

## **Case Study:-**

The University of Punjab requires analysis of its Campus Management System (CMS) data to derive actionable academic insights. Your task is to process student records to identify performance trends, monitor attendance compliance, and detect at-risk students. The solution must validate data, handle inconsistencies, and generate departmental performance reports. These insights will support student interventions and resource planning, ultimately enhancing institutional academic quality through data-driven decisions.

You are provided with a sample list of **student data** in the following format:

```
students_data = [
```

```
    "id:101,name:Ali,dept:CS,attendance:88,marks:[80,75,90],feedback:Excellent",  
    "id:102,name:Sara,dept:IT,attendance:72,marks:[60,65,58],feedback:Helpful",  
    "id:103,name:Hamza,dept:CS,attendance:95,marks:[90,92,88],feedback:Very Good",  
    "id:104,name:Maryam,dept:Math,attendance:67,marks:[55,60,50],feedback:Average",  
    "id:105,name:Usman,dept:IT,attendance:85,marks:[70,68,72],feedback:Helpful"
```

```
]
```

### **Q1: Student Record Conversion**

Convert each student's information from text into organized data. Make sure numbers like student ID and attendance are stored as numbers. If any record has errors, skip it and show an error message.

### **Q2: Department Attendance Summary**

Find the average attendance for students in each department. Show the results clearly for each department.

### **Q3: Low Attendance Identification**

Find students who have less than 75% attendance. Return their names for follow-up.

### **Q4: Student Grade Averages**

Calculate the average marks for each student across all their courses. Show each student's name with their average marks.

### **Q5: Top Students by Department**

Find which student has the highest average marks in each department. Return the top student for each department.

**Q6: Unique Course Count**

Count how many different courses are offered across all departments. Make sure you don't count duplicate courses.

**Q7: Feedback Analysis**

Check student feedback comments and count how many times the word "helpful" appears.  
Return both the count and all comments in lowercase.

**Q8: Performance Categories**

Put each student into a performance group based on their average marks:

- 85+ marks: Excellent
- 70–84 marks: Good
- 60–69 marks: Average
- Below 60: Needs Improvement

**Q9: Department Summary**

Create a summary for each department showing: department name, number of students, average attendance, and top student name.

**Q10: Student-Course Matching**

Pair each student with one course from the course list. If there are more students than courses (or vice versa), handle the mismatch by showing a clear message and only pairing the available pairs.