



W E L C O M E

MACHINE LEARNING WORKSHOP-I

With
AI Bangladesh

Presented By
Kanchon Gharami

SESSION CONTENT

Concepts
Of
ML & AI

Machine Learning
**PROJECT
PIPELINE**

Hands on
Coding!



ML vs Traditional Programming,
ML classifications, Uses



Steps Involved with ML
Projects with example



Basic Cricketer Classification
Project

What is ML and AI?

Machine Learning

Process of
Observing Similarities

Acquisition of
Knowledge & Experience

Artificial Intelligence

Ability of
Detect Pattern

Dynamic
Decision Making

How Machine Can Learn?

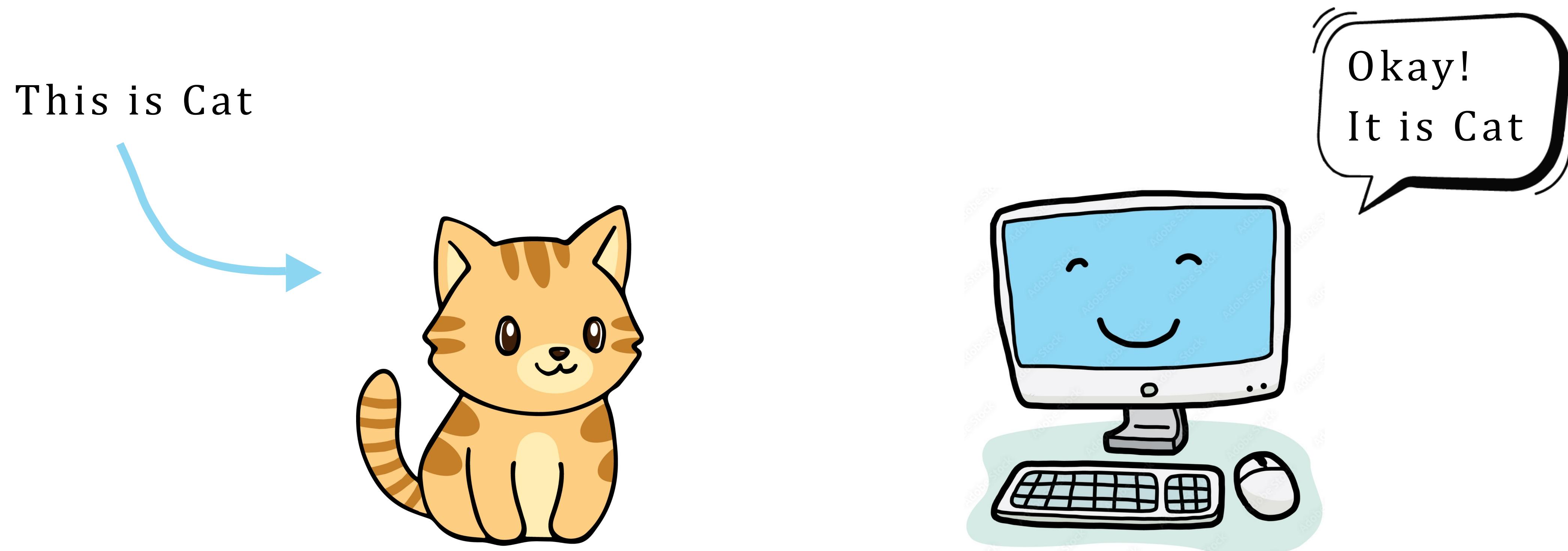


Figure: Training

How Machine Can Learn?

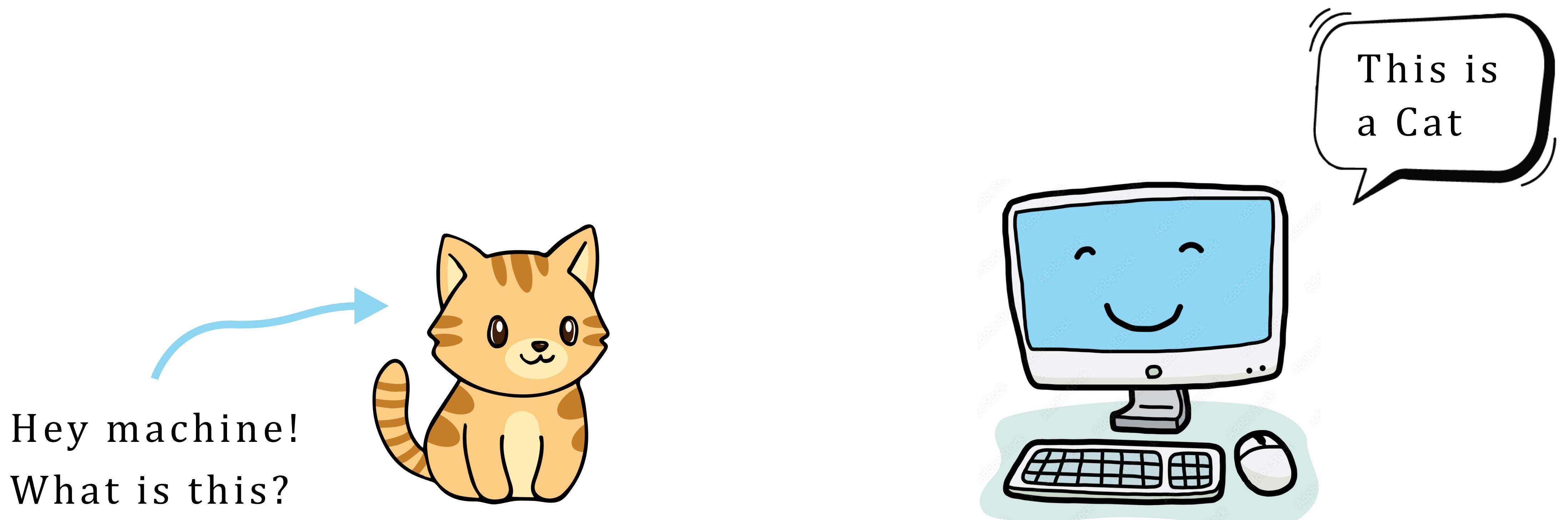


Figure: Testing

How Machine Can Learn?

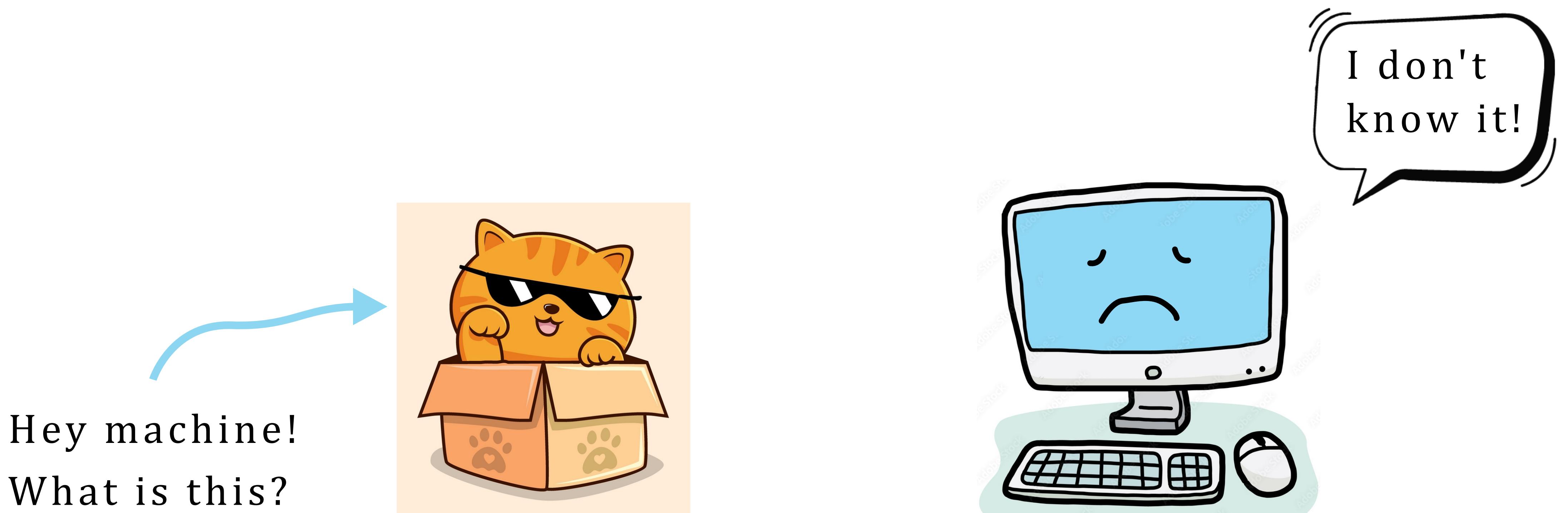


Figure: Testing 2

How Machine Can Learn?

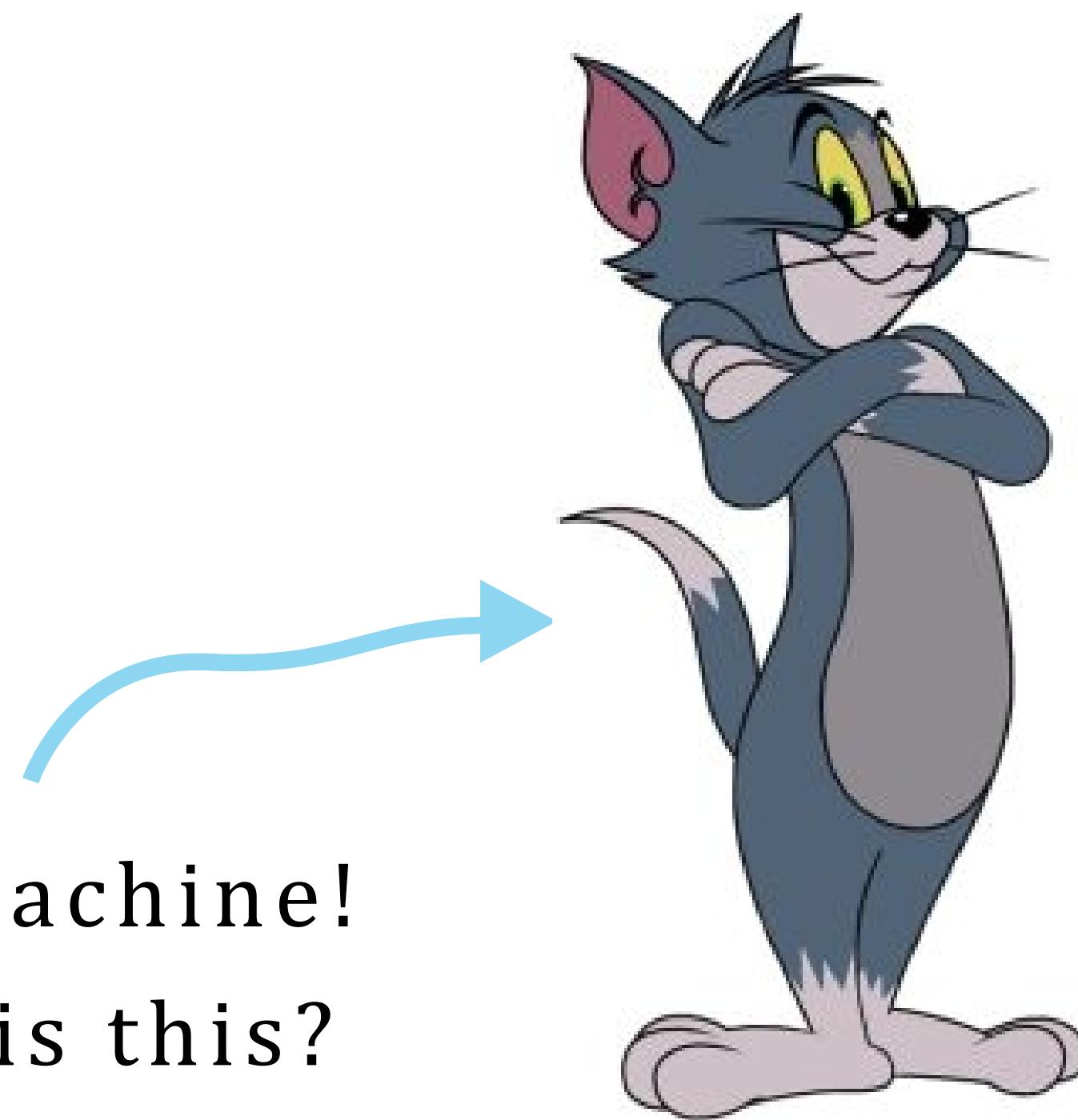


These all are cats.
Learn from it!



Figure: Training with huge data

How Machine Can Learn?



Hey machine!
What is this?

