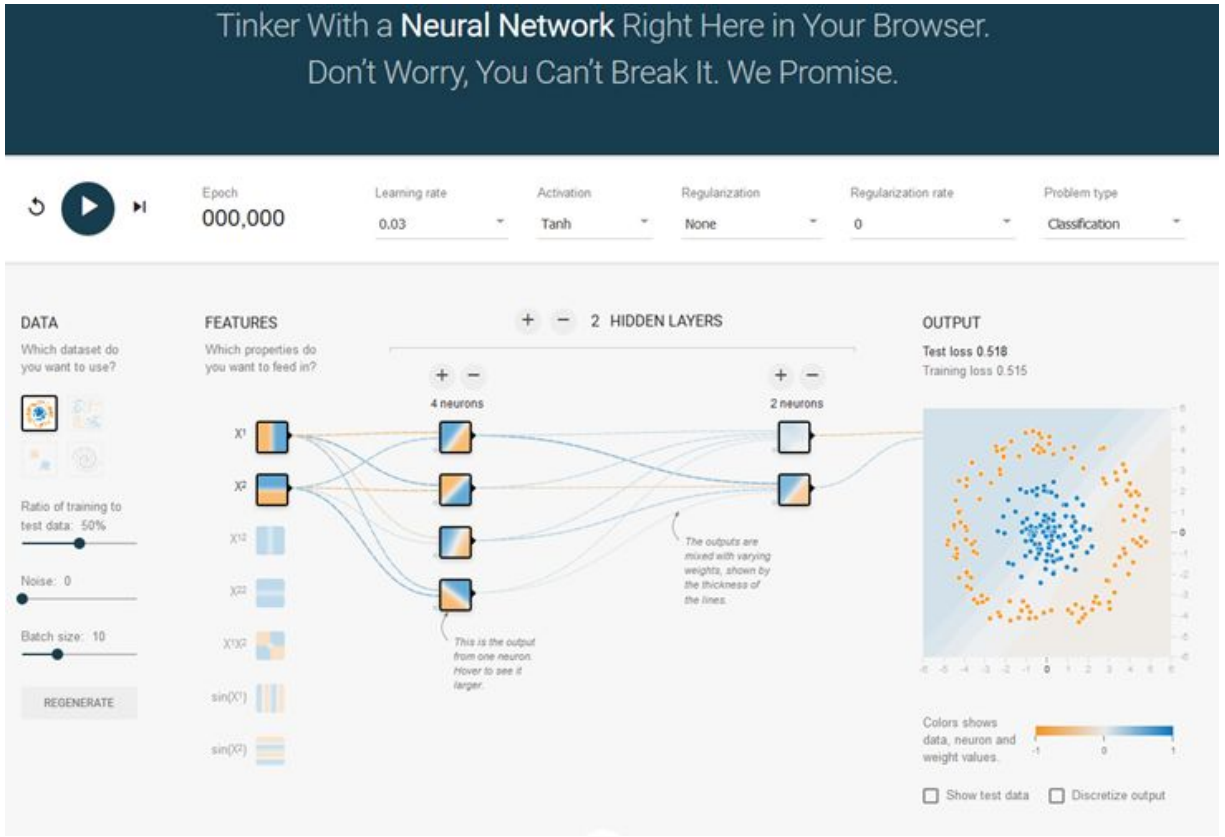
Repeat steps A and B until the centers converge to a stable solution.



Demo Practice : Neural Network & Deep Learning

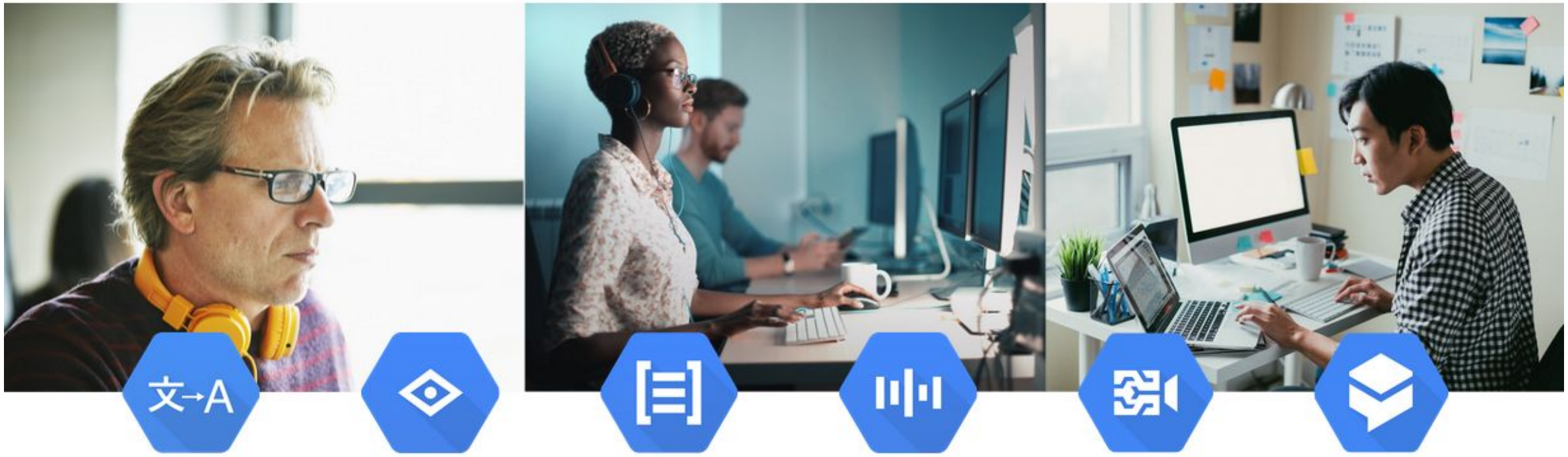
- **Tensorflow Playground**
  - https://playground.tensorflow.org/





