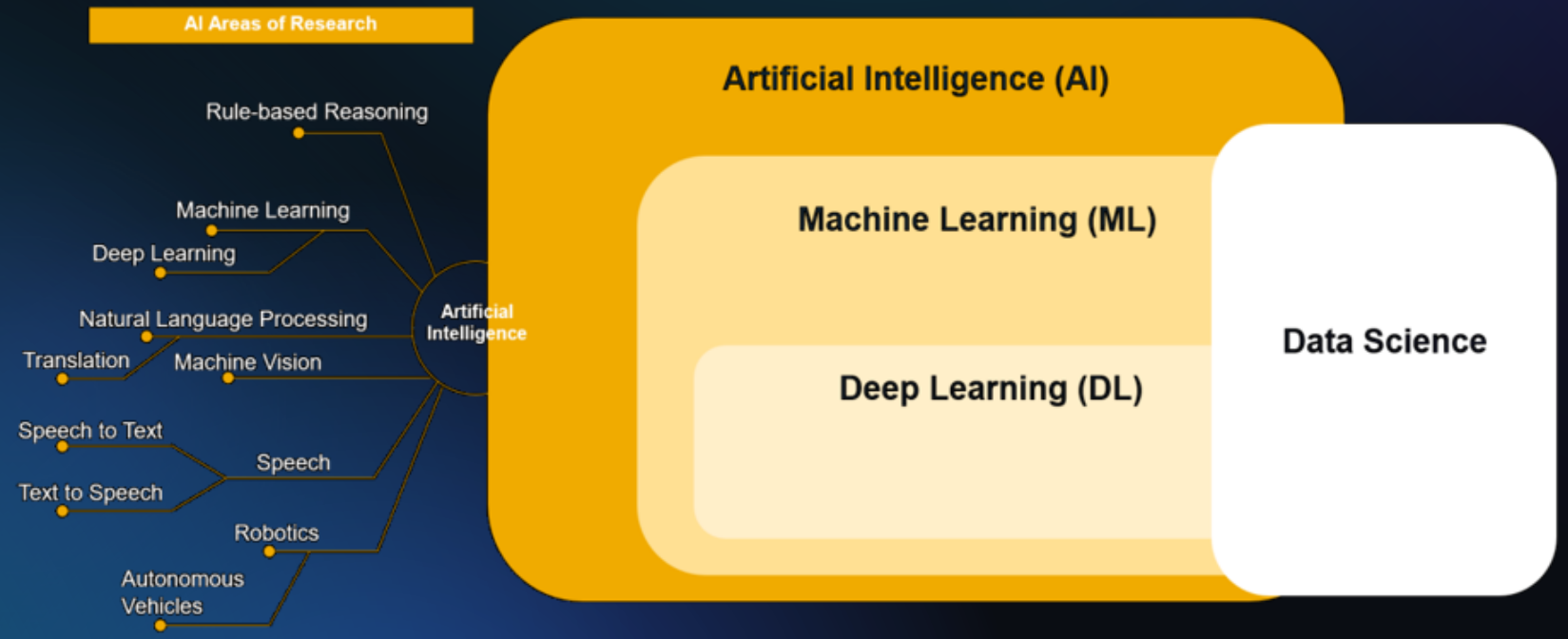
Overview of L1

1. AI, ML, DL
2. What is ML?
3. Intro to NumPy

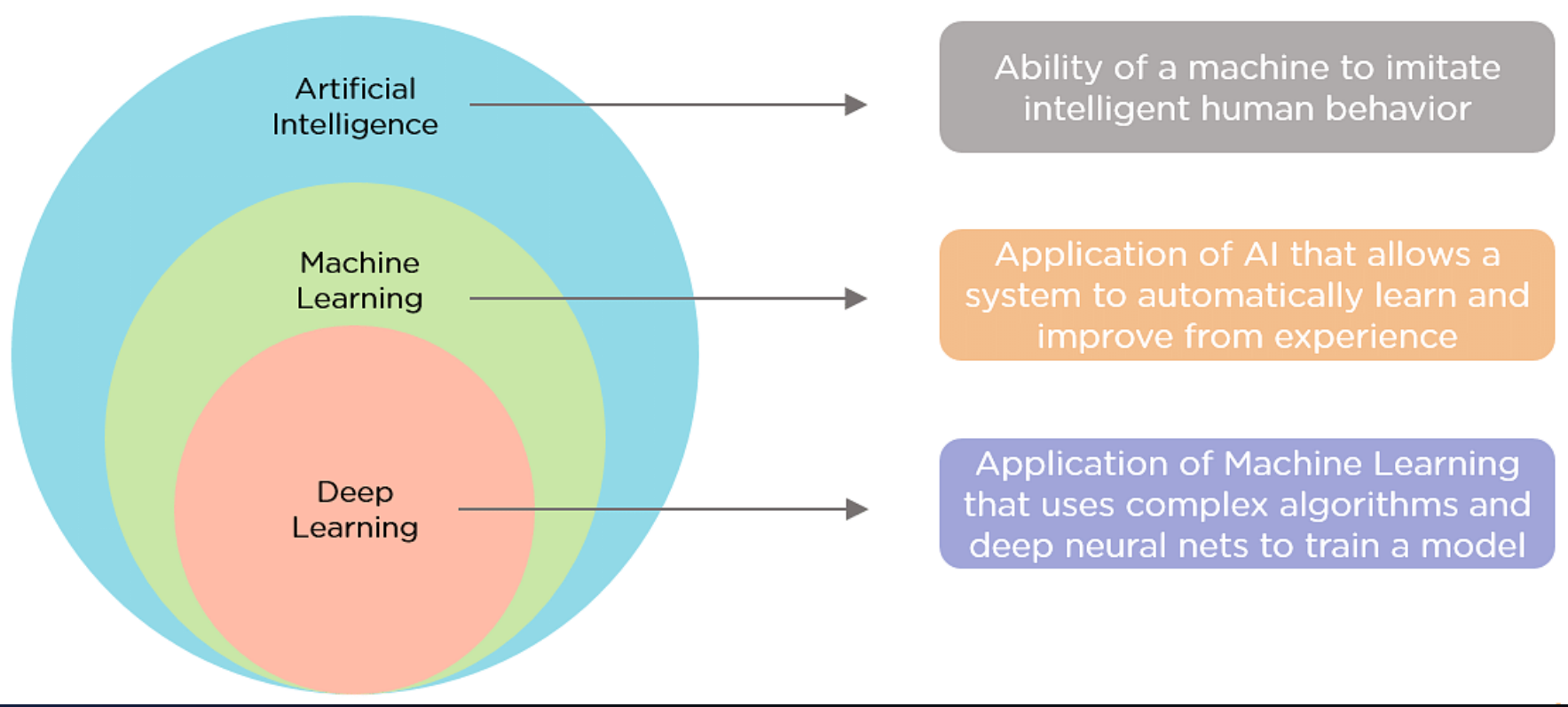
AI vs. ML (vs. Deep Learning)

- Not Interchangeable! (Technically)



Credit: https://medium.com/@marcellvollmer/how-to-make-it-simple-to-explain-ai-ml-dl-and-data-science-a49e54d54a12

AI vs. ML (vs. Deep Learning)



Credit: https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/ai-vs-machine-learning-vs-deep-learning#:~:text=Artificial%20Intelligence%20is%20the%20concept,algorithms%20to%20train%20a%20model.

Lecture Schedule - Reminder

Autumn Term

A new lecture every other week in Huxley 130/144!

1. What is Machine Learning? | October 18th
2. Real Data Science Project | November 3rd
3. Supervised Learning | November 15th
4. Unsupervised Learning | December 1st
5. How does a Neural Network work? | December 13th

- Practical focus
- Project-centric

Basic Python | Classical ML | Neural Networks | Deep Learning

Lecture Schedule - Reminder

Spring Term

A new lecture every other week!

1. Image Processing | January 10th
2. Real Life Examples |
3. Challenges of Going Deep |
4. RNNs and Time Series |
5. GANs and Transformers |

- Practical focus
- Project-centric

Basic Python | Classical ML | Neural Networks | Deep Learning

What is AI?

Artificial Intelligence: Imitate problem-solving and decision-making capabilities of the human brain on computers/ machines.

