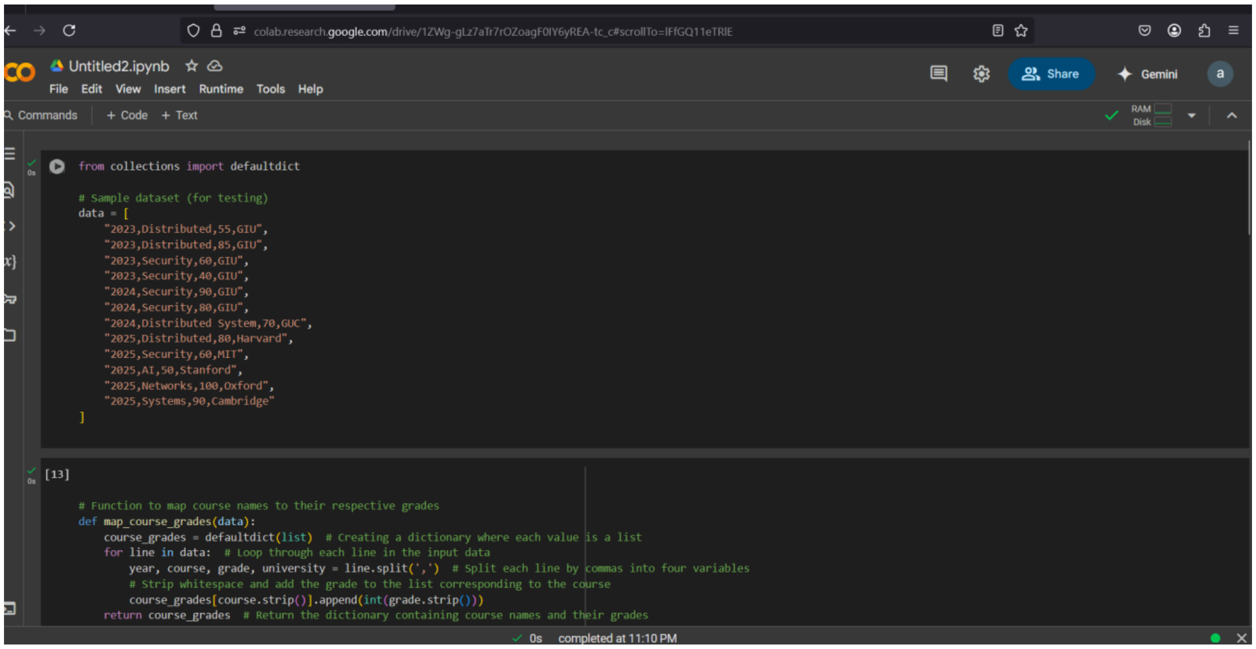
SCREEENSHOTS FOR CODE

THE DATA:



```
from collections import defaultdict

# Sample dataset (for testing)
data = [
    "2023,Distributed,55,GIU",
    "2023,Distributed,85,GIU",
    "2023,Security,60,GIU",
    "2023,Security,40,GIU",
    "2024,Security,90,GIU",
    "2024,Security,80,GIU",
    "2024,Distributed System,70,GUC",
    "2025,Distributed,80,Harvard",
    "2025,Security,60,MIT",
    "2025,AI,50,Stanford",
    "2025,Networks,100,Oxford",
    "2025,Systems,90,Cambridge"
]
```

```
[13]

# Function to map course names to their respective grades
def map_course_grades(data):
    course_grades = defaultdict(list)  # Creating a dictionary where each value is a list
    for line in data:  # Loop through each line in the input data
        year, course, grade, university = line.split(',')  # Split each line by commas into four variables
        # Strip whitespace and add the grade to the list corresponding to the course
        course_grades[course.strip()].append(int(grade.strip()))
    return course_grades  # Return the dictionary containing course names and their grades
```

