

# Convolutional Neural Networks for object detection in professional appliances

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In the context of industrial applications involving machine learning techniques, a challenging problem is represented by object detection, as can be seen in [1]. A particular application of it inside a leading company in the field of professional appliances, such as Electrolux Professional, is represented by the recognition and localization of different types of objects.

A possible approach to deal with object detection problems is represented by Artificial Neural Networks (ANN) and in particular by Convolutional Neural Networks (CNN). In order to solve this issue, we need to handle with two different tasks: classification and localization. The particular architecture of the existing CNNs is useful to extract the low-level features of the objects (i.e. edges, lines, ...), but it is not enough to cope also with the problem of finding their position in a picture. Therefore, some extra layers must be added on the top of a chosen CNN in order to detect the high-level features, such as the position.

We have decided to study mainly two state-of-the-art meta-architectures: Faster Region Based Convolutional Neural Network (Faster R-CNN) [3] and Single Shot Detector (SSD) [2], because the first is very accurate, whereas the second is very fast. Since our algorithm have to be included in a professional appliance, the computing time needed to detect a new object has to be as fast as possible (ideally real-time). Hence, in this work we will make a comparison between the two architectures in terms of speed and accuracy, proposing at the same time a new strategy for the construction of the training batches using an unsupervised approach.

## References

- [1] Goodfellow, I., Bengio Y. and Courville A., 2016, Deep Learning. MIT Press.
- [2] Liu W., Anguelov D., Erhan D., Szegedy C., Reed S., Fu C.-Y. and C. Berg A., 2016, SSD: Single Shot MultiBox Detector.
- [3] Ross S., He K., Girshick R., and Sun J., 2015, Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks. Advances in Neural Information Processing Systems.

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