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Project IDEA: Matrix operations are fundamental in many fields of mathematics, computer science, physics, engineering, and data science. In Python, matrix operations can be performed manually or with the help of libraries such as **NumPy**. This project involves creating a program that can handle basic matrix operations, like addition, subtraction, multiplication, and more.

Project:

# Matrix Operations in Python  
  
def add\_matrices(A, B):  
 *"""Add two matrices."""* # Check if matrices have the same dimensions  
 if len(A) != len(B) or len(A[0]) != len(B[0]):  
 raise ValueError("Matrices must have the same dimensions to be added.")  
  
 # Matrix addition: A[i][j] + B[i][j]  
 result = [[A[i][j] + B[i][j] for j in range(len(A[0]))] for i in range(len(A))]  
 return result  
  
  
def subtract\_matrices(A, B):  
 *"""Subtract matrix B from matrix A."""* # Check if matrices have the same dimensions  
 if len(A) != len(B) or len(A[0]) != len(B[0]):  
 raise ValueError("Matrices must have the same dimensions to be subtracted.")  
  
 # Matrix subtraction: A[i][j] - B[i][j]  
 result = [[A[i][j] - B[i][j] for j in range(len(A[0]))] for i in range(len(A))]  
 return result  
  
  
def multiply\_matrices(A, B):  
 *"""Multiply two matrices."""* # Check if the number of columns of A equals the number of rows of B  
 if len(A[0]) != len(B):  
 raise ValueError("Number of columns of A must be equal to the number of rows of B.")  
  
 # Matrix multiplication: Result[i][j] = sum(A[i][k] \* B[k][j] for k in range(cols of A))  
 result = [[sum(A[i][k] \* B[k][j] for k in range(len(A[0]))) for j in range(len(B[0]))] for i in range(len(A))]  
 return result  
  
  
# Example usage:  
  
# Matrices  
A = [  
 [1, 2],  
 [3, 4]  
]  
  
B = [  
 [5, 6],  
 [7, 8]  
]  
  
# Addition  
sum\_result = add\_matrices(A, B)  
print("Matrix A + Matrix B:")  
for row in sum\_result:  
 print(row)  
  
# Subtraction  
diff\_result = subtract\_matrices(A, B)  
print("\nMatrix A - Matrix B:")  
for row in diff\_result:  
 print(row)  
  
# Multiplication  
prod\_result = multiply\_matrices(A, B)  
print("\nMatrix A \* Matrix B:")  
for row in prod\_result:  
 print(row)

Output: 