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FCOS and Retina net used as representatives of anchor free and anchored based detectors and a detailed empirical study performed to see what kind of performance differences remain when other architectural differences between them are removed

The difference only seems to be about 0.8% AP which might well be within the limits of experimental or training errors so the argument that this is due to the way in which positive and negative samples are defined seems a bit weak

Similarly, the further argument that the differences between just these two specific detectors generalize all anchor free and anchor based detection seems unjustified

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the adaptive training sample selection (ATSS) method which is the main contribution of this paper seems remarkably simple

> Compute the mean and standard deviation of the IOUs of all the candidate boxes across all scales with the ground truth
> the IOU threshold for this ground truth is simply the sum of the mean and standard deviation
> In addition to this threshold, positives samples are also restricted to those whose center lies inside the GT box

Apparently, the standard deviation is supposed to be a measure of its pyramid/scale levels are suitable for detecting the GT with high values indicating a specific level while low values indicate several levels

Some evidence given to show that as long as positive samples but training are selected appropriately, the number of anchor boxes per location has little impact on performance