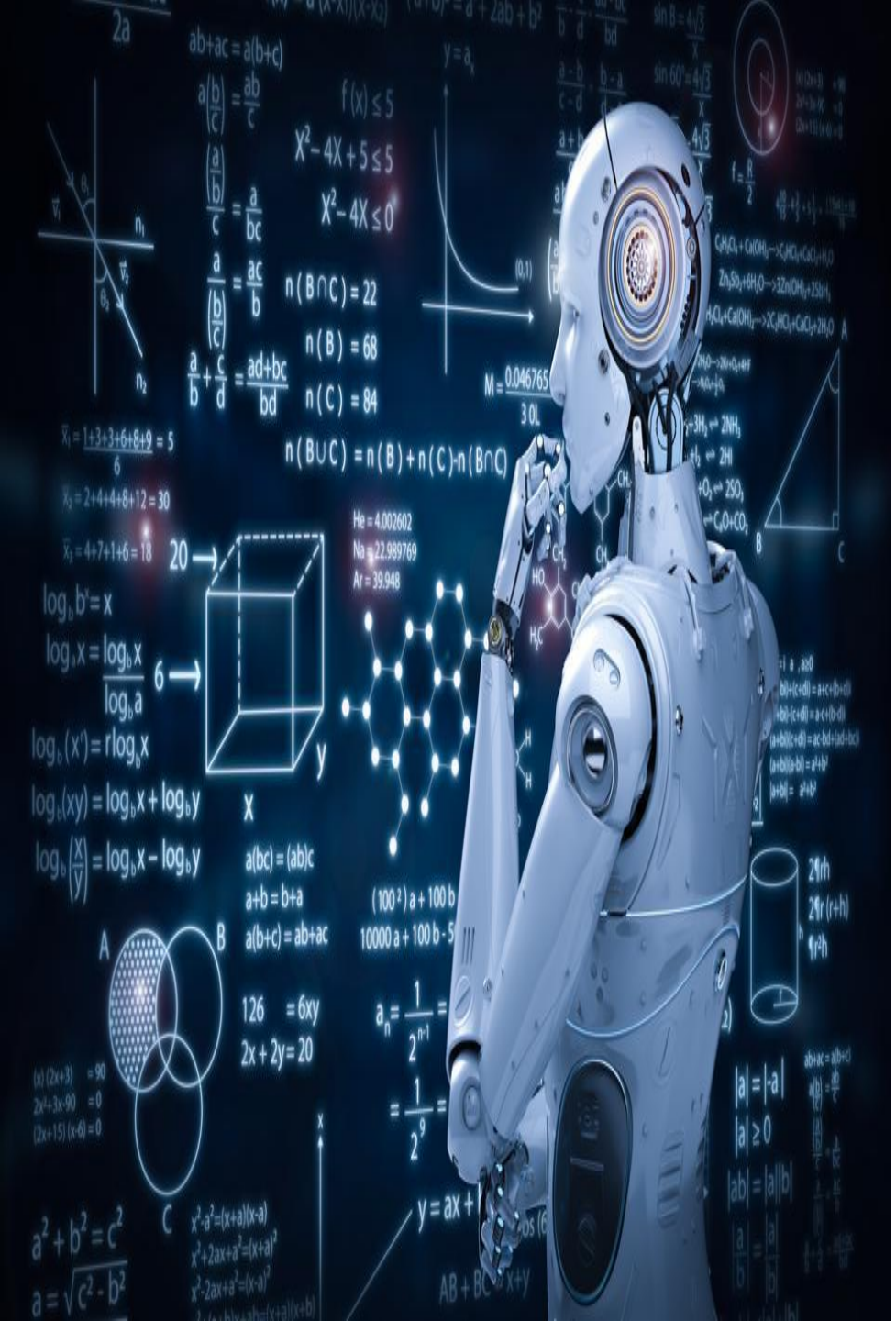


Practical Machine Learning

Day 2: SEP23 DBDA

Kiran Waghmare

Agenda

- Machine learning Applications
- Domains in Automation
- Machine Learning Modelling
- Evaluating ML techniques

