Torch for Matlab® Users

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General Commands

Get help for a specific function:

Matlab	`help sqrt`
Torch	`help(torch.sqrt)`

Documentation of `sqrt` function is shown.

Scalar operations:

Matlab	`testVar1 = (4*5-1+10.1)/3^2;`
Torch	`testVar1 = (4*5-1+10.1)/3^2;`

The resultant value (3.2333) is assigned to variable `testVar1`.

Scalar assignment:

Matlab	`testVar2 = testVar1;` or `testVar2 = testVar1`
Torch	`testVar2 = testVar1;` or `testVar2 = testVar1`

The value of variable `testVar1` (3.2333) is assigned to variable `testVar2`.

Matrices and Tensors

Create a two-dimensional tensor or matrix:

Matlab	`m = [9, 6, 3, 4; 7, 2, 8, 1]`
Torch	`m = torch.Tensor({{9, 6, 3, 4}, {7, 2, 8, 1}})`

A 2×4 two-dimensional tensor (matrix) with specified elements is formed and assigned to `m`.

Create a row vector:

Matlab	`v = [9, 7, 6, 8]` or `v = [9 7 6 8]`
Torch	`v = torch.Tensor({{9, 7, 6, 8}})`

Unlike Matlab, this is not used as a vector in Torch because it is a two-dimensional Tensor.

Create a column vector:

Matlab	`v = [9; 7; 6; 8]`
Torch	`v = torch.Tensor({{9}, {7}, {6}, {8}})`

Again unlike Matlab, this is not used as a vector in Torch because it is still a two-dimensional Tensor.

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Create a one-dimensional tensor:

Matlab	*Not available*
Torch	`t = torch.Tensor({9, 7, 6, 8})`

Matlab does not have *one-dimensional tensors*; this can be verified by running `ndims([9, 7, 6, 8])`. On the other hand, for many operations that Matlab uses row or column vectors, Torch uses one-dimensional tensors.

Access an element in a vector or one-dimensional tensor:

Matlab	`v(2)`
Torch	`t[2]`

Second element of the vector is accessed.

Access an element from the end of a vector or one-dimensional tensor:

Matlab	`v(end-1)`
Torch	`t[-2]`

Second element from the end of the vector is accessed.

Access a range of elements in a vector or one-dimensional tensor:

Matlab	`v(2:4)`
Torch	`t[{{2,4}}]`

Second to fourth elements of the vector are accessed.

Access an element in a matrix:

Matlab	`m(2, 3)`
Torch	`m[{2, 3}]` or `m[2][3]`

Second row, third column element is accessed.

Access a row in a matrix as a two-dimensional tensor:

Matlab	`m(2, :)`
Torch	`m[{{2}, {}}]`

The returned row is a two-dimensional tensor.

Access a row in a matrix as a one-dimensional tensor:

Matlab	*Not available*
Torch	`m[{2, {}}]` or `m[2]`

The returned row is a one-dimensional tensor.

Access a column in a matrix as a two-dimensional tensor:

Matlab	`m(:, 2)`
Torch	`m[{{}, {2}}]`

The returned column is a two-dimensional tensor.

Access a column in a matrix as a one-dimensional tensor:

Matlab	*Not available*
Torch	`m[{{}, 2}]`

The returned column is a one-dimensional tensor.

Access a range of elements in a matrix:

Matlab	`m(2, 2:4)`
Torch	`m[{{2}, {2,4}}] or m[{2, {2,4}}]`

The second to fourth columns of the second row are returned. In Torch, there is a slight difference between using `index` (e.g. 2) or `{index}` (e.g. `{2}`) for pointing to a singleton dimension. For `{index}`, the dimension of the returned tensor is same as the original tensor (e.g. tensor `m`). For `index`, the singleton dimension is removed, and the dimension of the returned tensor is one less than the original tensor (e.g. tensor `m`). Also, `{}` refers to all elements in that dimension. Finally, `-index` (e.g. `-4`) means `index`-th (e.g. fourth) element from the end.

Forming Basic Tensors

Create a vector over a range of values with unit step:

Matlab	`3:8`
Torch	`torch.range(3, 8)`

Torch's result is a one-dimensional tensor with elements spaced `1` strating at `3`.

Create a vector over a range of values with an arbitrary step:

Matlab	`3:-1.9:-4.2`
Torch	`torch.range(3, -4.2, -1.9)`

Torch's result is a one-dimensional tensor with elements spaced `-1.9` strating at `3`.

