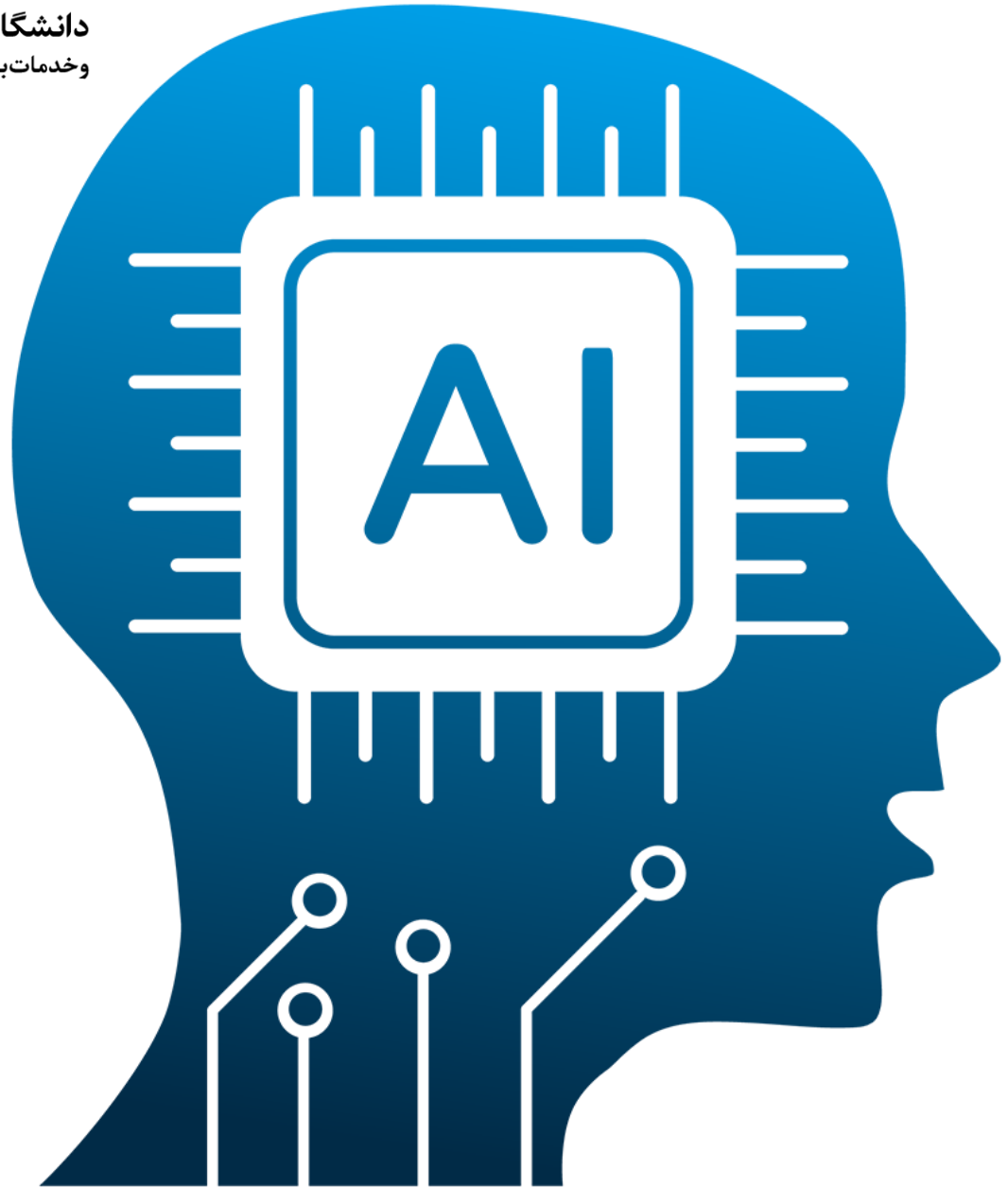
به نام خدا

دانشگاه علوم پزشکی
وخدمات بهداشتی درمانی کرمان

دانشگاه علوم پزشکی کرمان
شورای عالی هوش مصنوعی

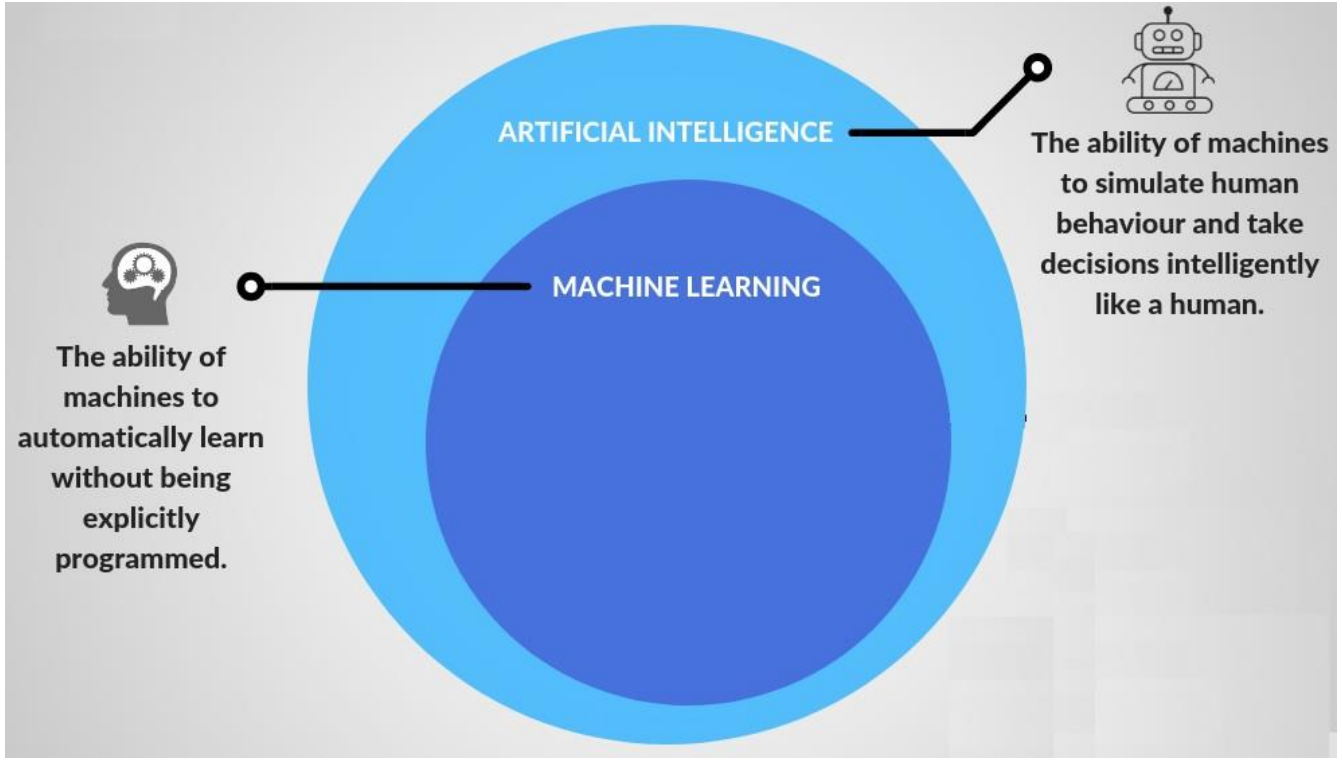


AI in Health

Nabizadeh

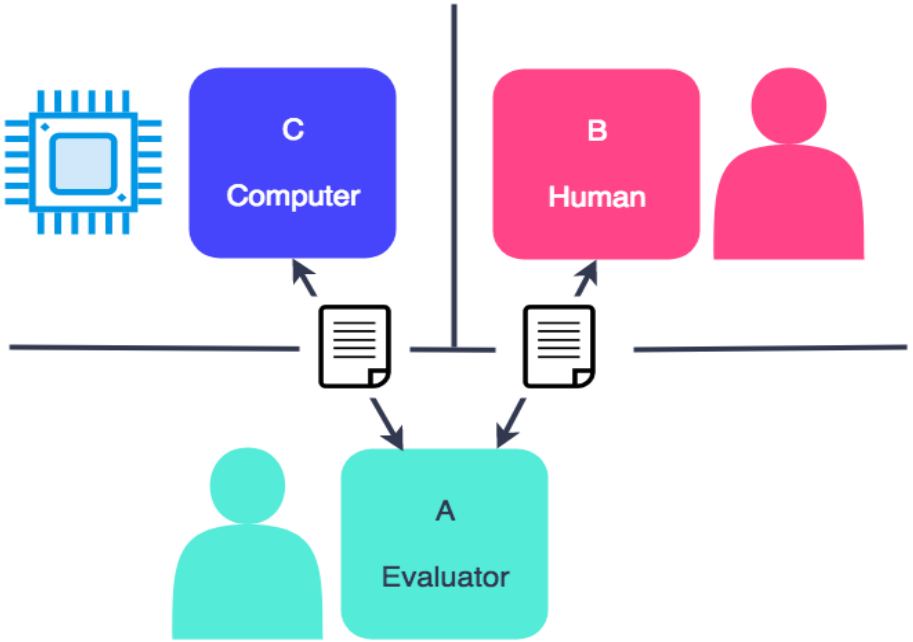
What are AI & ML?

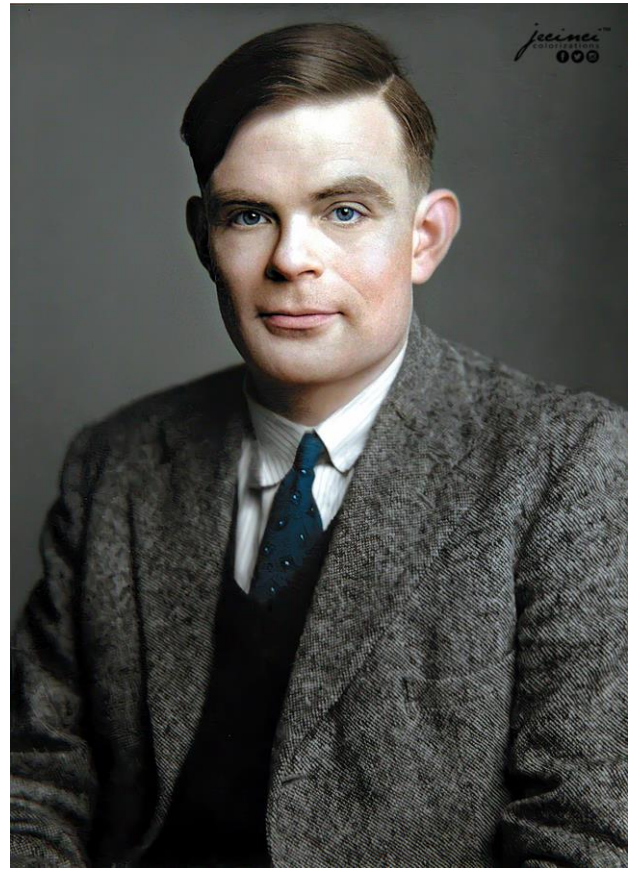
- Machine Learning (ML) a sub-set of Artificial Intelligence.
- Computer algorithms that improve automatically through experience.



When?

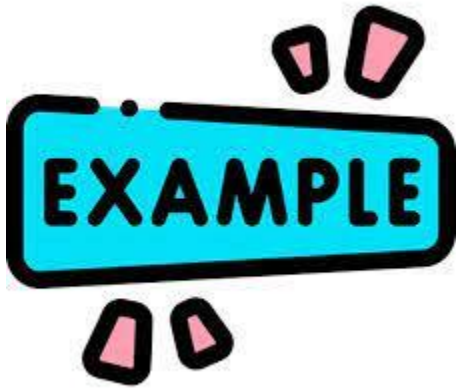
- Alan Turing – 1950
- Turing Test (Imitation Game)
- Predict if a machine is able to think like a human





How Does It Work?

Learning From



Example

Detect an Asian face.

Example

Detect an Asian face.