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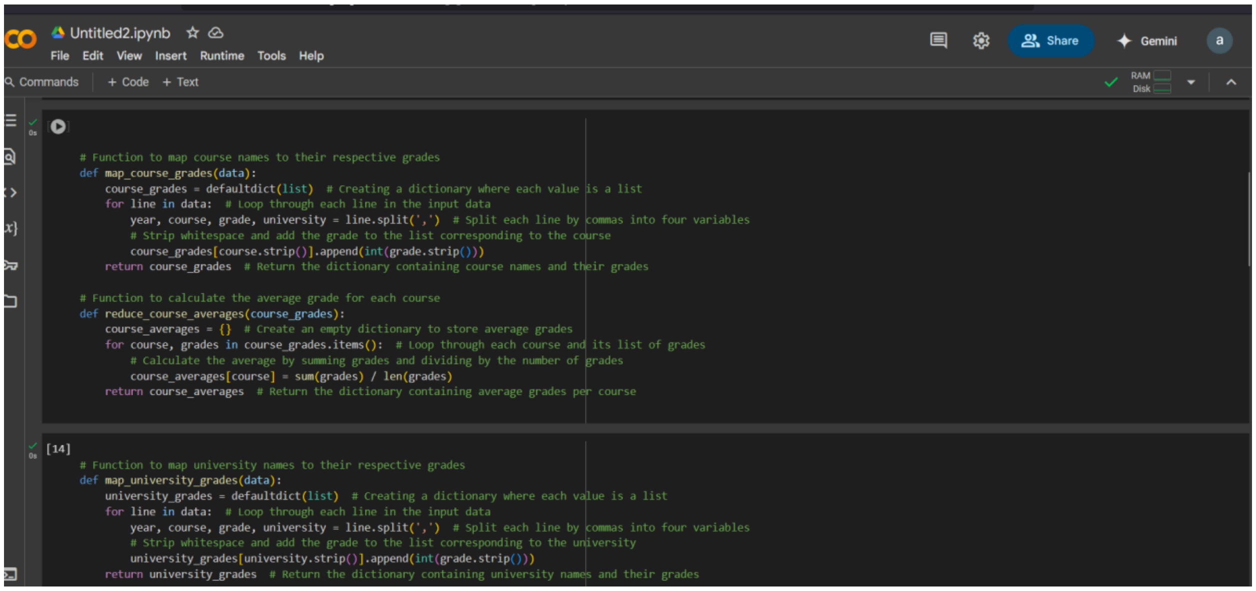
TASK 1

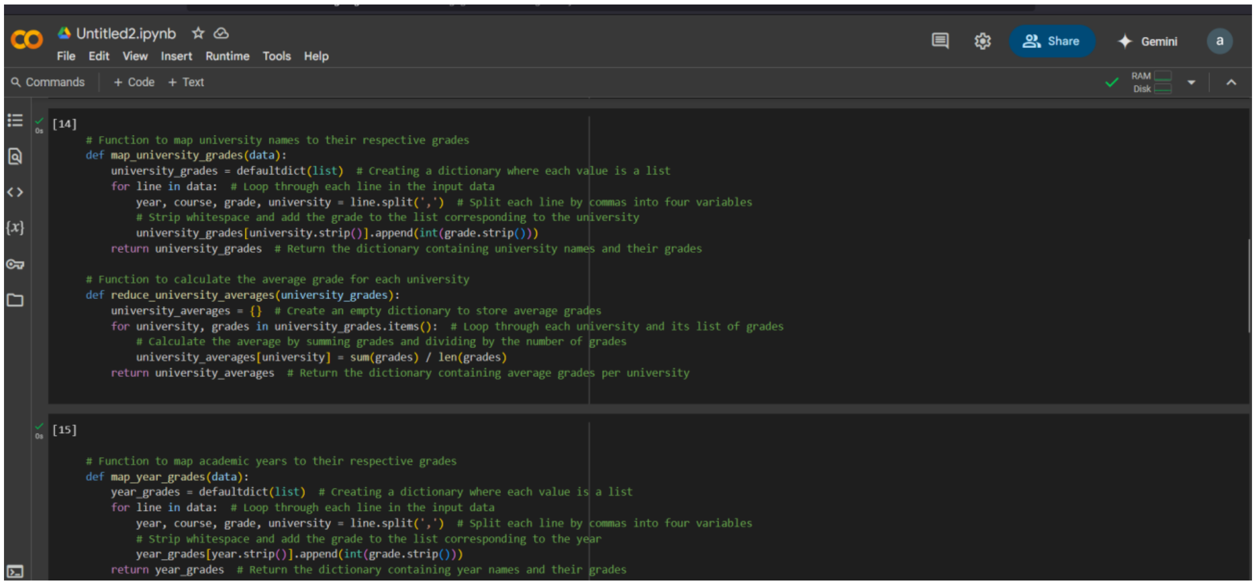


```
# Function to map course names to their respective grades
def map_course_grades(data):
    course_grades = defaultdict(list)  # Creating a dictionary where each value is a list
    for line in data:  # Loop through each line in the input data
        year, course, grade, university = line.split(',')  # Split each line by commas into four variables
        # Strip whitespace and add the grade to the list corresponding to the course
        course_grades[course.strip()].append(int(grade.strip()))
    return course_grades  # Return the dictionary containing course names and their grades

# Function to calculate the average grade for each course
def reduce_course_averages(course_grades):
    course_averages = {}  # Create an empty dictionary to store average grades
    for course, grades in course_grades.items():  # Loop through each course and its list of grades
        # Calculate the average by summing grades and dividing by the number of grades
        course_averages[course] = sum(grades) / len(grades)
    return course_averages  # Return the dictionary containing average grades per course
```

```
[14]
# Function to map university names to their respective grades
def map_university_grades(data):
    university_grades = defaultdict(list)  # Creating a dictionary where each value is a list
    for line in data:  # Loop through each line in the input data
        year, course, grade, university = line.split(',')  # Split each line by commas into four variables
        # Strip whitespace and add the grade to the list corresponding to the university
        university_grades[university.strip()].append(int(grade.strip()))
    return university_grades  # Return the dictionary containing university names and their grades
```

