

# Deep Learning & Matrices in Julia

ROB 102: Introduction to AI & Programming

2021/12/01

# Today...

1. Deep learning image recognition activity
2. Matrix math review
3. Matrix math in Julia

# Matrix Math in Julia

Create two square matrices:

```
main.jl x
1 D = 5
2 A = rand(1:10, (D, D))
3 B = rand(1:10, (D, D))
4
5 @show A
6 @show B
7
8
```

Console Shell

```
A = [4 1 2 5 5; 6 3 8 10 9
9 6 9 1; 6 9 1 7 6; 5 8 8 9 6]
B = [8 4 9 9 10; 9 6 6 9 5; 7
8 5 4 3; 3 7 5 9 3; 3 5 10 5 8
]
```

**Challenge 1:** Print row 2 of matrix A and column 2 of matrix B.

# Matrix Math in Julia

Create two square matrices:

```
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1 D = 5
2 A = rand(1:10, (D, D))
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4
5 @show A
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```

Console Shell

```
A = [4 1 2 5 5; 6 3 8 10 9
9 6 9 1; 6 9 1 7 6; 5 8 8 9 6]
B = [8 4 9 9 10; 9 6 6 9 5; 7
8 5 4 3; 3 7 5 9 3; 3 5 10 5 8
]
```

**Challenge 2:** Calculate the Euclidean distance between A and B two ways: by looping through the matrix and by using matrix math.

# Matrix Multiplication in Julia

What do you expect the output to be?

```
main.jl x
1 D = 5
2 A = rand(1:10, (D, D))
3 B = rand(1:10, (D, D))
4
5 @show A
6 @show B
7 @show A * B
8 @show A .* B
9
10
11
12
```

Console Shell

```
A = [5 8 3 8 9; 6 4 3 10 5; 4 1
; 6 5 4 1 3; 6 5 3 6 1]
B = [10 7 6 3 9; 7 8 6 4 10; 9 7 5 6
1; 9 2 7 7 7; 10 1 9 3 8]
```

# Matrix Multiplication in Julia

What do you expect the output to be?

```
main.jl x
1 D = 5
2 A = rand(1:10, (D, D))
3 B = rand(1:10, (D, D))
4
5 @show A
6 @show B
7 @show A * B
8 @show A .* B
9
10
11
12
```

Console Shell

```
A = [5 8 3 8 9; 6 4 3 10 5; 4 1
; 6 5 4 1 3; 6 5 3 6 1]
B = [10 7 6 3 9; 7 8 6 4 10; 9 7 5 6
1; 9 2 7 7 7; 10 1 9 3 8]
A * B = [295 145 230 148 256; 255 120
190 137 207; 252 108 184 135 165; 17
0 115 120 78 139; 186 116 132 101 157
]
```

# Matrix Multiplication in Julia

What do you expect the output to be?

```
main.jl x
1 D = 5
2 A = rand(1:10, (D, D))
3 B = rand(1:10, (D, D))
4
5 @show A
6 @show B
7 @show A * B ← Matrix multiplication
8 @show A .* B ← Elementwise multiplication
9
10
11
12
```

Console Shell

```
A = [5 8 3 8 9; 6 4 3 10 5; 4 1
; 6 5 4 1 3; 6 5 3 6 1]
B = [10 7 6 3 9; 7 8 6 4 10; 9 7 5 6
1; 9 2 7 7 7; 10 1 9 3 8]
A * B = [295 145 230 148 256; 255 120
190 137 207; 252 108 184 135 165; 17
0 115 120 78 139; 186 116 132 101 157
]
A .* B = [50 56 18 24 81; 42 32 18 40
50; 36 7 35 48 7; 54 10 28 7 21; 60
5 27 18 8]
julia
```

# Matrix Math in Julia

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Console Shell

```
A = [4 1 2 5 5; 6 3 8 10 9
9 6 9 1; 6 9 1 7 6; 5 8 8 9 6]
B = [8 4 9 9 10; 9 6 6 9 5; 7
8 5 4 3; 3 7 5 9 3; 3 5 10 5 8
]
```

**Challenge 3:** Perform matrix multiplication 2 ways: by looping through the rows and columns, and using the matrix multiplication operator.