Computing on Data visuals

```
>> A = [1 2; 3 4; 5 6]
A =

   1   2
   3   4
   5   6

>> B = [11 12; 13 14; 15 16]
B =

   11   12
   13   14
   15   16

>> C = [1 1; 2 2]
C =

   1   1
   2   2
```

```
>> A*C
ans =

    5    5
   11   11
   17   17
```

Remember matrix multiplication:

Matrix-Vector Multiplication

We map the column of the vector onto each row of the matrix, multiplying each element and summing the result.

$$\begin{bmatrix} a & b \\ c & d \\ e & f \end{bmatrix} * \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} a*x+b*y \\ c*x+d*y \\ e*x+f*y \end{bmatrix}$$

The result is a **vector**. The number of **columns** of the matrix must equal the number of **rows** of the vector.

An **m x n matrix** multiplied by an **n x 1 vector** results in an **m x 1 vector**.

Matrix-Matrix Multiplication

We multiply two matrices by breaking it into several vector multiplications and concatenating the result.

$$\begin{bmatrix} a & b \\ c & d \\ e & f \end{bmatrix} * \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} a*w+b*y & a*x+b*z \\ c*w+d*y & c*x+d*z \\ e*w+f*y & e*x+f*z \end{bmatrix}$$

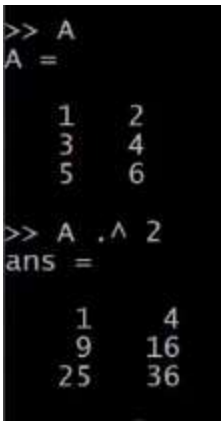
An **m x n matrix** multiplied by an **n x o matrix** results in an **m x o** matrix. In the above example, a 3 x 2 matrix times a 2 x 2 matrix resulted in a 3 x 2 matrix.

To multiply two matrices, the number of **columns** of the first matrix must equal the number of **rows** of the second matrix.

#element wise operations

The following will take each element of A and multiply it by each element of B

```
>> A
A =

    1    2
    3    4
    5    6

>> B
B =

   11   12
   13   14
   15   16

>> A .* B
ans =

   11   24
   39   56
   75   96
```


>> A
A =
1 2
3 4
5 6
>> A .^ 2
ans =
1 4
9 16
25 36