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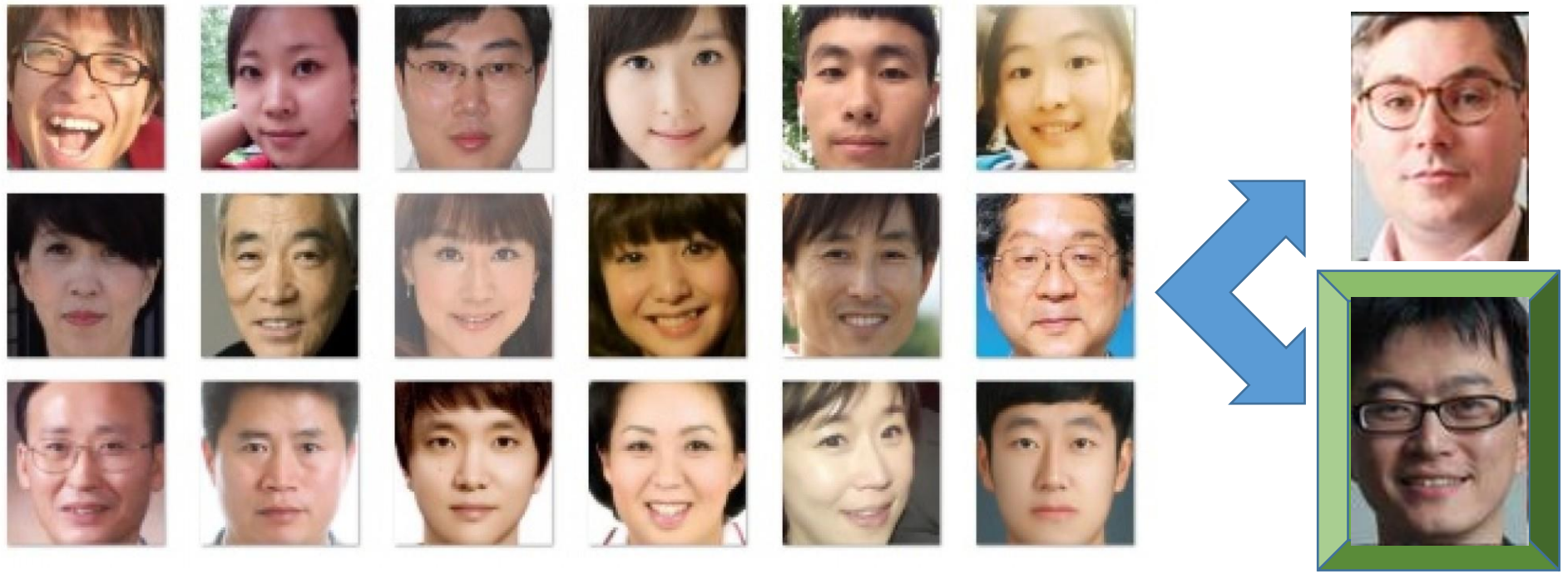
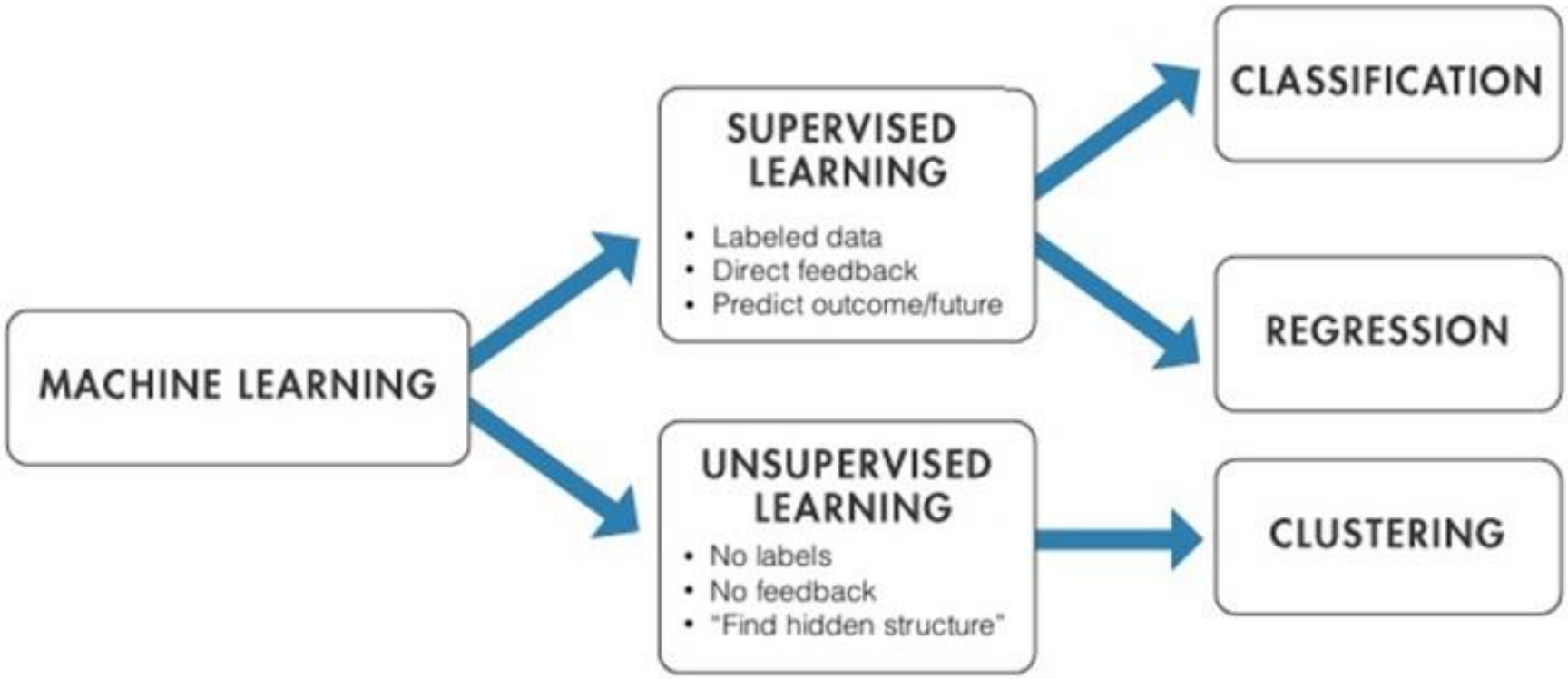


Algorithms


MACHINE LEARNING
SUPERVISED LEARNING
• Labeled data
• Direct feedback
• Predict outcome/future
UNSUPERVISED LEARNING
• No labels
• No feedback
• "Find hidden structure"
CLASSIFICATION
REGRESSION
CLUSTERING

Supervised Algorithms

- Main Goal: Developing a finely tuned predictor.

- “Learning” consists of using complex mathematical algorithms to optimize a function, given input data $\underline{x}$, it will accurately predict some interesting value.

