

Selected topics in AI-

2

Assignment 2

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In this report we have constructed a classification model using active learning strategies applied on three datasets, two datasets are normally distributed while the third is unbalanced.

First, we'll give a brief regarding the datasets and the strategies used then we advance to the analysis and the information extracted from these scenarios.

Dataset brief

1. MNIST dataset: It consists of a collection of 70,000 grayscale images of handwritten digits, each of size 28 x 28 pixels. The dataset is split into two parts: 60,000 images for training and 10,000 images for testing.
2. Mushroom datasets: The dataset consists of 60,000 color images of size 32 x 32 pixels, divided into 10 classes with 6,000 images per class. The classes in the CIFAR dataset are: airplane, automobile, bird, cat, deer, dog, frog, horse, ship, and truck. Like the MNIST dataset, CIFAR is often used as a benchmark for evaluating the performance of machine learning algorithms on image classification tasks.
3. SVHN Dataset: consists of over 600,000 images, each of size 32 x 32 pixels, and is divided into three sets: a training set of 73257 images, a test set of 26032 images, and an extra set of 531131 images. The digits in the images can appear in various sizes, colors, fonts, and orientations, and can be located anywhere within the image. Next, we discuss the four query strategies that were used.

Query strategies

1. Least confidence Sampling: This strategy selects the instances where the model is most uncertain about the predicted class label. The query strategy queries the instances for which the classifier is least confident. In the code, it is implemented by selecting the samples with the least confidence score as measured by the maximum probability of the predicted class. This strategy helps to maximize the model's accuracy by focusing on the most informative samples.
2. Entropy Sampling: This strategy measures the uncertainty of the predicted probability distribution of the classes. In other words, the query strategy chooses samples for which the model is most uncertain about the predicted probability distribution of the classes. In the code, it is implemented by selecting the samples with the highest entropy as measured by the predicted probability distribution. This strategy is useful when the model has low confidence or exhibits poor performance, but the samples it identifies are diverse and can help to better understand the data.
3. Random Sampling: This strategy selects the samples randomly from the unlabeled dataset, without any bias towards the informative samples. In the code, it is implemented by randomly selecting an instance from the pool of unlabeled samples. This strategy is useful when the dataset is uniformly distributed and there is no specific structure or pattern in the data.

4. **Margin Sampling:** This strategy selects the samples based on the difference in the probability of the predicted classes. The query strategy chooses samples for which the difference in the probability of the predicted classes is the smallest. In the code, it is implemented by selecting the samples with the smallest margin as measured by the predicted probability difference. This strategy is useful when the model has high accuracy and exhibits a high degree of confidence, but the samples it identifies are biased towards the most informative samples.

5. **BALD drop out sampling:** "Bald" (acronym for "Bayesian active learning by disagreement") drop out sampling is a technique used in deep learning models to estimate model uncertainty.

In deep learning, dropout is a regularization technique used to prevent overfitting. It involves randomly "dropping out" (i.e., setting to zero) a fraction of the neurons during training. This forces the remaining neurons to learn more robust features and reduces the reliance on any one neuron. "Bald" dropout extends this technique by using dropout during inference (i.e., when making predictions) and using the resulting variability in the predictions to estimate model uncertainty. Specifically, it involves computing the entropy (a measure of uncertainty) of the predicted probabilities over a set of dropout masks, and then selecting the samples with the highest entropy. The idea is that if the model is uncertain about a particular prediction, then it will give different results when different neurons are dropped out. By sampling from the dropout masks and selecting the samples with the highest entropy, we can estimate the uncertainty of the model's predictions. This technique has been shown to be effective in various applications, such as image classification, segmentation, and object detection, among others.

Now onto the analysis of the experiment,

MNIST Analysis

We picked 10000 random samples from dataset as initialized dataset then conducted a pool-based sampling approach for training and deep model for prediction. The model achieved 0.954 without active learning after applying it here are the results.