AI VS Machine Learning VS Deep Learning

- Artificial Intelligence originated around 1950s
- AI represents simulate intelligence in machines
- AI is a subset of data science
- Aim is to build machines which are capable of thinking like humans

Artificial Intelligence

- Machine Learning originated around 1960s
- Machine learning is the practice of getting machines to make decisions without being programmed
- Machine learning is a subset of AI & Data Science
- Aim is to make machines learn through data so that they can solve problems

Machine Learning

- Deep Learning originated around 1970s
- Deep Learning is the process of using artificial neural networks to solve complex problems
- Deep Learning is a subset of Machine Learning, AI & Data Science
- Aim is to build neural networks that au6tonetically discover patterns for feature detection

Deep Learning

Features of Machine Learning:

- Machine learning **uses data to detect various patterns** in a given dataset.
- It can **learn from past data** and improve automatically.
- It is a **data-driven technology**.
- Machine learning is much **similar to data mining** as it also deals with a huge amount of data.

- Following are some key points that show the importance of Machine Learning:
  - **Rapid increment** in the production of data
  - **Solving complex problems**, which are difficult for a human
  - **Decision-making in various sectors** including finance
  - Finding **hidden patterns and extracting useful information** from data.

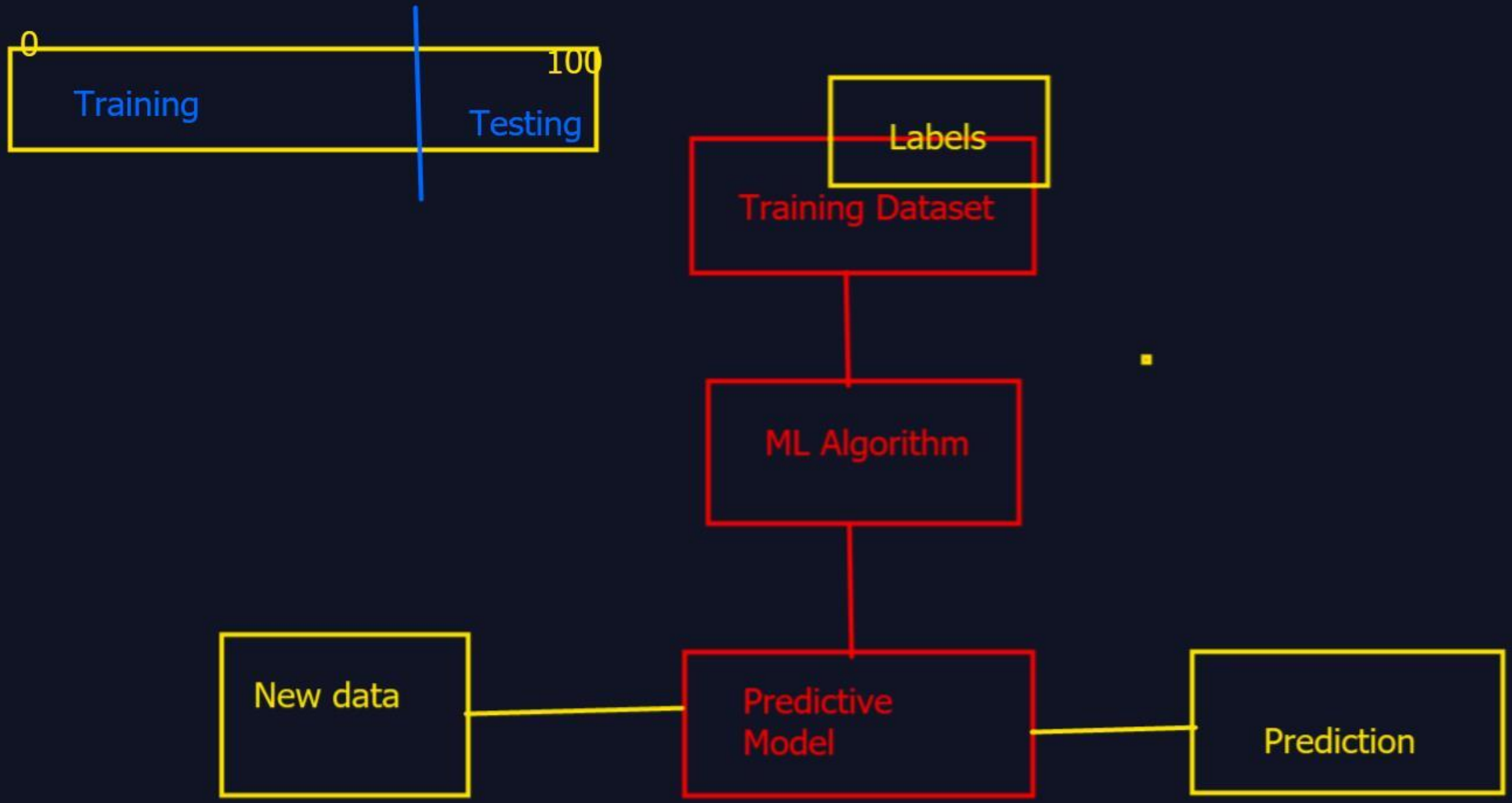
What is Machine Learning Model?

