Pooling

Pooling operates on a features map matrix and reduces its spatial size.

Max Pooling

For each pooling window R (e.g. 2x2):

$$y = \max_{(i,j) \in R} x_{i,j}$$

This means:

- take the maximum value inside the region.
- Keep the strongest activation

Average Pooling

For each pooling window R:

$$y = \frac{1}{|R|} \sum_{(i,j) \in R} x_{i,j}$$

This means:

- sum all values in the region
- divide by number of elements

Output size

If:
- input size = N
- pool size = F
- stride = S

Then:

$$\text{Output size} = \frac{N - F}{S} + 1$$

Key Idea

Pooling reduces feature map size while preserving important information, making CNNs faster and more robust.