Machine Learning

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Artificial Inelegance

- What's the AI ?
- The simulation of human intelligence by machines
- Why AI?

- What's the different between human and machine (the human ability) ?
- Think & act
- Emotional & Ratinal

"A year spent in artificial intelligence is enough to make one believe in God." Alan Perlis

AI applications

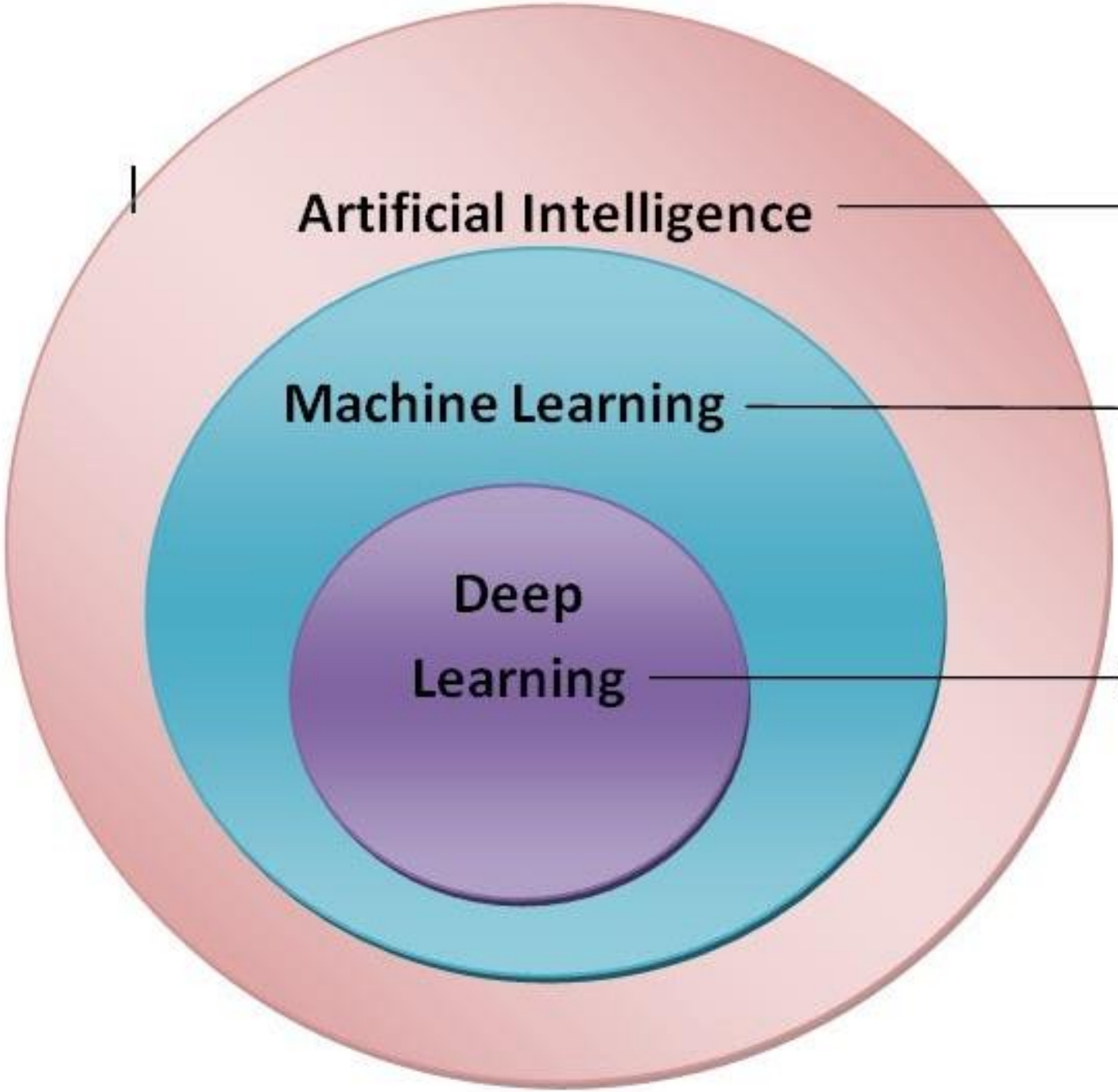
- **Computer Vision / Pattern Recognition**
  - Image Processing
  - Face Recognitions
  - Object Detection