- **Definition:**
  - Machine Learning is a concept which allows the machine
  - **to learn from examples and experience**,
  - and that **too without being explicitly programmed**.

- Machine Learning algorithms are an evolution of **normal algorithms**.
- They make your **programs "smarter",** by **allowing them to automatically learn** from the data you provide.
- The algorithm is mainly divided into:
  - **Training Phase**
  - **Testing phase**

4. Steps in Python Machine Learning

- We follow the following steps in Machine Learning Using Python-
- Collecting data.
- Preprocessing data.
- Learning data.
- Training phase for Evaluation.
- Testing phase for Prediction.
- Using algorithms for future predictions.


0
100
Training
Testing
Labels
Training Dataset
ML Algorithm
New data
Predictive Model
Prediction

Training Phase

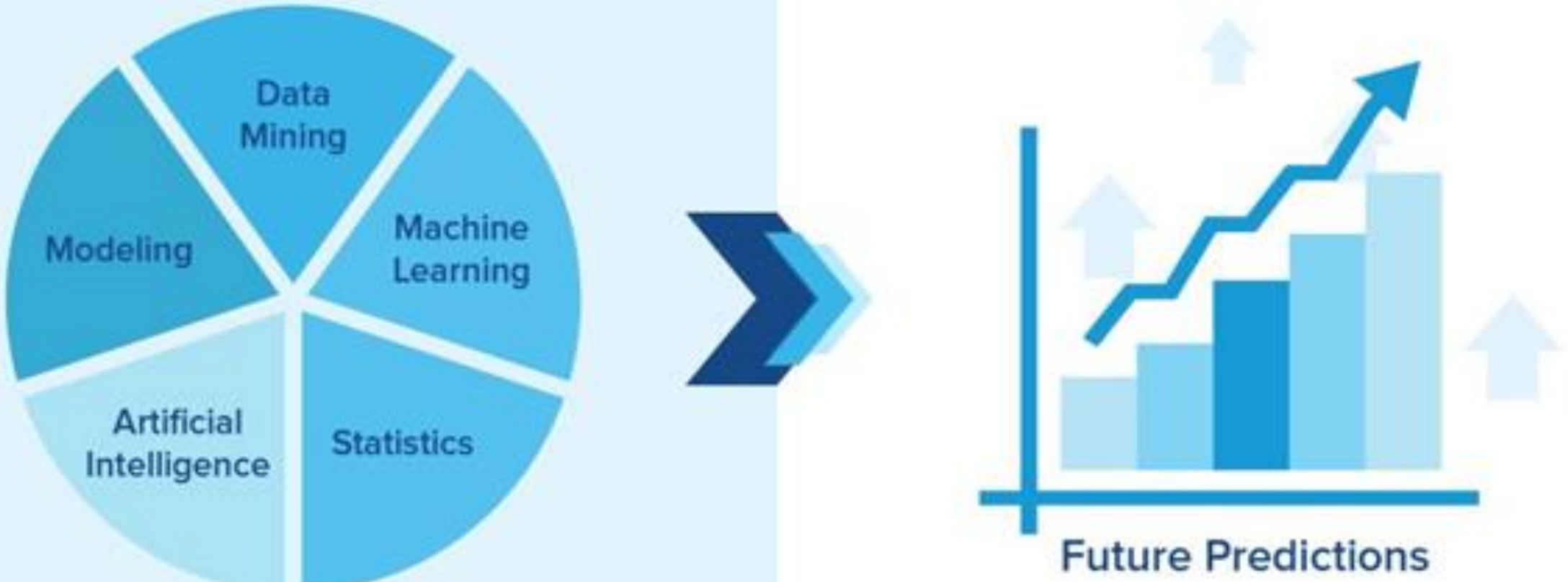
- You take a randomly selected specimen of mangoes from the market (**training data**),
- make a table of all the **physical characteristics** of each mango,
  - like **color, size, shape, grown** in which part of the country,
  - **sold by which vendor**, etc (**features**),
  - along with the **sweetness, juiciness, ripeness** of that mango (**output variables**).
- You feed this data to the machine learning algorithm (**classification/regression**), and it learns a model of the correlation between an average mango's physical characteristics, and its quality.

