Summary of Mini Project 2

Unsupervised Learning

Traditional datasets in machine learning have labels which means we can do regression and classification based on labeled dataset. Unsupervised learning, which is also called “learning without a teacher”, is a learning task that given unlabeled examples, predict hidden labels of all seen and unseen examples, where examples are the data used for training or evaluation and labels mean categories, values, or ordering in output/ label space assigned to examples. For unsupervised learning main use cases are clustering, association and anomaly detect.The pros of unsupervised learning is that less complexity, takes place real time, easier to get unlabeled data.Cons for unsupervised learning is that trouble in data sorting, outputs are not specific and less accuracy.

Supervised Learning

For supervised learning, the machine learning uses labeled dataset to feed the machine learning model. For supervised learning, the main use cases are classification(discrete) and regression(continuous).The algorithms for supervised learning mainly are random forest, SVM, Logistic regression
Apart from unsupervised learning and supervised learning there is also another method named semi-supervised learning: some labeled data bolstering a larger set of unlabeled data.

Meta Learning

Current AI algorithms are problem specific. for every problem, the model needs to be trained again. However, meta-Learning addresses this issue.Trains model for a variety of environments so that it acquires many skills. So now when a new problem is given, only a limited amount of training data is sufficient.Meta Learning is categorized by the approaches to takes as:

- Recurrent Model: In the learner, the recurrent network is applied and in the meta learning phase, a gradient descent approach is used. Used in LSTM models.
- Metric Learning: The learner optimizes by a comparison scheme while the meta-learner uses a gradient descent approach. Used for few-shot classification problems.
- Learning optimizers: The meta learner learns to update the learner and this translates the learner into learning the tasks more efficiently. Recurrent networks are used for this process.

Object detection

2-stage model （1. Produce region proposal （the region may have object) 2. Classify the object in region proposal)

- R-CNN

- Fast R-CNN (do the first step and second step parallel)

- Faster R-CNN (The former model produce region proposal based on algorithm and in this model the Regional Proposal Networks)

1- stage model (Do not produce region proposal and do the classification directly)
- YOLO (Do the regression directly)

- SSD (Use anchor to accurate the region of bounding box)

Recommendation: 2-stage models are more accurate but need more time to train and run slower. More popular in cloud production.
1-stage models are easy to ignore small object, however run faster. So, it is more suitable for real-time detection.