- **Natural Language Processing (NLP)**
  - Natural Language understanding
  - Natural Language Generation
  - Machine translation
  - Sentiment Analysis

- **Speech Resonations**

- **Gaming**

- **Robot**



Ability of machine to imitate human intelligence

Algorithms to incorporate intelligence into machine by automatically learning from data

Algorithms that mimics human brain to incorporate intelligence into machine

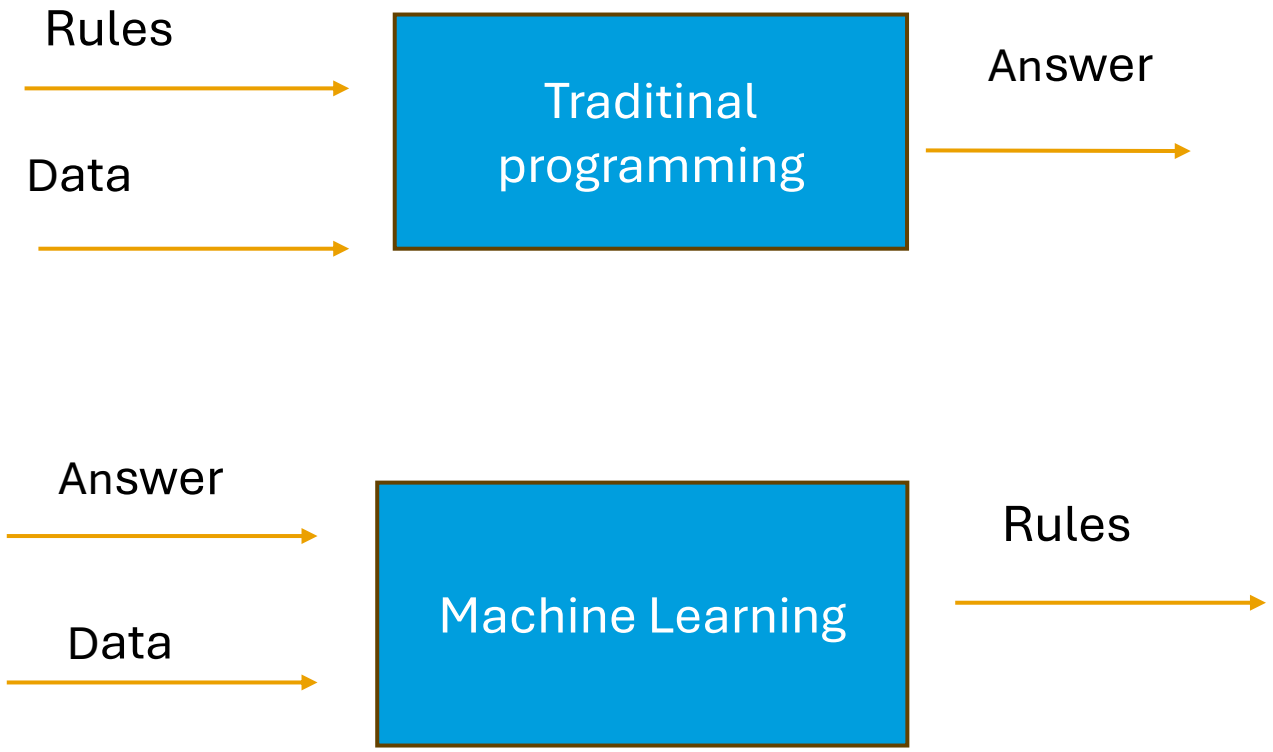
Machine Learning Basics:

- **What's the Machine Learning (ML)?**
- - ML anew way of programming(why?)
- ML is the art of programming machine to learn from data

- **ML applications :**
- Face recognition(smart phones)
- Self driving cars
- Google maps
- Email filtering (Gmail)
- Recommendation (Amazon)
- Personal Assistant