https://www.pnas.org/content/116/4/1074

Cloud ML Engines



Cloud Translation

Cloud Vision

Cloud Natural Language

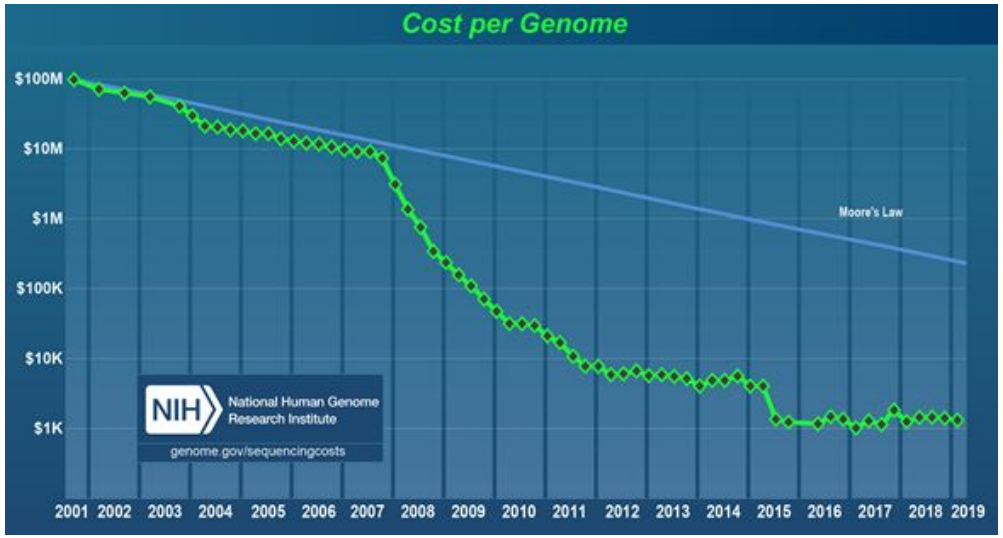
Cloud Speech

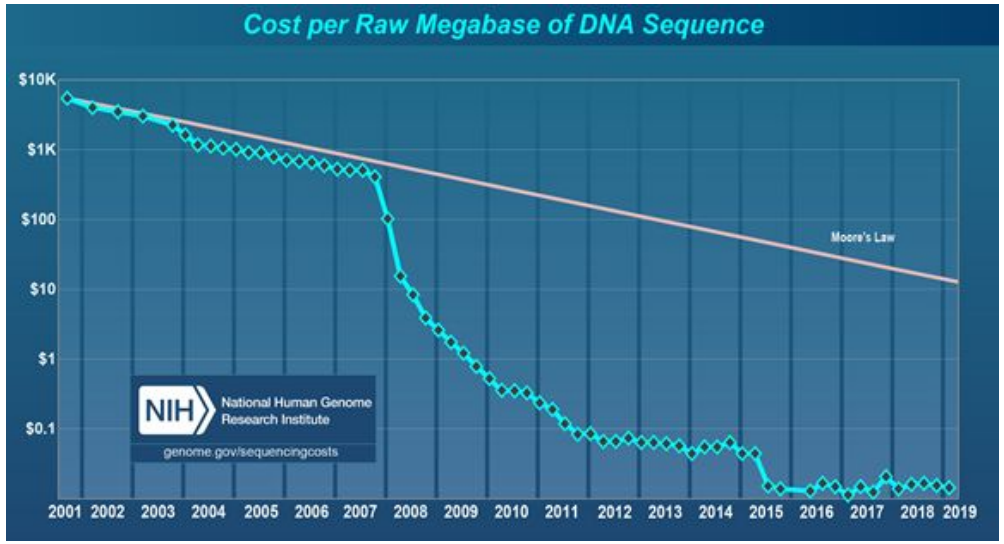
Cloud Video Intelligence

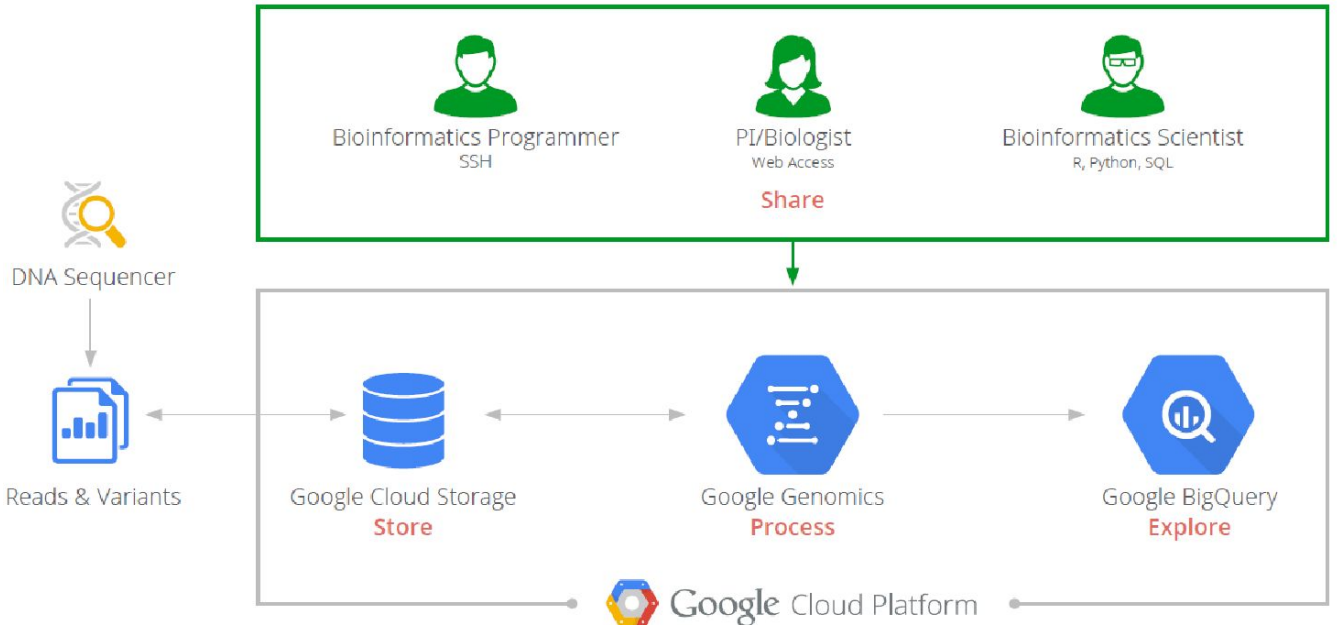
Dialogflow Enterprise Edition

Google Cloud

Bioinformatics







biopython

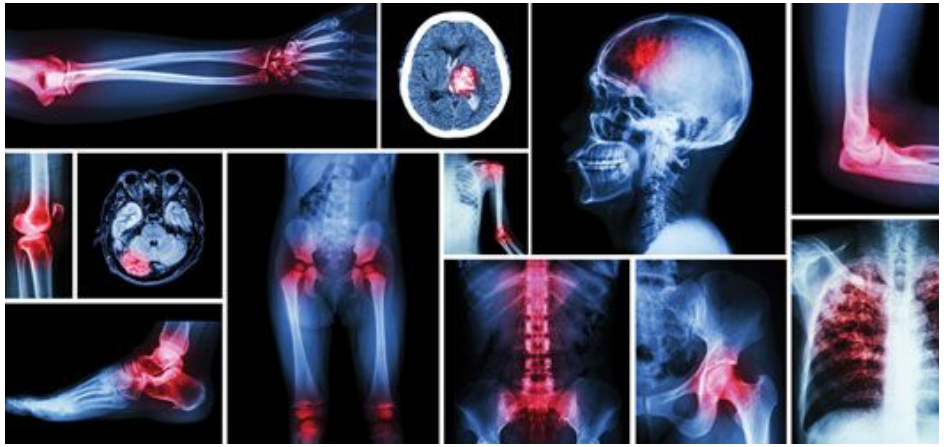
GenBank
NCBI

RCSB PDB
PROTEIN DATA BANK

NIH, Google & Coursera, Biopython.org, NCBI, RCSB PDB

AI for Science & Healthcare

IBM Watson

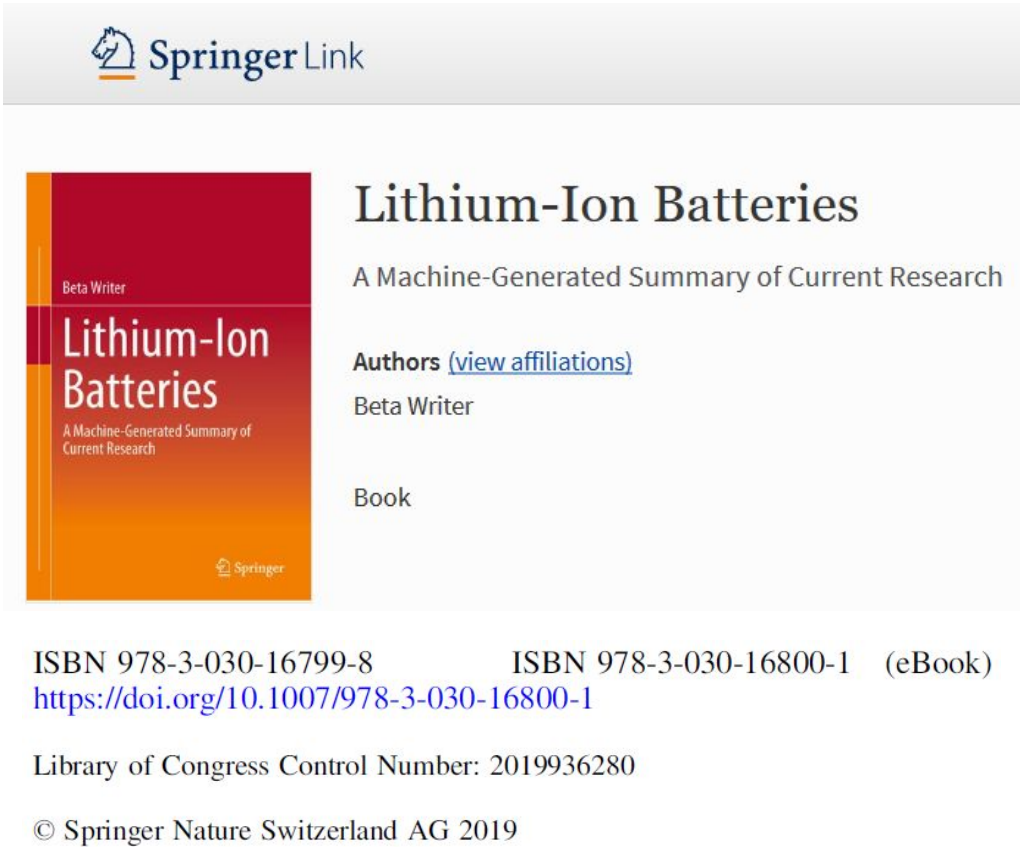


AI Judge & AI Writer

- **Estonia's AI Judge** WIRED

https://www.wired.com/story/can-ai-be-fair-judge-court-estonia-thinks-so/

