Master Thesis: Active Learning for Object Detection

One of the most challenging problems in the fields of computer vision and machine learning is that of object classification and detection. Despite the recent advances in the state of the art, one of the main drawbacks to push research further, is the lack of large amount annotated training data, which are necessary in the learning phase of the classifier’s model. In order to overcome the labelling bottleneck, active learning systems have been proposed in the literature [1]. The key idea behind active learning is that a machine learning algorithm can achieve greater accuracy with fewer labelled training instances if it is allowed to choose the data from which is learns. An active learner may ask for validation only for a subset of the unlabelled instances to be labelled by a human annotator.

One significant application of object classification is that of pedestrian detection in advanced driving assistance systems (ADAS). Pedestrian detection has certain challenges to be addressed, such as detection at different scales, non-rigid motion, large intra-class variation and heavy clutter. Moreover, to fine tune a detection algorithm, one will need to boost the training process with additional positive and negative samples. For these reasons, a big and, at the same time, precise training database is necessary, which makes the idea of active learning very much relevant.

This MSc thesis, aims to investigate the most appropriate method of active learning for the pedestrian detection problem. The appropriateness of a method is based on how well it can automatically annotate data, select training samples and incrementally boost the performance of the classifier.

### Goals of the thesis:
- Review literature on active learning approaches for boosting a classifier by expanding the training database with both positive and negative samples. The student is expected to acquire a broad knowledge in the most recent and advanced techniques of the field and be able to recognize which one is most suitable for the problem in hand.
- Select the most relevant method and adopt it to the pedestrian detection problem. This will include adaptation of the method to the provided recorded data, incremental classifier updating and evaluating performance in terms of a ROC curve.

### Requirements
- General knowledge in machine learning and willingness to study and learn more in depth.
- Good programming skills on C/C++.

### References

### Details:
The thesis will be conducted with IEE S.A. (http://www.iee.lu),
The training place is at IEE in Contern, Luxemburg
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