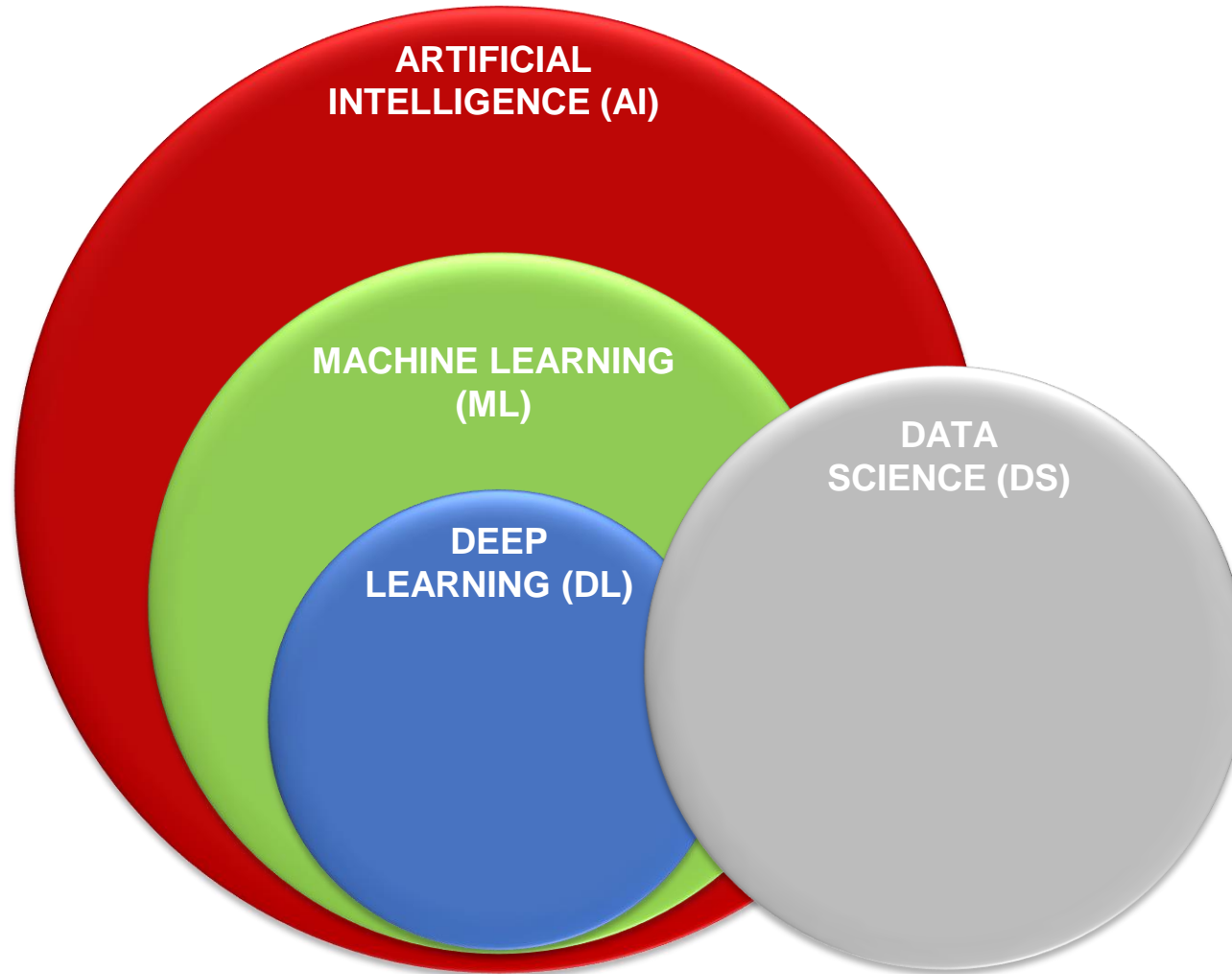




Concept

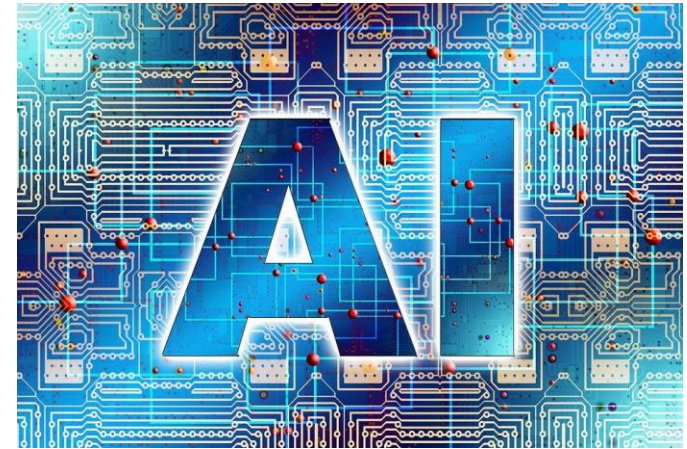
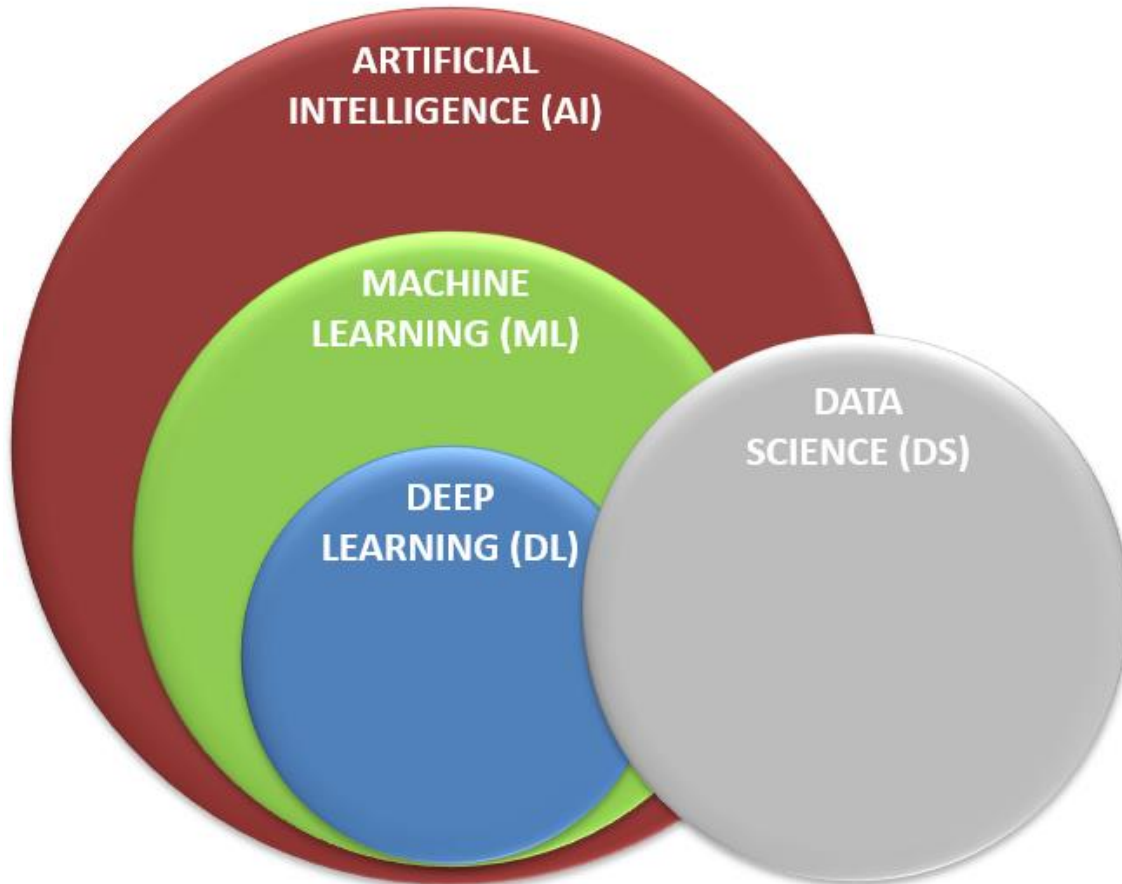
ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, DATA SCIENCE