1. random sampling

```
{'dataset_name': 'MNIST',  
 'n_init_labeled': 10000,  
 'n_query': 1000,  
 'n_round': 10,  
 'seed': 1,  
 'strategy_name': 'RandomSampling'}  
Train size: 60000 , Test size: 10000  
number of labeled pool: 10000  
number of unlabeled pool: 50000  
number of testing pool: 10000  
Round 0
```

```
100%|
| 10/10 [00:33<00:00, 3.37s/it]
Round 0 trainig accuracy: 0.9541
Round 0 testing accuracy: 0.9562
Round 1
100%|
| 10/10 [00:36<00:00, 3.62s/it]
Round 1 training accuracy: 0.9532166666666667
Round 1 testing accuracy: 0.9564
Round 2
100%|
| 10/10 [00:40<00:00, 4.02s/it]
Round 2 training accuracy: 0.95895
Round 2 testing accuracy: 0.9601
Round 3
100%|
| 10/10 [00:43<00:00, 4.37s/it]
Round 3 training accuracy: 0.9584833333333334
Round 3 testing accuracy: 0.9617
Round 4
100%|
| 10/10 [00:47<00:00, 4.73s/it]
Round 4 training accuracy: 0.9615
Round 4 testing accuracy: 0.9668
Round 5
100%|
| 10/10 [00:50<00:00, 5.07s/it]
Round 5 training accuracy: 0.9646666666666667
Round 5 testing accuracy: 0.965
Round 6
100%|
| 10/10 [00:53<00:00, 5.35s/it]
Round 6 training accuracy: 0.9654333333333334
Round 6 testing accuracy: 0.9686
Round 7
100%|
| 10/10 [00:57<00:00, 5.74s/it]
Round 7 training accuracy: 0.9706166666666667
Round 7 testing accuracy: 0.9728
Round 8
100%|
| 10/10 [00:59<00:00, 5.94s/it]
Round 8 training accuracy: 0.9647333333333333
Round 8 testing accuracy: 0.9663
Round 9
100%|
| 10/10 [01:03<00:00, 6.35s/it]
Round 9 training accuracy: 0.9683333333333334
Round 9 testing accuracy: 0.9719
Round 10
100%|
| 10/10 [01:06<00:00, 6.68s/it]
Round 10 training accuracy: 0.9703333333333334
Round 10 testing accuracy: 0.9716
```

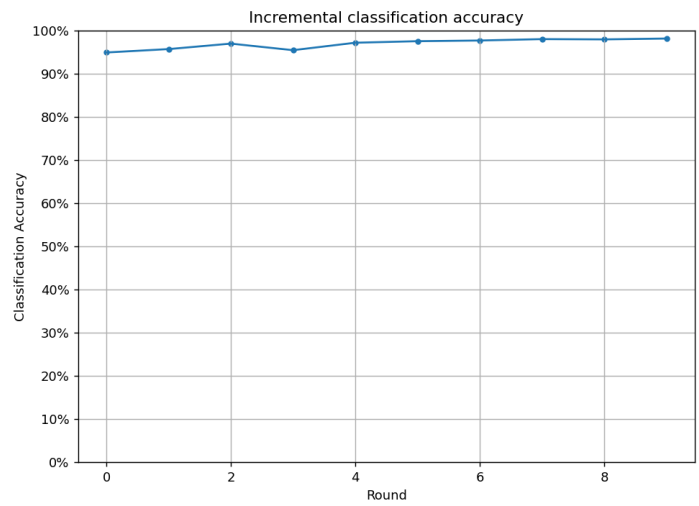
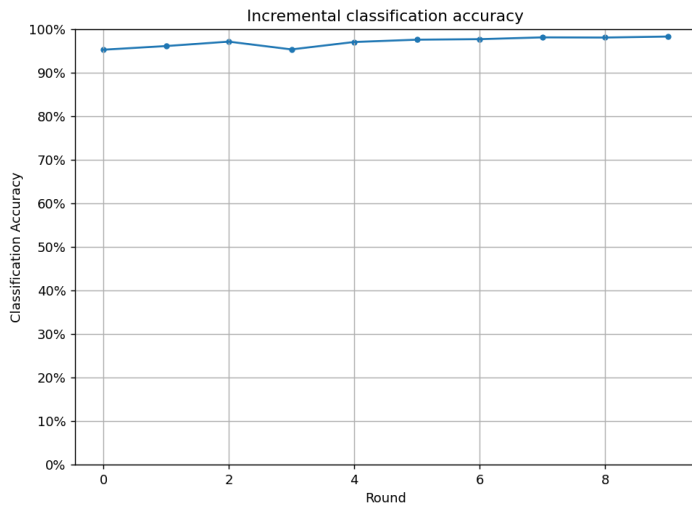
we used 25 queries instead of 30 as the first because it worsens after this number and this is the best strategy in terms of final acc

```
{'dataset_name': 'MNIST',  
  'n_init_labeled': 5000,  
  'n_query': 1000,  
  'n_round': 10,  
  'seed': 1,  
  'strategy_name': 'EntropySampling'}
```

```
Train size: 60000 , Test size: 10000
number of labeled pool: 5000
number of unlabeled pool: 55000
number of testing pool: 10000
```

```
Round 0
100%|
| 10/10 [00:17<00:00, 1.80s/it]
Round 0 training accuracy: 0.9285833333333333
Round 0 testing accuracy: 0.934
Round 1
100%|
| 10/10 [00:21<00:00, 2.11s/it]
Round 1 training accuracy: 0.9487
Round 1 testing accuracy: 0.9523
Round 2
100%|
| 10/10 [00:23<00:00, 2.34s/it]
Round 2 training accuracy: 0.9565666666666667
Round 2 testing accuracy: 0.9607
Round 3
100%|
| 10/10 [00:26<00:00, 2.69s/it]
Round 3 training accuracy: 0.9692166666666666
Round 3 testing accuracy: 0.9708
Round 4
100%|
| 10/10 [00:30<00:00, 3.05s/it]
Round 4 training accuracy: 0.9540166666666666
Round 4 testing accuracy: 0.953
Round 5
100%|
| 10/10 [00:32<00:00, 3.28s/it]
Round 5 training accuracy: 0.9712833333333334
Round 5 testing accuracy: 0.97
Round 6
100%|
| 10/10 [00:36<00:00, 3.65s/it]
Round 6 training accuracy: 0.9748166666666667
Round 6 testing accuracy: 0.9753
Round 7
100%|
| 10/10 [00:39<00:00, 3.94s/it]
Round 7 training accuracy: 0.9764333333333334
Round 7 testing accuracy: 0.9765
Round 8
```

```
100%|██████████████████████████████████████████████████████████████████████████|  
| 10/10 [00:43<00:00, 4.31s/it]  
Round 8 training accuracy: 0.9796333333333333  
Round 8 testing accuracy: 0.9806  
Round 9  
100%|██████████████████████████████████████████████████████████████████████████|  
| 10/10 [00:46<00:00, 4.63s/it]  
Round 9 training accuracy: 0.979  
Round 9 testing accuracy: 0.9802  
Round 10  
100%|██████████████████████████████████████████████████████████████████████████|  
| 10/10 [00:49<00:00, 4.93s/it]  
Round 10 training accuracy: 0.9809833333333333  
Round 10 testing accuracy: 0.9825
```



