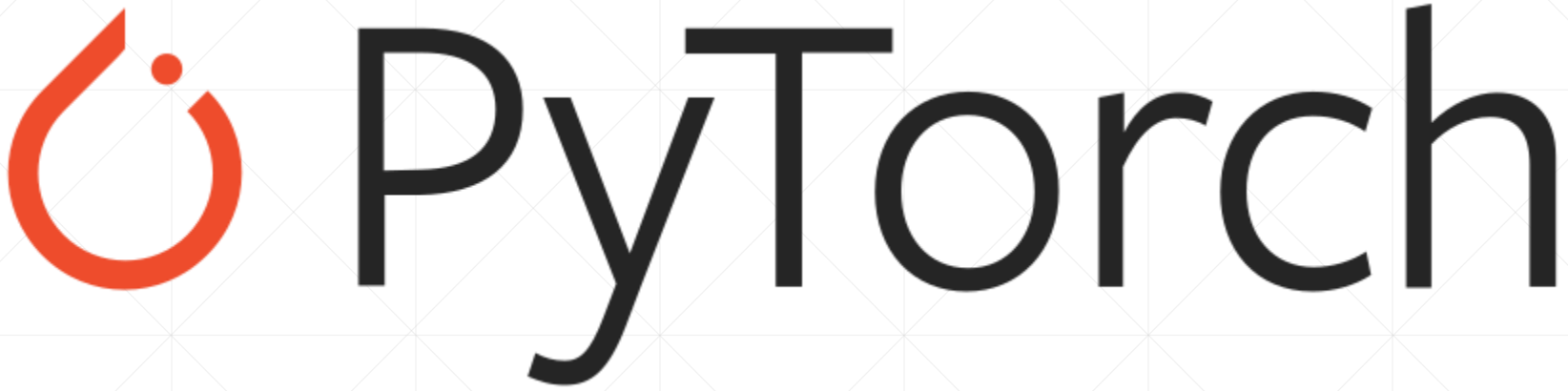


Broadcast自动扩展

主讲人：龙良曲

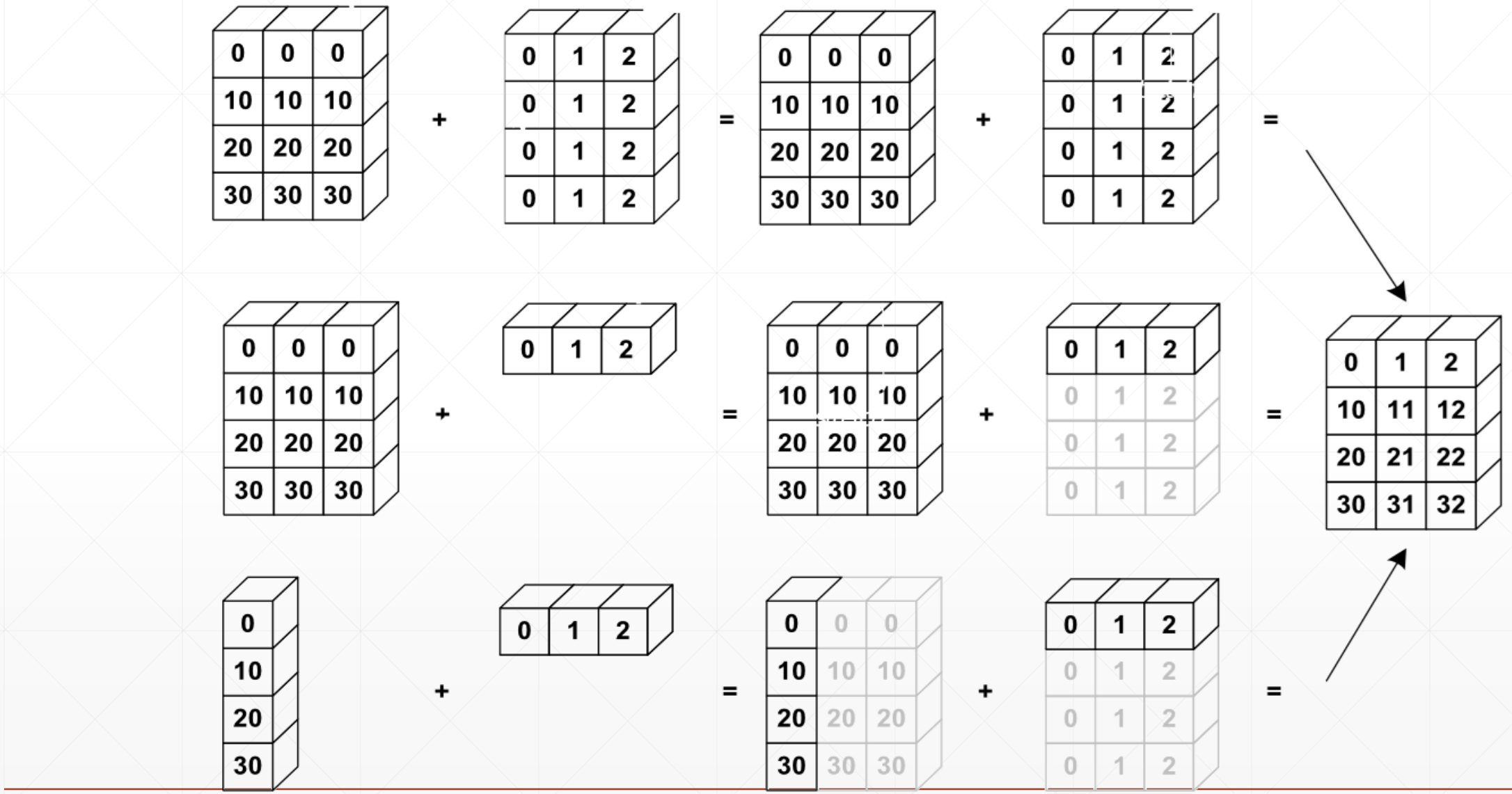
Broadcasting

- Expand

- without copying data

Key idea

- Insert 1 dim ahead
- Expand dims with size 1 to same size
- Feature maps: [4, 32, 14, 14]
- Bias: [32, 1, 1] => [1, 32, 1, 1] => [4, 32, 14, 14]


0 0 0
10 10 10
20 20 20
30 30 30
+
0 1 2
0 1 2
0 1 2
0 1 2
=
0 0 0
10 10 10
20 20 20
30 30 30
+
0 1 2
0 1 2
0 1 2
0 1 2
=
0 0 0
10 10 10
20 20 20
30 30 30
+
0 1 2
=
0 0 0
10 10 10
20 20 20
30 30 30
+
0 1 2
0 1 2
0 1 2
0 1 2
=
0 1 2
10 11 12
20 21 22
30 31 32
0
10
20
30
+
0 1 2
=
0 0 0
10 10 10
20 20 20
30 30 30
+
0 1 2
0 1 2
0 1 2
0 1 2
=

Why broadcasting

- 1. for actual demanding
  - [class, students, scores]
  - Add bias for every students: +5 score
  - [4, 32, 8] + [4, 32, 8]
  - [4, 32, 8] + [5.0]

- 2. memory consumption
  - [4, 32, 8] => 1024
  - [5.0] => 1

Is it broadcasting-able?

- Match from Last dim!
  - If current dim=1, expand to same
  - If either has no dim, insert one dim and expand to same
  - otherwise, NOT broadcasting-able

Situation 1:

- [4, 32, 14, 14]
- [1, 32, 1, 1] => [4, 32, 14, 14]

Situation 2

- [4, 32, 14, 14]
- [14, 14] => [1, 1, 14, 14] => [4, 32, 14, 14]

Situation 3

- [4, 32, 14, 14]
- [**2**, 32, 14, 14]
  - Dim 0 has dim, can NOT insert and expand to same
  - Dim 0 has distinct dim, NOT size 1
  - NOT broadcasting-able

How to understand this behavior?

- When it has no dim
  - treat it as all own the same
  - [class, student, scores] + [scores]
- When it has dim of size 1
  - Treat it shared by all
  - [class, student, scores] + [student, 1]

It's effective and critically, intuitive

- [4, 3, 32, 32]
- + [32, 32]
- + [3, 1, 1]
- + [1, 1, 1, 1]

Thank You.