ARTIFICIAL INTELLIGENCE Vs. MACHINE LEARNING Vs. DEEP LEARNING Vs. DATA SCIENCE



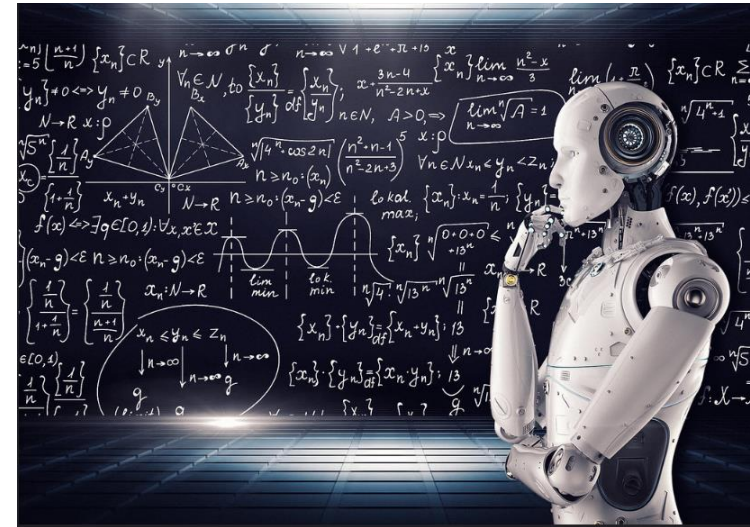
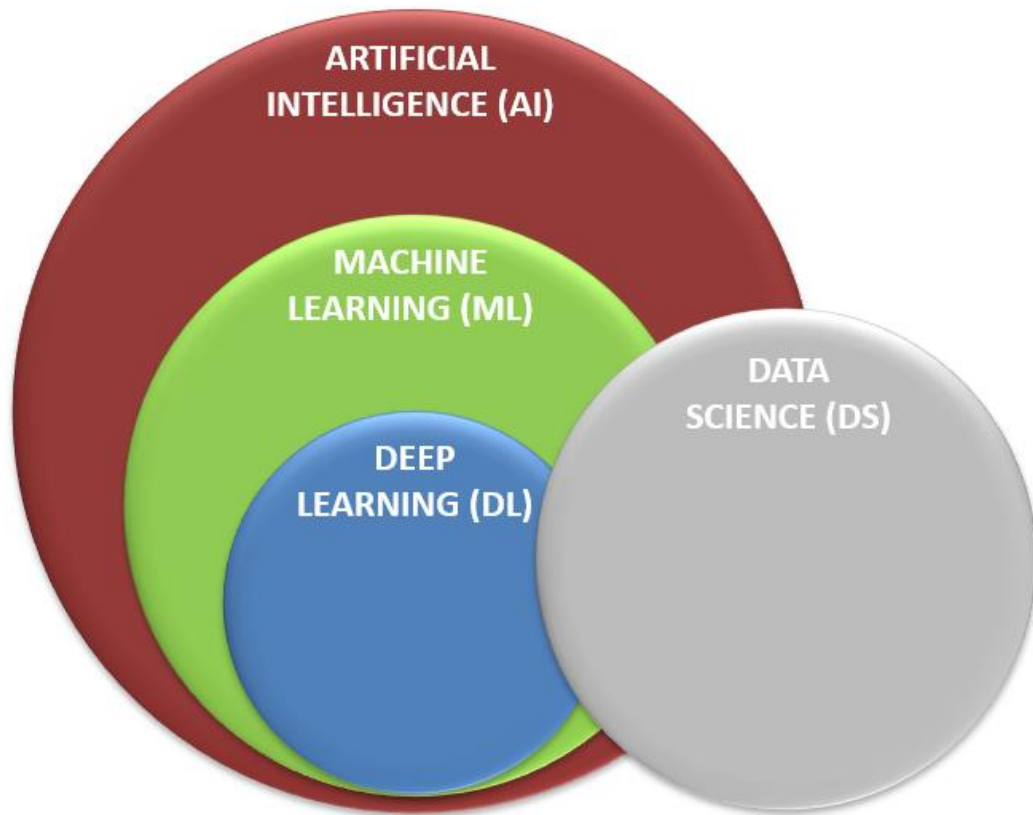
ARTIFICIAL INTELLIGENCE (AI)