3. Bald sampling

```
{'dataset_name': 'MNIST',  
'n_init_labeled': 5000,  
'n_query': 1000,  
'n_round': 10,  
'seed': 1,  
'strategy_name': 'BALDDropout'}
```

```
Train size: 60000 , Test size: 10000
number of labeled pool: 5000
number of unlabeled pool: 55000
number of testing pool: 10000
```

```

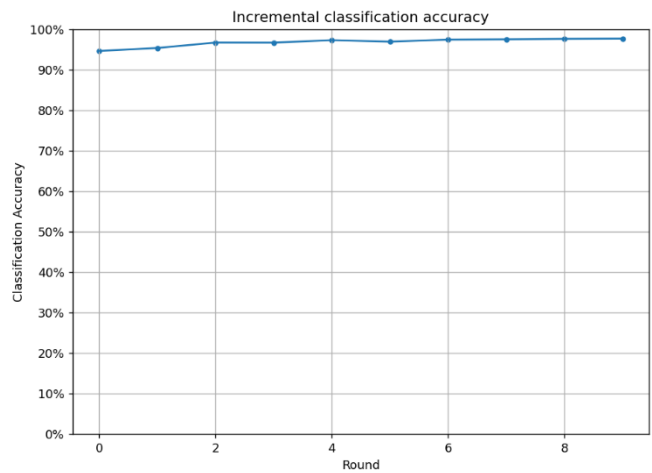
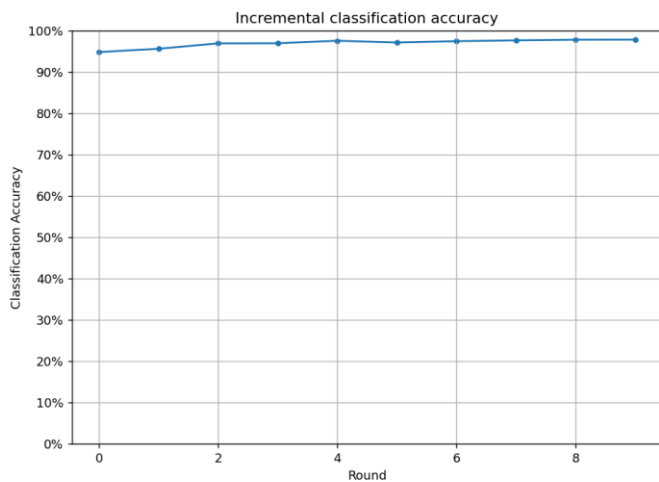
Round 0
100%|
| 10/10 [00:17<00:00, 1.74s/it]
Round 0 training accuracy: 0.9285833333333333
Round 0 testing accuracy: 0.934
Round 1
100%|
| 10/10 [00:20<00:00, 2.06s/it]
Round 1 training accuracy: 0.9461
Round 1 testing accuracy: 0.9477
Round 2
100%|
| 10/10 [00:24<00:00, 2.43s/it]
Round 2 training accuracy: 0.9534
Round 2 testing accuracy: 0.9557
Round 3
100%|
| 10/10 [00:26<00:00, 2.64s/it]
Round 3 training accuracy: 0.9668
Round 3 testing accuracy: 0.9687
Round 4
100%|
| 10/10 [00:30<00:00, 3.01s/it]
Round 4 training accuracy: 0.9666166666666667
Round 4 testing accuracy: 0.969
Round 5
100%|
| 10/10 [00:33<00:00, 3.31s/it]
Round 5 training accuracy: 0.9727
Round 5 testing accuracy: 0.9751
Round 6
100%|
| 10/10 [00:36<00:00, 3.68s/it]
Round 6 training accuracy: 0.9690833333333333
Round 6 testing accuracy: 0.9709
Round 7
100%|
| 10/10 [00:39<00:00, 3.92s/it]
Round 7 training accuracy: 0.974
Round 7 testing accuracy: 0.974
Round 8
100%|
| 10/10 [00:43<00:00, 4.32s/it]
Round 8 training accuracy: 0.9748166666666667