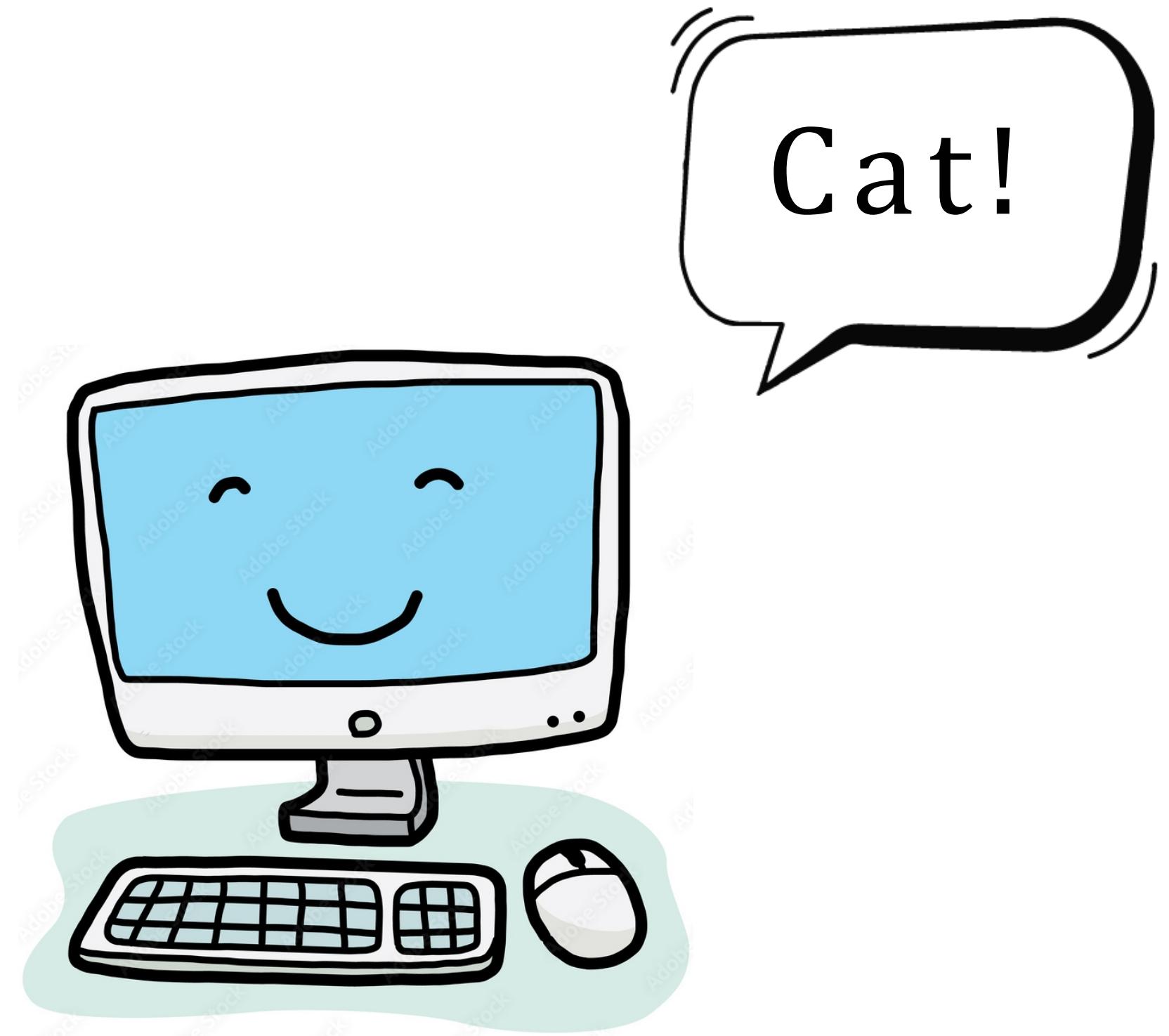
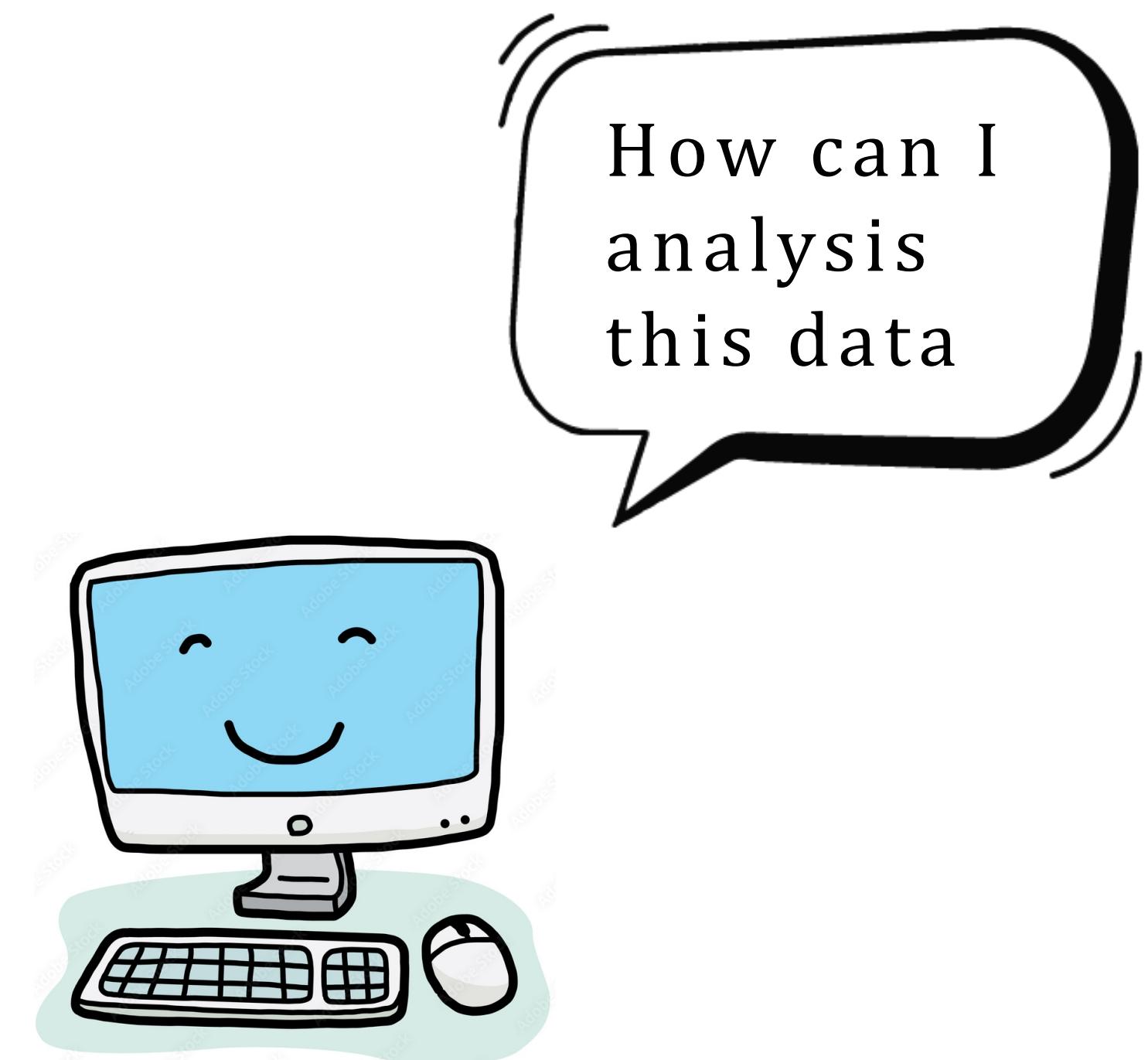


Figure: Testing

How Machine Analyze The Patterns?

Table-1: Records of air humidity, speed and rain status of that day

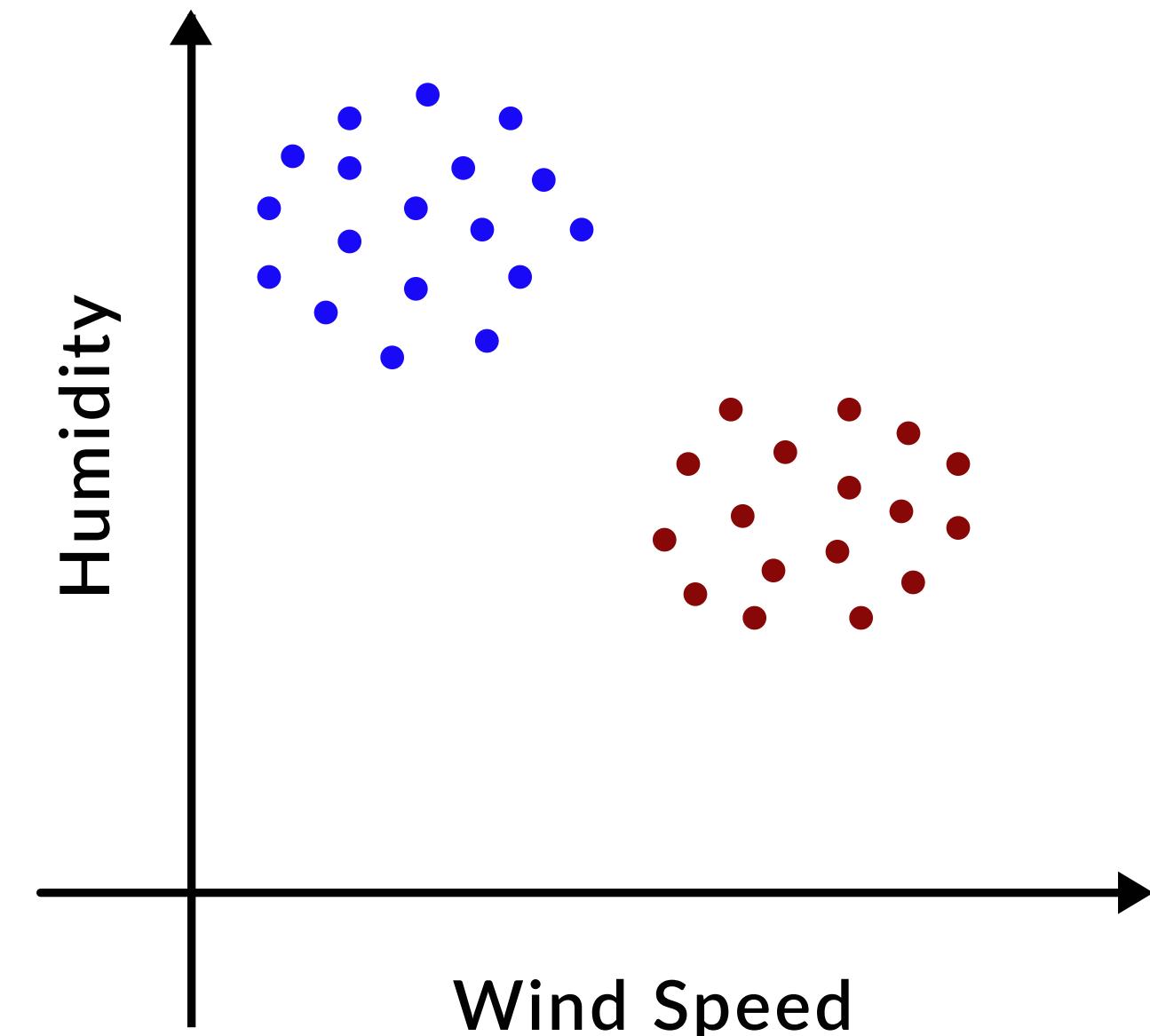
Day	Humidity in air (%)	Wind Speed (km/h)	Rainning
1	92	6	Yes
2	45	10	No
3	61	15	No
4	85	4	Yes
5	50	12	No