Machine Learning Definitions :

“ML is the field of study that gives computers the ability to learn without being explicitly programmed” ~ Arthur Samuel, 1959



Machine Learning Purpose

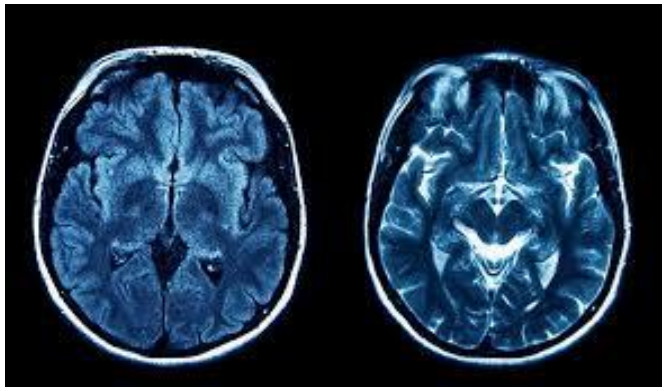
Categorization

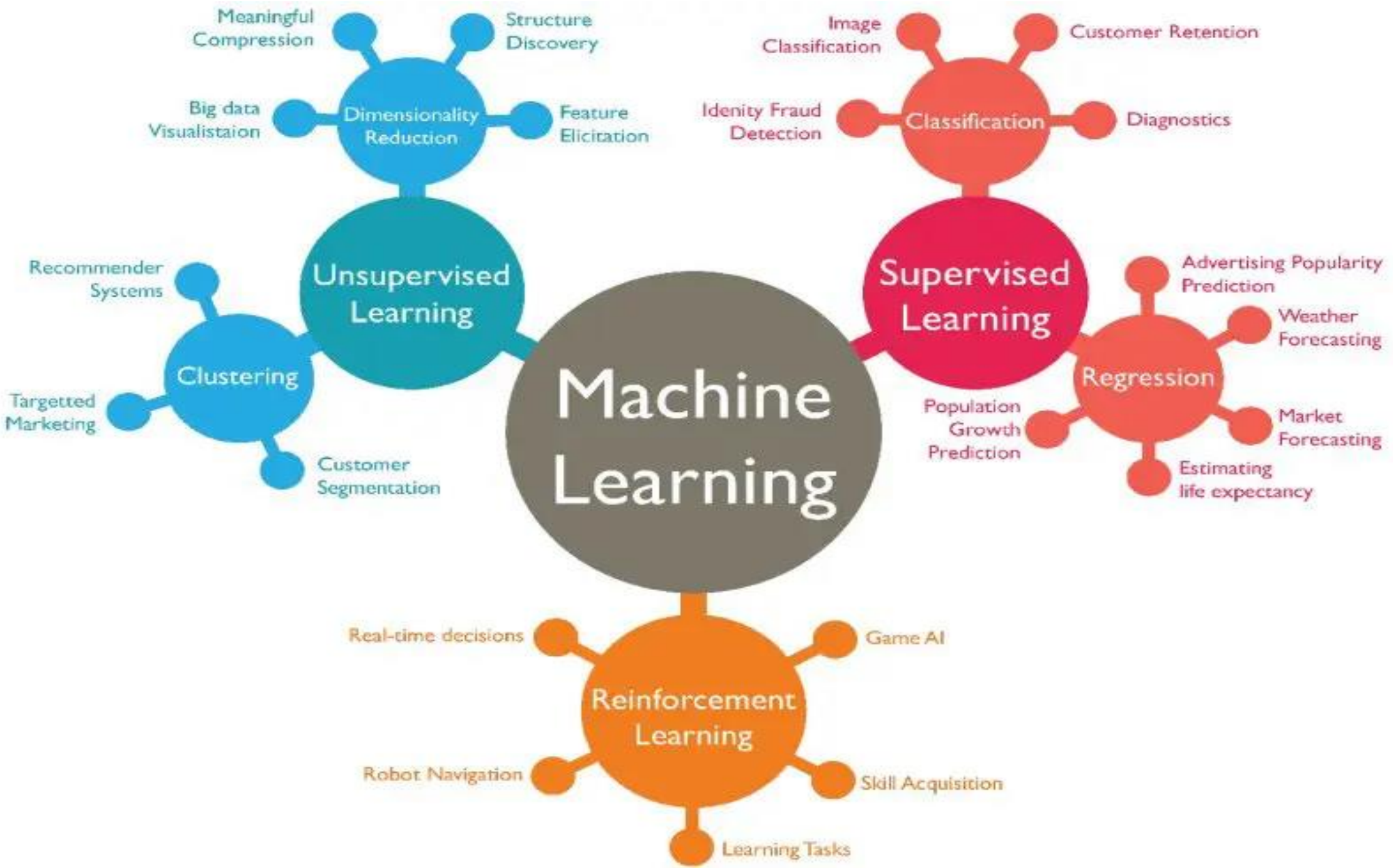
Prediction

Connections

Pattern

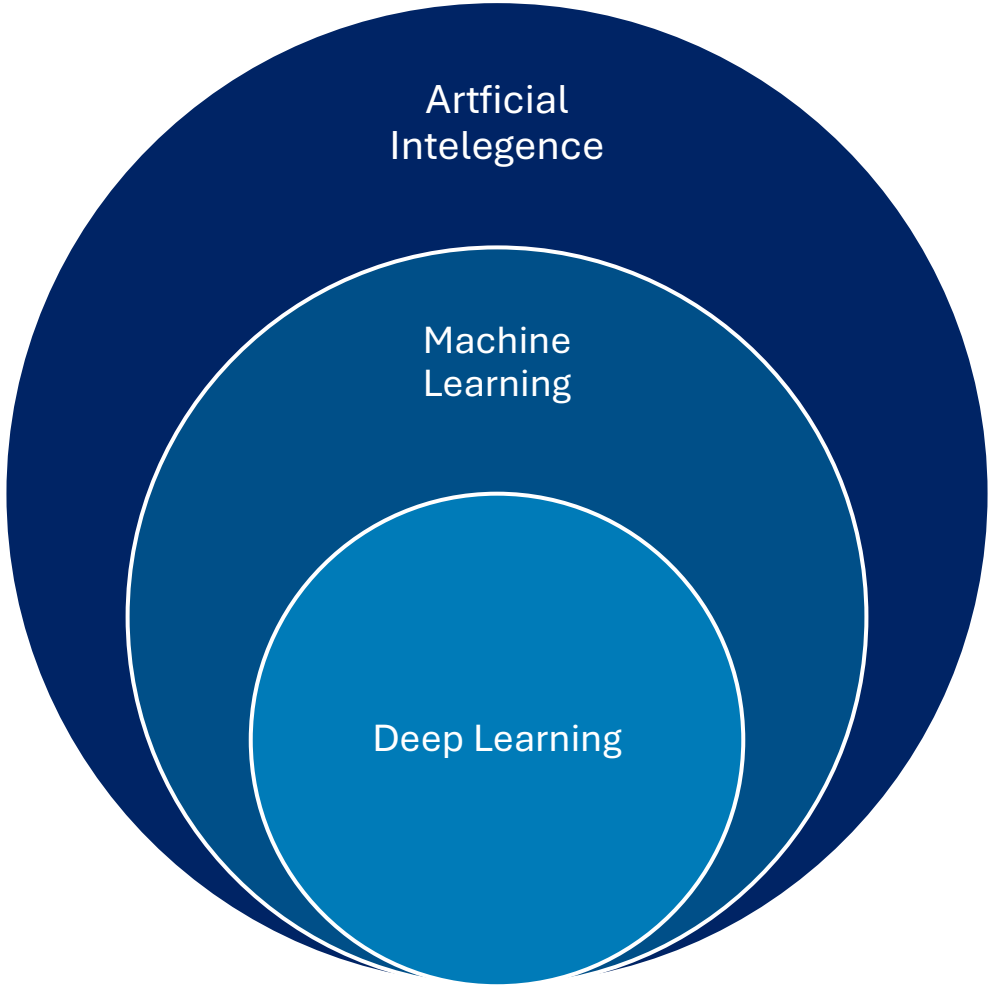
Unusual things



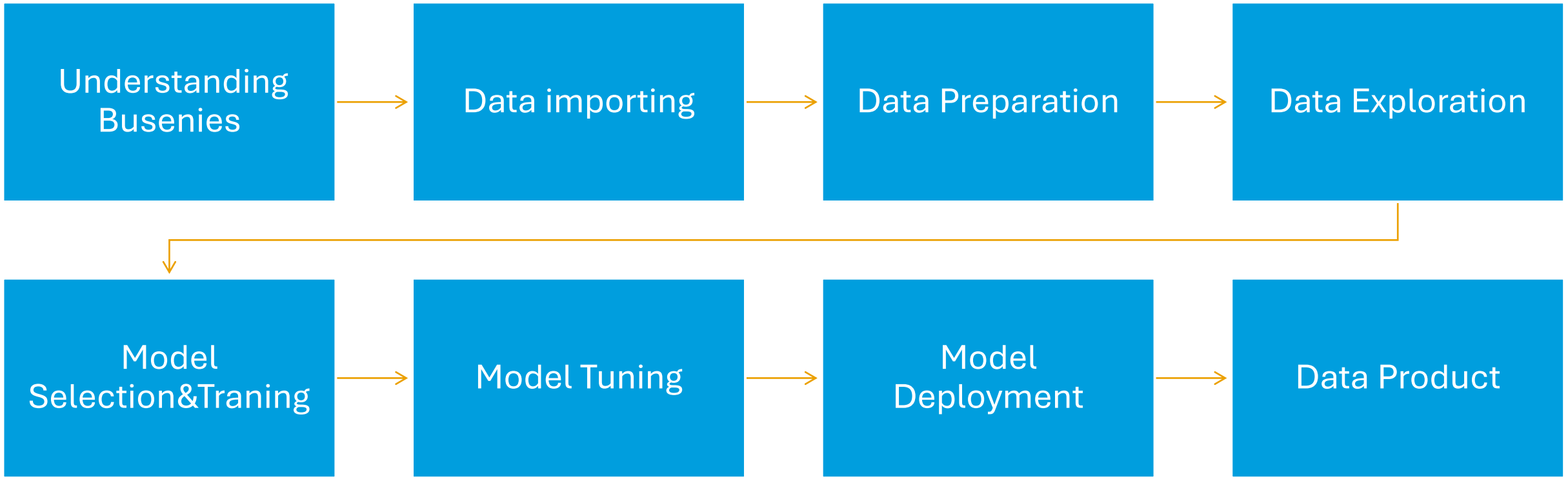

Machine Learning
Unsupervised Learning
Dimensionality Reduction