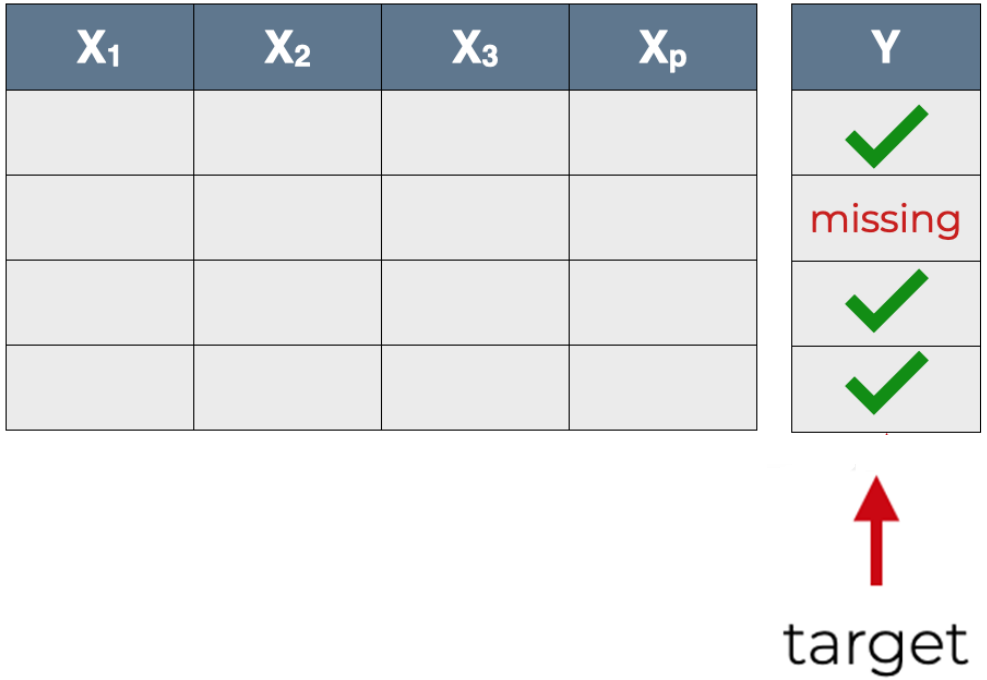
  - ✓Random Forest
  - ✓Bayes Network
  - ✓Neural Network

- $\underline{x}$ represents multiple data points.

Example

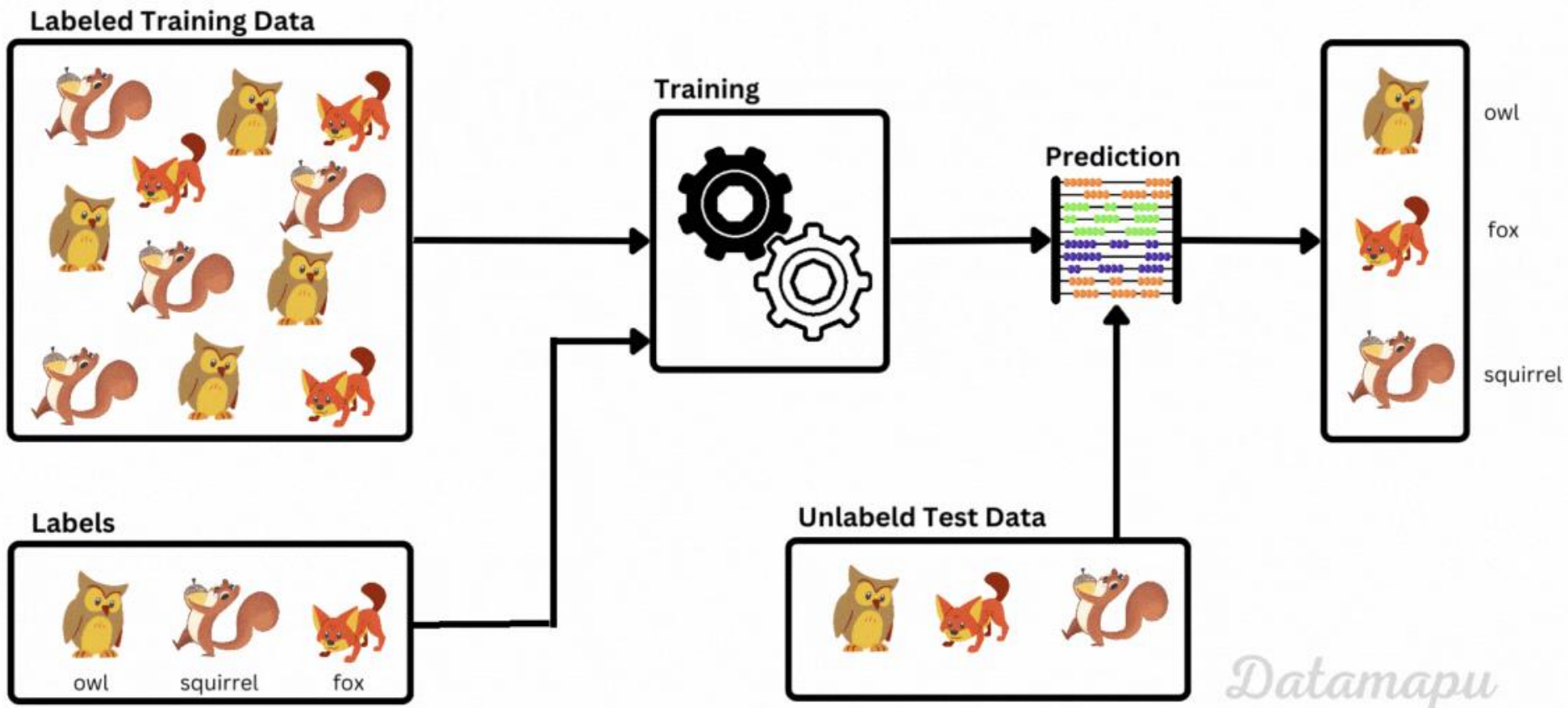
Housing price predictor

- X1: Square-footage
- X2: Number of bedrooms
- X3: Number of bathrooms
- X4: Number of floors
- X5: Year built
- X6: Zip code



What else?

