

## Object Detection Using CUDA

Object detection without any doubt is the most important aspect of visual perception. If machines are equipped with visual perception all aspects of the human life including economy, social life, manufacturing, medication, and education will face a groundbreaking prosper.

This thesis focuses on developing an algorithm for object detection to be used in medical equipment, using the state of the art methods and computational tools. It involves evaluating and boosting the best currently used algorithms and proposes a novel configuration of hardware and software trying to realize a reliable yet swift object detection system. Modern hardware platforms equipped with GPU as well as robust and successful CNN (convolutional neural network) frameworks have been utilized to implement such a system.

The developed system is composed of three different parts:

1. Region of interest finder
2. Classifier (CNN)
3. Decision maker

### Region of interest finder:

It is developed based on segmentation and merging the acquired segments based on criteria such as color histogram, SIFT feature and spatial position of the segments.

### Classifier:

Caffe which is a deep learning framework is used to implement a convolutional neural network for classification of the found regions of interest.

### Decision maker:

Using the information provided by the classifier and region of interest finder this part is responsible for identification and localization of the objects within the image.

The algorithm has been developed using C++ and CUDA (C++ extension for GPU). It can be run on CPU alone or on the combination of CPU and GPU. The algorithm's dependency to resolution is linear ( $O(n)$ ). It can be executed on both Windows and Linux.

**Keywords:** cuDNN, CUDA, Framework, CPU, GPU, Segmentation, Region of interest, CNN, BVLC, Deep learning, Classifier, Prediction, Convolution layer, Pooling layer, Normalizing layer, ReLU, Fully connected layer, Caffe, EGBIS, OpenCV, Features, Multithreading, Mutex.