- **AI Writer**



https://link.springer.com/book/10.1007/978-3-030-16800-1

AI & Future Jobs

THE FUTURE OF EMPLOYMENT: HOW SUSCEPTIBLE ARE JOBS TO COMPUTERISATION?*

Carl Benedikt Frey† and Michael A. Osborne‡

September 17, 2013

DR CARL BENEDIKT FREY

Oxford Martin Citi Fellow

MICHAEL A OSBORNE

Dyson Associate Professor in Machine Learning at the University of Oxford

https://www.oxfordmartin.ox.ac.uk/publications/the-future-of-employment/
https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf
https://www.robots.ox.ac.uk/~mosb/

Rank	Probability	Occupation
1	0.0028	Recreational Therapists
14	0.0041	Sales Eng
32	0.0065	Com Sys Analysts
56	0.012	Microbiologist
77	0.017	Chem Eng
87~88	0.021	Mater Sci/Eng
99	0.027	Biochem, Biophys
619	0.95	Animal Breeders
629	0.96	Office Clerks, General
641	0.96	Cooks, Restaurant
674	0.98	Driver/Sales Workers
676	0.98	Parts Salespersons
698	0.99	Insurance Underwriters
702	0.99	Telemarketers

Highest Paying Jobs for New Grads

Highest Paying Jobs for New Grads

Entry-level Job	Base Salary
Data Scientist	95,000
Software Engineer	90,000
Product Manager	89,000
Investment Banking Analyst	85,000
Product Designer	85,000
UX Designer	73,000
Implementation Consultant	72,000
Java Developer	72,000
Systems Engineer	70,000
Software Developer	68,000

Bloomberg

https://www.bloomberg.com/news/articles/2019-05-15/big-data-skills-earn-high-pay-for-today-s-college-graduates

Question & Answer