

Home Work

CS221: Data Structures and Algorithms

Usman Institute of Technology

Fall 2019

Matrices

1. Consider following matrices of given sizes:

Matrix	Rows	Columns
A	10	100
B	100	5
C	5	50

Calculate the cost of following operations:

- a. $(A * B) * C$
 - b. $A * (B * C)$
2. Whether the answer of Q1(a) and Q1(b) are same or different? Why?
 3. What is a Sparse Matrix? What is Three Column Representation (aka as Triplet Representation) for sparse matrices?
 4. Design and implement a class in Python that allows a teacher to track the grades in a single course. Include methods that calculate the average grade, the highest grade, and the lowest grade. Write a program to test your class implementation (taken from Data Structure and Algorithms using C#)
 5. Write a function that return diagonal of an array.
def GetDiagonal(array: numpy.ndarray) -> list:
 6. Write a function to return the sum of all elements in an array.
def GetSum(array: numpy.ndarray) -> numpy.ndarray:
 7. Write a function to return the maximum element in an array
def GetMax(array: numpy.ndarray) -> int:
 8. Write a function to find whether the given matrix is symmetric or not
def IsSymmetric(array: numpy.ndarray) -> bool:
 9. Write a function that receive a two-dimension matrix and convert into a triplet representation
def GetTriplet(array: numpy.ndarray) -> numpy.ndarray:
 10. Write a function that receive a sparse matrix (in triplet form) and return a two dimension matrix.
def GetMatrix(array: numpy.ndarray) -> numpy.ndarray:

11. Write a function that receive two sparse matrices (in Triplet representation) and return the sum of both matrices

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def SumSparse(array1: numpy.ndarray, array2: numpy.ndarray)
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Resources:

- Sparse Matrix (http://btechsmartclass.com/DS/U1_T14.html)
- Sparse Matrix(2D-Array):Basic and Three Column Representation (<https://www.youtube.com/watch?v=WHdVUbeVnTg>)
- Symmetric Matrix (https://en.wikipedia.org/wiki/Symmetric_matrix)