**Оценка среднего**

M = mean(A)  
M = mean(A,dim)

1. **Description**

M = mean(A) returns the mean values of the elements along different dimensions of an array.

If A is a vector, mean(A) returns the mean value of A.

If A is a matrix, mean(A) treats the columns of A as vectors, returning a row vector of mean values.

If A is a multidimensional array, mean(A) treats the values along the first non-singleton dimension as vectors, returning an array of mean values.

M = mean(A,dim) returns the mean values for elements along the dimension of A specified by scalar dim. For matrices, mean(A,2) is a column vector containing the mean value of each row.

1. **Examples**

A = [1 2 3; 3 3 6; 4 6 8; 4 7 7];

mean(A)

ans =

3.0000 4.5000 6.0000

mean(A,2)

ans =

2.0000

4.0000

6.0000

6.0000

**Медиана**

* M = median(A) [example](file:///C:\Program%20Files\MATLAB\R2013a\help\matlab\ref\median.html#btrh56v-2_1)
* M = median(A,dim) [example](file:///C:\Program%20Files\MATLAB\R2013a\help\matlab\ref\median.html#btric72-2)

1. **Description**

[example](file:///C:\Program%20Files\MATLAB\R2013a\help\matlab\ref\median.html#btrh56v-2_1)

M = median([A](file:///C:\\Program%20Files\\MATLAB\\R2013a\\help\\matlab\\ref\\median.html" \l "inputarg_A)) returns the median value of A.

* If A is a vector, then median(A) returns the median value of A.
* If A is a nonempty matrix, then median(A) treats the columns of A as vectors and returns a row vector of median values.
* If A is an empty 0-by-0 matrix, median(A) returns NaN.
* If A is a multidimensional array, then median(A) acts along the [first nonsingleton dimension](file:///C:\Program%20Files\MATLAB\R2013a\help\matlab\ref\median.html#btrjqgw-2) and returns an array of median values. The size of this dimension reduces to 1 while the sizes of all other dimensions remain the same.

median computes natively in the numeric class of A, such that class(M) = class(A).

[example](file:///C:\Program%20Files\MATLAB\R2013a\help\matlab\ref\median.html#btric72-2)

M = median([A](file:///C:\\Program%20Files\\MATLAB\\R2013a\\help\\matlab\\ref\\median.html" \l "inputarg_A),[dim](file:///C:\Program%20Files\MATLAB\R2013a\help\matlab\ref\median.html#inputarg_dim)) returns the median of elements along dimension dim. For example, if A is a matrix, then median(A,2) is a column vector containing the median value of each row.

1. **Examples**

[expand all](javascript:void(0);)

**[Median of Matrix Columns](javascript:void(0);" \o "Expand/Collapse)**

**[Median of Matrix Rows](javascript:void(0);" \o "Expand/Collapse)**

**[Median of 3-D Array](javascript:void(0);" \o "Expand/Collapse)**

**[Median of 8-bit Integer Array](javascript:void(0);" \o "Expand/Collapse)**

1. **Input Arguments**

[expand all](javascript:void(0);)

**[A — Input array](javascript:void(0);" \o "Expand/Collapse)vector | matrix | multidimensional array**

**[dim — Dimension to operate along](javascript:void(0);" \o "Expand/Collapse)positive integer scalar**

**Мода**

M = mode(X) exampleM = mode(X,dim) example[M,F] =

mode(\_\_\_) example[M,F,C]

= mode(\_\_\_) exampleDescription

exampleM = mode(X) returns

the sample mode of X, which is the most frequently

occurring value in X. When there are multiple values

occurring equally frequently, mode returns the

smallest of those values. For complex inputs, the smallest value is

the first value in a sorted list.If X is a vector, then mode(X) returns

the most frequent value of X.If X is a nonempty matrix, then mode(X) returns

a row vector containing the mode of each column of X.If X is an empty 0-by-0 matrix, mode(X) returns NaN.If X is a multidimensional array,

then mode(X) acts along the first nonsingleton dimension and

returns an array of most frequent values. The size of this dimension

reduces to 1 while the sizes of all other dimensions

remain the same.

exampleM = mode(X,dim) returns

the mode of elements along dimension dim. For example,

if X is a matrix, then mode(X,2) is

a column vector containing the most frequent value of each row

example[M,F] =

mode(\_\_\_) also returns a frequency array F,

using any of the input arguments in the previous syntaxes. F is

the same size as M, and each element of F represents

the number of occurrences of the corresponding element of M.

example[M,F,C]

= mode(\_\_\_) also returns a cell array C of

the same size as M and F. Each

element of C is a sorted vector of all values that

have the same frequency as the corresponding element of M.

Examplesexpand allMode of Matrix ColumnsDefine a 3-by-4 matrix.X = [3 3 1 4; 0 0 1 1; 0 1 2 4]X =

3 3 1 4

0 0 1 1

0 1 2 4

Find the most frequent value of each column.M = mode(X)M =

0 0 1 4Mode of Matrix Row

**Дисперсия**

V = var(X)  
V = var(X,1)  
V = var(X,w)  
V = var(X,w,dim)

## Description

V = var(X) returns the variance of X for vectors. For matrices, var(X)is a row vector containing the variance of each column of X. For N-dimensional arrays, var operates along the first nonsingleton dimension of X. The result V is an unbiased estimator of the variance of the population from which X is drawn, as long as X consists of independent, identically distributed samples.

var normalizes V by N – 1 if N > 1, where N is the sample size. This is an unbiased estimator of the variance of the population from which X is drawn, as long as X consists of independent, identically distributed samples. For N = 1, V is normalized by 1.