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Clustering
Recommender Systems
Targetted Marketing
Customer Segmentation
Supervised Learning
Classification
Image Classification
Customer Retention
Idenity Fraud Detection
Diagnostics
Regression
Advertising Popularity Prediction
Weather Forecasting
Population Growth Prediction
Market Forecasting
Estimating life expectancy
Reinforcement Learning
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks

AI vs. ML vs. DL

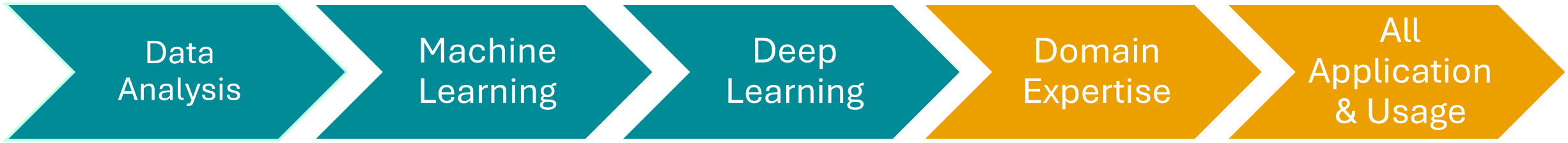
- Artificial Intelligence (AI) is an umbrella discipline that covers everything related to making machines smarter.
- Machine Learning (ML) is commonly used along with AI but it is a subset of AI. ML refers to an AI system that can self-learn based on the algorithm. Systems that get smarter and smarter over time without human intervention is ML.
- Deep Learning (DL) is a machine learning (ML) applied to large data sets. Most AI work involves ML because intelligent behavior requires considerable knowledge.