- AI is the science that enable computers to think like humans.
- AI allows computers to imitate human intelligence and do things that humans do!
- AI can make decision (Example: buy/sell stocks), understand text (Example: read articles), and detect faces.



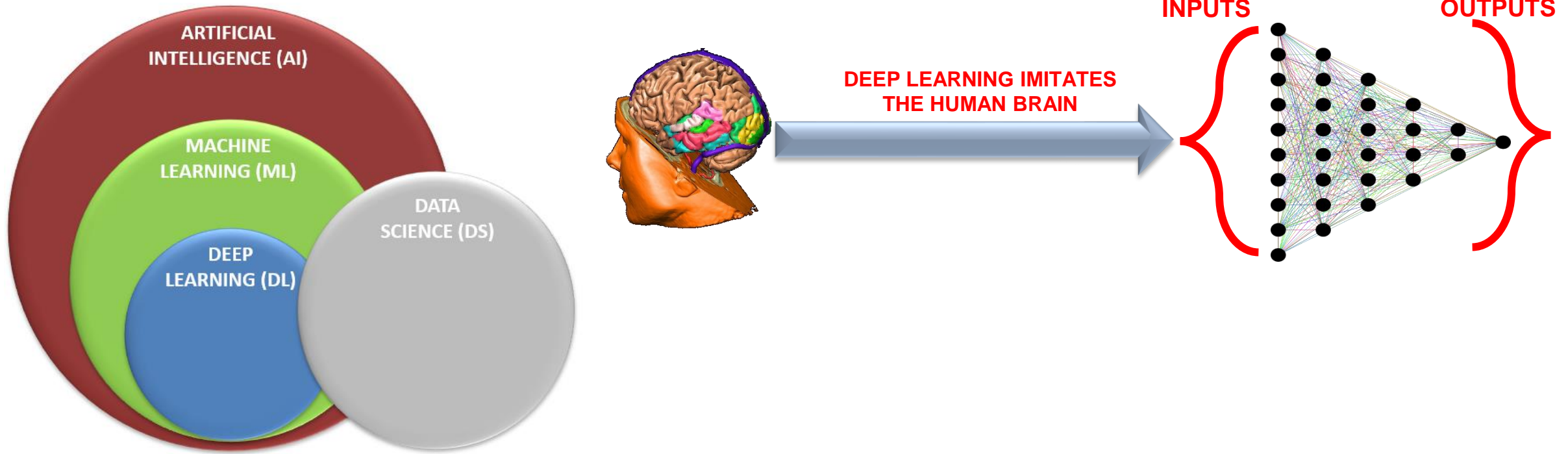
MACHINE LEARNING (ML)

- Machine Learning is a subfield of Artificial Intelligence that enables machines to improve at a given task with experience without being explicitly programmed.
- Note that all machine learning techniques are classified as Artificial Intelligence. However, not all Artificial Intelligence could count as Machine Learning since some basic Rule-based algorithms could be classified as AI but they do not learn from experience therefore they do not belong to the machine learning category.



DEEP LEARNING (DL)

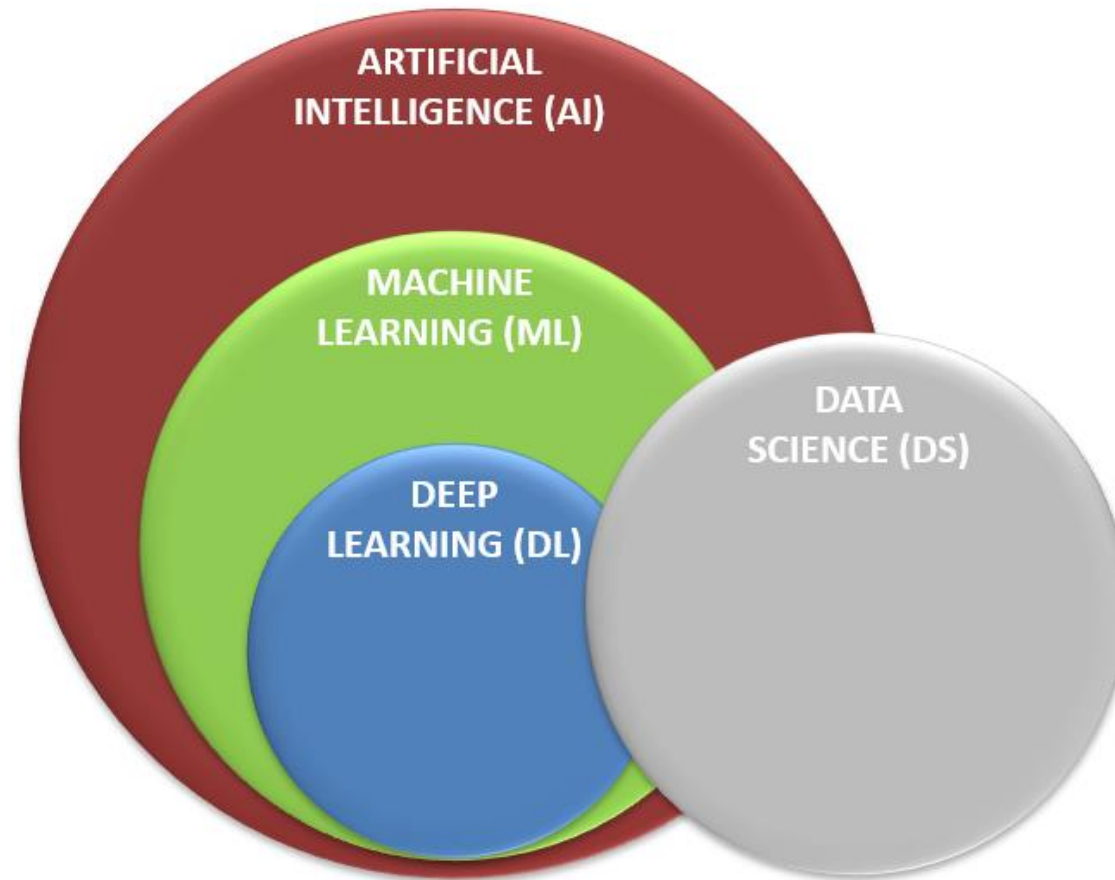
- Deep Learning is a subset of machine learning that aims at imitating the human brain using mathematical equations.
- The human brain consists of billions of neurons that communicate to each other and enable humans to see, think and make decision.
- Features from input data are automatically extracted.