Supervised Learning

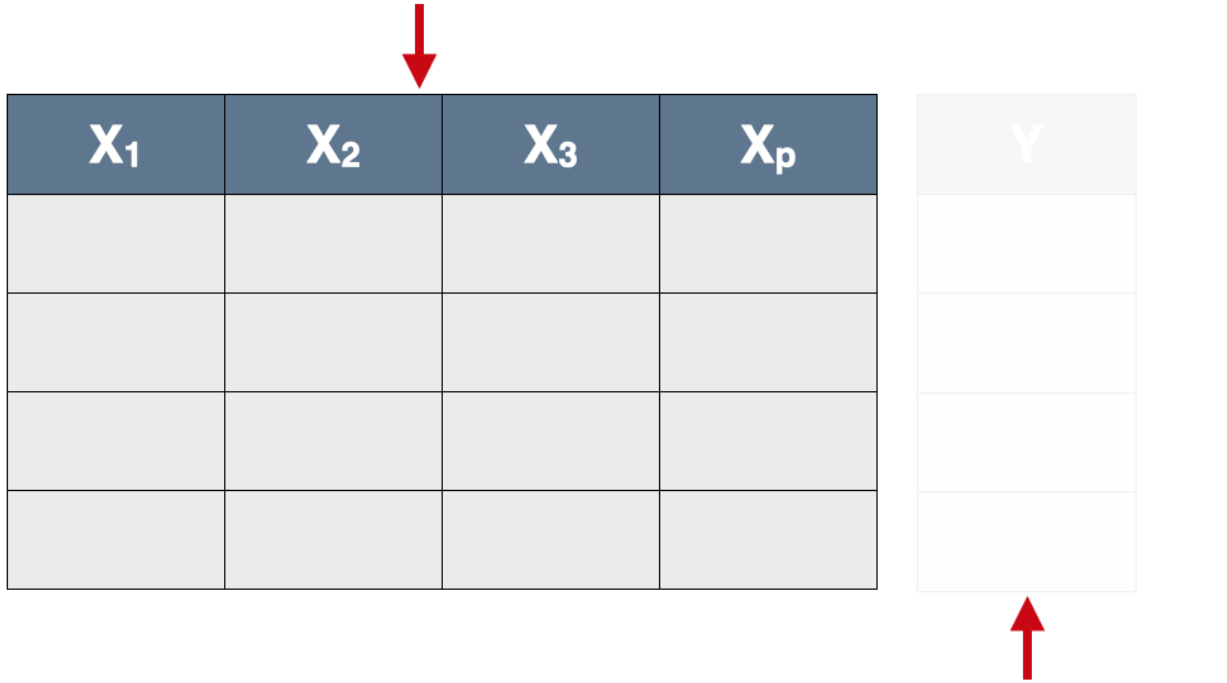


Unsupervised Algorithms

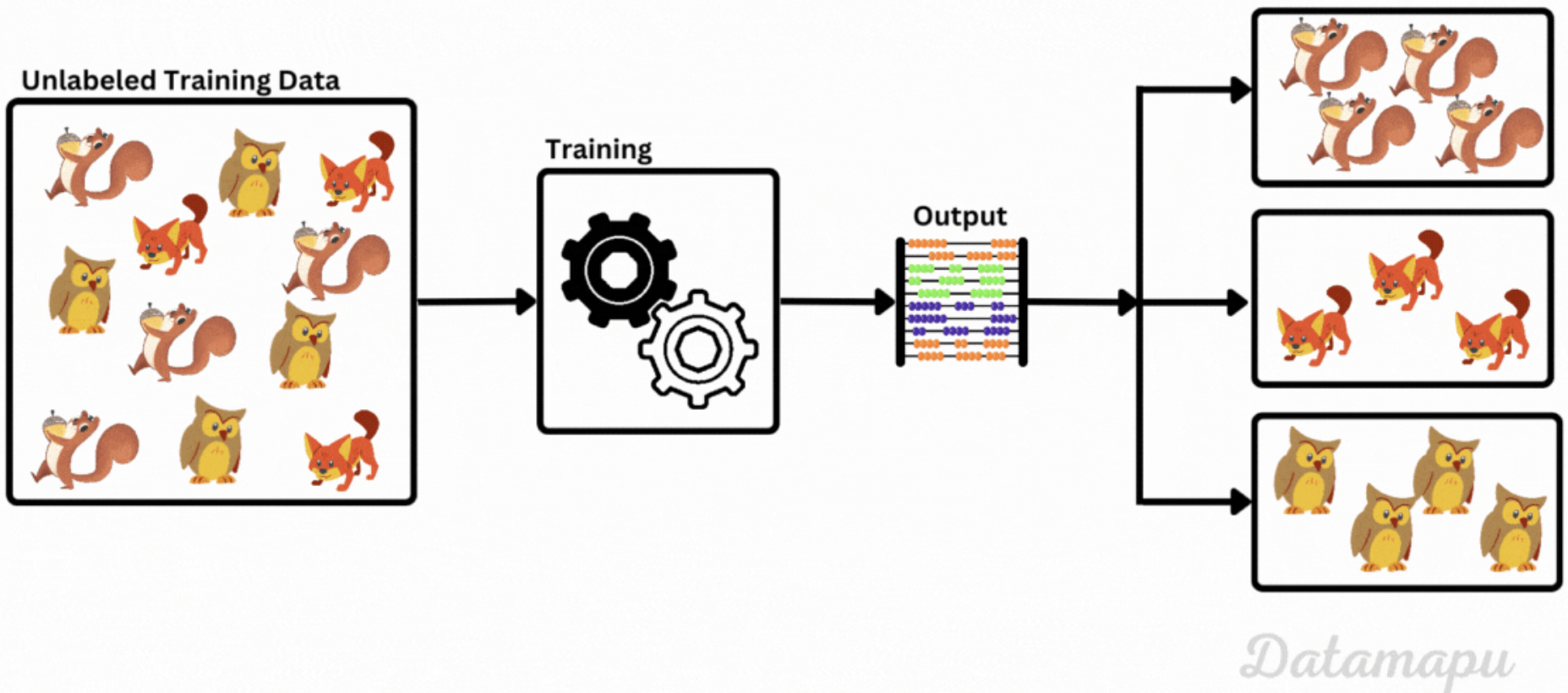
- Main Goal: Finding relationships within data.
- An algorithm is given a set data and tasked with finding patterns and correlations therein.
  - ✓K-means
  - ✓Hierarchical Clustering
- Example: Identifying close-knit groups of friends in social network data.