Testing Phase

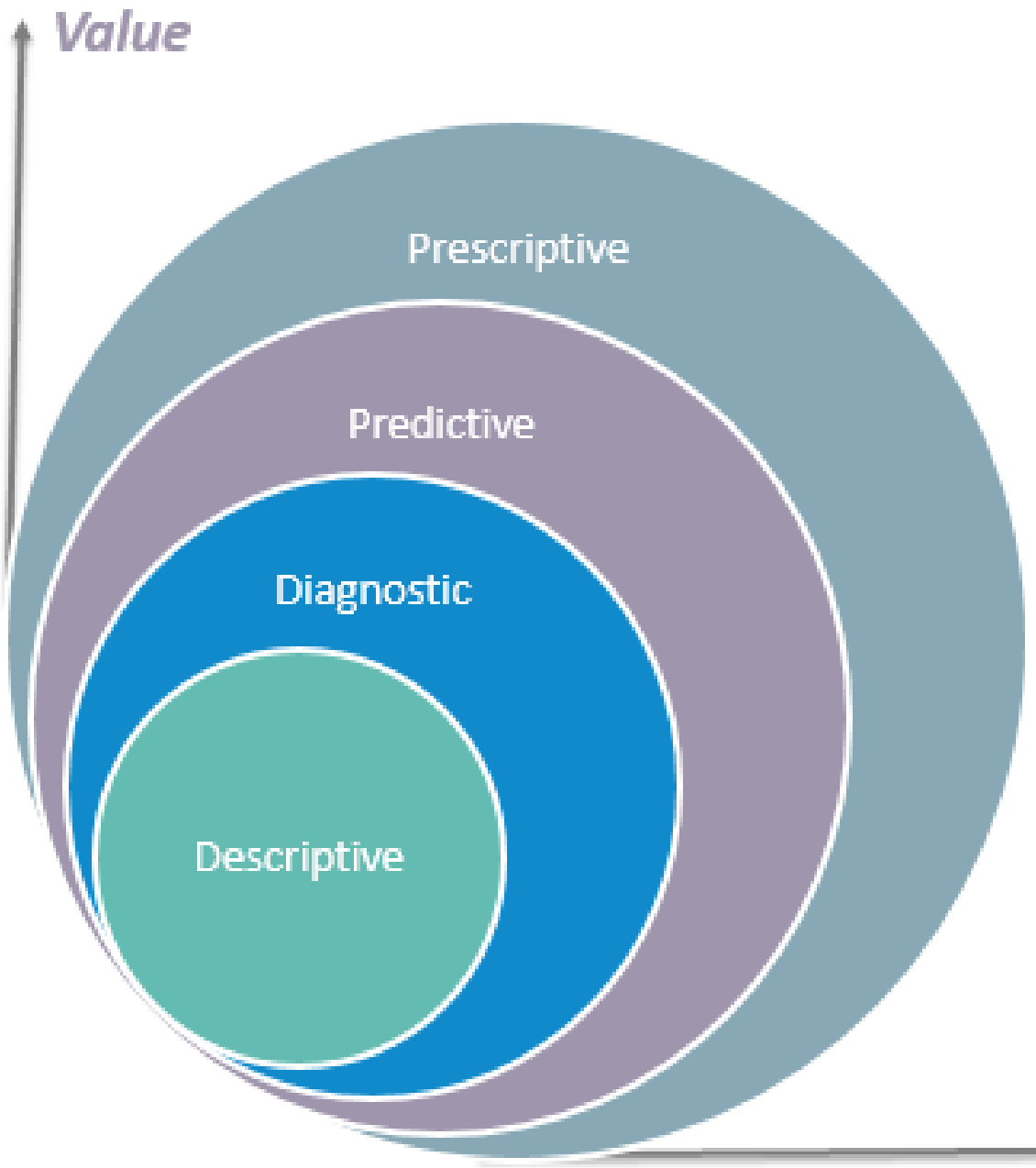
- Next time when you go shopping, you will **measure the characteristics of the mangoes** which you are purchasing(**test data**)and **feed it to the Machine Learning algorithm**.
- It will **use the model** which was **computed earlier to predict**
  - if the mangoes are sweet, ripe and/or juicy.
- The algorithm may internally **use the rules**, similar to the one you manually wrote earlier (for eg, a **decision tree**).
- Finally, you can now shop for mangoes with great confidence, without worrying about the details of how to choose the best mangoes.