- **Photo Credit:** <https://pixabay.com/en/neural-network-thought-mind-mental-3816319/>
- **Photo Credit:** <https://commons.wikimedia.org/wiki/File:Voxel-man-brain.jpg>

DATA SCIENCE (DS)

- Data science is a science that aims at gaining useful information from the data.
- Data science can help companies make better decisions.
- For example, a bank can analyze customer data and identify which customers have high credit score and tailor products/services to meet their needs.

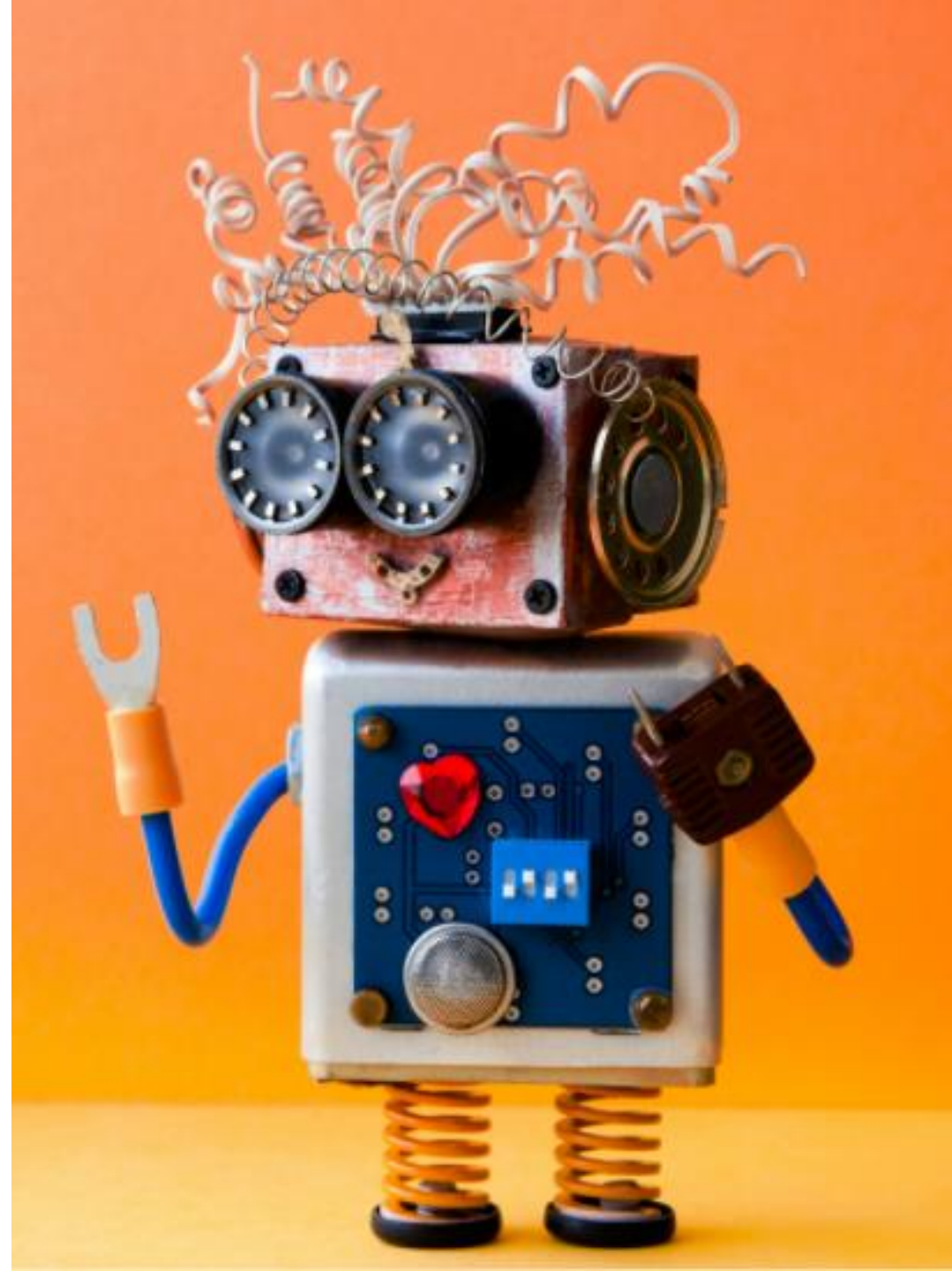


EXAMPLE

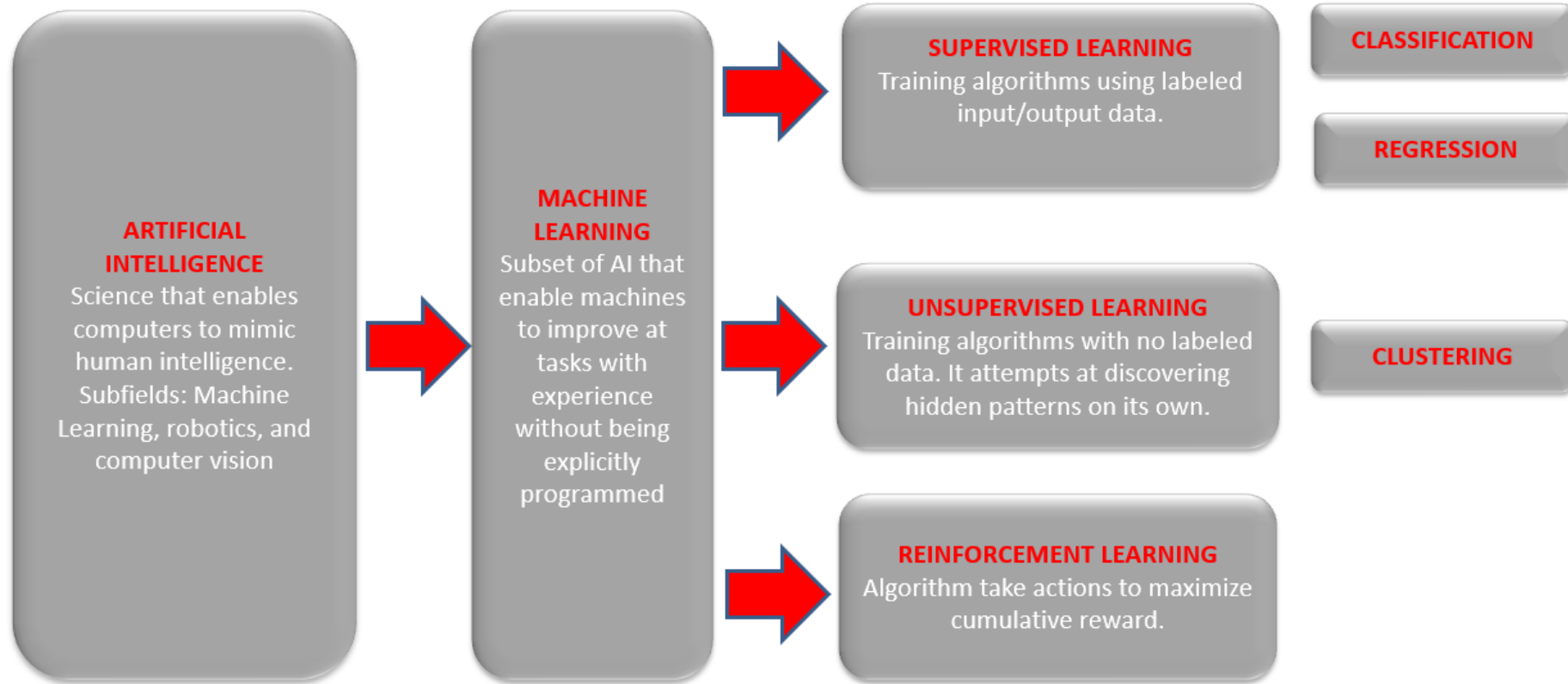
- “Understanding The Difference Between AI, ML, And DL: Using An Incredibly Simple Example” by Gavita Regunath
- Link to blog: <https://www.advancinganalytics.co.uk/blog/2021/12/15/understanding-the-difference-between-ai-ml-and-dl-using-an-incredibly-simple-example>