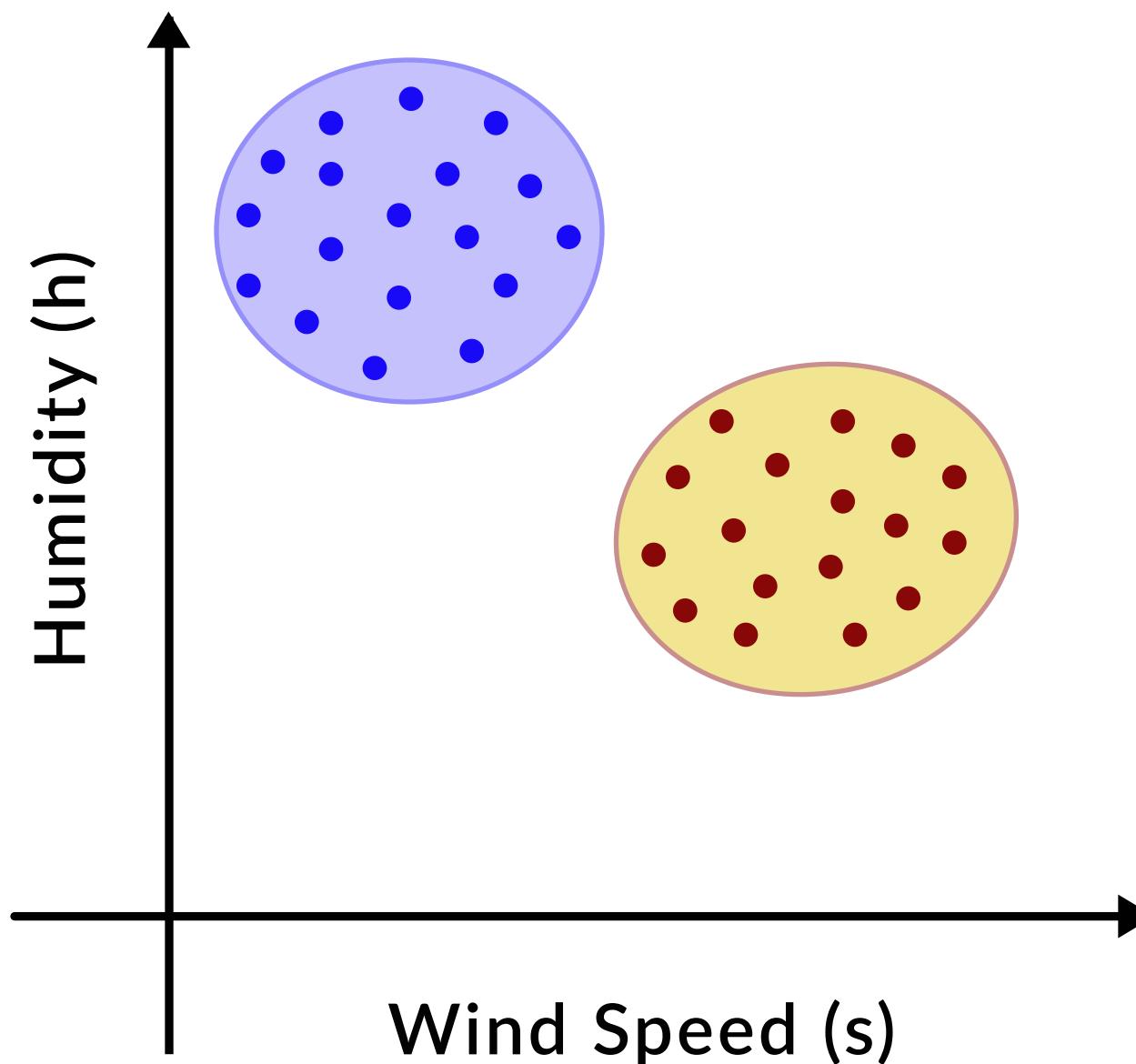
How Machine Analyze The Patterns?

Table-1: Records of air humidity, speed and rain status of that day

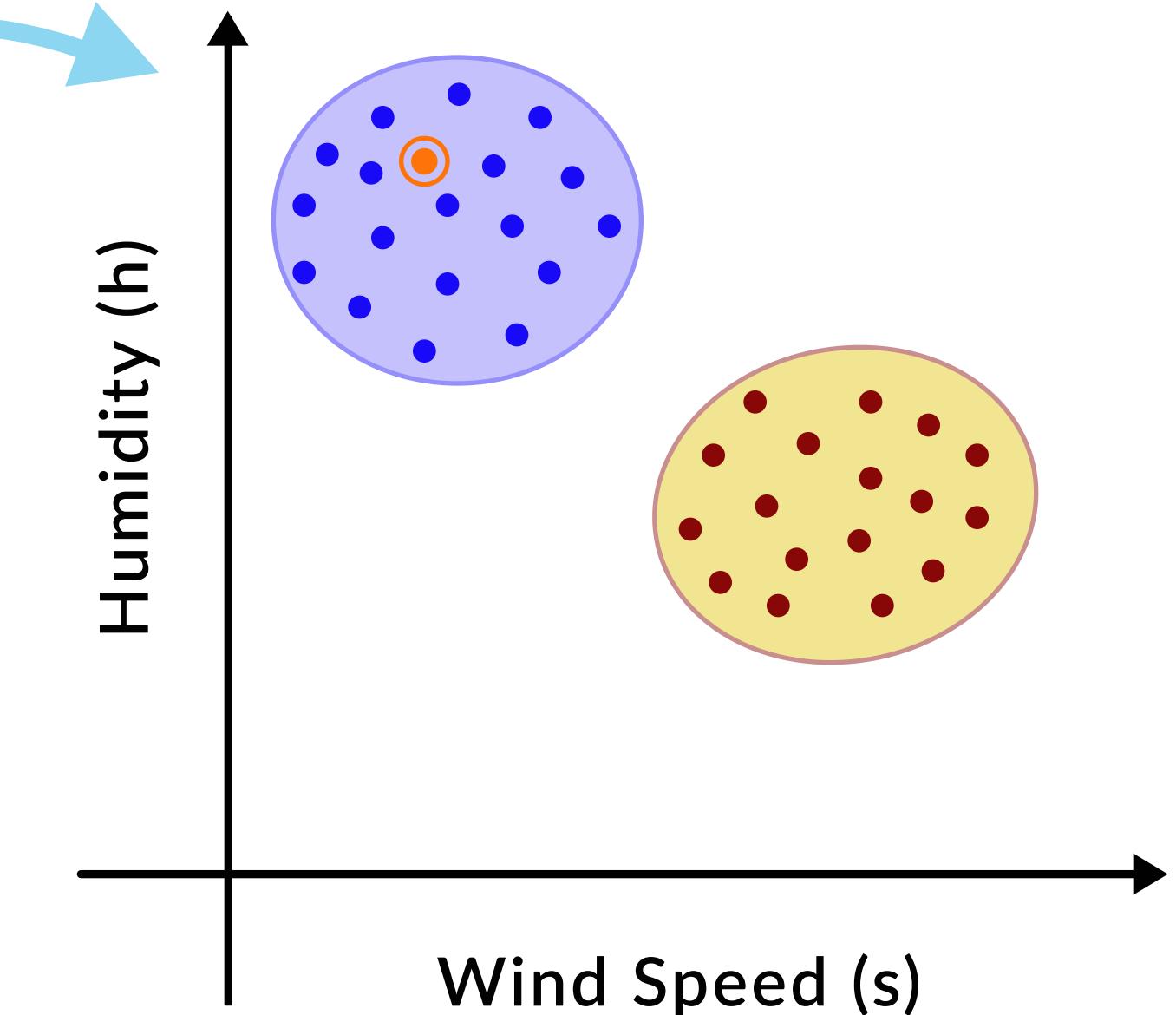
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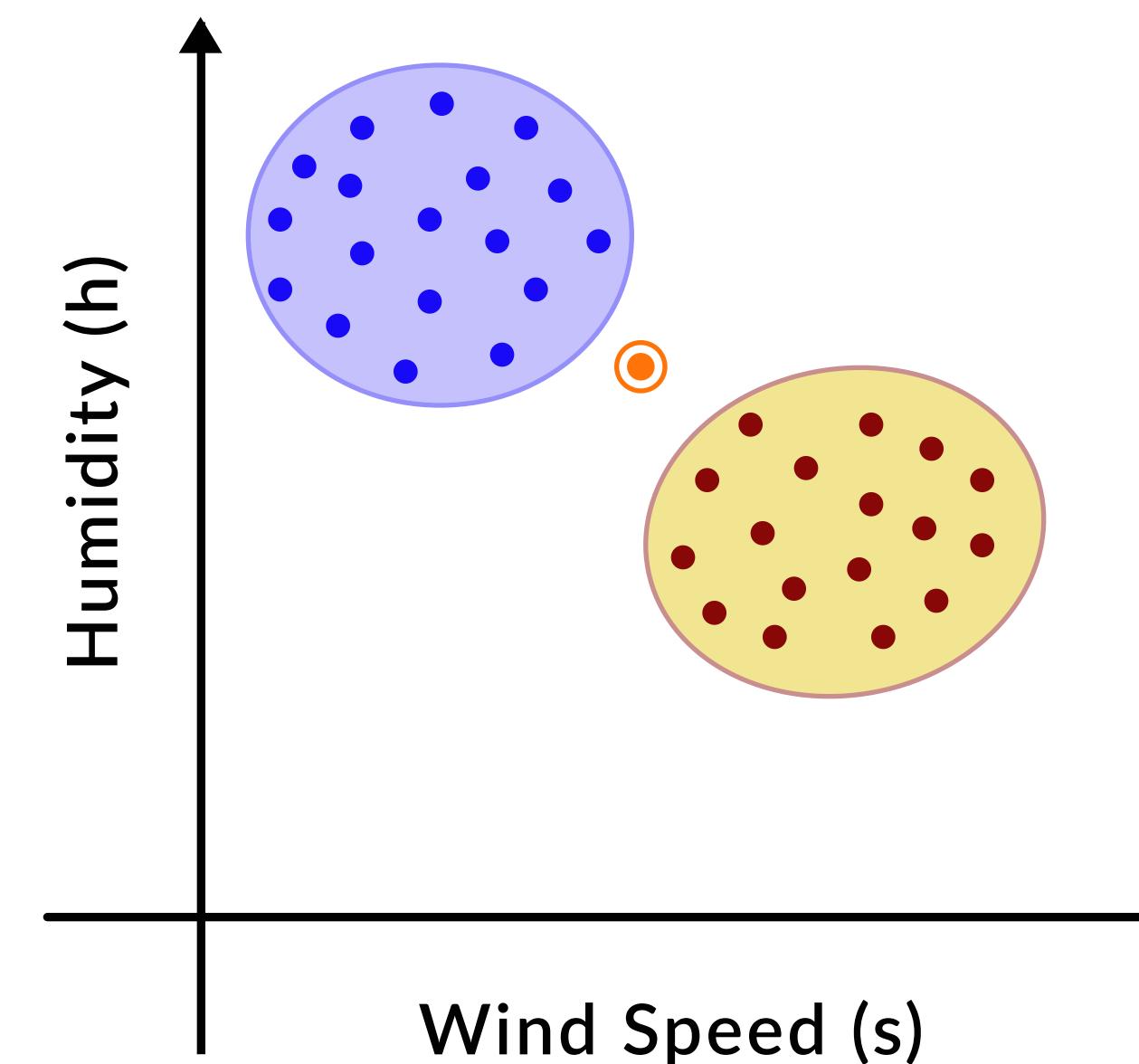
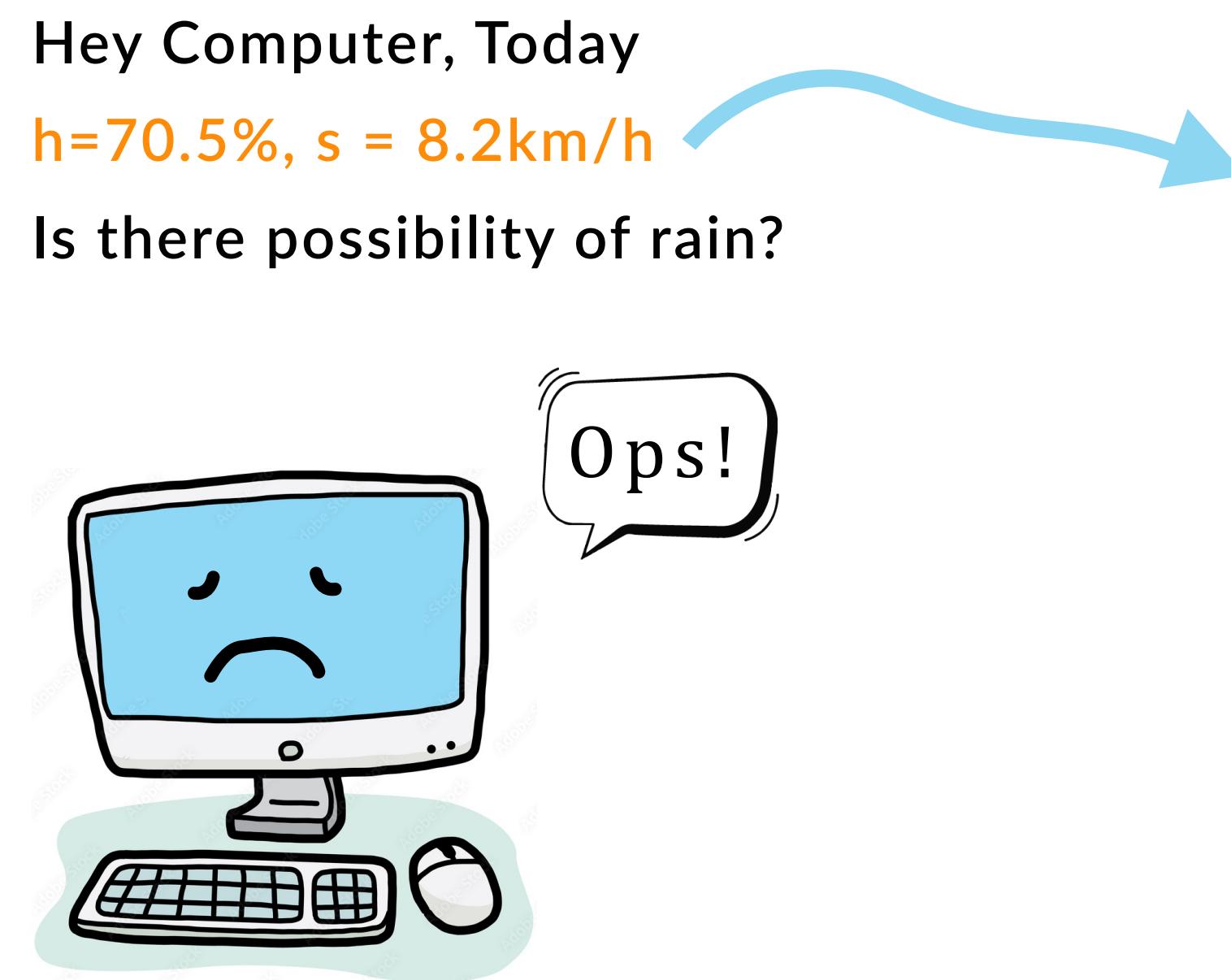
Analyzing Patterns: Bounding Box



Hey Computer, Today
 $h=83\%$, $s = 3.5\text{km/h}$
Is there possibility of rain?

