Identifying Unseen Objects

A robot must recognize the entities around it in order to understand the environment and act in it. This is perhaps the most fundamental task for a robotic visual perception system and it lays the foundation for higher-level tasks. Despite the recent progresses in deep learning that achieved impressive results in previously impossible tasks, the problem of open set recognition remains far from being solved. Current deep learning methods for object recognition can only effectively recognize object classes that they have been trained on. They operate under the so called “closed-set scenario” where the algorithm can only face the classes present at training time. The closed-set scenario is completely unrealistic for most real-life application, when the robot will likely face a large variety of objects that do not belong to any of the training classes. Differently from the closed-set scenario, the “open set scenario” allows to recognize unseen objects as “unknowns” instead of simply assigning one of the training classes to any newly encountered object. The pivotal work of Bendale and Boult [1] marked the first step towards a deep learning solution to the open set problem. The goal of this master thesis project is to stress test this method to understand its true capabilities and then to design a solution to overcome some of the limitations.

Tasks

- Convert the existing code of [1] to the more commonly used deep learning library TensorFlow.

- Evaluate the method with different datasets and in different conditions, such as varying degrees of “openness” and domain shift.

- The evaluation should indicate the weaknesses and limitations of the method. The final task is to combine the work with other possible solutions to output more accurate and meaningful confidence for its predictions.

Workload split

- Research and theory: 50%

- Programming and implementation: 30%

- Writing: 20%

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References