MACHINE LEARNING: THE BIG PICTURE

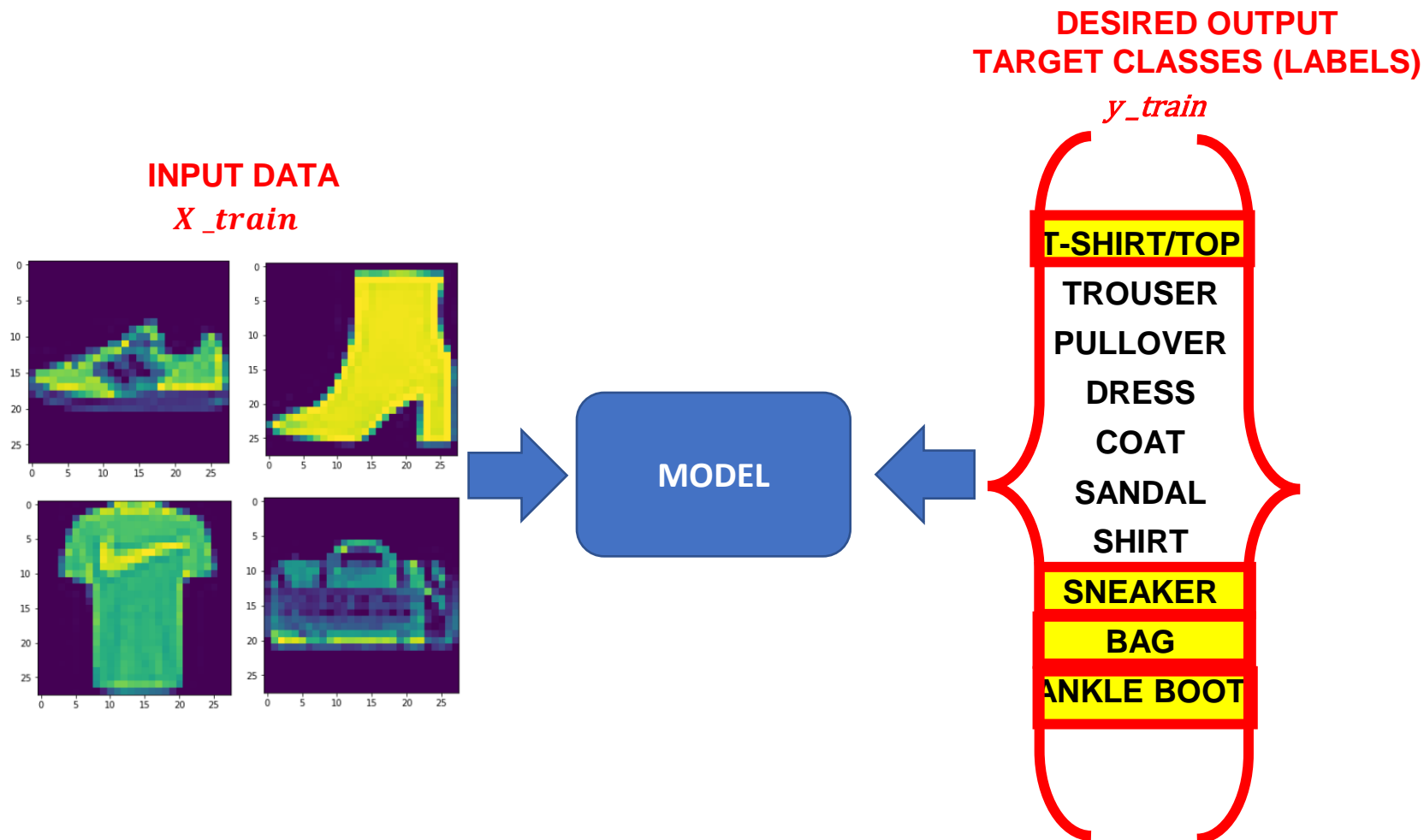


MACHINE LEARNING: BIG PICTURE



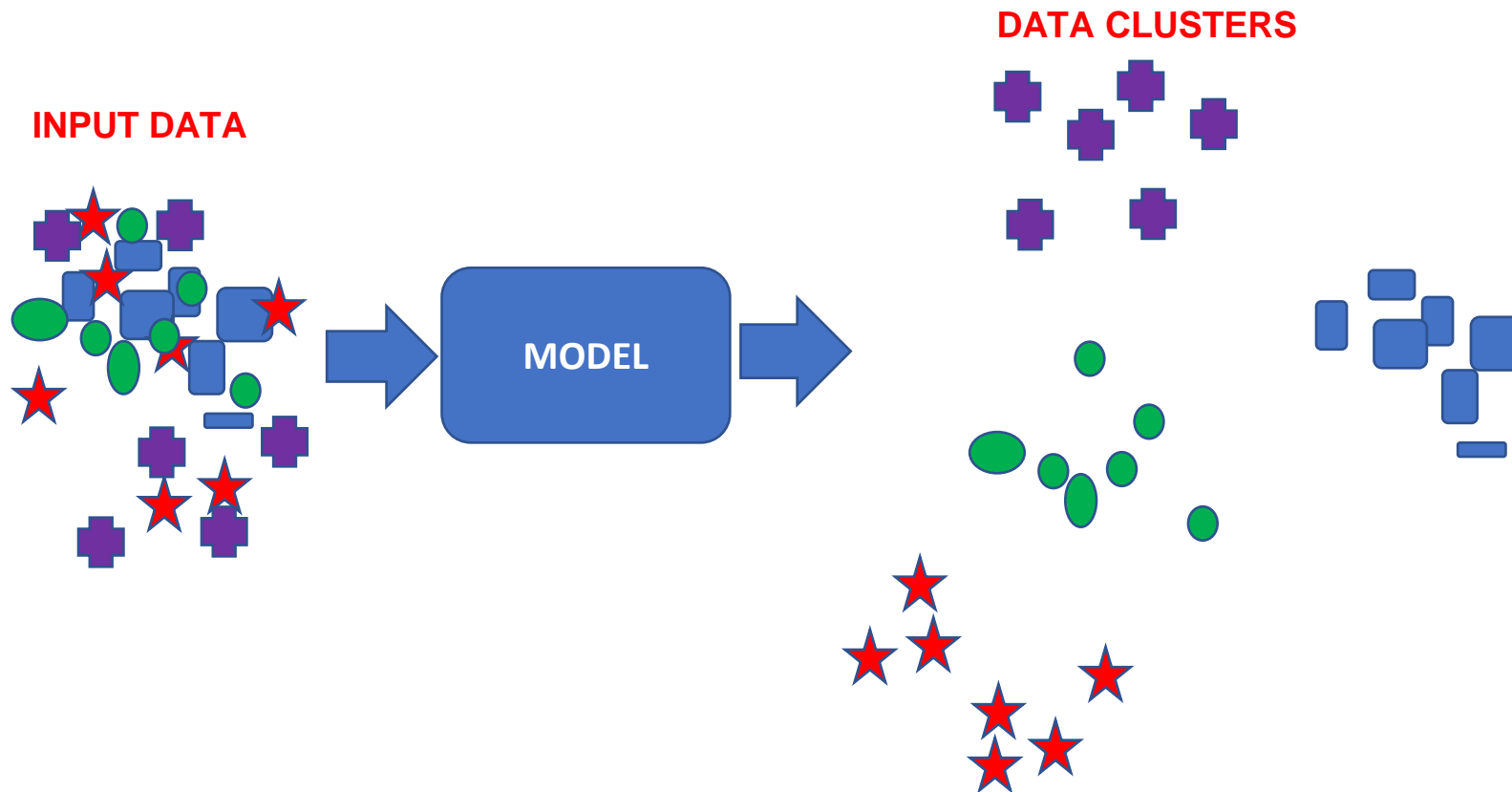
MACHINE LEARNING: SUPERVISED LEARNING

- Supervised: used to train algorithms using labeled input and output data.
- Performance is assessed by comparing trained model prediction vs. real output.



