Supervised
vs Unsupervised Learning

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- Machine Learning
- Supervised Learning
- Unsupervised Learning
- ML Applications

Learning Objectives

- Why Machine Learning?

- What is Machine Learning?

- What is Supervised Learning?

- Applications of Supervised Learning?

- What is Unsupervised Learning?

- Applications of Unsupervised Learning?

Why Machine Learning?

- **Why Machine Learning?**
  - Everyone like to know the Future
  - Adapt and learn fast with changing scenario
  - Act fast with changing data

- **What is Machine Learning?**
  - An algorithm that learns from data, identifies patterns in data and store the learnings in form of a Model
  - Apply the Model to predict on new data
  - It has the ability to quickly change, refresh, and enhance the Model with changing data and newer datasets

Simple Business Scenario

Scenario

Let us assume you are working in a Bank and the Chief Marketing Officer suggests that he wish to run a campaign to promote a financial product, say, some Investment Product

Based on business filters, you have an eligible contactable base of 1,000,000 customers.

Cost of Targeting each customer being Rs. 10/-

It is expected that 0.5% incremental customers will purchase the Investment Product because of the campaign

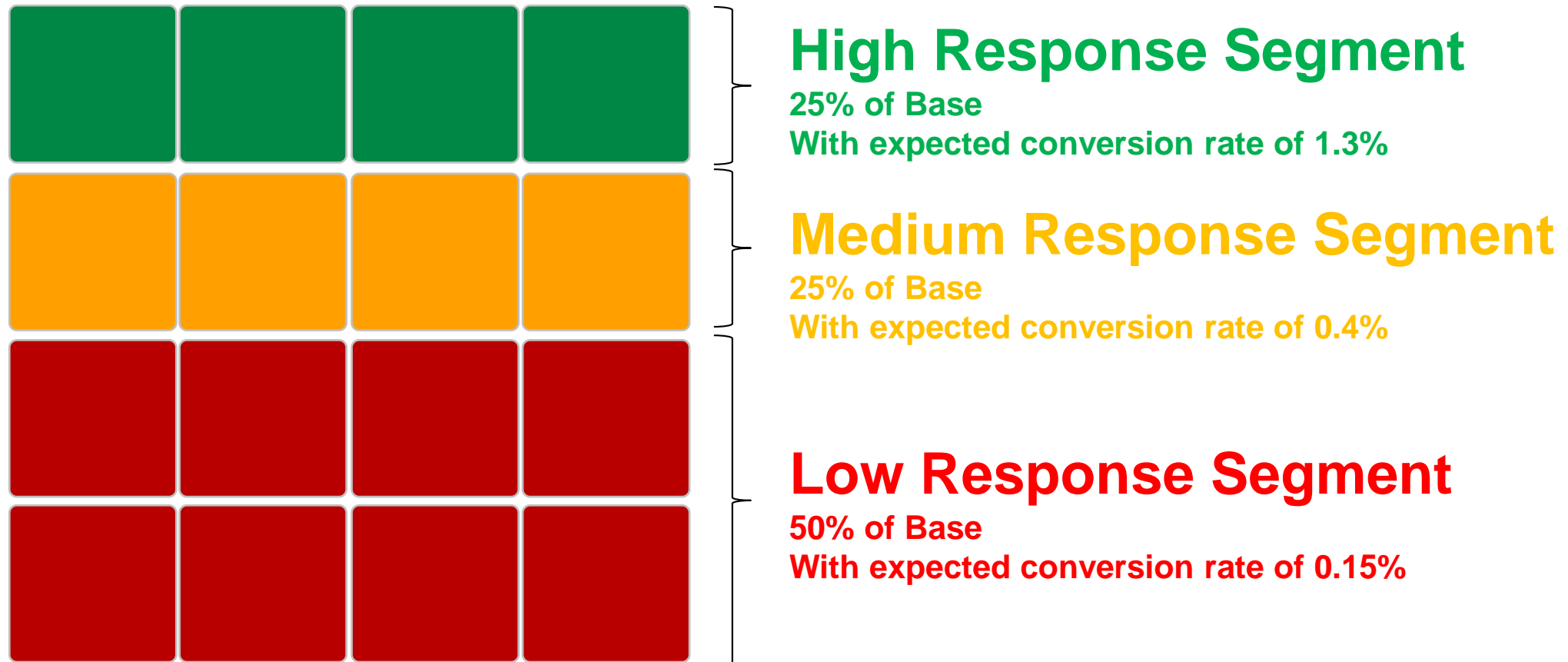*Expected Revenue per customer who purchases the product is Rs. 2500/-*