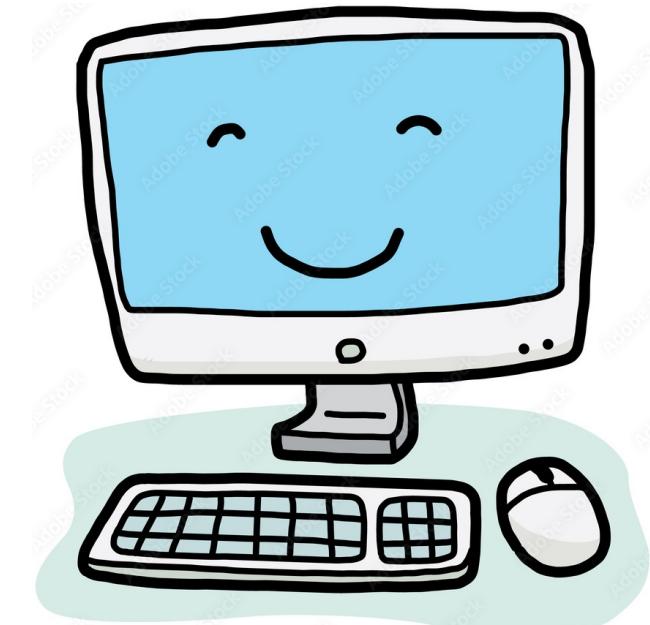


Bounding Box Problem

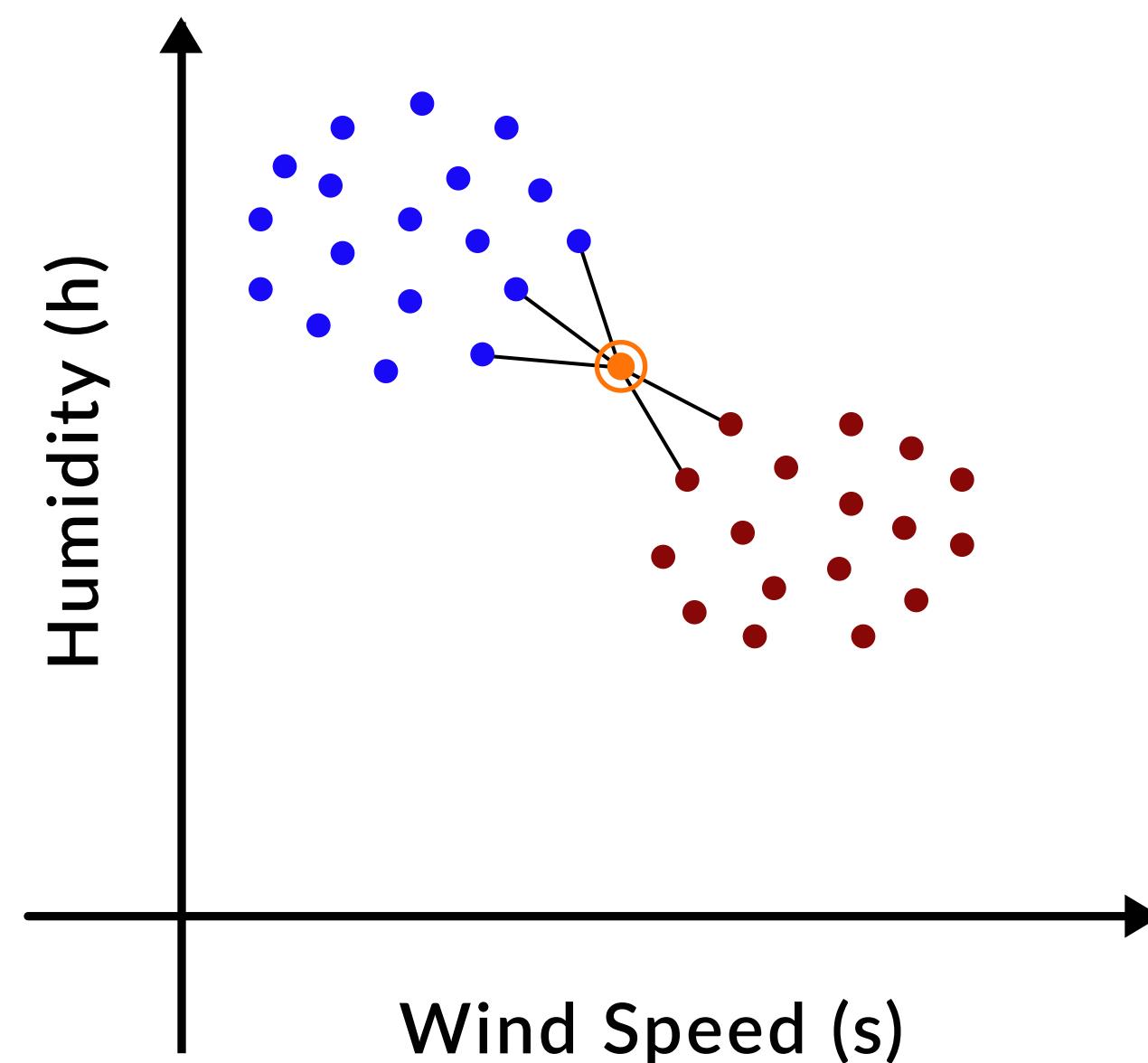


Analyzing Patterns: kNN

Hey Computer, Today
 $h=70.5\%$, $s = 8.2\text{km/h}$
Is there possibility of rain?



Yes



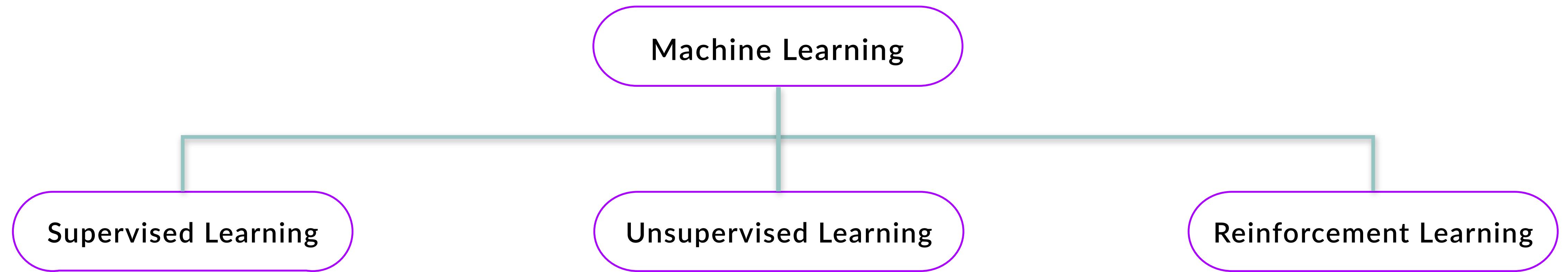
kNN

k Nearest Neighbor

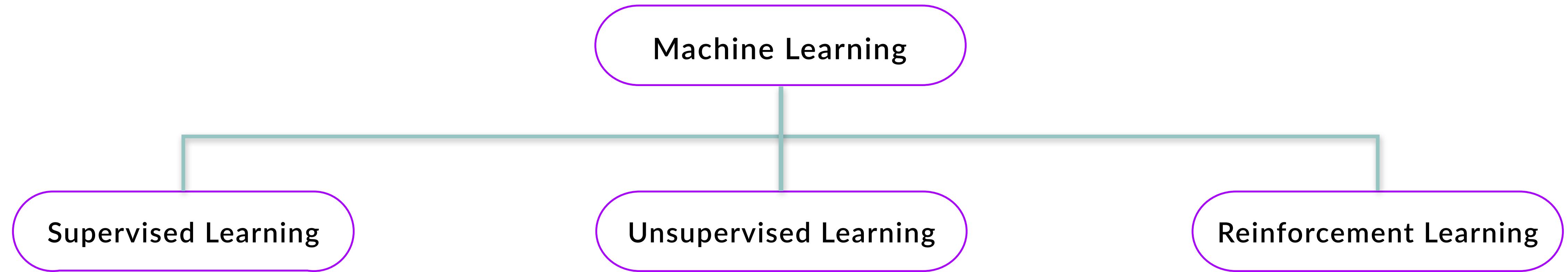
- Find distance from all node
- Take k shortest distance
- Make decision by majority voting