Example

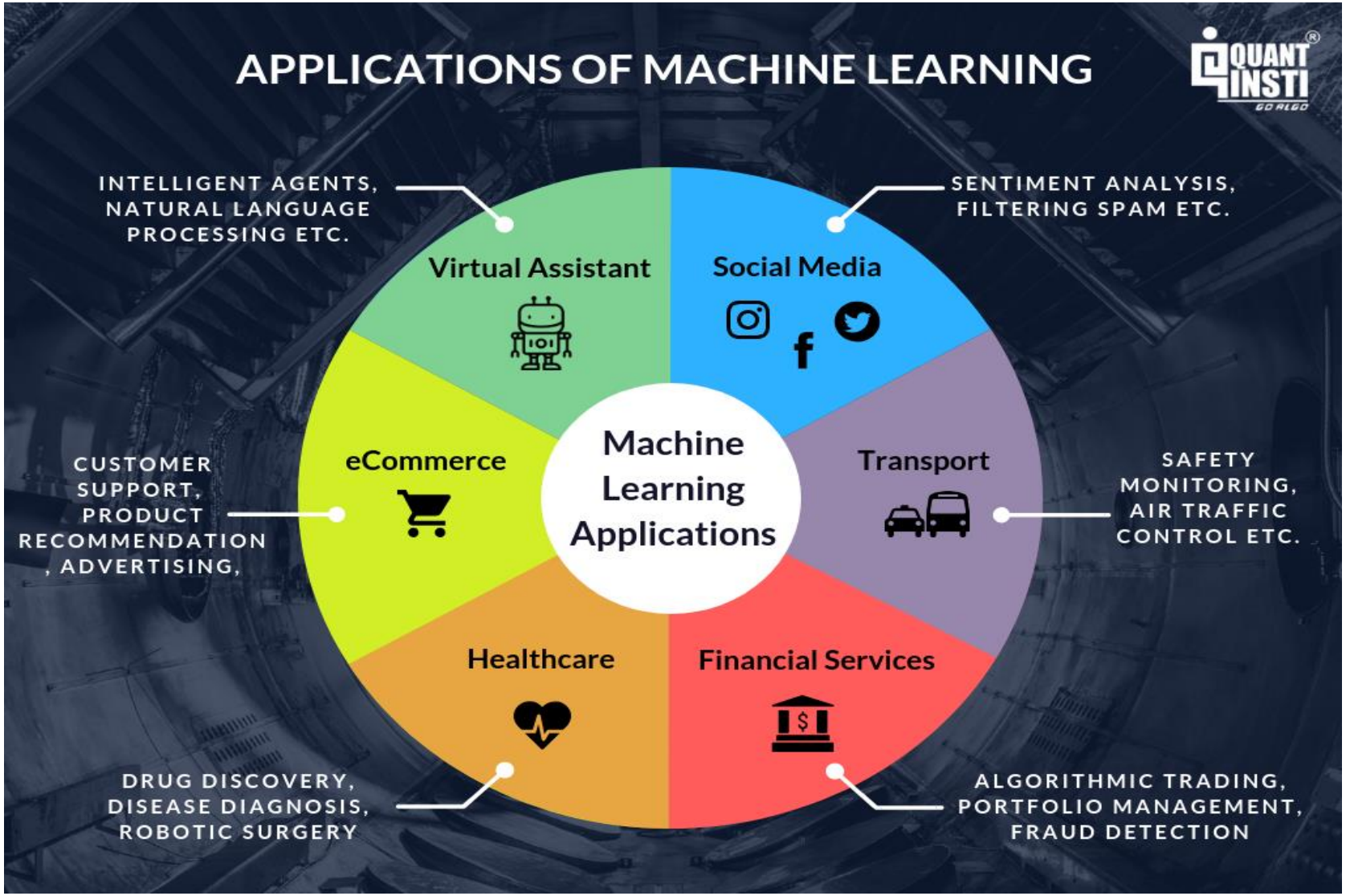
In unsupervised learning,
there *is* a set of input variables