Conclusion as an Algorithm

- You know what! you can make your algorithm **improve over time** (**reinforcement learning**) so that it **will improve its accuracy** as it gets trained on more and more training dataset.
- In case it makes a wrong prediction it will update its rule by itself.
- The best part of this is, you can use the **same algorithm to train different models.**
- You can create one each for predicting the quality of apples, grapes, bananas, or whatever you want.


Data Mining
Machine Learning
Statistics
Artificial Intelligence
Modeling
Future Predictions

4 types of Data Analytics



What is the data telling you?

Descriptive: *What's happening in my business?*

- Comprehensive, accurate and live data
- Effective visualisation

Diagnostic: *Why is it happening?*

- Ability to drill down to the root-cause
- Ability to isolate all confounding information

Predictive: *What's likely to happen?*

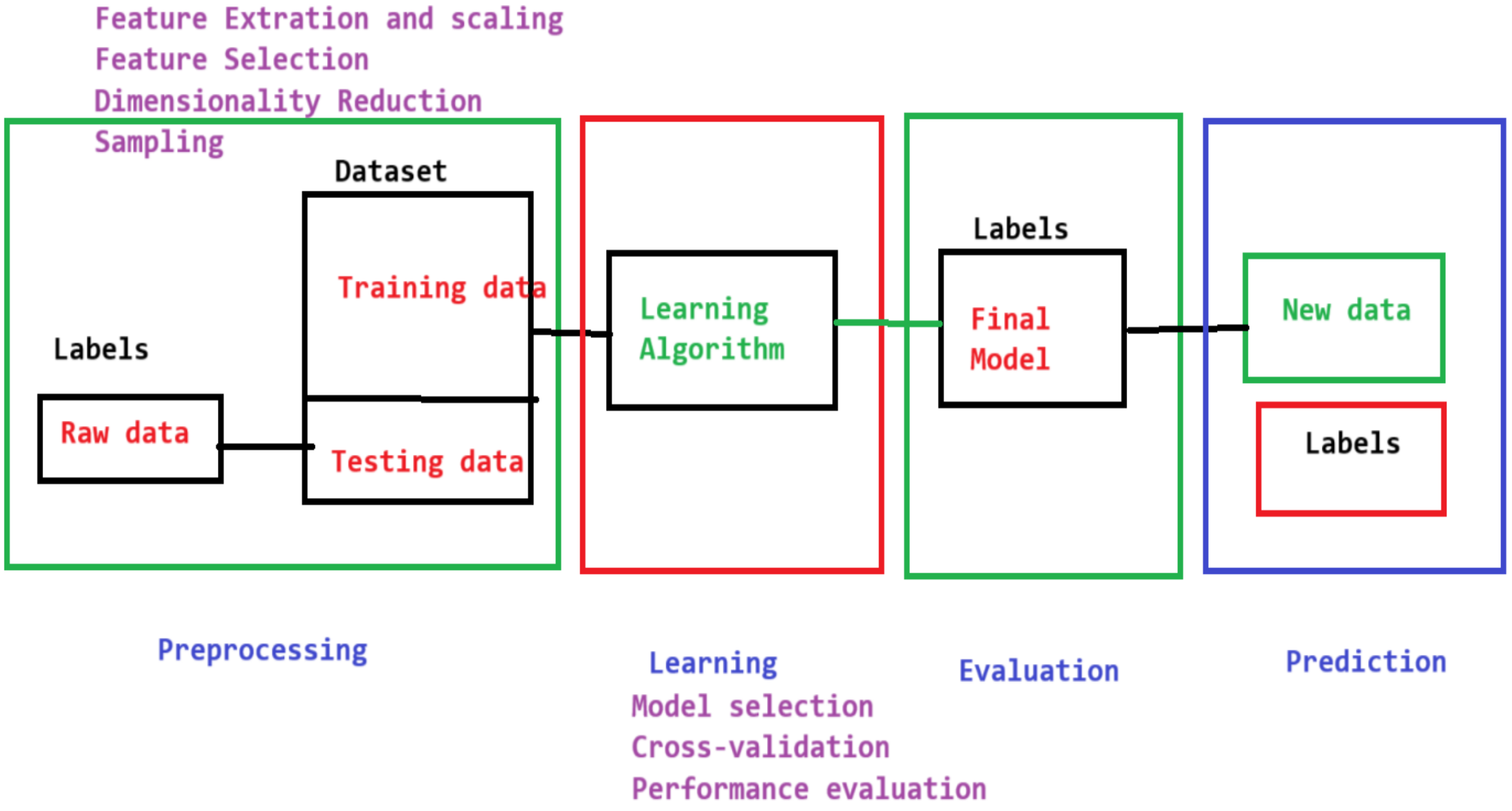
- Business strategies have remained fairly consistent over time
- Historical patterns being used to predict specific outcomes using algorithms
- Decisions are automated using algorithms and technology

Prescriptive: *What do I need to do?*

- Recommended actions and strategies based on champion / challenger testing strategy outcomes
- Applying advanced analytical techniques to make specific recommendations

Challenges and Limitations of Machine Learning

- The primary challenge of machine learning is the lack of data or the **diversity in the dataset.**
- A machine cannot learn if there **is no data available**.
- Besides, a dataset with a lack of diversity gives the machine a hard time.
- A machine **needs to have heterogeneity** to learn meaningful insight.
- It is rare that an algorithm can extract information when there are no or few variations.
- It is recommended to have at least 20 observations per group to help the machine learn.
- This constraint leads to poor evaluation and prediction.


Feature Extration and scaling
Feature Selection
Dimensionality Reduction
Sampling
Dataset
Training data
Labels
Raw data
Testing data
Learning Algorithm
Labels
Final Model
New data
Labels
Preprocessing
Learning
Model selection
Cross-validation
Performance evaluation
Evaluation
Prediction