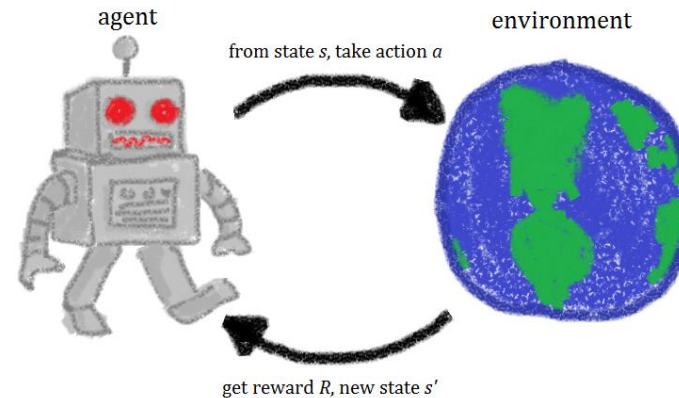
MACHINE LEARNING: UNSUPERVISED LEARNING

- Unsupervised learning: provides the algorithm with no labeled data.
- The algorithm attempts at discovering hidden patterns within the training data.
- Unsupervised learning methods can analyze complex data that humans might find difficult to interpret.
- No feedback!



MACHINE LEARNING: REINFORCEMENT LEARNING

- Reinforcement learning allows machines take actions to maximize cumulative reward.
- Reinforcement algorithms learn by trial and error through reward and penalty.
- Two elements: environment and learning agent.
- The environment rewards the agent for correct actions.
- Based on the reward or penalty, agent improves its environment knowledge to make better decision.



AI/ML KEY INGREDIENTS



1. DATA

- Data can come from so many sources such as images, audio, video, and text.
- Collecting, structuring and analysing this data is critical for companies to gain customers insights and set their marketing and product strategies.

IMAGE/VIDEO



TEXT (CORPUS)



AUDIO/SOUND



TIMESERIES/SIGNALS



Photo Credit: <https://pxhere.com/en/photo/1454351>

Photo Credit: <https://www.flickr.com/photos/29881930@N00/2086641598>

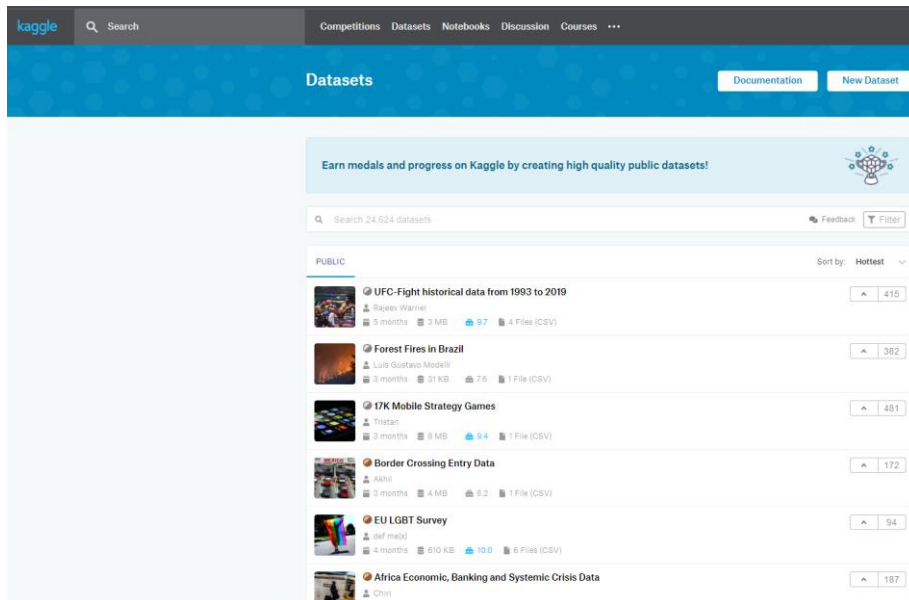
Photo Credit: https://commons.wikimedia.org/wiki/File:Mobile_phone_text_messages.jpg

Photo Credit: https://en.wikipedia.org/wiki/File:Messages_Yosemite.svg

Photo Credit: <https://www.pexels.com/photo/blue-and-yellow-graph-on-stock-market-monitor-159888/>

1. DATA: WHERE DOES THIS DATA COME FROM?

- Data could also come from multiple sources such as Kaggle and University of California, Irvine (UCI).
- Example: ImageNet is an open source repository of images consisting of 21,841 subcategories (classes) and over 14 million images.

A screenshot of the UCI Machine Learning Repository website. The header features the UCI logo and the text 'Machine Learning Repository' and 'Center for Machine Learning and Intelligent Systems'. A search bar and navigation links are present. Below the header, a table lists 488 data sets. The table has columns for Name, Data Types, Default Task, Attribute Types, # Instances, # Attributes, and Year. The datasets listed include Abalone, Adult, Ameslign, Anonymous Microsoft Web Data, Arrhythmia, Artificial Characters, Audiology (Original), Audiology (Standardized), Auto MPG, Automobile, and UCI Badges.