Strong AI/ AGI (Artificial General Intelligence):

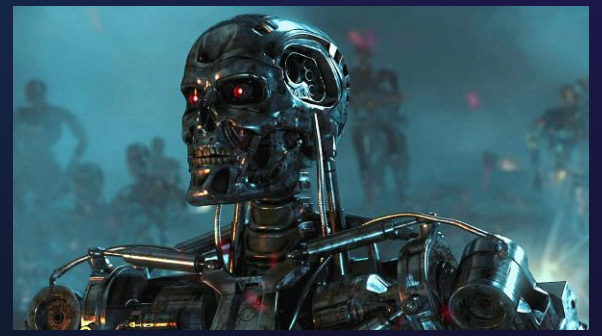
- Form of AI where a machine would have an intelligence similar to humans
- Self-aware consciousness, problem solving, etc.

Weak (Narrow) AI:

- The only type of AI that exists (as of now)
- Trained to perform very specific tasks

Credit: https://www.ibm.com/cloud/learn/what-is-artificial-intelligence

Our attempts at AGI



Spoilers: They aren't AGIs...

- Self-driving cars
- Music/ Art AIs
- ROSS intelligence ("AI Attorney")
  - Can mine data & analyse from billions of text documents
- GPT-3 (Generative Pre-trained Transformer 3)
  - Deep learning model, trained with 45TB of text data & 175 billion parameters
  - Performs a wide variety of natural language tasks

Credit: http://www.radiofreemobile.com/artificial-intelligence-here-comes-skynet/

Examples from GPT-3

Summarize this email into a single sentence:

Dear Olivia,

The solar energy conference went great. New Horizon Manufacturing wants to meet with us to talk about our photovoltaic window system we're about to launch.
I think it would be great to talk this Tuesday.

Best,
Allison

Allison is excited to meet with New Horizon Manufacturing to discuss their photovoltaic window system.

```
"""
Table customers, columns = [CustomerId, FirstName,
LastName, Company, Address, City, State, Country,
PostalCode, Phone, Fax, Email, SupportRepId, TotalSpend]

Create a MySQL query for all customers in Texas who have
spent over five thousand dollars.
"""

query = "SELECT * FROM customers WHERE State = 'TX' AND
TotalSpend > 5000"
```

```
"""
Extract all the html from the string and replace the tags
with ''
"""

def extract_html(text):
    return re.sub('&lt;[^&lt;]+?&gt;', '', text)
```

Credit: https://openai.com/api/

What is ML?

Machine Learning: Allows machines to learn from examples/ data without explicit instructions

- A means of enabling Artificial Intelligence!

"Traditional" Coding:

- Write exact/ explicit instructions for a machine to perform specific tasks
- Example in chess: If the opponent moves their bishop, move your rook

ML:

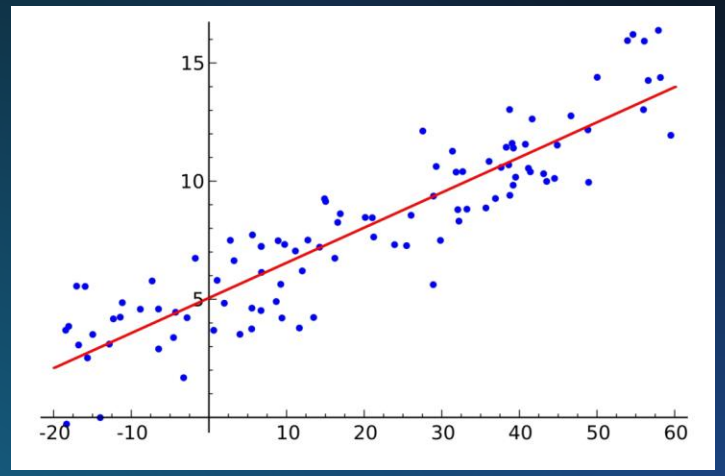
- Provide general examples to the machine
- The machine "learns" to perform tasks based on the given examples

