Lesson 18: Compatibility between two tensors

Compatibility of two Tensors for Arithmetic Operation

Two tensors x and y are said to be compatible if

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Two tensors x and y are said to be compatible if

- Their dimensions and shapes are same
  - Dimension(x) = Dimension(y)
  - Shape(x) = Shape(y)

X (2d array):	**2**	**x**	**4**
Y (2d array):	**2**	**x**	**4**
Result (2d array) :	**2**	**x**	**4**

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X (2d array):	**2**	**x**	**4**
Y (2d array):	**2**	**x**	**4**
Result (2d array) :	**2**	**x**	**4**

- Their dimensions or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.

X (2d array):	**2**	**x**	**1**
Y (2d array):	**2**	**x**	**4**
Result (2d array) :	**2**	**x**	**4**

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  - Dimension(x) = Dimension(y)
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X (2d array):	2	x	4
Y (2d array):	2	x	4
Result (2d array) :	2	x	4

- Their dimensions or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.

X (2d array):	2	x	1
Y (2d array):	2	x	4
Result (2d array) :	2	x	4

X (3d array):	2	x	1	x	3
Y (3d array):	2	x	4	x	1
Result (3d array) :	2	x	4	x	3

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  - Shape(x) = Shape(y)

X (2d array):	2 x 4
Y (2d array):	2 x 4
Result (2d array) :	2 x 4

- Their dimensions or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.

X (2d array):	2 x 1
Y (2d array):	2 x 4
Result (2d array) :	2 x 4

X (3d array):	2 x 1 x 3
Y (3d array):	2 x 4 x 1
Result (3d array) :	2 x 4 x 3

X (3d array):	2 x 1 x 3
Y (3d array):	1 x 4 x 1
Result (3d array) :	2 x 4 x 3

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- Their dimensions and shapes are same
  - Dimension(x) = Dimension(y)
  - Shape(x) = Shape(y)

X (2d array): 2 x 3

Y (2d array): 2 x 4

Result (2d array) : 2 x 4

- Their dimensions and/or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.

```
a: (2d array): 256 x 3
b: (1d array):       3
Result: (2d array): 256 x 3
```

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  - Dimension(x) = Dimension(y)
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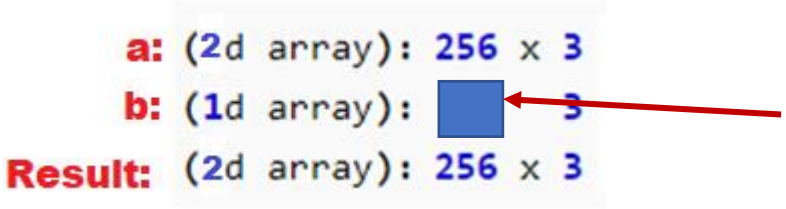
X (2d array): 2 x 3

Y (2d array): 2 x 4

Result (2d array) : 2 x 4

- Their dimensions and/or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.



We assume that, we have default 1.

(3) ~ (1 x 3)

(2 x 3) ~ (1 x 2 x 3)

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  - Dimension(x) = Dimension(y)
  - Shape(x) = Shape(y)

```
X (2d array):      2  x  3
Y (2d array):      2  x  4
Result (2d array) :  2  x  4
```

- Their dimensions and/or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.

```
a: (2d array): 256 x 3
b: (1d array):       3
Result: (2d array): 256 x 3
```

~

```
a: (2d array): 256 x 3
b: (1d array):   1 x 3
Result: (2d array): 256 x 3
```

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Two tensors x and y are said to be compatible if

- Their dimensions and shapes are same
  - Dimension(x) = Dimension(y)
  - Shape(x) = Shape(y)

X (2d array): 2 x 3

Y (2d array): 2 x 4

Result (2d array) : 2 x 4

- Their dimensions and/or shapes are different, but the following condition is satisfied.
  - For all dimension position, one of component dimension has shape 1.

```
A      (4d array):  8 x 1 x 6 x 1
B      (3d array):      7 x 1 x 5
Result (4d array):  8 x 7 x 6 x 5
```

The resultant dimension is
- Higher dimension
- Higher shape of the component dimensions

They are not compatible

```
A     (1d array):  3
B     (1d array):  4 # trailing dimensions do not match

A     (2d array):     2 x 1
B     (3d array):  8 x 4 x 3 # second from last dimensions mismatched
```

Summary

- Operations are performed element wise.
- If the shapes between the two tensors are different, but compatible, the tensor with smaller shape is stretched.