

- Welcome
- Introduction
- Review
- Model and Cost Function
- Parameter Learning
- Review
- Linear Algebra Review

- Video:** Matrices and Vectors  
8 min
- Reading:** Matrices and Vectors  
2 min
- Video:** Addition and Scalar Multiplication  
6 min
- Reading:** Addition and Scalar Multiplication  
3 min
- Video:** Matrix Vector Multiplication  
13 min
- Reading:** Matrix Vector Multiplication  
2 min
- Video:** Matrix Matrix Multiplication  
11 min
- Reading:** Matrix Matrix Multiplication  
2 min
- Video:** Matrix Multiplication Properties  
9 min
- Reading:** Matrix Multiplication Properties  
2 min
- Video:** Inverse and Transpose  
11 min
- Reading:** Inverse and Transpose  
3 min

## Review

# Matrices and Vectors

Matrices are 2-dimensional arrays:

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \\ j & k & l \end{bmatrix}$$

The above matrix has four rows and three columns, so it is a 4 x 3 matrix.

A vector is a matrix with one column and many rows:

$$\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix}$$

So vectors are a subset of matrices. The above vector is a 4 x 1 matrix.

## Notation and terms:

- $A_{ij}$  refers to the element in the  $i$ th row and  $j$ th column of matrix  $A$ .
- A vector with ' $n$ ' rows is referred to as an ' $n$ '-dimensional vector.
- $v_i$  refers to the element in the  $i$ th row of the vector.
- In general, all our vectors and matrices will be 1-indexed. Note that for some programming languages, the arrays are 0-indexed.
- Matrices are usually denoted by uppercase names while vectors are lowercase.
- "Scalar" means that an object is a single value, not a vector or matrix.
- $\mathbb{R}$  refers to the set of scalar real numbers.
- $\mathbb{R}^n$  refers to the set of  $n$ -dimensional vectors of real numbers.

Run the cell below to get familiar with the commands in Octave/Matlab. Feel free to create matrices and vectors and try out different things.

```

1 % The ; denotes we are going back to a new row.
2 A = [1, 2, 3; 4, 5, 6; 7, 8, 9; 10, 11, 12]
3
4 % Initialize a vector
5 v = [1;2;3]
6
7 % Get the dimension of the matrix A where m = rows and n = columns
8 [m,n] = size(A)
9
10 % You could also store it this way
11 dim_A = size(A)
12
13 % Get the dimension of the vector v
14 dim_v = size(v)
15
16 % Now let's index into the 2nd row 3rd column of matrix A
17 A_23 = A(2,3)
18

```

Run

Reset

A =

1	2	3
4	5	6
7	8	9
10	11	12

v =

1
2
3