Unsupervised Learning



Applications

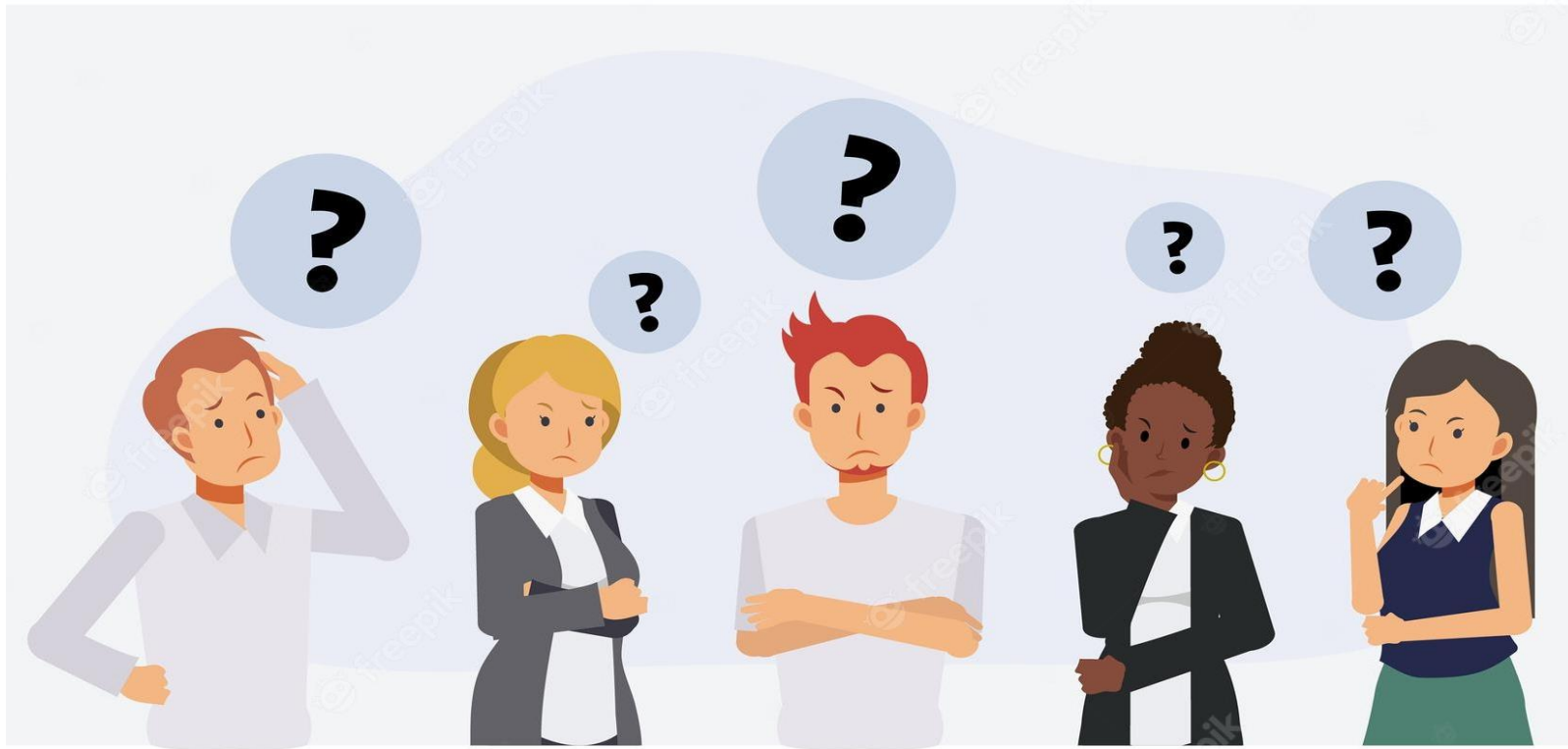


AI in Healthcare

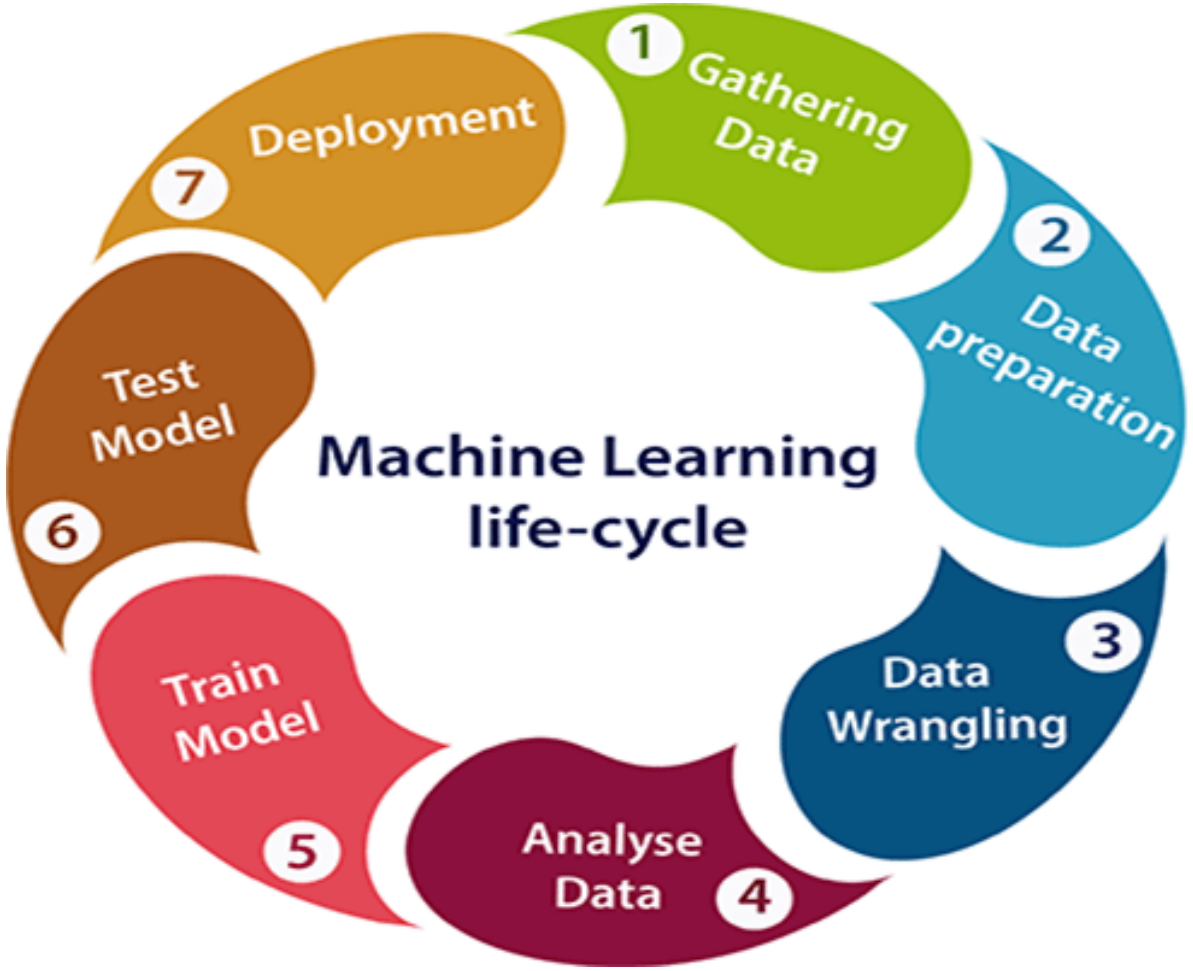
- Disease Identification and Diagnosis.
- Drug Discovery and Manufacturing.
- Medical Imaging.
- Personalized Medicine/Treatment.
- Smart Health Records.
- Disease Prediction.
- Clinical Decision Support Systems.

Ha???

How to Start??