TASK 2



[14]

```python
# Function to map university names to their respective grades
def map_university_grades(data):
    university_grades = defaultdict(list)  # Creating a dictionary where each value is a list
    for line in data:  # Loop through each line in the input data
        year, course, grade, university = line.split(',')  # Split each line by commas into four variables
        # Strip whitespace and add the grade to the list corresponding to the university
        university_grades[university.strip()].append(int(grade.strip()))
    return university_grades  # Return the dictionary containing university names and their grades

# Function to calculate the average grade for each university
def reduce_university_averages(university_grades):
    university_averages = {}  # Create an empty dictionary to store average grades
    for university, grades in university_grades.items():  # Loop through each university and its list of grades
        # Calculate the average by summing grades and dividing by the number of grades
        university_averages[university] = sum(grades) / len(grades)
    return university_averages  # Return the dictionary containing average grades per university
```

[15]

```python
# Function to map academic years to their respective grades
def map_year_grades(data):
    year_grades = defaultdict(list)  # Creating a dictionary where each value is a list
    for line in data:  # Loop through each line in the input data
        year, course, grade, university = line.split(',')  # Split each line by commas into four variables
        # Strip whitespace and add the grade to the list corresponding to the year
        year_grades[year.strip()].append(int(grade.strip()))
    return year_grades  # Return the dictionary containing year names and their grades
```

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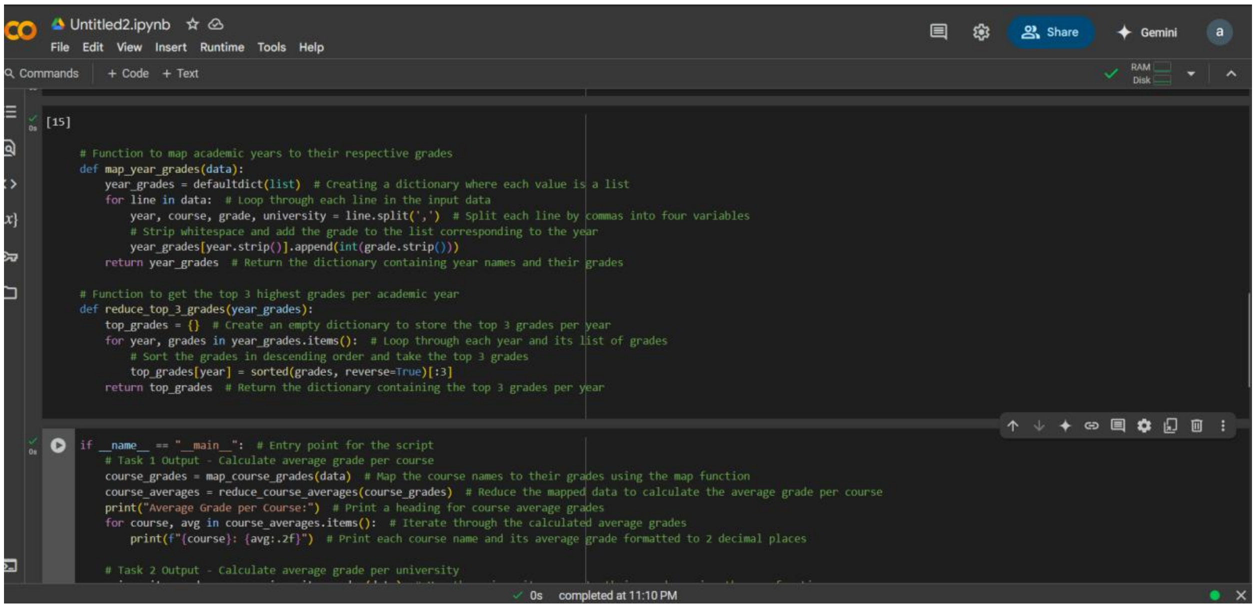