V = var(X,1) normalizes by N and produces the second moment of the sample about its mean. var(X,0) is equivalent to var(X).

V = var(X,w) computes the variance using the weight vector w. The length of w must equal the length of the dimension over which var operates, and its elements must be nonnegative. If X(i) is assumed to have variance proportional to 1/w(i), then V \* mean(w)/w(i) is an estimate of the variance of X(i). In other words, V \* mean(w) is an estimate of variance for an observation given weight 1.

V = var(X,w,dim) takes the variance along the dimension dim of X. Pass in 0 for w to use the default normalization by N – 1, or 1 to use N.

The variance is the square of the standard deviation (STD).

## Examples

Create a matrix and find the variance along the dimensions.

X = [4 -2 1; 9 5 7]

var(X,0,1)

ans =

12.5000 24.5000 18.0000

var(X,0,2)

ans =

9

4

**Среднеквадратическое отклонение**

# std

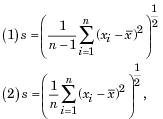
Standard deviation

## Syntax

s = std(X)  
s = std(X,flag)  
s = std(X,flag,dim)

## Definitions

There are two common textbook definitions for the standard deviation s of a data vector X.



where

C:\Program Files\MATLAB\R2013a\help\matlab\ref\eqn1311624147.png

and *n* is the number of elements in the sample. The two forms of the equation differ only in *n* – 1 versus *n* in the divisor.

## Description

s = std(X), where X is a vector, returns the standard deviation using (1) above. The result s is the square root of an unbiased estimator of the variance of the population from which X is drawn, as long as X consists of independent, identically distributed samples.

If X is a matrix, std(X) returns a row vector containing the standard deviation of the elements of each column of X. If X is a multidimensional array, std(X) is the standard deviation of the elements along the first nonsingleton dimension of X.

s = std(X,flag) for flag = 0, is the same as std(X). For flag = 1, std(X,1) returns the standard deviation using (2) above, producing the second moment of the set of values about their mean.

s = std(X,flag,dim) computes the standard deviations along the dimension of X specified by scalar dim. Set flag to 0 to normalize Y by *n*-1; set flag to 1 to normalize by *n*.

The input array, X, must be of type double or single for all syntaxes.

## Examples

For matrix X

X =

1 5 9

7 15 22

s = std(X,0,1)

s =

4.2426 7.0711 9.1924

s = std(X,0,2)

s =

4.000

7.5056

**Коэффициент корреляции**

# corrcoef

Correlation coefficients

## Syntax

R = corrcoef(X)  
R = corrcoef(x,y)  
[R,P]=corrcoef(...)  
[R,P,RLO,RUP]=corrcoef(...)  
[...]=corrcoef(...,'param1',val1,'param2',val2,...)

## Description

R = corrcoef(X) returns a matrix R of correlation coefficients calculated from an input matrix X whose rows are observations and whose columns are variables. The matrix R = corrcoef(X) is related to the covariance matrix C = cov(X) by

C:\Program Files\MATLAB\R2013a\help\matlab\ref\eqn1311614938.png

corrcoef(X) is the zeroth lag of the normalized covariance function, that is, the zeroth lag of xcov(x,'coeff') packed into a square array.

R = corrcoef(x,y) where x and y are column vectors is the same as corrcoef([x y]). If x and y are not column vectors, corrcoef converts them to column vectors. For example, in this case R=corrcoef(x,y) is equivalent to R=corrcoef([x(:) y(:)]).

[R,P]=corrcoef(...) also returns P, a matrix of p-values for testing the hypothesis of no correlation. Each p-value is the probability of getting a correlation as large as the observed value by random chance, when the true correlation is zero. If P(i,j) is small, say less than 0.05, then the correlation R(i,j) is significant.

[R,P,RLO,RUP]=corrcoef(...) also returns matrices RLO and RUP, of the same size as R, containing lower and upper bounds for a 95% confidence interval for each coefficient.

[...]=corrcoef(...,'param1',val1,'param2',val2,...) specifies additional parameters and their values. Valid parameters are the following.

|  |  |
| --- | --- |
| 'alpha' | A number between 0 and 1 to specify a confidence level of 100\*(1 – alpha)%. Default is 0.05 for 95% confidence intervals. |
| 'rows' | Either 'all' (default) to use all rows, 'complete' to use rows with no NaN values, or 'pairwise' to compute R(i,j) using rows with no NaN values in either column i or j. |

The p-value is computed by transforming the correlation to create a t statistic having n-2 degrees of freedom, where n is the number of rows of X. The confidence bounds are based on an asymptotic normal distribution of 0.5\*log((1+R)/(1-R)), with an approximate variance equal to 1/(n-3). These bounds are accurate for large samples when X has a multivariate normal distribution. The 'pairwise' option can produce an R matrix that is not positive definite.

## Examples

Generate random data having correlation between column 4 and the other columns.

x = randn(30,4); % Uncorrelated data

x(:,4) = sum(x,2); % Introduce correlation.

[r,p] = corrcoef(x) % Compute sample correlation and p-values.

[i,j] = find(p<0.05); % Find significant correlations.

[i,j] % Display their (row,col) indices.

r =

1.0000 -0.3566 0.1929 0.3457

-0.3566 1.0000 -0.1429 0.4461

0.1929 -0.1429 1.0000 0.5183

0.3457 0.4461 0.5183 1.0000

p =

1.0000 0.0531 0.3072 0.0613

0.0531 1.0000 0.4511 0.0135

0.3072 0.4511 1.0000 0.0033

0.0613 0.0135 0.0033 1.0000

ans =

4 2

4 3

2 4

3 4