Project Life Cycle

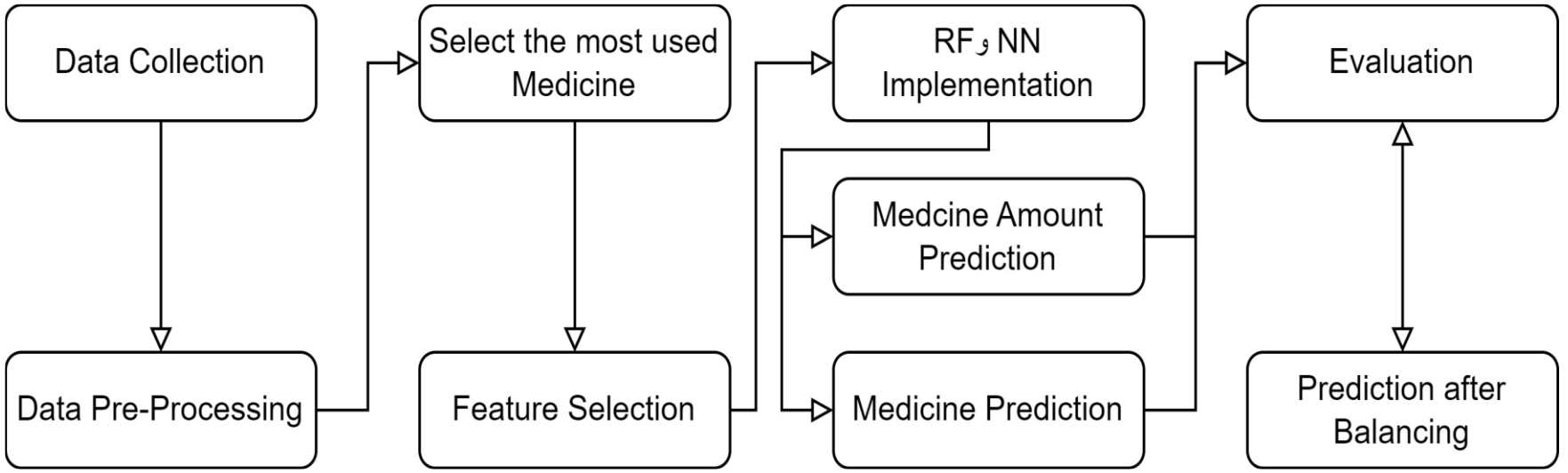


PROJECT @ KMU

Project

Predicting Pharmaceutical Requirement of High-Consumption Medicine of a Hospital

Research Methodology



Steps

1. Receive Ethical Code and Data: 8 months!

2. Receive Data
   - Three years – 2018 to 20 (97 to 99)
   - 283 features, including patients' demographic features,

     admission date, prescribed medicine, prescribed volume,…

Steps

3. Generating Dataset

Year	# Admission	# Different Medicine	# Prescribed Medicine	# Records
2018	48012	4032	4063539	2132075
2019	45171	4066	3994663	2231849
2020	28507	3467	4235229	2029816
Total	121690	9351	12293431	6393740

4. Pre-Processing Step

- Remove Null.
- Remove Repeated variables
- Modify the negative value for the prescribed volume.
- Remove admissions having no dates

Steps

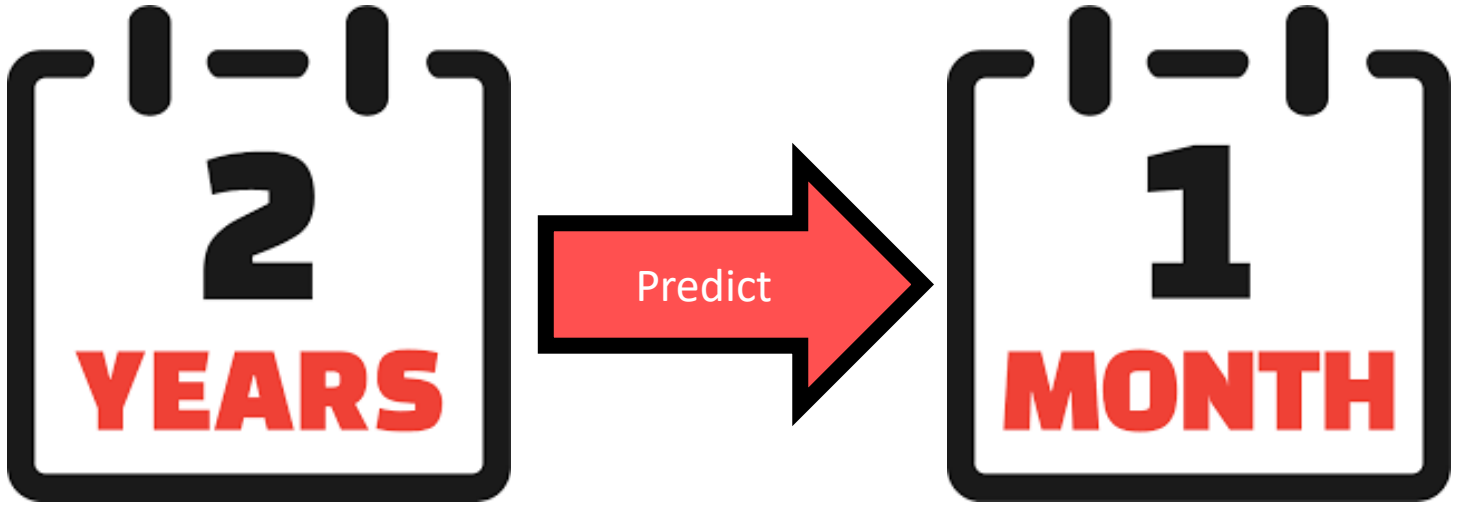
5. Find the most prescribed medicine

Medicine	Amount	ID01	ID02	ID03	ID04	ID05	ID06
Dextrose chlorsodium serum 0.3\% injection 0.5 liters	178025	65165	53607	54922	65031	52363	-
Sodium chloride serum injection bottle/0.9\%/0.5 liter	177304	42870	52384	54345	46789	65004	56707
Sodium heparin/ampoule/5000 units/1 liter	128955	51857	55200	53788	56339	-	-
Clindamycin Phosphate/Ampoule/300mg/2ml	89876	51844	46009	55275	-	-	-
Vancomycin/vial/500 mg	58411	56543	48179	-	-	-	-
Dexamethasone/ampoule/8mg/2ml	57110	65019	51847	-	-	-	-
Pantazol vial / 40 mg	50976	47138	-	-	-	-	-
Ceftriaxone/vial/1 gram	50264	45785	51841	-	-	-	-
Calcium gluconate/ ampoule/ 10\%	31634	56200	-	-	-	-	-
Potassium chloride/ampoule/10 ml	29935	57379	-	-	-	-	-
Naloxone/ampoule/0.4mg/1ml	29352	56354	-	-	-	-	-
Azithromycin/capsule/250 mg	27688	56221	-	-	-	-	-
Calcium carbonate/pill/500 mg	27028	56178	-	-	-	-	-
Pantoprazole/pill/40 mg	26972	43079	-	-	-	-	-
Sodium chloride serum bottle/injection/0.4\%/0.5 liter	26117	51921	-	-	-	-	-
Famotidine/pill/40 mg	22600	64620	-	-	-	-	-
Furosemide/ampoule/20 mg/2 ml	22187	46813	-	-	-	-	-
Prednisolone/pill/5 mg	22026	47310	-	-	-	-	-
Ciprofloxacin/bag/200mg/100ml	21251	46524	-	-	-	-	-
Ranitidine/ampoule/50 mg	19657	46831	-	-	-	-	-

Steps

6. Feature selection
    - Remove Constants.
    - Using Feature Selection Alg. (Boruta).
7. Prediction Algorithms (RF and NN)
    - Predicting medicine.
    - Predicting medicine amount.
9. Evaluation via confusion matrix (Accuracy, Precision,….)
10. Class balancing using SMOTE.

Final Results



Random Forest

83.3%

Final Notes

- We do not have something as the best model.
- AI/ML models are highly data dependent.

WHAT TO DO?

- Understand your data first.
- Always visualize the results which help understanding them.
- If possible, try with various datasets.

”Artificial Intelligence will be part of our future. It’s inevitable.”

Sundar Pichai

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