End-to-End Machine Learning Project



Data Scinece Road-Map



Data Visualization •Data Importing •Data Pre-processing •Time-series Analysis •Reporting & Dashboards

Classification •Regression •Unsupervised Learning •Clustering •Model Selection & Evaluatio

Artificial Neural Networks •ANN Architectures •CNN •RNN

•Business •Marketing •Engineering •Health-care •Agriculture •Banking & Finance •Etc.

•NLP •Recommender Systems •Time-series Forecasting •Computer Vision •Anomaly Detection •Speech Recognition •Etc.

Algorithm vs. Model (1)

ML Algorithm

- An “algorithm” in machine learning is a procedure that is run on data to create a machine learning “model.”
  - Linear Regression, Logistic Regression, Decision Tree, .. Etc.

ML Model

- A “model” in machine learning is the output of a machine learning algorithm run on data.
  - Machine Learning Model = Model Data + Prediction Algorithm

ML Applications / Examples

Supervised Learning

• Determining whether a tumor is benign based on a medical image .

• Forecasting your company's revenue next year, based on many performance metrics.

•Identifying the zip code from handwritten digits on an envelope.

• Creating a chatbot

• Making your app react to voice commands

Unsupervised Learning

• Identifying topics in a set of blog posts.

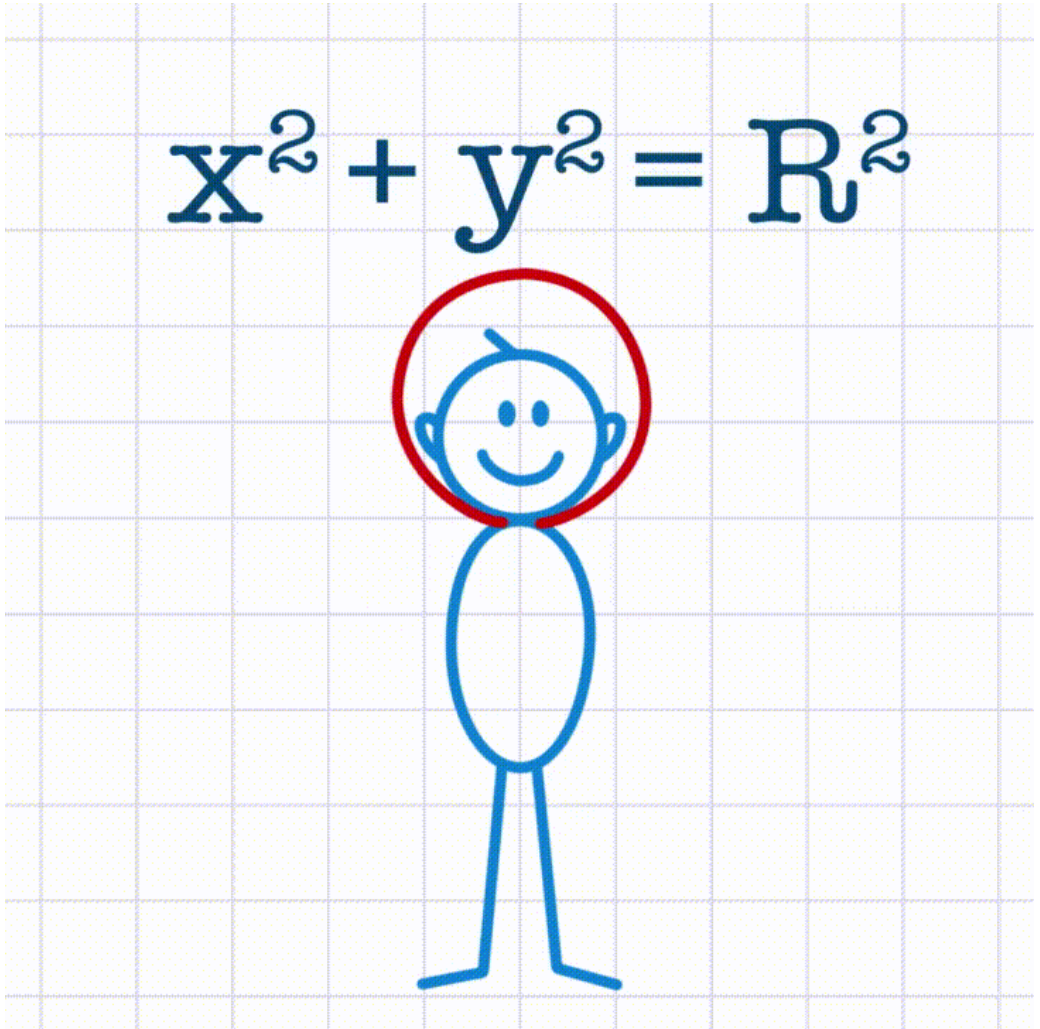
• Segmenting customers into groups with similar preferences.

