

ECE 257 - LESSON 1 - INTRODUCTION TO MATRICES

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IN CLASS

Matrices of numbers are really nothing more than *tables* of numbers like the following

$$a = \begin{array}{ccc} 1 & 3 & 7 \\ 2 & 4 & 2 \end{array}$$

They're very useful in many applications including storing of data and for solving of linear equations. Our matrix a has two rows and three columns. We say it is a 2x3 (2 by 3) matrix

GENERATION OF MATRICES

1. Inputting matrices

```
>> a = [1 3 2; 4 1 -2]
>> a11 = a(1, 1)
>> a23 = a(2, 3)
>> a(2, 3) = 5;
>> a
>> size(a)
```

- How do we enter a matrix with m rows and n columns
- What is $a(h, k)$ of a matrix a
- How do we change the value of a matrix element
- What is the *size* of a matrix

2. Some special matrices

```
>> a1 = ones(1, 2)
>> a2 = ones(2)
>> a3 = 3*ones(2)
>> a4 = zeros(1, 2)
```

- What does the function *ones* do
- What does the function *zeros* do

3. Adding elements to a matrix

```
>> a = ones (2)
>> a(3, 3) = 5
```

- What happens when we add a new element to an existing matrix

GENERATION OF VECTORS

4. Inputting vectors

```
>> a = [1 3 5]
>> a2 = a(2)
>> length(a)
>> b = [1; 3; 5]
>> b2 = b(2)
>> length(b)
```

- How do we generate a row vector
- What is $a(k)$ of a row vector a
- How do we generate a column vector
- What is $b(k)$ of a column vector b
- What is the length of a vector

5. Using colons to generate vectors

```
>> x1 = 2: 4
>> x2 = 0: 0.1: 0.4
>> x3 = 0: 0.2: 0.5
>> x4 = -1: 0.5: 1
>> x5 = 1: -0.5: -1
```

- How can we generate row vectors with colons

MANIPULATION OF MATRICES

6. Transposing matrices

```
>> x1 = 0: 0.1: 0.4
>> x2 = x1'
>> x3 = x2'
>> x4 = [1 2 3; 4 5 6]
>> x5 = x4'
```

- What happens to the n 'th row when we transpose a matrix
- What happens when we take the transpose of a transpose

7. Flipping of matrices

```
>> a = [1 2 3; 4 5 6]
>> a1 = flipud(a)
>> a2 = fliplr(a)
```

- What does *flipud* do
- What does *fliplr* do

CONCATENATION

8. Concatenation examples

```
>> voltage = [1 2 3]
>> current = [6 7 8]
>> vc_1 = [voltage current]
>> vc_2 = [voltage; current]
```

- What does concatenation do

9. Tables

```
>> voltage = [1 2 3]
>> current = [6 7 8]
>> table_3 = [voltage; current]'
>> table_4 = [voltage' current']
```

- a. How can we use concatenation and transpose to form a table

SUBMATRICES

10. Submatrices of a vector

```
>> a = [0 2 4 6 8 10 12]
>> a1 = a(3)
>> a2 = a(3, 4, 5)
>> a3 = a([3 4 5])
>> a3 = a(3: 5)
>> a4 = a(3: end)
>> a5 = a(1: 2: 5)
>> a6 = a(1: 2: end)
```

- What is `a(h: k)`
- What is `a(h: end)`
- What is `a(1: 2: end)`

11. Changing values of a vector

```
>> a = [0 2 4 6 8 10 12];
>> a(1: 2: 5) = 10
>> b = [1 3 5];
>> a(b) = 15
```

- How were the values of the vector changed

12. Submatrices of a matrix

```
>> b = [1 2 3; 4 5 6; 7 8 9]
>> b1 = b(:, 2)
>> b2 = b(2, :)
>> b3 = b(:, 2:3)
>> b4 = b(2:3, :)
>> b5 = b(1:2, 2:3)
```

- What is `b(:, k)`
- What is `b(h, :)`
- What is `b(:, h:k)`
- What is `b(h:k, :)`
- What is `b(h:k, m:n)`

13. Changing values of a submatrix of a matrix

```
>> b = [1 2 3; 4 5 6; 7 8 9]
>> b(:, 2) = 2;
>> b
```

- How were the values in the second column changed