EPSRC CDT in Distributed Algorithms

PhD Project: Distributed Machine Learning for Automatic Annotation and Analyses of Vast Distributed Image Archives

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Project Description

This project has been developed by the University of Liverpool in partnership with Collins Aerospace. The project will develop novel learning strategies that allow for automatic object detection in large airborne sensor imagery with sparse labels and varying characteristics. Particular focus will be on high resolution airborne imagery collected by unmanned air vehicles and/or satellites. Missions that collect such imagery generate vast amounts of data that are labour-intensive to review and analyse. Therefore, it is highly desirable to remove the requirement for human analysts to sift through mountains of data. There are many challenges in training automatic object detection algorithms for these scenarios. There are a wide range of objects of interest often with varying sizes of extent. The image can also vary for example in their resolution, look angle with respect to nadir, typical objects they contain and the background. Most modern object detection solutions use convolutional neural networks, that are pretrained on data from similar tasks and then fine-tuned. These methods rely on large databases of labelled data. However, in our scenario, we often have very few labels, due to the time-consuming nature of annotation. We may also lack sufficient representative data. A promising area to help address these problems is meta-learning. This project will use meta-learning techniques to invent new algorithms, that are tailored to the problem space outlined above. This will allow for the making of an object detector, that improves on previous state of the art methods in tackling these problems.

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