In our example $k = 5$

Classification of ML



Classification of ML

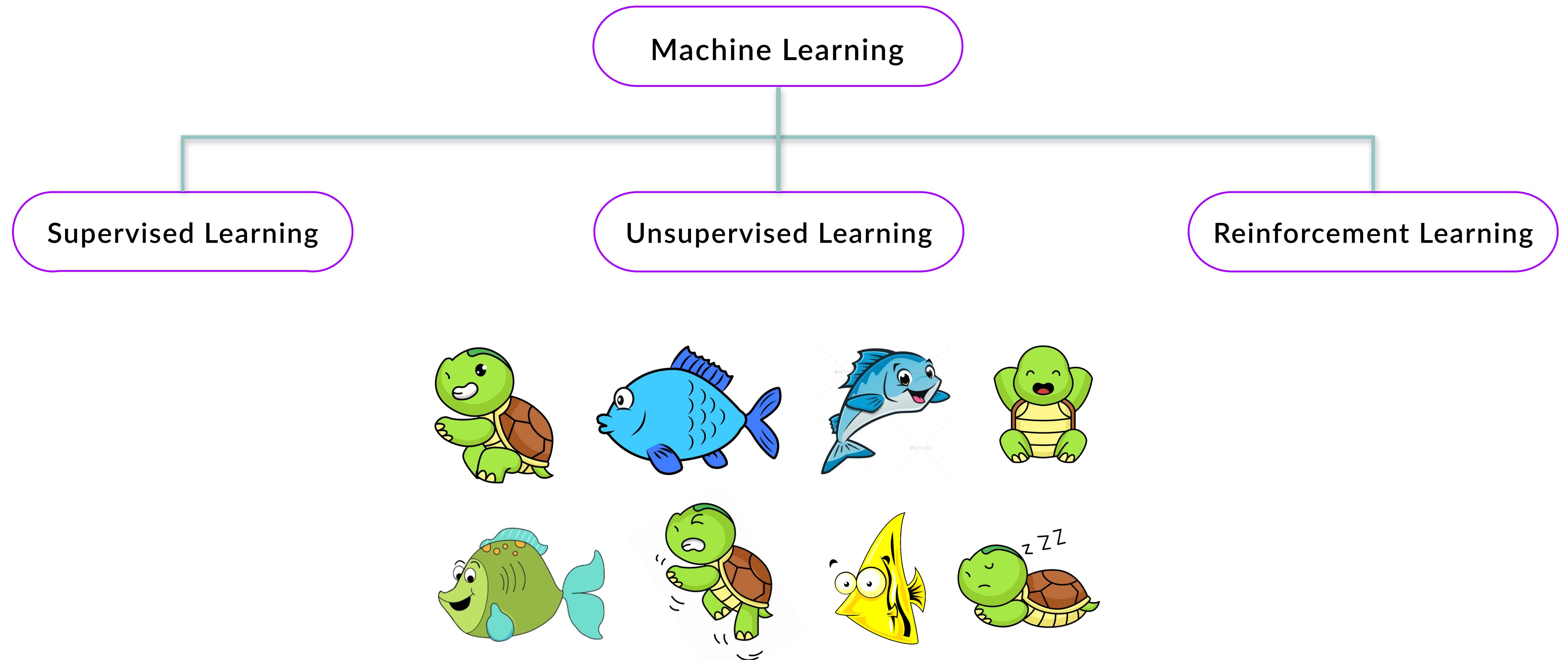


Happy

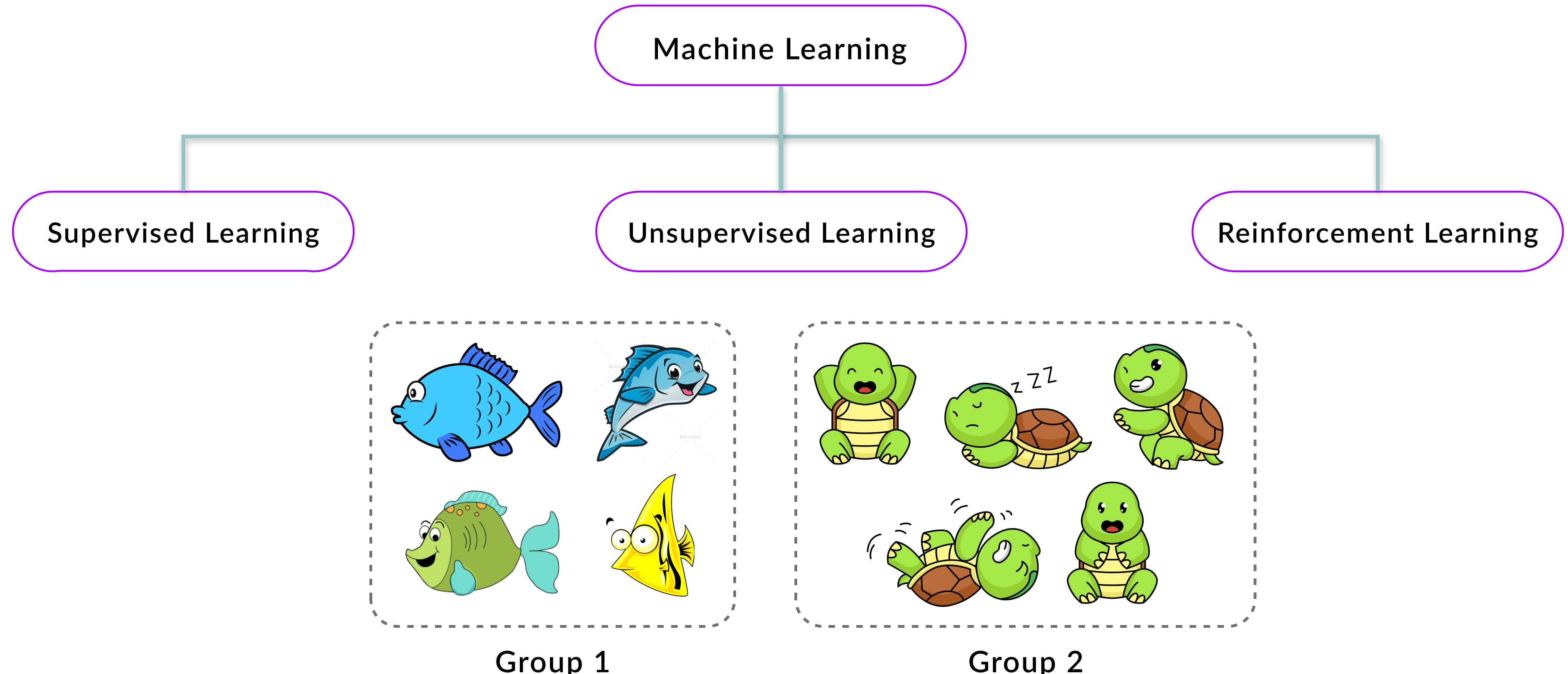
Happy

Sad

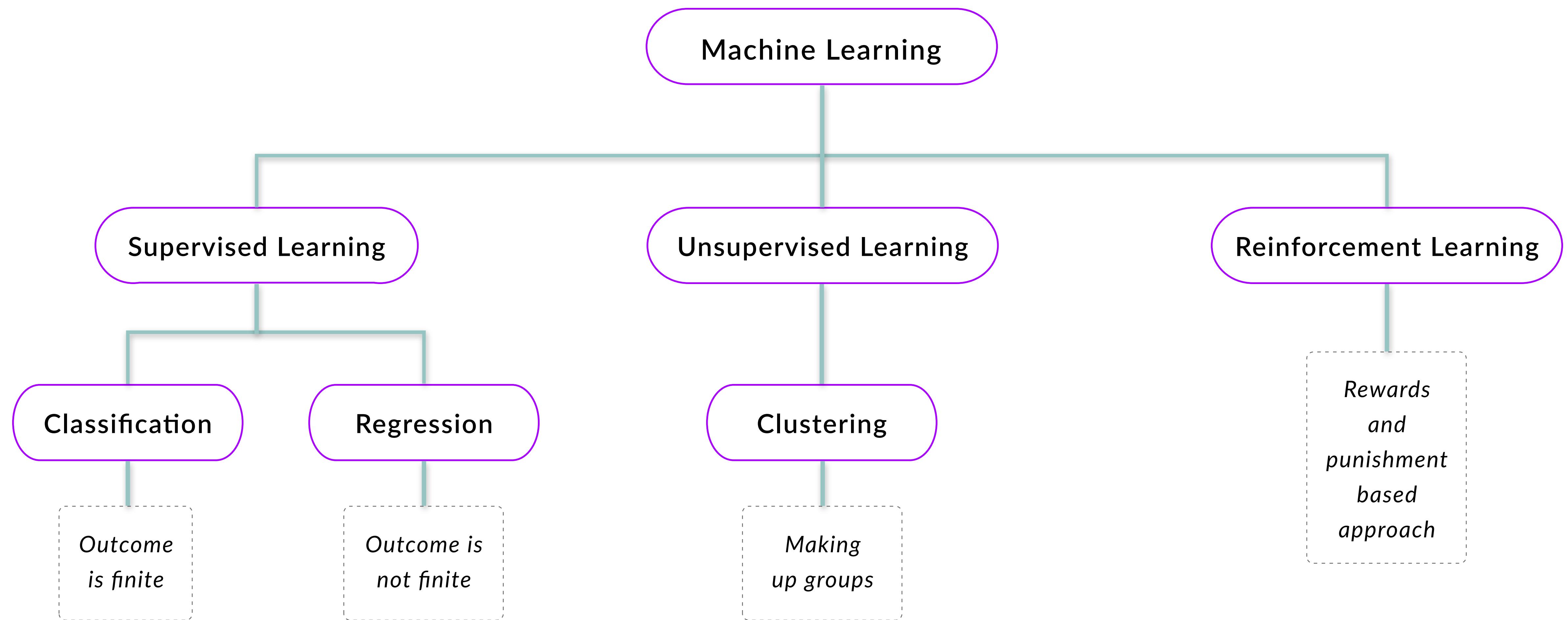
Classification of ML



Classification of ML



Classification of ML



Applications of ML & AI



Health
Care



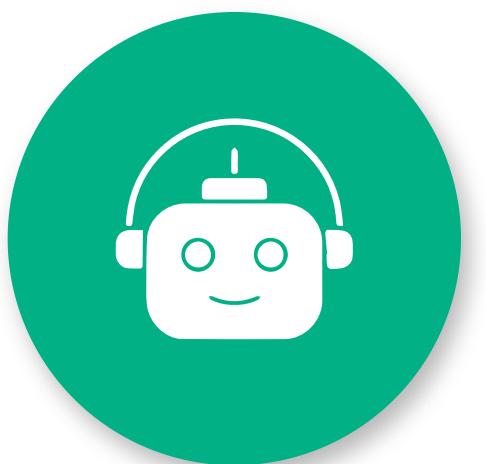
Product
Manufacturing



Security &
Surveillance



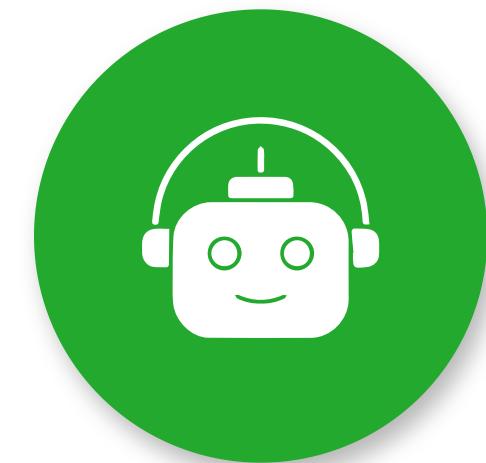
Education &
Entertainment



Smart
Assistants



Automotion



Robotics



Recommendation



Chatbots



Fraud Detection

Applications of ML & AI

Object Detection

Image Processing

- Identifies objects in images/videos
- Enables facial recognition technology.
- Trains on labeled image datasets
- Recognizes multiple objects simultaneously
- Integrates with computer vision systems
- Mostly utilizes deep learning & pre-trained model

Project on Image Dataset



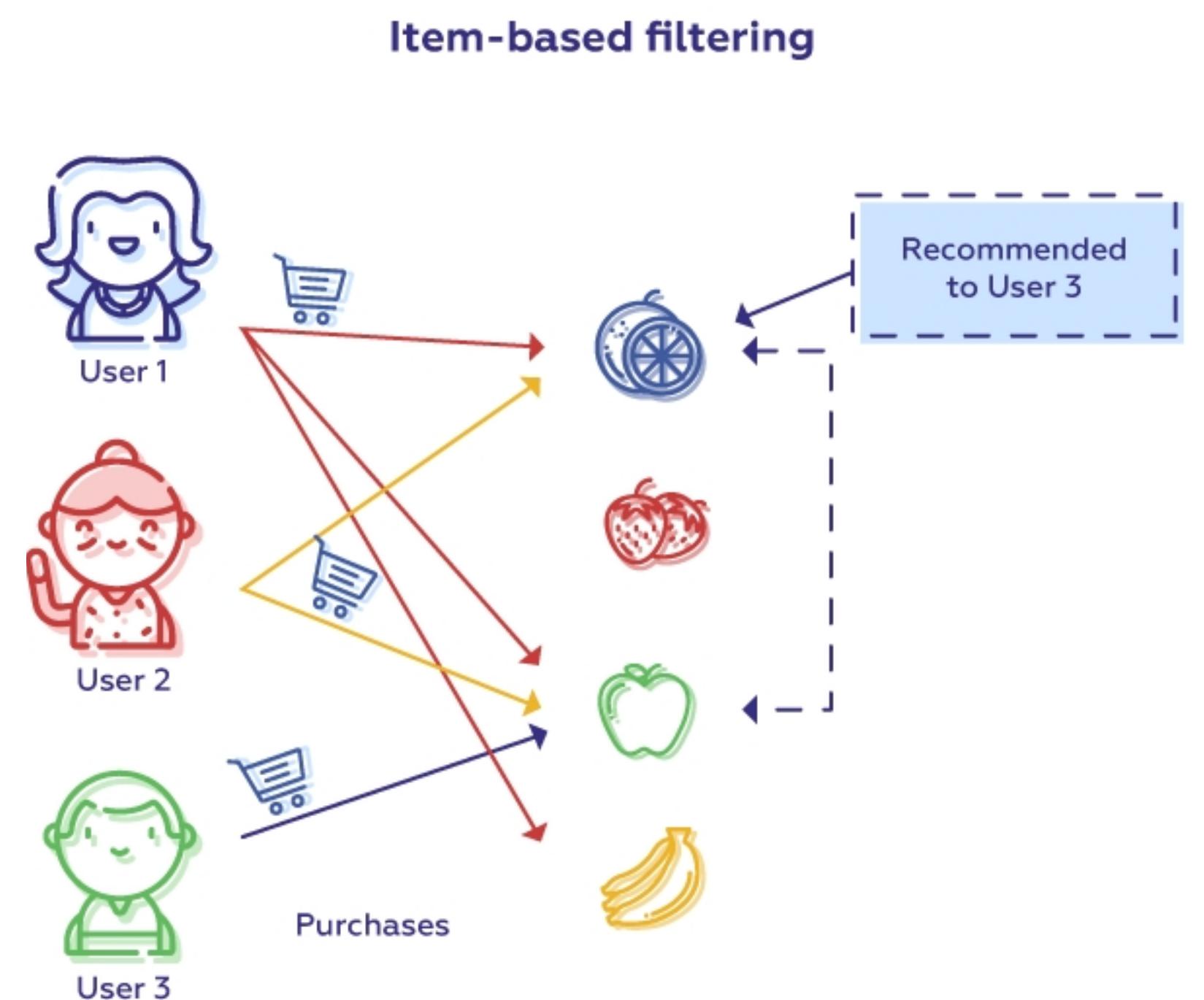
Applications of ML & AI

Recommendation System

Collaborative Filtering

- Personalizes user content suggestions
- Utilizes collaborative filtering techniques
- Employs content-based filtering methods
- Analyzes historical user data
- Optimizes targeted advertising
- Adapts to real-time user behavior