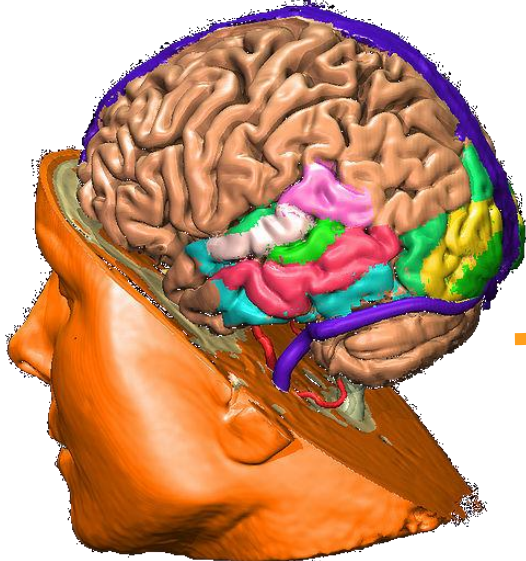
| Name | Data Types | Default Task | Attribute Types | # Instances | # Attributes | Year |
|------------------------------|------------------|---------------------|----------------------------|-------------|--------------|------|
| Abalone | Multivariate | Classification | Categorical, Integer, Real | 4177 | 8 | 1995 |
| Adult | Multivariate | Classification | Categorical, Integer | 48842 | 14 | 1996 |
| Ameslign | Multivariate | Classification | Categorical, Integer, Real | 798 | 38 | |
| Anonymous Microsoft Web Data | | Recommender-Systems | Categorical | 37711 | 294 | 1998 |
| Arrhythmia | Multivariate | Classification | Categorical, Integer, Real | 452 | 279 | 1986 |
| Artificial Characters | Multivariate | Classification | Categorical, Integer, Real | 6000 | 7 | 1992 |
| Audiology (Original) | Multivariate | Classification | Categorical | 226 | | 1987 |
| Audiology (Standardized) | Multivariate | Classification | Categorical | 226 | 69 | 1992 |
| Auto MPG | Multivariate | Regression | Categorical, Real | 398 | 8 | 1993 |
| Automobile | Multivariate | Regression | Categorical, Integer, Real | 265 | 26 | 1987 |
| UCI Badges | Univariate, Text | Classification | | 294 | 1 | 1994 |

Check out website here: <https://archive.ics.uci.edu/ml/datasets.php>

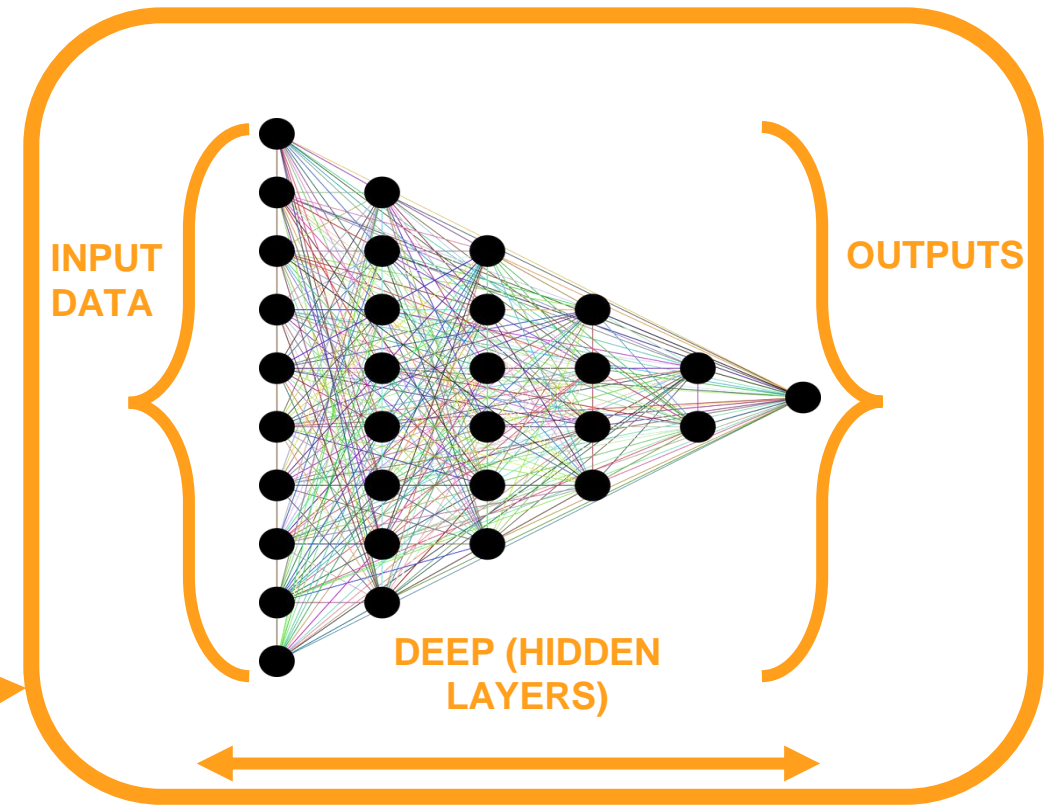
Check out website here: <https://www.kaggle.com/datasets>

2. MODEL

- The human brain consists of billions of neurons that communicate to each other using electrical/chemical signals and enable humans to see, feel, and make decision.
- Artificial neural networks (ANNs) are information processing models inspired by the human brain.
- Simply, ANNs are couple of equations that mimic the human brain!



MIMIC HUMAN BRAIN
USING MATHEMATICAL
EQUATIONS



3. COMPUTE

- ANN requires computation power to be able to learn from the data.
- AI-based specific chips are being developed and optimized for AI training.
- The amount of compute has been increasing exponentially with ~3 months doubling time!!
- Great article by OpenAI:
<https://openai.com/blog/ai-and-compute/>



- **Photo Credit:** <https://www.flickr.com/photos/3336/27830149309>

3. COMPUTE: AI IMMORTAL DICTATOR

TECH

Elon Musk warns A.I. could create an ‘immortal dictator from which we can never escape’

PUBLISHED FRI, APR 6 2018•9:40 AM EDT | UPDATED FRI, APR 6 2018•1:11 PM EDT



Ryan Browne
@RYAN_BROWNE_

SHARE    

“The least scary future I can think of is one where we have at least democratized AI because if one company or small group of people manages to develop godlike digital superintelligence, they could take over the world,” Elon Musk.

Link to article: <https://www.cnbc.com/2018/04/06/elon-musk-warns-ai-could-create-immortal-dictator-in-documentary.html>