Group 3 Summary

Unsupervised Learning: K-Means Clustering --- Jialun Wang

Unsupervised learning is a method to analyze data without labels. It contains two main methods, clustering analysis and dimensionality reduction. K-means clustering is one of algorithms in clustering analysis. It performs an automatic classification to divide groups into k clusters, in which items has nearest mean. The classification is based on the distance of each point to the centroids of clusters. It will iterate and re-center until the sum of distances reach the minimum value.

Object Detection Models --- Cagri Yoruk

The models selected are Yolo, Faster R-CNN, Mask R-CNN and Rotated Mask R-CNN. YOLO. is a real-time object detection system, which is faster and more accurate than other algorithm. The system sees images as whole and predict bounding boxes for each grid at the same time, and then calculates the confidence for all boxes and comes out the class classification. It is really easy to trade-off between the accuracy and speed by changing the model size without train it again. R-CNN basically focuses on bounding boxes for each object. It performs the function of generating 2000 different regions that have the possibility to contain an object. The process is pretty slow so that a faster model called Fast-R-CNN, which solves the problem of R-CNN. Fast R-CNN process the image by a convolutional feature map instead of extracted region proposals, but it’s still a time-consuming process. Mask R-CNN is conceptually very similar to Faster R-CNN. Rotated Mask R-CNN is an implementation of Mask R-CNN. When the objects have high bounding box overlap, Mask R-CNN would struggle in detect each object. So Rotated R-CNN solves the problem to some extent.

Object Detection ---Zeyu Song

The report also focuses on R-CNN, Fast-RCNN and Mask R-CNN. The theories of models are explained and also cover pros and cons for each model. The Region-based CNN is a multi-stage pipeline training, which is slow and expensive. Fast R-CNN has a higher detection quality (mAP) than R-CNN but it still a time-consuming process. Mask R-CNN extends Faster R-CNN by adding a branch for predicting an object mask in parallel with the existing branch for bounding box recognition. Mask R-CNN is simpler to be implemented and trained given the Faster R-CNN framework.

Unsupervised Learning ---Fengxu Tu

The report introduces a new unsupervised learning method which is CNN-RNN model based on cloud computing technology. It trains neutral network with batch gradient descent and data parallel, which makes the mothed is more efficient than others. The method mainly realizes distributed computing of big data. The result is more accurate when the scale of data is larger. But there are many problems need to be solved, such as the method is not versatile, and computing distribution problem.