Project on Tabular Data



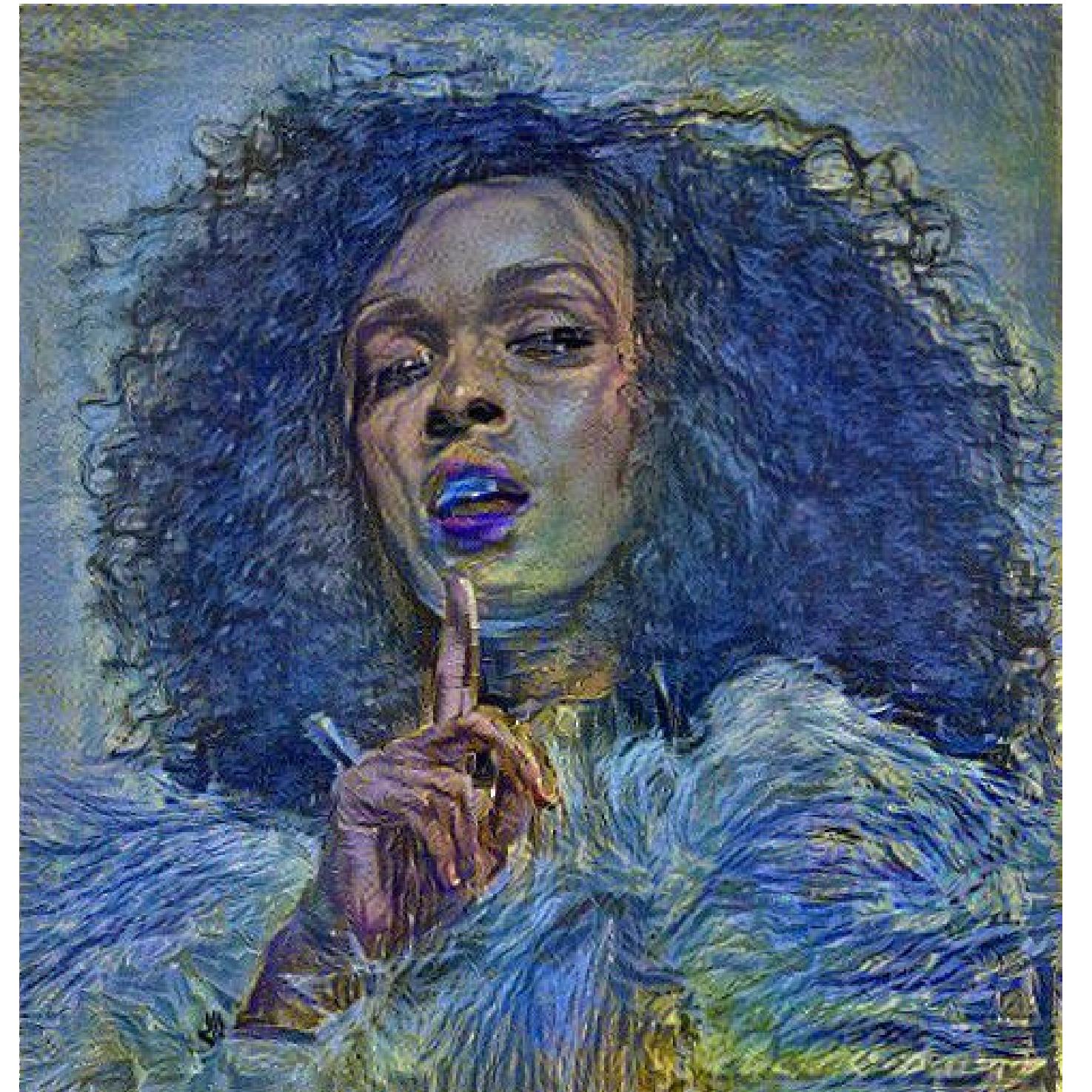
Applications of ML & AI

Neural Style Transfer

Image Processing

- Blends content and artistic styles
- Utilizes convolutional neural networks
- Separates and recombines image features
- Trains on artistic style references
- Preserves content structure, alters texture
- Mostly utilizes deep learning & pre-trained model

Project on Image Dataset



Applications of ML & AI

AI Chatbot

NLP Project

- Simulates human-like conversations
- Utilizes natural language processing (NLP)
- Learns from user interactions
- Personalizes user experience
- Continuously improves through feedback
- Automates repetitive inquiries

Project on Json Dataset



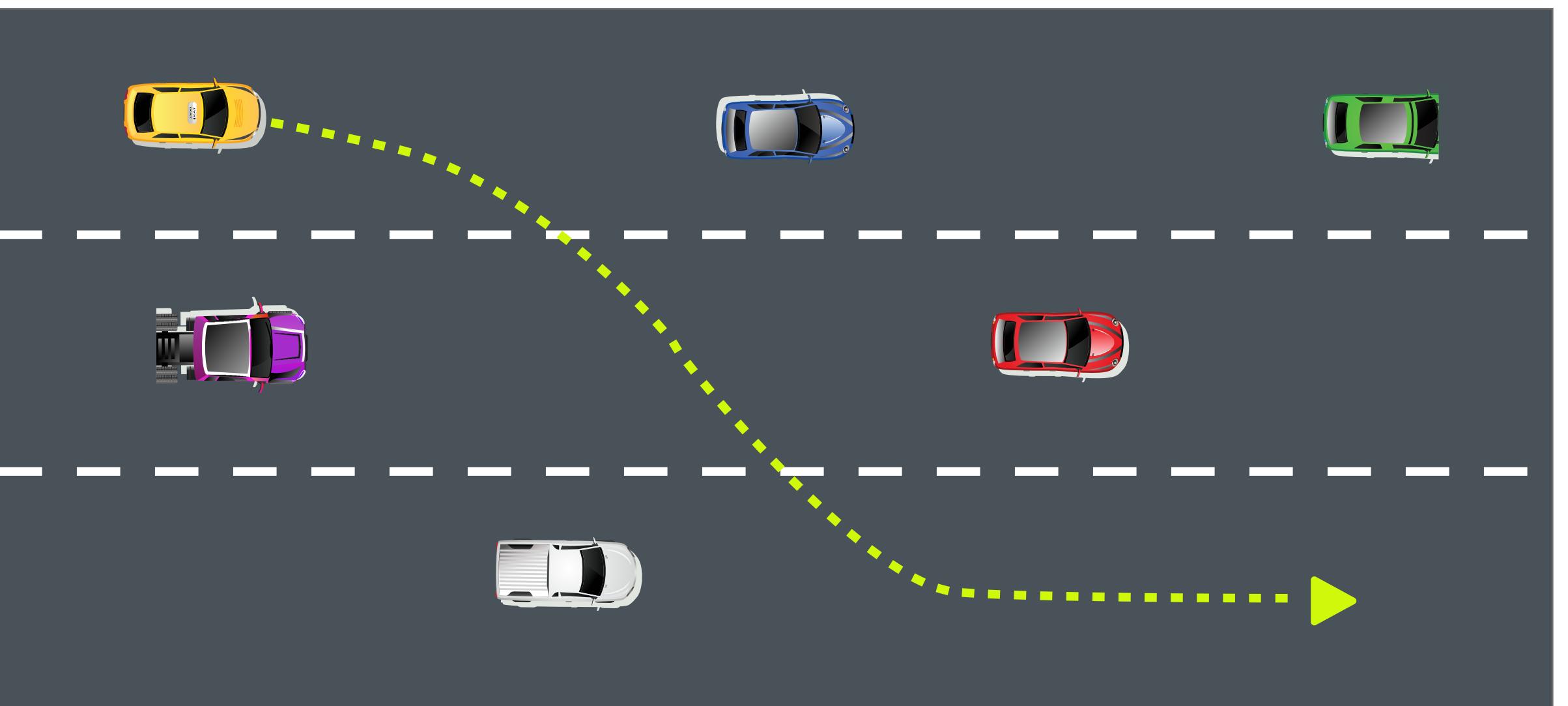
Applications of ML & AI

Autonomous Driving

Trajectory Prediction

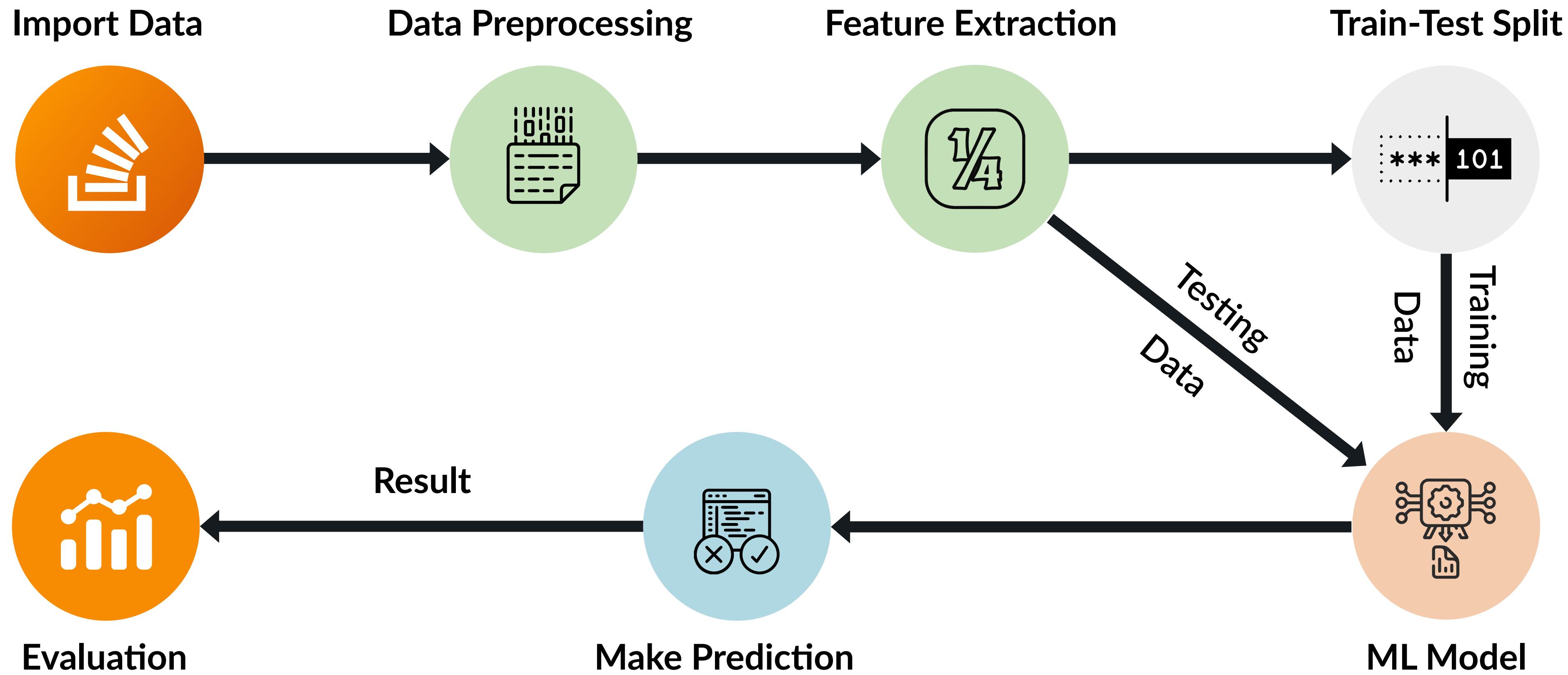
- Self-driving technology
- Driverless vehicles
- Intelligent mobility
- Dynamic Navigation
- Lifelong learning mechanism

Project on Time-Series Data



Project Pipeline

Steps of ML Projects



Project Pipeline
Dataset

Table-2: Sample Data Frame of Cricketers from a One Day Match (fake data)

ID	Name	Height	Runs	Wicket taken	Role
1	Musfik	5'2"	92	0	Batsman
2	Virat	5'7"	124	1	Batsman
3	Malinga	5'4"	37	5	Bowler
4	Sakib	5'9"	110	3	All Rounder
5	Malcolm	6'4"	45	4	Bowler

Project Pipeline
Dataset

	Feature ↓	Feature ↓	Feature ↓	Feature ↓	Feature ↓	Label / Class ↓
	ID	Name	Height	Runs	Wicket	Role
Sample → 1		Musfik	5'2"	92	0	Batsman
Sample → 2		Virat	5'7"	124	1	Batsman
Sample → 3		Malinga	5'4"	37	5	Bowler
Sample → 4		Sakib	5'9"	110	3	All Rounder
Sample → 5		Malcolm	6'4"	45	4	Bowler

Data Preprocessing

Table-2: Sample Data Frame of Cricketers from a One Day Match (fake data)

