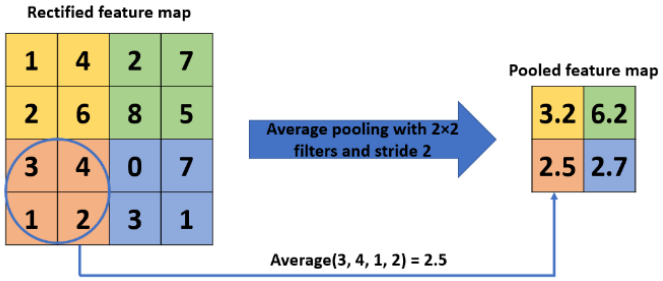
Types of Pooling

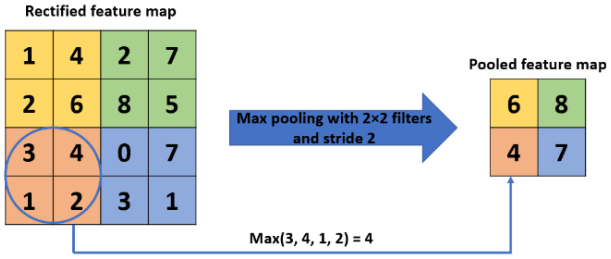
Average Pooling

an average pooling layer performs down-sampling by dividing the input into rectangular pooling regions and computing the average values of each region.



Max-Pooling

A max-pooling operator [12] can be applied to down-sample the convolutional output bands, thus reducing variability. The max-pooling operator passes forward the maximum value within a group of R activations.



Mixed Pooling

Mixed pooling combines max pooling and average pooling by randomly choosing between them based on a parameter λ (lambda). When λ=0, it uses average pooling, and when λ=1, it uses max pooling. This approach blends the strengths of both methods and has shown improved performance in image classification tasks compared to using max or average pooling alone.

$$s_j = \lambda \max_{i \in R_j} a_i + (1 - \lambda) \frac{1}{|R_j|} \sum_{i \in R_j} a_i$$

LP Pooling

LP pooling computes a weighted average of inputs within a pooling region. The parameter p controls the behavior: p = 1 corresponds to average pooling, and $p \to \infty$ approximates max pooling. It offers a balance between these extremes, claimed to enhance generalization in comparison to max pooling alone

$$s_j = \left(\frac{1}{|R_j|} \sum_{i \in R_j} a_i^p \right)^{1/p}$$

Super-Pixel Pooling

Super-pixels are created by grouping image pixels based on similar low-level properties, reducing the complexity of image processing tasks. They offer a meaningful way to segment images, enhancing efficiency in various computer vision applications like object detection, semantic segmentation, saliency estimation, and more