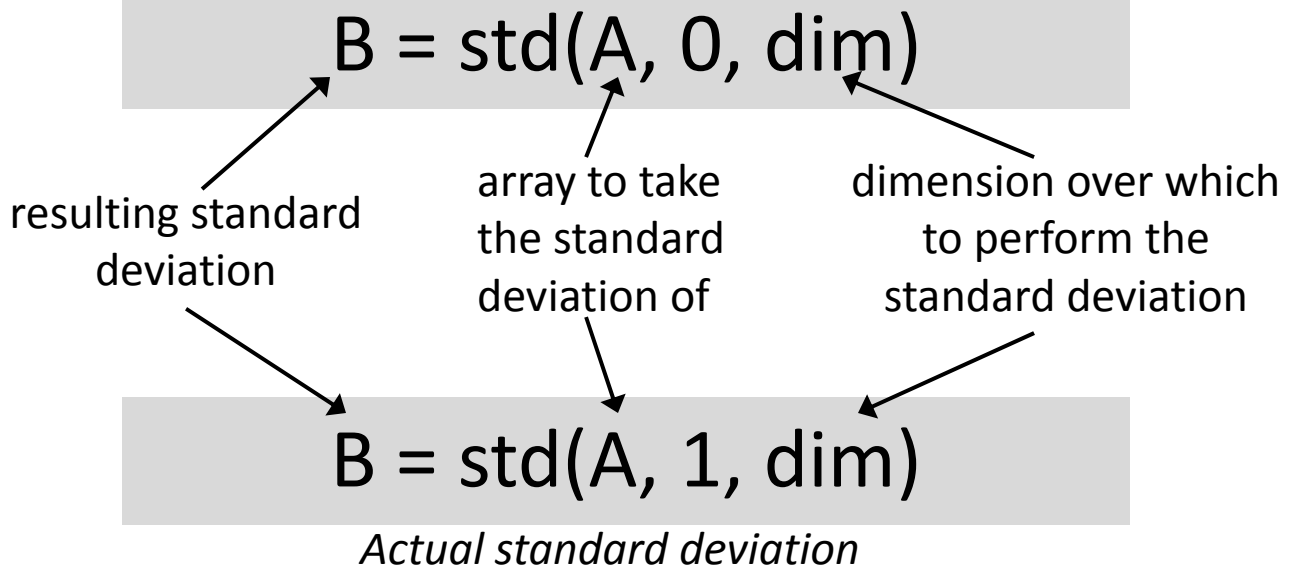


# CS 1173: MATLAB std function

The std function returns the standard deviation of A along an array dimension. Standard deviation measures how spread out the values are around the mean.

*Unbiased estimator of the population standard deviation  
(assuming A has samples drawn from the population)*



## Example 1: Different ways to apply std to array A

```
A = [1, 2, 6; 4, -7, 0];  
B0 = std(A, 0, 1);  
B1 = std(A, 1, 1);  
C0 = std(A, 0, 2);  
C1 = std(A, 1, 2);
```

dim 1      dim 2  
↓      →  
A =  $\begin{bmatrix} 1 & 2 & 6 \\ 4 & -7 & 0 \end{bmatrix}$

$$B0 = \text{std}(A, 0, 1) = [2.1 \quad 6.4 \quad 4.2]$$

$$C0 = \text{std}(A, 1, 2) = \begin{bmatrix} 2.6 \\ 5.6 \end{bmatrix}$$

$$B1 = \text{std}(A, 1, 1) = [1.5 \quad 4.5 \quad 3]$$

$$C1 = \text{std}(A, 1, 2) = \begin{bmatrix} 2.2 \\ 4.5 \end{bmatrix}$$

# CS 1173: MATLAB std function (1 argument)

When you call `std` with only one argument, `std` calculates the unbiased estimator of the population standard deviation along the first non-singleton dimension.

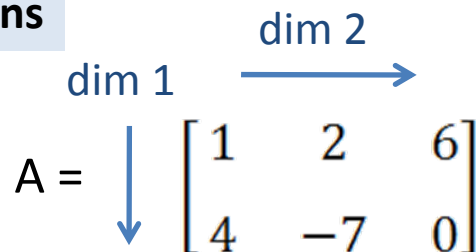
$$B = \text{std}(A)$$

resulting standard deviation

array to take standard deviation of

## Example 1: A has both rows and columns

```
A = [1, 2, 6; 4, -7, 0];  
B = std(A);  
C = std(A(:));
```


$$A = \begin{bmatrix} 1 & 2 & 6 \\ 4 & -7 & 0 \end{bmatrix}$$

The first non-singleton dimension is 1

$$B = \text{std}(A) = \text{std}(A, 0) = \text{std}(A, 0, 1) = [2.1 \quad 6.4 \quad 4.2]$$

$$C = \text{std}(A(:)) = \text{std}(A(:), 0) = \text{std}(A(:), 0, 1) = 4.5$$

## Example 2: A has just one row

```
A = [1, 2, 6];  
B = std(A);
```

$$A = [1 \quad 2 \quad 6]$$

$$B = \text{std}(A) = \text{std}(A, 0) = 2.6$$

The first non-singleton dimension is 2

## Example 3: A has just one column

```
A = [1; 4];  
B = std(A);
```

$$A = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

$$B = \text{std}(A) = \text{std}(A, 0) = 2.1$$

The first non-singleton dimension is 1