Campaign Return on Marketing Investment without Analytical Approach

- Target Customer Base : 1,000,000
- Cost of Targeting per customer : INR 10/-
- Cost of Campaign = 1,000,000 * 10 = INR 10,000,000 = 10 Mn
- Expected Incremental Conversion Rate : 0.5%
- Expected Incremental Conversions = 1,000,000 * 0.5% = 5,000
- Expected Revenue per Convert : INR 2500/-
- Expected Incremental Revenue = 5,000 * 2500 = 12,500,000 = 12.5 Mn
- Expected Profit = 12.5 Mn – 10 Mn = 2.5 Mn

Campaign ROMI

Return on Marketing Investment (ROMI) = $\dfrac{\text{Revenue} - \text{Cost}}{\text{Cost}}$ = $\dfrac{12.5 - 10}{10}$ = **25%**

Analytics Based Approach

High Response Segment
25% of Base
With expected conversion rate of 1.3%

Medium Response Segment
25% of Base
With expected conversion rate of 0.4%

Low Response Segment
50% of Base
With expected conversion rate of 0.15%

Analytics Based ROMI

Note: Cost of Targeting per customer : INR 10/-   ;   Expected Revenue per Convert : INR 2500/-

Segment	# Customer (A)	Exp. Conv. Rate (B)	# Conv's (C = A * B)	Cost of Targeting (D = A * 10)	Exp. Revenue (E = C * 2500)	Profit (F = E − D)	ROMI G = F / D
High Response Segment	250,000	1.3%	3250	2,500,000	8,125,000	5,625,000	225%
Medium Response Segment	250,000	0.4%	1000	2,500,000	2,500,000	0	0%
Low Response Segment	500,000	0.15%	750	5,000,000	1,875,000	-3,125,000	-ve
Total	1,000,000	0.5%	5000	10,000,000	12,500,000	2,500,000	25%

Recommendation to CMO

Your recommendation to the CMO:

- **Target only the High Response Segment**

Benefits of your strategy

A) It will reduce Marketing Cost by 75%

B) It will increase Profits by 125%

C) 9X increase in ROMI

Supervised
vs Unsupervised Learning

Machine Learning Techniques Categories

- **Supervised learning** is the Machine Learning task of finding a function from a Labeled Data
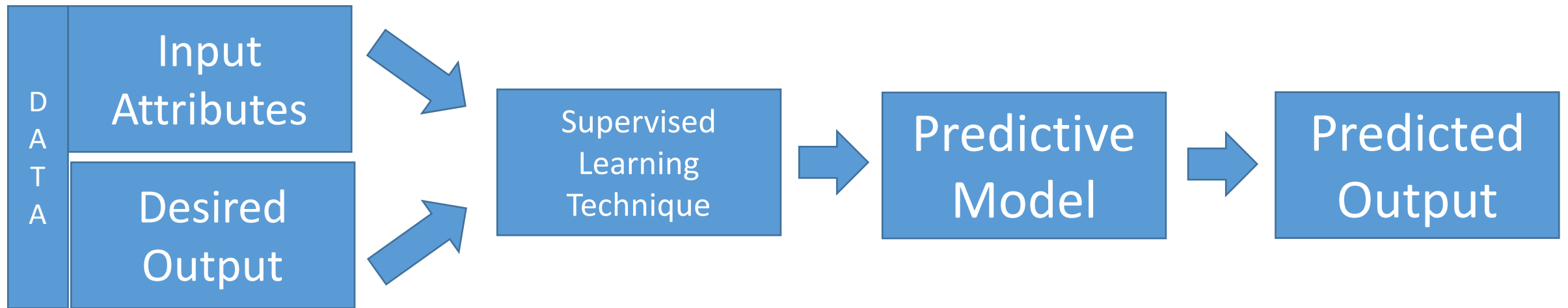
  - Labeled Data is a dataset which has Independent Variable/s and a Dependent Variable

- **Unsupervised learning** is the Machine Learning task of exploring the data to derive some inferences / insights from the dataset

  - The "Target Variable" or the "Labeled Class" is not present in the Unsupervised Learning dataset