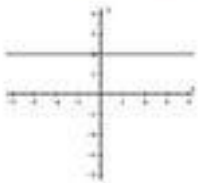
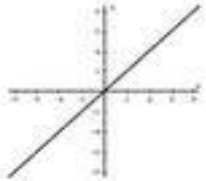
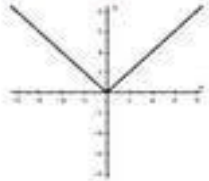
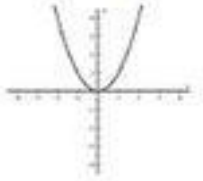
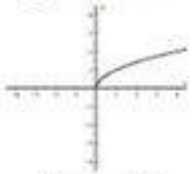
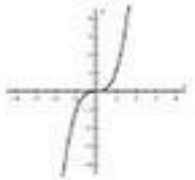
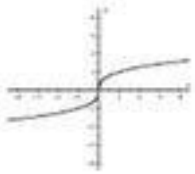
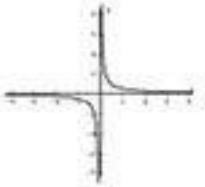
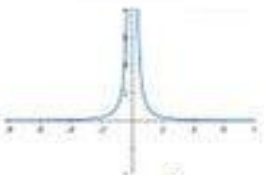
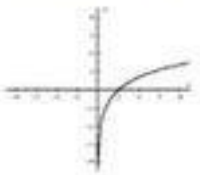
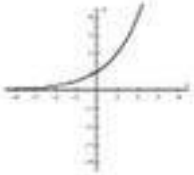
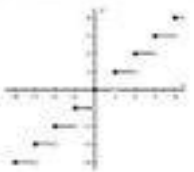
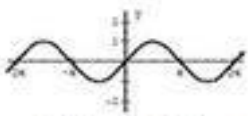
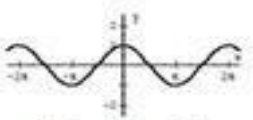
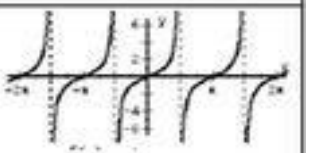
• Detecting abnormal access patterns to a website.

• Detecting fraudulent activity in credit card transactions

• Representing a complex dataset in a clear and insightful diagram

Mathematical Models



Constant  $f(x) = c$	Linear  $f(x) = x$	Absolute Value  $f(x) = \lvert x \rvert$	Quadratic  $f(x) = x^2$
Square Root  $f(x) = \sqrt{x}$	Cubic  $f(x) = x^3$	Cube Root  $f(x) = \sqrt[3]{x}$	Reciprocal/Inverse/ Rational  $f(x) = \frac{1}{x}$
Rational  $f(x) = \frac{1}{x^2}$	Logarithmic  $f(x) = \ln(x)$	Exponential  $f(x) = e^x$	Greatest Integer (Step Function)  $f(x) = [[x]]$
Trigonometric Functions →	 $f(x) = \sin(x)$	 $f(x) = \cos(x)$	 $f(x) = \tan(x)$