

## Task 1: Supermarket Transaction Data Analysis

The goal of this task is to clean, prepare, and analyze supermarket transaction data to generate business insights using data analytics and machine learning techniques.

### 1. Data Loading:

- I loaded four datasets: item.csv, promotion.csv, sales.csv, and supermarkets.csv.
- I used pandas to inspect the datasets, check for missing values, and understand the structure of the data.

### 2. Data Cleaning:

- I checked for missing or incorrect data.
- I ensured that all data types were correct and that columns were consistent across the datasets.

### 3. Data Merging:

Step1: Merged Item with Sales on the code column.

Step2: Merged Promotion with Item on the code column.

Step3: Merged Promotion with Supermarkets on the supermarkets and supermarket\_No columns.

Step4: Merged Sales with Supermarkets on the supermarket\_No column

### Business Insights:

- Sales by Item Type: I created a bar chart to show the distribution of sales across different item types.
- Sales Trends Over Time: I used a line plot to illustrate how sales amounts varied over time.
- Top Selling Brands: A bar chart was used to visualize the brands that generated the most sales.
- Effect of Promotions on Sales: I analyzed how different types of promotions impacted sales.

Machine Learning:

- I implemented a Linear Regression model to predict sales amounts based on features like units sold, item type, and supermarket location.

## **Task 2: Maze Navigation using Reinforcement Learning**

The goal of this task was to design and train an agent using reinforcement learning to navigate a maze and reach the goal while avoiding walls (obstacles).

### **1. Maze Setup:**

- I created a grid to represent the maze, where 0 = open space, 1 = wall (obstacle), and 2 = goal.
- The agent starts at the top-left corner (0, 0) and must reach the goal at (4, 4).

### **2. Q-Learning Algorithm:**

- The agent used the Q-learning algorithm, where it learns through trial and error by interacting with the maze environment.

### **3. Training the Agent:**

- I trained the agent over many episodes (trial runs) to help it learn the most efficient path through the maze.

### **4. Testing the Agent:**

- After training, the agent was able to successfully navigate the maze, reaching the goal in 48 steps.