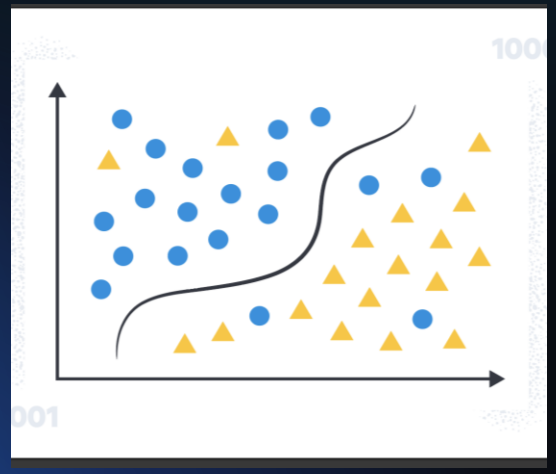
Credit: https://www.ibm.com/cloud/learn/what-is-artificial-intelligence

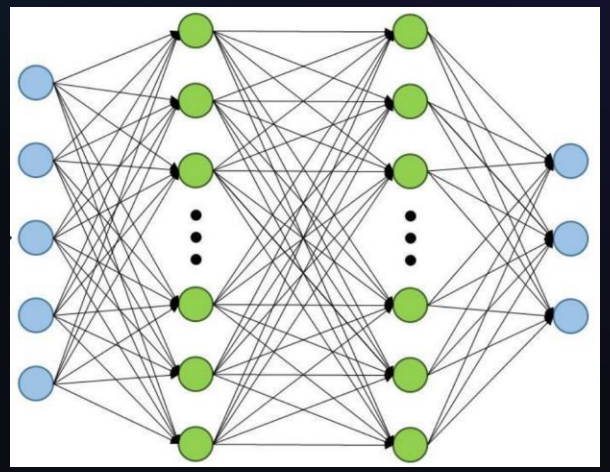
What is ML?

Machine Learning: Allows machines to learn from examples and data without explicit instructions

- Includes: Regression, Classification, Neural Networks etc..
- You've probably used it before!







Credit: https://www.ibm.com/cloud/learn/what-is-artificial-intelligence (Information)
https://www.elastic.co/guide/en/machine-learning/current/ml-dfa-classification.html (Classification)

What is ML?

There are 2 main types of Machine Learning: **Supervised** and **Unsupervised**

Supervised:

- Regression & Classification
- Uses "labeled" datasets: direct evaluation of accuracy
- The dataset "supervises" the model to predict or classify accurately
- Predicts on new data points

Unsupervised:

- Clustering, Association & Dimensionality Reduction
- Doesn't use "labeled" datasets
- Discovers hidden patterns in data without intervention: hence "unsupervised"

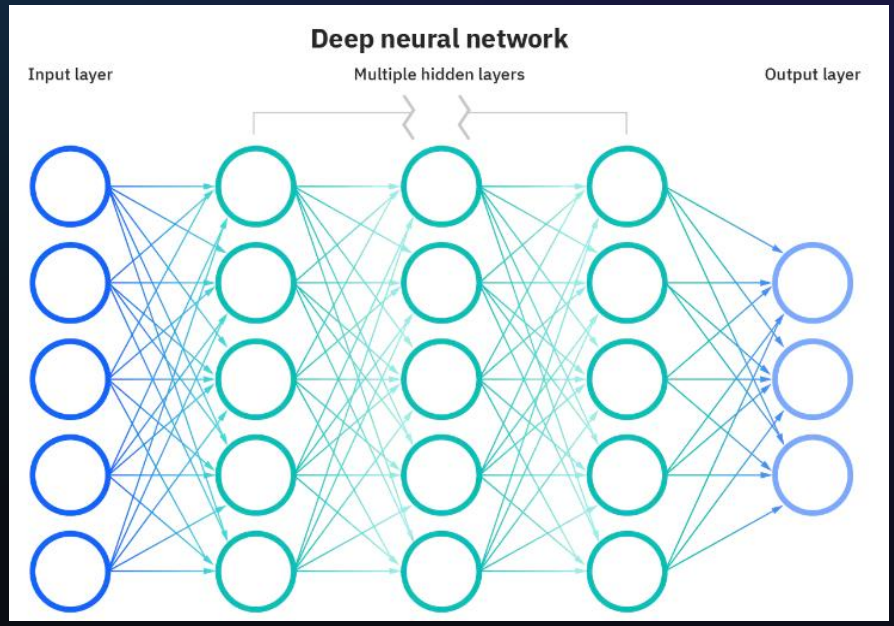
Credit: https://www.ibm.com/cloud/blog/supervised-vs-unsupervised-learning

What about DL?