[15]

```python
# Function to map academic years to their respective grades
def map_year_grades(data):
    year_grades = defaultdict(list)  # Creating a dictionary where each value is a list
    for line in data:  # Loop through each line in the input data
        year, course, grade, university = line.split(',')  # Split each line by commas into four variables
        # Strip whitespace and add the grade to the list corresponding to the year
        year_grades[year.strip()].append(int(grade.strip()))
    return year_grades  # Return the dictionary containing year names and their grades

# Function to get the top 3 highest grades per academic year
def reduce_top_3_grades(year_grades):
    top_grades = {}  # Create an empty dictionary to store the top 3 grades per year
    for year, grades in year_grades.items():  # Loop through each year and its list of grades
        # Sort the grades in descending order and take the top 3 grades
        top_grades[year] = sorted(grades, reverse=True)[:3]
    return top_grades  # Return the dictionary containing the top 3 grades per year
```

```python
if __name__ == "__main__":  # Entry point for the script
    # Task 1 Output - Calculate average grade per course
    course_grades = map_course_grades(data)  # Map the course names to their grades using the map function
    course_averages = reduce_course_averages(course_grades)  # Reduce the mapped data to calculate the average grade per course
    print("Average Grade per Course:")  # Print a heading for course average grades
    for course, avg in course_averages.items():  # Iterate through the calculated average grades
        print(f"{course}: {avg:.2f}")  # Print each course name and its average grade formatted to 2 decimal places

    # Task 2 Output - Calculate average grade per university
```

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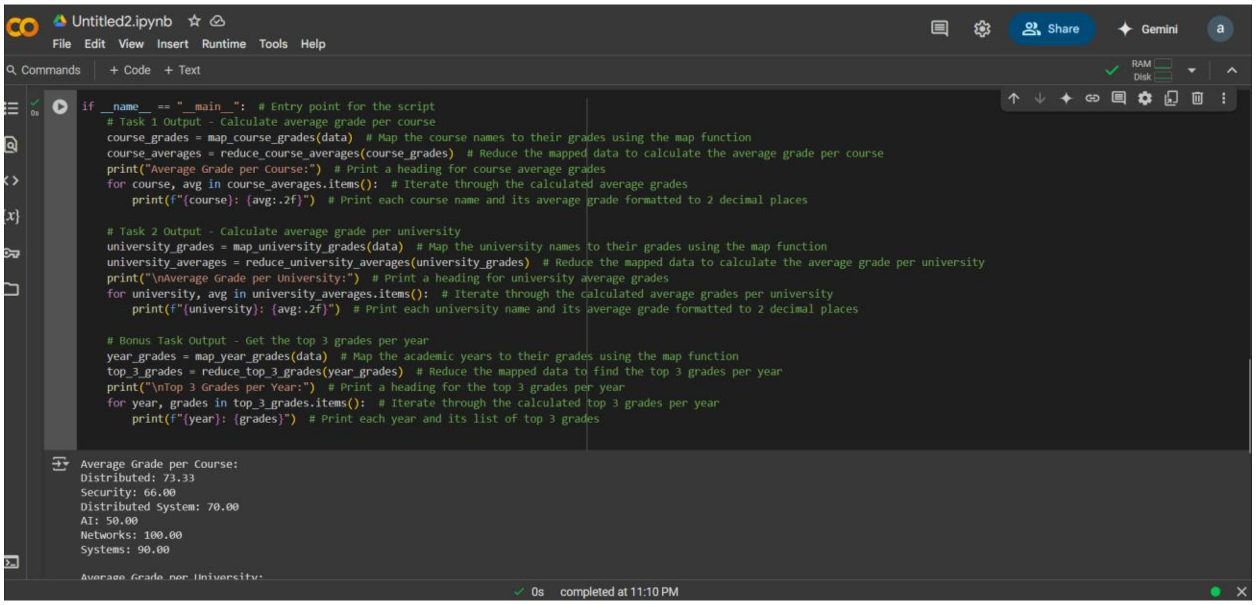
MAIN:

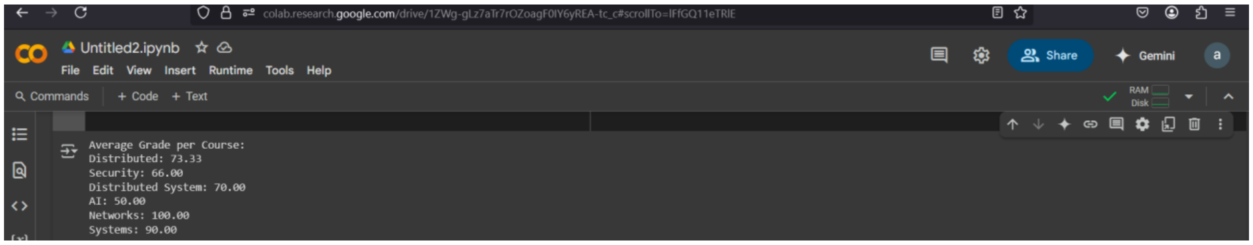


```python
if __name__ == "__main__":  # Entry point for the script
    # Task 1 Output - Calculate average grade per course
    course_grades = map_course_grades(data)  # Map the course names to their grades using the map function
    course_averages = reduce_course_averages(course_grades)  # Reduce the mapped data to calculate the average grade per course
    print("Average Grade per Course:")  # Print a heading for course average grades
    for course, avg in course_averages.items():  # Iterate through the calculated average grades
        print(f"{course}: {avg:.2f}")  # Print each course name and its average grade formatted to 2 decimal places

    # Task 2 Output - Calculate average grade per university
    university_grades = map_university_grades(data)  # Map the university names to their grades using the map function
    university_averages = reduce_university_averages(university_grades)  # Reduce the mapped data to calculate the average grade per university
    print("\nAverage Grade per University:")  # Print a heading for university average grades
    for university, avg in university_averages.items():  # Iterate through the calculated average grades per university
        print(f"{university}: {avg:.2f}")  # Print each university name and its average grade formatted to 2 decimal places

    # Bonus Task Output - Get the top 3 grades per year
    year_grades = map_year_grades(data)  # Map the academic years to their grades using the map function
    top_3_grades = reduce_top_3_grades(year_grades)  # Reduce the mapped data to find the top 3 grades per year
    print("\nTop 3 Grades per Year:")  # Print a heading for the top 3 grades per year
    for year, grades in top_3_grades.items():  # Iterate through the calculated top 3 grades per year
        print(f"{year}: {grades}")  # Print each year and its list of top 3 grades
```

```
Average Grade per Course:
Distributed: 73.33
Security: 66.00
Distributed System: 70.00
AI: 50.00
Networks: 100.00
Systems: 90.00

Average Grade per University:
```

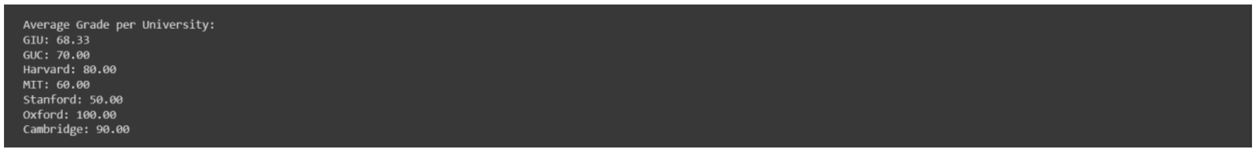
SCREENSHOTS FOR OUTPUT :

The ouput for task 1:



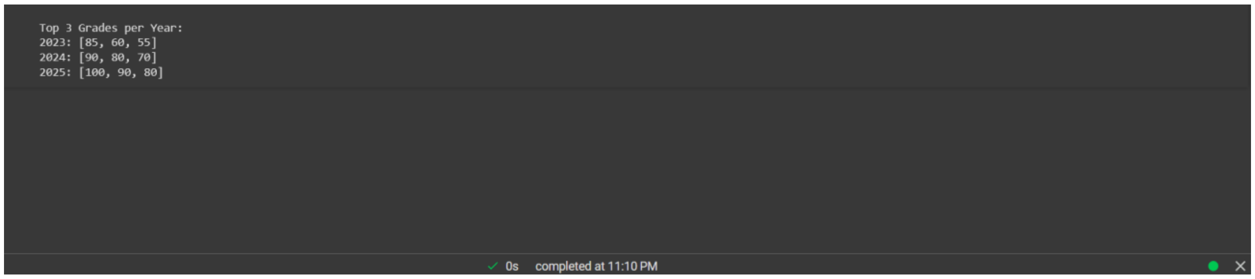
```
Average Grade per Course:
Distributed: 73.33
Security: 66.00
Distributed System: 70.00
AI: 50.00
Networks: 100.00
Systems: 90.00
```

OUTPUT FOR TASK 2:



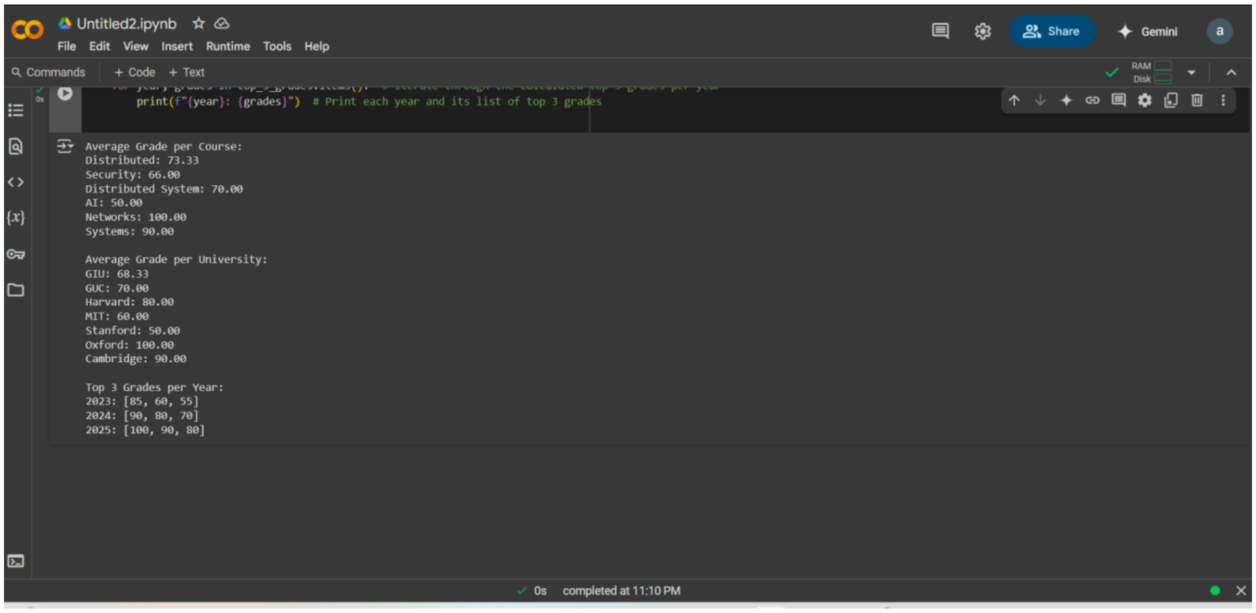
```
Average Grade per University:
GIU: 68.33
GUC: 70.00
Harvard: 80.00
MIT: 60.00
Stanford: 50.00
Oxford: 100.00
Cambridge: 90.00
```

OUTPUT FOR BOUNES :



```
Top 3 Grades per Year:
2023: [85, 60, 55]
2024: [90, 80, 70]
2025: [100, 90, 80]
```

OUTPUT :


Untitled2.ipynb
File Edit View Insert Runtime Tools Help
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```
    print(f"{year}: {grades}")  # Print each year and its list of top 3 grades
```

```
Average Grade per Course:
Distributed: 73.33
Security: 66.00
Distributed System: 70.00
AI: 50.00
Networks: 100.00
Systems: 90.00

Average Grade per University:
GIU: 68.33
GUC: 70.00
Harvard: 80.00
MIT: 60.00
Stanford: 50.00
Oxford: 100.00
Cambridge: 90.00

Top 3 Grades per Year:
2023: [85, 60, 55]
2024: [90, 80, 70]
2025: [100, 90, 80]
```