Supervised Learning

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┌──────┬──────────────┐
│      │    Input     │ ──→  ┌─────────────┐
│ D    │  Attributes  │      │ Supervised  │      ┌────────────┐      ┌────────────┐
│ A    ├──────────────┤      │ Learning    │ ──→  │ Predictive │ ──→  │ Predicted  │
│ T    │   Desired    │      │ Technique   │      │   Model    │      │   Output   │
│ A    │   Output     │ ──→  └─────────────┘      └────────────┘      └────────────┘
└──────┴──────────────┘
```

- Supervised Learning Techniques
  - Classification
  - Regression

UnSupervised Learning

```
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│    Input     │ ───▶ │ Unsupervised │ ───▶ │    Output    │
│    Data      │      │  Learning    │      │              │
│              │      │  Technique   │      │              │
└──────────────┘      └──────────────┘      └──────────────┘
```
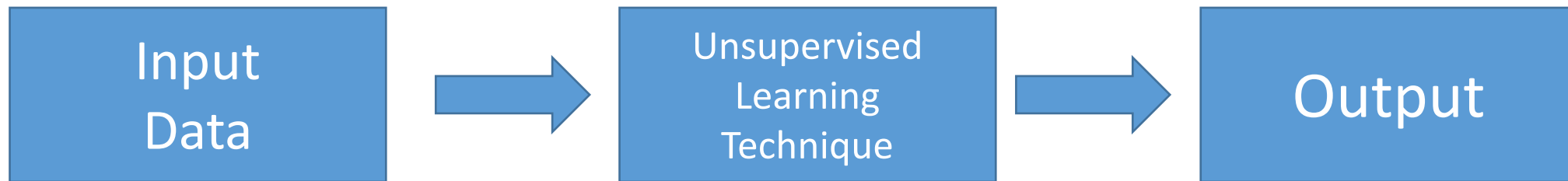
- UnSupervised Learning Techniques
  - Dimension Reduction Techniques like PCA, Factor Analysis
  - Clustering
  - Association Analysis

Application of Supervised Learning

- Assume you are working in a bank (say MyBank)
- The Chief Marketing Officer has assigned you the task of growing the Personal Loans Portfolio by cross-selling the loans to existing Customers
- Data of past promotional campaigns and offers sent to the Customers, their behavioural data and those who took the loan is all available with you

- **This is an example where Supervised Learning can be applied**

Marketing Modeling Dataset

- Sample Predictive Modeling Dataset

	Cust_ID	Target	Age	Gender	Balance	Occupation	No_OF_CR_TXNS	AGE_BKT	SCR	Holding_Period
1	C1	0	30	M	160378.60	SAL	2	26-30	826	9
2	C10	1	41	M	84370.59	SELF-EMP	14	41-45	843	9
3	C100	0	49	F	60849.26	PROF	49	46-50	328	26
4	C1000	0	49	M	10558.81	SAL	23	46-50	619	19
5	C10000	0	43	M	97100.48	SENP	3	41-45	397	8
6	C10001	0	30	M	160378.60	SAL	2	26-30	781	11
7	C10002	0	43	M	26275.55	PROF	23	41-45	354	12
8	C10003	0	53	M	33616.47	SAL	45	>50	239	5
9	C10004	0	45	M	1881.37	PROF	3	41-45	339	13

Some e.g. of Supervised Learning Applications

Industry / Vertical	Supervised Learning Technique Applications	Labeled Class
HR	To predict whether a good employee is likely to resign or not	Resign / Not-Resign
Telecom	To classify customers who are likely to be Churners	Churn / Not-Churn
Retail / Ecommerce	To find potential customers from churned base who can be won back again	Win-back Yes / No
Banking	To build a model that will help assign the probability to a customer to take a product / service	Respond / Not-Respond
Insurance	To build a model to assess the likelihood of customer not renewing his / her policy	Lapse / Not-Lapse

Application of UnSupervised Learning

- Assume you are working in a Retail Company
- You have 1 Mn Loyalty Members
- You have been asked to segment them based on their Buying Behaviour Pattern

- **This is an example of UnSupervised Learning Application**

Clustering Modeling Dataset

- Sample Clustering Modeling Dataset

	Cust_ID	Name	Avg_Mthly_Spend	No_Of_Visits	Apparel_Items	FnV_Items	Staples_Items
1	1	A	10000	2	1	1	0
2	2	B	7000	3	0	10	9
3	3	C	7000	7	1	3	4
4	4	D	6500	5	1	1	4
5	5	E	6000	6	0	12	3
6	6	F	4000	3	0	1	8
7	7	G	2500	5	0	11	2
8	8	H	2500	3	0	1	1
9	9	I	2000	2	0	2	2
10	10	J	1000	4	0	1	7

Thank you

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