ID	Name	Height	Runs	Wicket taken	Role
1	Musfik	5'2"	92	0	Batsman
2	Virat	5'7"	124	1.5	Batsman
3	Malinga	5'4"	37	11	Bowler
4	Sakib	5'9"	110	3	All Rounder
5	Lionel Messi	5'7"	64	1	Striker
6	Malcolm	6'4"	-	5	Bowler
7	Sakib	5'9"	110	3	All Rounder

Feature Extraction

Table-2: Sample Data Frame of Cricketers from a One Day Match (fake data)

ID	Name	Height	Runs	Wicket taken	Role
1	Musfik	5'2"	92	0	Batsman
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3	Malinga	5'4"	37	5	Bowler
4	Sakib	5'9"	110	3	All Rounder
5	Malcolm	6'4"	45	4	Bowler

Feature Extraction: Fresh Dataset

Table-2: Sample Data Frame of Cricketers from a One Day Match (fake data)

Name	Runs	Wicket taken	Role
Musfik	92	0	Batsman
Virat	124	1	Batsman
Malinga	37	5	Bowler
Sakib	110	3	All Rounder
Malcolm	45	4	Bowler

Project Pipeline
Train-Test Split



Machine Learning Model

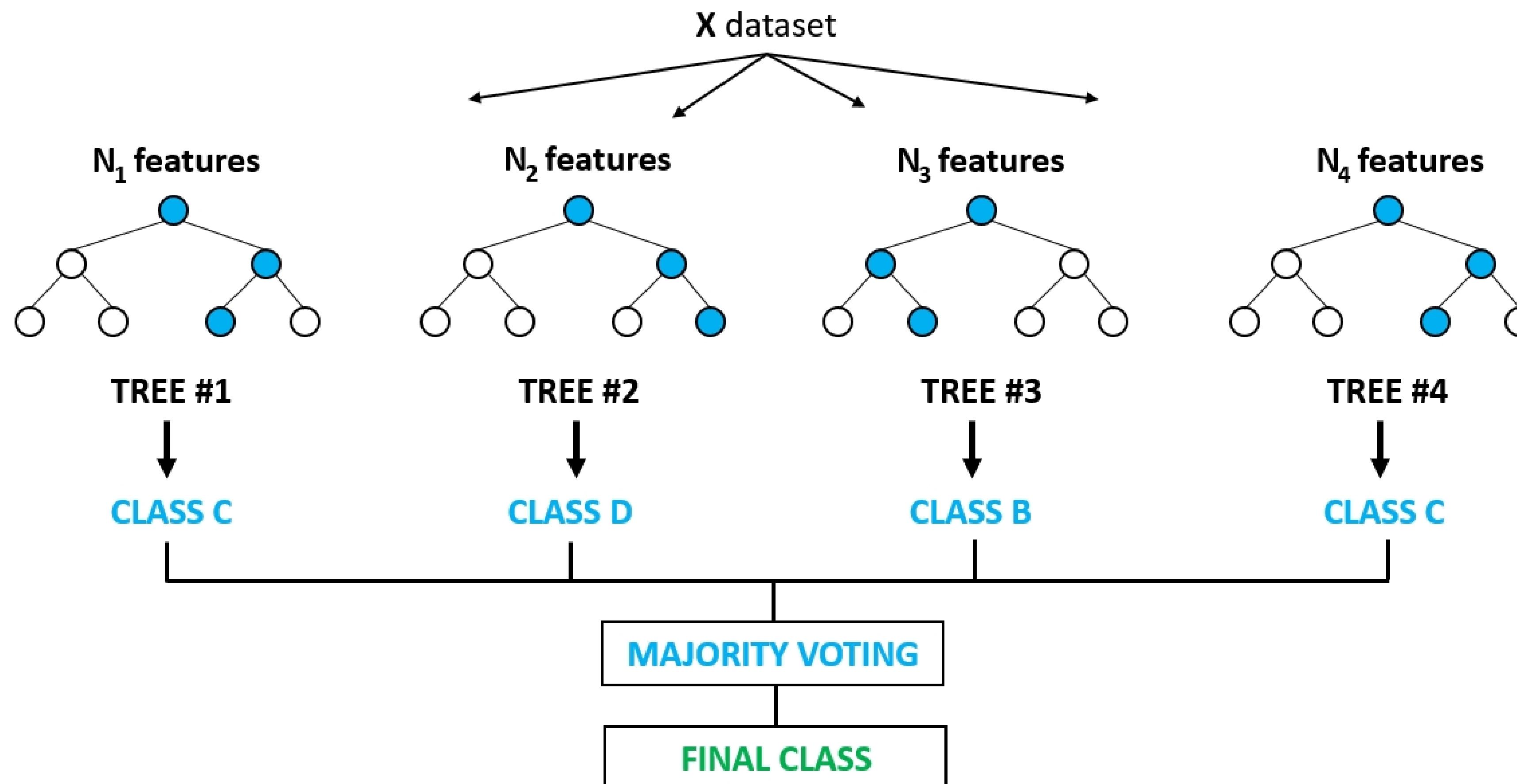
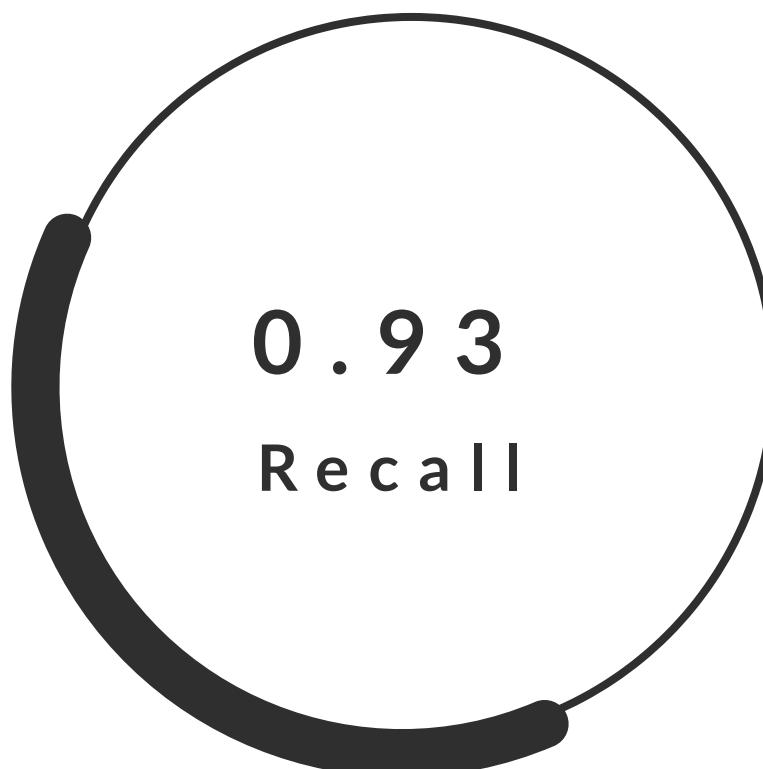
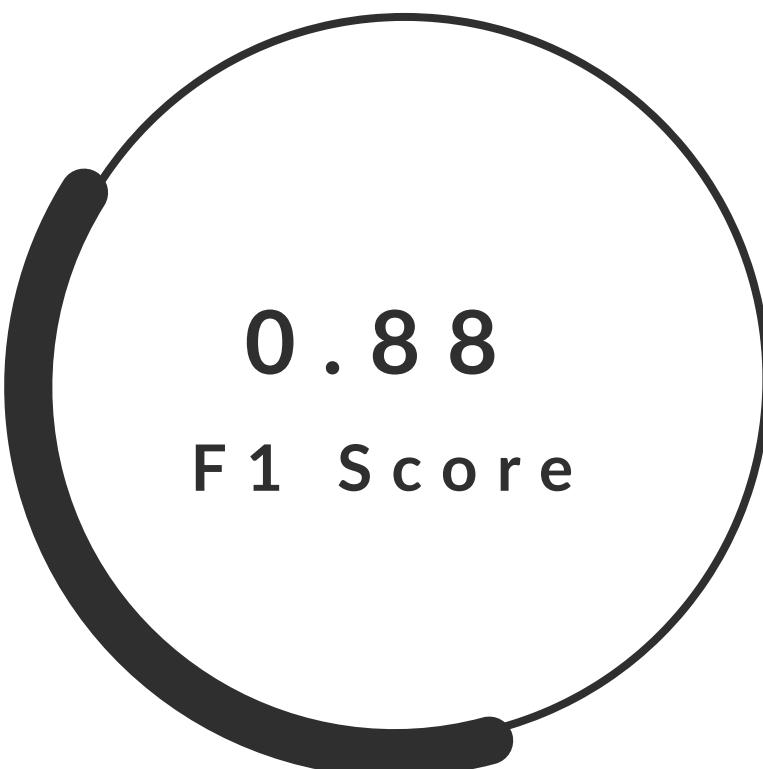
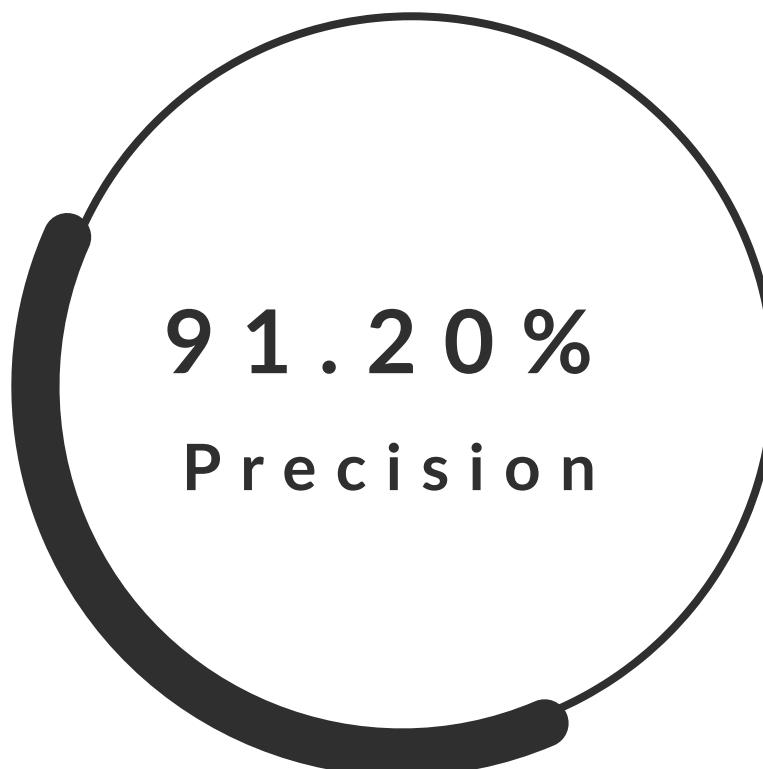
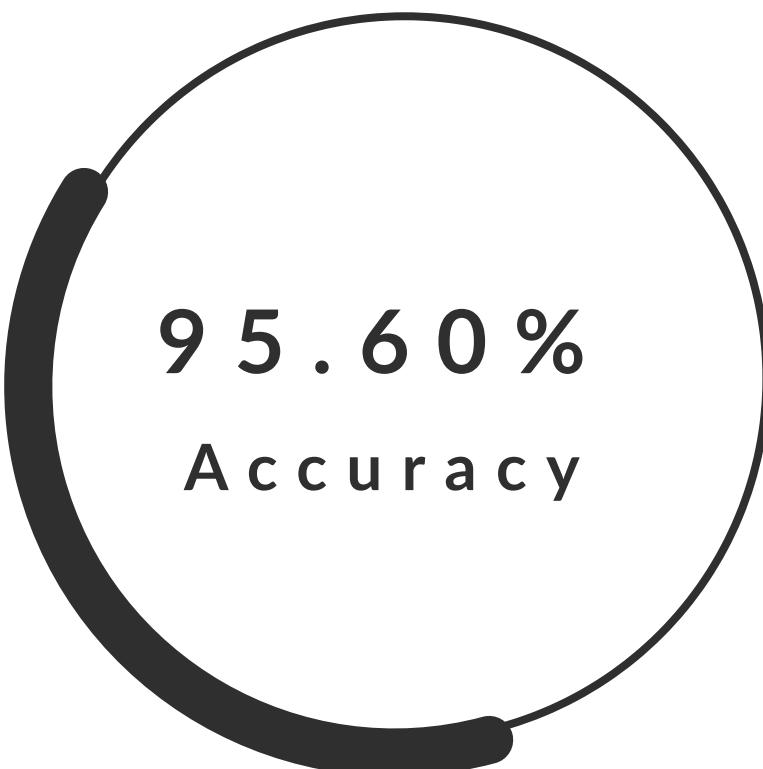