Create a vector with linearly-located elements:

Matlab	`linspace(3, 8, 50)`
Torch	`torch.linspace(3, 8, 50)`

Torch's result is a one-dimensional tensor with `50` equally-spaced elements strating at `3` and ending at `8`.

Create a vector with logarithmically-located elements:

Matlab	`logspace(3, 8, 50)`
Torch	`torch.logspace(3, 8, 50)`

Torch's result is a one-dimensional tensor with `50` exponentially-spaced elements strating at 10^3 and ending at 10^8.

Create an all zeros vector or one-dimensional tensor:

Matlab	`zeros(1,4)` or `zeros(4,1)`
Torch	`torch.zeros(4)`

Torch's result is a one-dimensional tensor with `4` zero elements.

Create an all zeros matrix:

Matlab	`zeros(5,3)`
Torch	`torch.zeros(5,3)`

`5`×`3` matrix of zeros is generated.

Create an all ones vector or one-dimensional tensor:

Matlab	`ones(1,4)` or `ones(4,1)`
Torch	`torch.ones(4)`

Torch's result is a one-dimensional tensor with `4` one elements.

Create an all ones matrix:

Matlab	`ones(5,3)`
Torch	`torch.ones(5,3)`

5×3 matrix of ones is generated.

Create an identity matrix:

Matlab	`eye(5,3)`
Torch	`torch.eye(5,3)`

5×3 identity matrix is generated.

Create a square identity matrix:

Matlab	`eye(4)`
Torch	`torch.eye(4)`

4×4 identity matrix is generated.

Create a uniformly-distributed random vector or one-dimensional tensor:

Matlab	`rand(1,4)` or `rand(4,1)`
Torch	`torch.rand(4)`

Torch's result is a one-dimensional tensor with 4 random elements from uniform probability distribution.

Create a uniformly-distributed random matrix:

Matlab	`rand(5,3)`
Torch	`torch.rand(5,3)`

5×3 matrix of random elements from uniform probability distribution is generated.

Create a normally-distributed random vector or one-dimensional tensor:

Matlab	`randn(1,4)` or `randn(4,1)`
Torch	`torch.randn(4)`

Torch's result is a one-dimensional tensor with 4 random elements from normal probability distribution.

Create a normally-distributed random matrix:

Matlab	`randn(5,3)`
Torch	`torch.randn(5,3)`

5×3 matrix of random elements from normal probability distribution is generated.

Operations

Tensor assignment without memory copy:

Matlab	*Not directly available*
Torch	`matOut = matIn` or `matOut = matIn;`

Matlab internally handles memory assignment for a copied array. As soon, as the copied array is modified in Matlab, a copy of the initial array is generated. Whereas, Torch gives this option to have a copied tensor that points to the same location in the memory as the initial tensor. For example, if elements of the `matOut` tensor are modified here, the same changes happen to the elements of the `matIn` tensor.

Tensor assignment with memory copy:

Matlab	`matOut = matIn` or `matOut = matIn;`
Torch	`matOut = matIn:clone()` or `matOut = matIn:clone();`

Matlab's internal memory handling for array assignment is somewhat closer to this. Here, Torch generates a copy of the tensor content in memory. Any changes in `matOut` elements are independent of the changes in the elements of the `matIn` tensor.

Square root of elements returned in a new tensor:

Matlab	`matOut = sqrt(matIn)`
Torch	`matOut = torch.sqrt(matIn)`

Square root of each element is saved in an output tensor with the same size as the input tensor.

Square root of elements returned in the same tensor:

Matlab	`matIn = sqrt(matIn)`
Torch	`matIn = torch.sqrt(matIn)` or `matIn.sqrt(matIn)` or `matIn:sqrt()`

`matIn:sqrt()` is same as `matIn.sqrt(matIn)`. Generally in Torch, `object:function(p1, p2, ...)` is same as `object.function(object, p1, p2, ...)`, where the function's object (also known as `self`) is passed as the first input to the function.

Element-wise power to a scalar:

Matlab	`matOut = matIn.^5`
Torch	`matOut = torch.pow(matIn, 5)`

Each element to the power of 5 is saved in an output tensor with the same size as the input tensor.

Element-wise power to a tensor:

Matlab	`matOut = matIn.^matPow`
Torch	`matOut = torch.cpow(matIn, matPow)`

Each element of the `matIn` tensor to the power of the corresponding element of the `matPow` tensor is saved in an output tensor with the same size as the input tensor.