

**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**  
**SCHOOL OF ELECTRICAL AND INFORMATION ENGINEERING**

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**ELEN4020A: Data Intensive Computing: Lab 1**

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1 INTRODUCTION

2 RANK2TENSOR

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**Algorithm 1:** Rank 2 Tensor Addition(A,B)

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**Function name:** *rank2TensorAdd*

Initialization :

- A and B are  $n \times n$  matrices
- Let C be an empty  $n \times n$  matrix

```
for  $i=1$  to  $n$  do  
    for  $j=1$  to  $n$  do  
         $C[i][j] = A[i][j] + B[i][j]$   
    end  
end  
return C
```

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**Algorithm 2:** Rank 2 Tensor Multiplication(A,B)

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**Function name:** *rank2TensorMult*

Initialization :

- A and B are  $n \times n$  matrices
- Let C be an empty  $n \times n$  matrix

```
for  $i=1$  to  $n$  do  
    for  $j=1$  to  $n$  do  
         $C[i][j] = 0$   
        for  $k=1$  to  $n$  do  
             $C[i][j] = C[i][j] + A[i][k] * B[k][j]$   
        end  
    end  
end  
return C
```

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### 3 RANK3TENSOR

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**Algorithm 3:** Rank 3 Tensor Addition(A,B)

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**Function name:** *rank3TensorAdd*

Initialization :

- A and B are  $n \times n \times n$  matrices
- Let C be an empty  $n \times n \times n$  matrix

**for**  $i=1$  to  $n$  **do**|  $C[i] = \text{rank2TensorAdd}(A[i], B[i])$ **end****return** C

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**Algorithm 4:** Rank 3 Tensor Multiplication(A,B)

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**Function name:** *rank3TensorMult*

Initialization :

- A and B are  $n \times n \times n$  matrices
- Let C be an empty  $n \times n \times n$  matrix
- Let hplane = matA = matB be empty  $n \times n$  matrices
- tmp = rslt = 0

**for**  $i=1$  to  $n$  **do**

| hplane = A[i]

| **for**  $j=1$  to  $n$  **do**

| | vplane = extract column(B,j)

| | **for**  $k=1$  to  $n$  **do**| | | **for**  $x=1$  to  $n$  **do**

| | | | VplaneColumn = extract column(vplane,x)

| | | | matA = RowvecToMat(hplane(k))

| | | | matB = ColvecToMat(VplaneColumn)

| | | | tmp = rank2TensorMult(matA, matB)

| | | | rslt = tmp[0][0]

| | | **end**| | **end**| **end****end**

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### 4 CONCLUSION