Figure: Random Forest Classifier

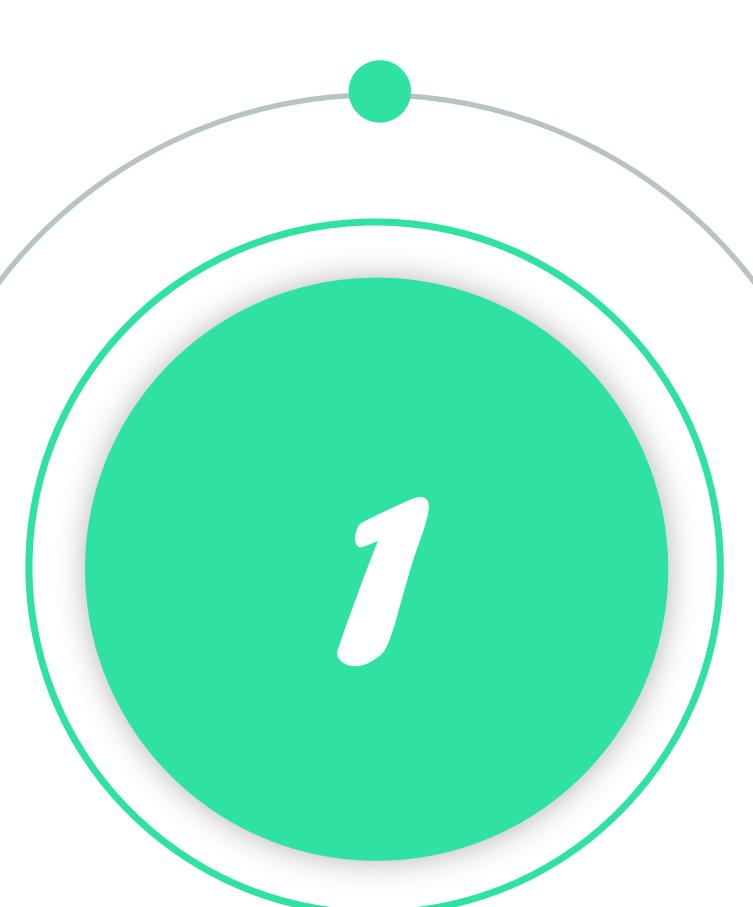
Project Pipeline Evaluation



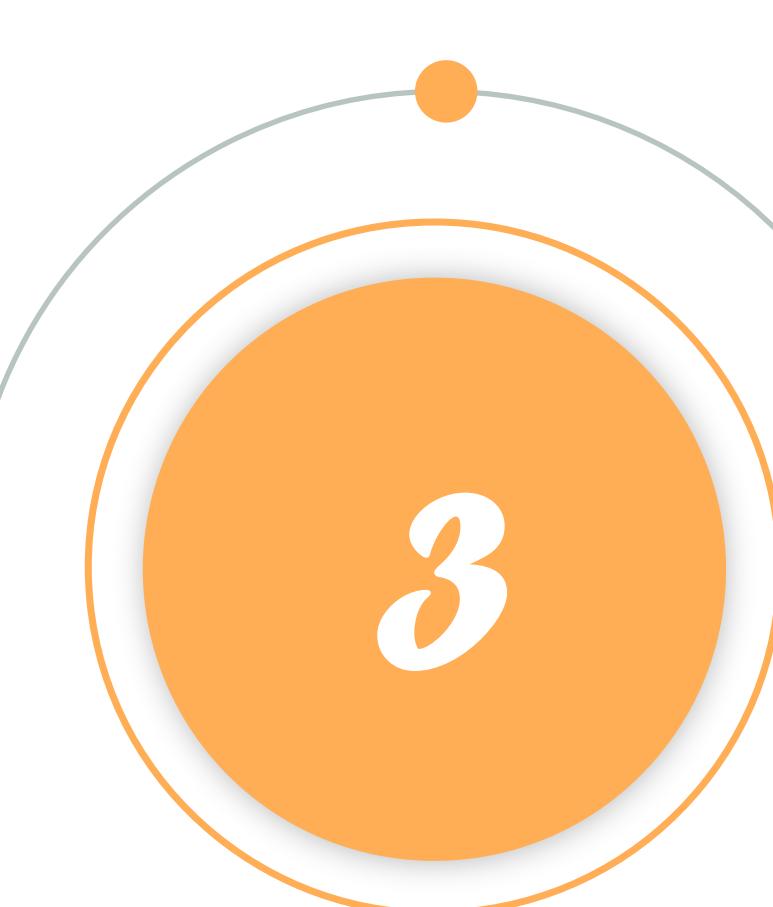
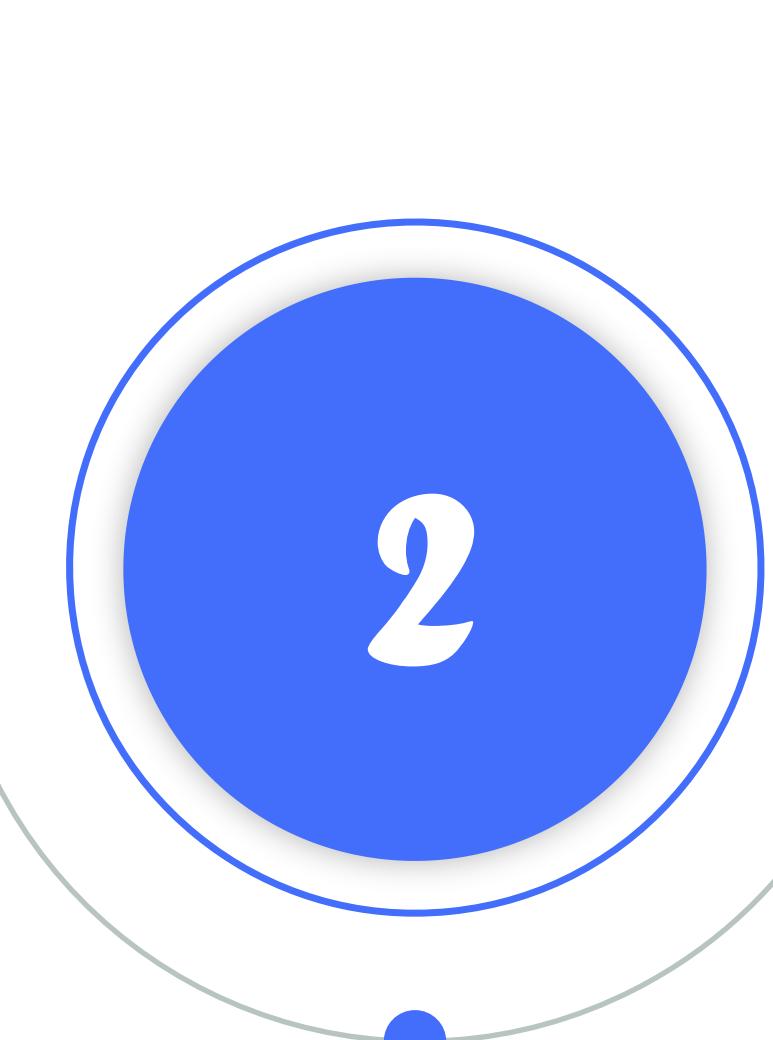
		Predicted	
		Negative (N) -	Positive (P) +
Actual	Negative -	True Negative (TN)	False Positive (FP) Type I Error
	Positive +	False Negative (FN) Type II Error	True Positive (TP)

Career Opportunities in ML and AI

Data Scientist



AI Research Scientist

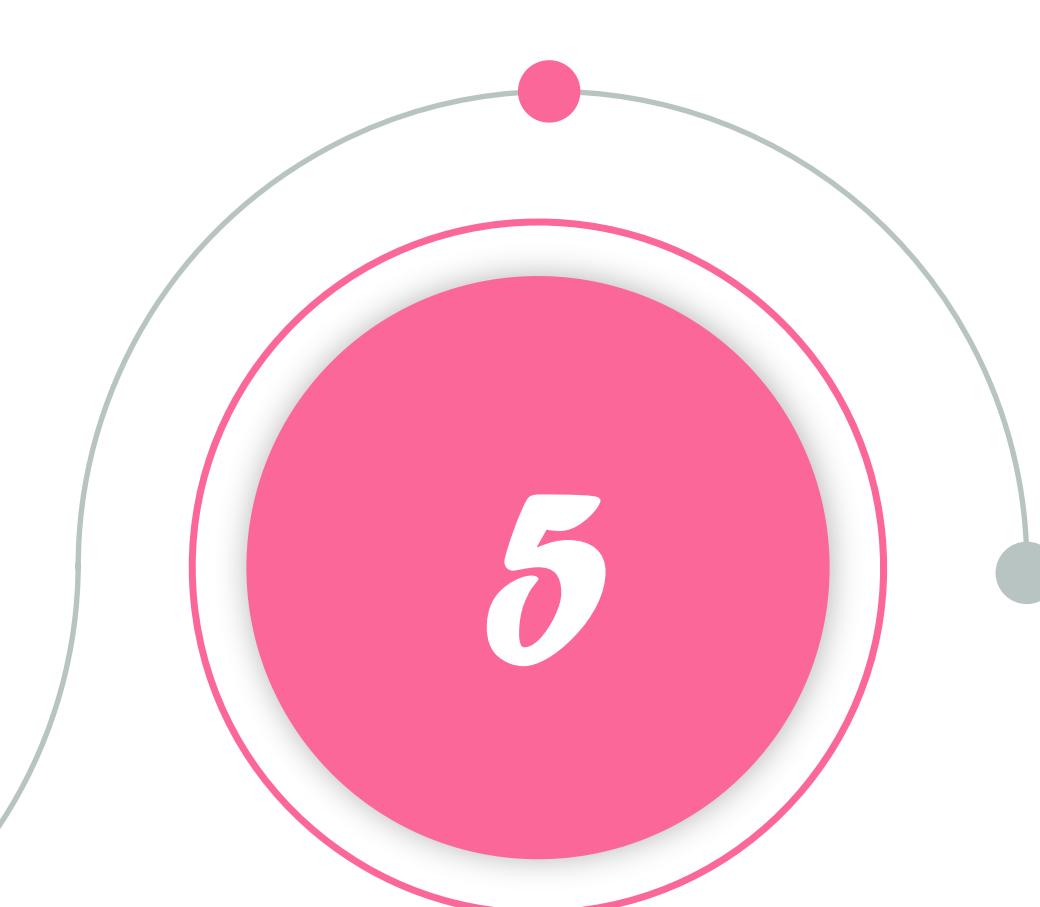


Machine Learning
Engineer

AI Architect



Big Data Engineer



Career Opportunities
Data Scientist

Data Scientist

Responsibilities

- Collecting the data
- Cleaning up the data
- Visualizing data
- Analyzing data
- Building Datasets

Entry ~ Advance level

30%
BSc

40%
MS

30%
PhD

1 - 3 Yr
Job Experience

Machine Learning Engineer

ML/AI Engineer

Responsibilities

- Product level Implementation
- Deploy ML models into production
- Apply ML technologies into work
- Evaluate and benchmark ML models
- Hyper parameter tuning

Experienced ~ Advance level

23%
BSc

60%
MS

17%
PhD

2 - 4 Yr
Job Experience

AI Research Scientist

AI Researcher

Responsibilities

- Design new ML models and algorithms
- Customize existing model
- Ensure scalability, sustainability
- Prototype new concepts
- Evaluate new AI technologies

Mid ~ Advance level

10%
BSc

60%
PhD

30%
MS

3 - 6 Yr
Job Experience

AI Architect

Responsibilities

- Define the technical architecture and frameworks
- Design AI solutions to meet business challenges
- Oversee the development and deployment of AI models
- Ensure solutions are scalable, sustainable, and secure
- Lead technical teams in the implementation

Advance level

15%
BSc

55%
MS

30%
PhD

8+ Yr
Job Experience

Big Data Engineer

Big Data Engineer

Responsibilities

- Design, build, and maintain data pipelines
- Manage data warehouses and data lakes
- Ensure data quality and integrity
- Monitor data performance
- Utilize Hadoop, Spark, Kafka, etc

Advance level

25%
BSc

50%
MS

25%
PhD

8+ Yr
Job Experience

Research Opportunities in ML and AI



Theoretical ML

- Learning Theory
- Algo Development
- Algo Customization
- Optimization



Computational Improvements

- Hardware for ML
- Software for ML
- Distributed ML System
- ML Parallelization



Applied Machine Learning

- Domain-specific
- Transfer Learning
- Human-in-the-loop
- Interactive ML

Research Opportunities in ML and AI



Interdisciplinary ML

- Hybrid System
- Cognitive Modeling
- Neuro-inspired ML
- Quantum ML



Data Science

- Feature Engineering
- Representation Learning
- Data Augmentation
- Feature Selection



Trustworthiness in ML

- Privacy-preserving ML
- Fairness and Bias
- Explainable AI
- Mankind Security!

THANK YOU

FOR CONSIDERATE AUDIENCE

THE END



AI Bangladesh