Deep Learning is a sub-field of Machine Learning, comprising of "deep" neural networks

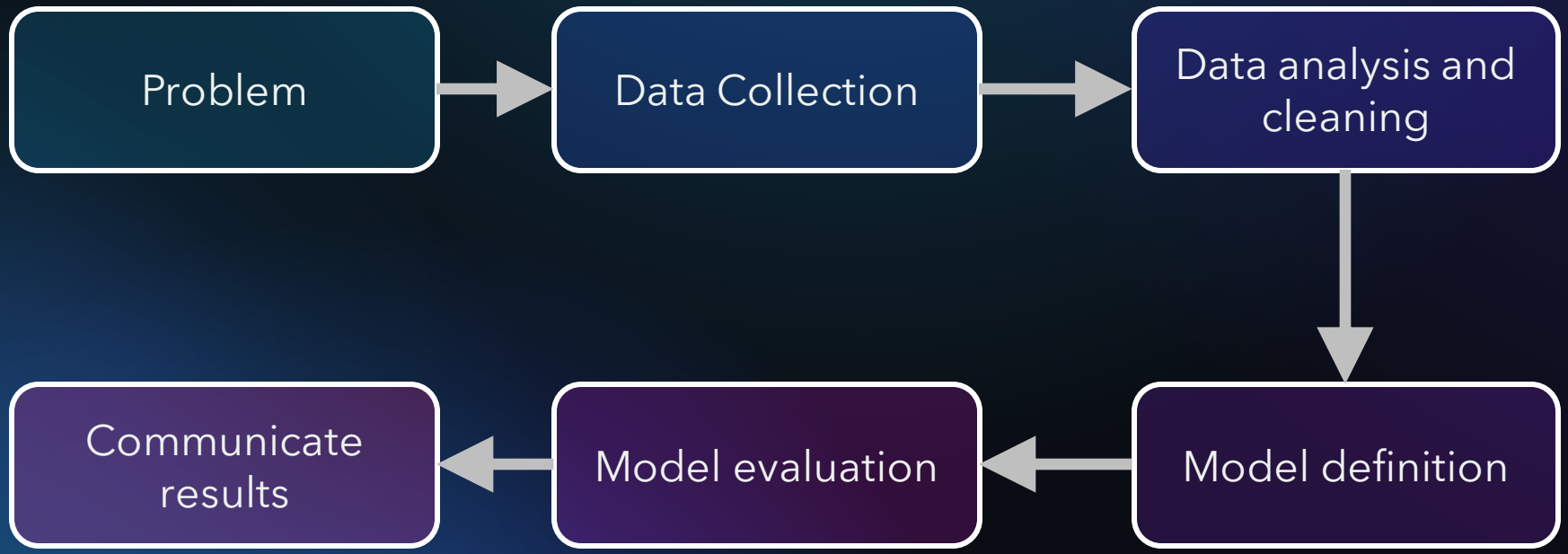
Deep Learning:

- Automates "feature extraction"
  - Process of transforming raw data into numerical features while preserving information from original dataset
- Reduces human intervention, allowing use of larger data sets and unstructured data
  - Scalable



Credit: https://www.ibm.com/uk-en/cloud/learn/machine-learning

Simple Project Pipeline



Credit: https://open-dse.github.io/new-venn-diagram/

Introduction to NumPy

NumPy stands for "Numerical Python"

- Contains functions for Linear Algebra, Fourier Transform and matrices
- Open Source and Free
- Partially written in Python but mostly written in C and C++ (FAST!)

The main component of NumPy are "**NumPy Arrays**"

- Similar to Python Lists but can perform calculations quicker
- Arrays are stored at one continuous place in memory (unlike lists)
    - Locality of reference

NumPy: Notebook

We will be using Google Colab!

- Or you can go to the ICDSS github > Lecture Series 2022-23 > L1 > Numpy_Basics.ipynb