Selective Feature Learning with Filtering Out Noisy Objects in Background Images

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Introduction

• Lifelong Robot Vision – Lifelong Object Recognition
  • Human could recognize some objects through pre-built large datasets before and continuous learning in the current environment. But machines are hard to recognize objects in a strange environment and conditions. Therefore machine should update their model weight without distortion of previous model to trained data. In this competition, we propose a selective feature learning method to eliminate irrelevant objects in target images.

Dataset Analysis

• The provided data set of each task were taken in different environment conditions (illumination, Occlusion, Pixel, Clutter)
• Each 69 objects had different sizes and backgrounds. Therefore, reducing the size and background effects should be designed.
• The data sets were analyzed in two ways for design of software architecture
  • Region of Objects (relative scale) :
    • Median relative size = 0.142
    • Relative size difference: 4.14 = object@90% / object@10%
  • Position of Objects (relative scale) :
    • 0.2< center of object < 0.8

Software Design

• Propose a selective feature learning method by eliminating irrelevant features in training dataset.
• Selective learning procedure:
  1) Extracting target objects from training dataset by an object detection algorithm
  2) Feeding the refined dataset into a deep neural network to predict labels.
• Object detection algorithm : SSD (Single Shot Multibox Detection) for convenience of flexible feature network design
  • SSD model with human-annotated dataset in task1
  • Converted the SSD model to a frozen graph to infer object location
• Classification network : traditional MobileNet
  • The refined dataset were fed into the network

Future works

• Lifelong learning of object selection inference graph
  • Update inference technique to each task learning
• Lifelong learning of Feature extraction network
  • Update create and connection neurons under deformation and restoration of the object
• Object selection Deep Learning Neural Network Integration

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