Announcements

• Project 4: First Team Project
  • Homework: Pick a team or let us know you need a team
  • Instructions are on the course pages under projects
  • Teams should be of size 3

• Mid-semester evaluations are now open
  • Course home page has details
ANY QUESTIONS?
Table of Contents

- More Examples on Matrices
Matrix Definition

- 4-by-4 all zero matrix:
  \[ A = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \]

- Populate \( A \) with values using for loop

```python
for i in range(len(A)):
    for j in range(len(A[0])):
        A[i][j] = i+j
```
Example 1: Take one minute and write a nested for loop that will calculate the sum of diagonal elements.

```python
Sum = 0
for i in range(len(A)):
    for j in range(len(A[0])):
        if (i==j):
            Sum = Sum + A[i][j]
```

```
0  2  3  1  2
1  6  5  7  2
2  2  1  1  5
3  3  4  5  3
```
Example 2: Take one minute and write a nested for loop that will calculate the sum of each row

```python
sumRow = 0
for i in range(len(A)):
    for j in range(len(A[0])):
        sumRow = sumRow + A[i][j]
    print(sumRow)
sumRow = 0
```
Example 3: Take one minute and write a nested for loop that will calculate the sum of each column

```python
sumCol = 0
for i in range(len(A[0])):  
    for j in range(len(A)):  
        sumCol = sumCol + A[j][i]  
    print (sumCol)  
sumCol = 0
```
Sum of two matrices

\[
\begin{array}{c|c|c|c|c}
A[0][0]+B[0][0] & A[0][1]+B[0][1] & \ldots & A[0][2]+B[0][2] \\
\hline
\ldots & \ldots & \ldots & \ldots \\
\hline
\end{array}
\]

\[
\begin{array}{cccc}
2 & 3 & 1 & 2 \\
6 & 5 & 7 & 2 \\
2 & 1 & 1 & 5 \\
3 & 4 & 5 & 3 \\
\end{array}
\]

\[
\begin{array}{cccc}
5 & 5 & 5 & 5 \\
1 & 1 & 1 & 1 \\
3 & 3 & 3 & 3 \\
4 & 4 & 4 & 4 \\
\end{array}
\]

Example 4: Take one minute and write a nested for loop that will calculate the sum of two matrices

```python
for i in range(len(A)):
    for j in range(len(A[0])):
        C[i][j] = A[i][j]+B[i][j]
```
Matrix Vector Multiplication

\[ C = A \times B \]


Example 5: Take one minute and write a nested for loop that will calculate the Matrix-Vector multiplication
Matrix Vector Multiplication

\[
\begin{align*}
\text{C} & = \text{A} \times \text{B} \\
& = \begin{bmatrix}
16 & 0 & 222 & 222 & 16 & 16 & 20 \\
16 & 12 & 4 & 3 & 1 & 2 & 1 \\
20 & 3 & 2 & 1 & 1 & 1 & 1
\end{bmatrix}
\begin{bmatrix}
2 \\
2 \\
2
\end{bmatrix}
\end{align*}
\]

```python
for i in range(len(A)):
    for j in range(len(A[0])):
        C[i] = C[i] + A[i][j]*B[j]
```
Example 6: Take one minute and write a nested for loop that will find the max element in the matrix.

```python
maxElement = A[0][0]
    for i in range(len(A)):
        for j in range(len(A[0])):
            if (maxElement < A[i][j]):
                maxElement = A[i][j]
print(maxElement)
```
Example 7: Take one minute and write a nested for loop that will print the matrix in the reverse order by row: 1,3,5,4,3,3,5,…

```python
for i in range(len(A)-1,-1,-1):
    for j in range(len(A[0])-1,-1,-1):
        print (A[i][j])
```
Example 8: Take one minute and write a nested for loop that will print the matrix in the reverse order by row: 1,3,8,1,3,5,2,…

```python
for i in range(len(A[0])-1,-1,-1):
    for j in range(len(A)-1,-1,-1):
        print (A[j][i])
```
Example 9: Take one minute and write a nested for loop that will print the upper half of the matrix without the diagonal.

```
for i in range(len(A)):
    for j in range(len(A[0])):
        if i < j:
            print(A[i][j])
```
Example 10: Take one minute and write a nested for loop that will print the lower half of the matrix without the diagonal

```python
for i in range(len(A)):
    for j in range(len(A[0])):
        if (i>j):
            print(A[i][j])
```
ANY QUESTIONS?