```

```

Round 8 testing accuracy: 0.976
Round 9
100%|
| 10/10 [00:46<00:00, 4.64s/it]
Round 9 training accuracy: 0.976
Round 9 testing accuracy: 0.9776
Round 10
100%|
| 10/10 [00:49<00:00, 4.93s/it]
Round 10 training accuracy: 0.97665
Round 10 testing accuracy: 0.9778

```



4. Least-confidence sampling

```

{'dataset_name': 'MNIST',
 'n_init_labeled': 5000,
 'n_query': 1000,
 'n_round': 10,
 'seed': 1,
 'strategy_name': 'LeastConfidence'}

```

```

Train size: 60000 , Test size: 10000
number of labeled pool: 5000
number of unlabeled pool: 55000
number of testing pool: 10000

```

```

Round 0
100%|
| 10/10 [00:18<00:00, 1.82s/it]
Round 0 trainig accuracy: 0.9285833333333333
Round 0 testing accuracy: 0.934
Round 1
100%|
| 10/10 [00:20<00:00, 2.07s/it]
Round 1 training accuracy: 0.9506333333333333
Round 1 testing accuracy: 0.9539
Round 2

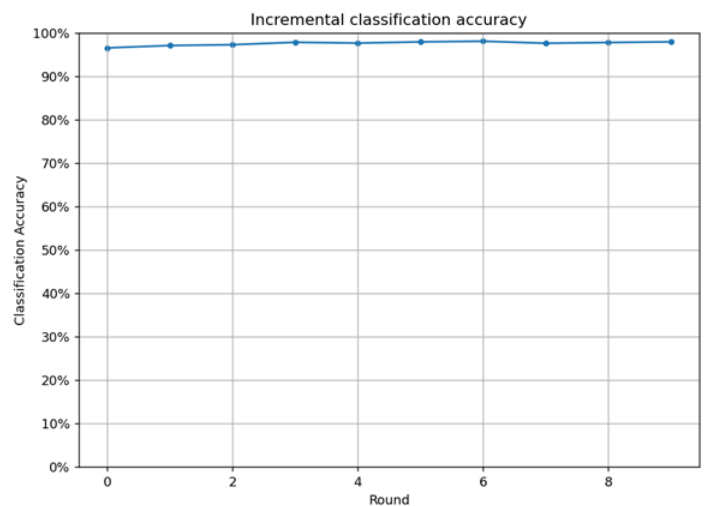
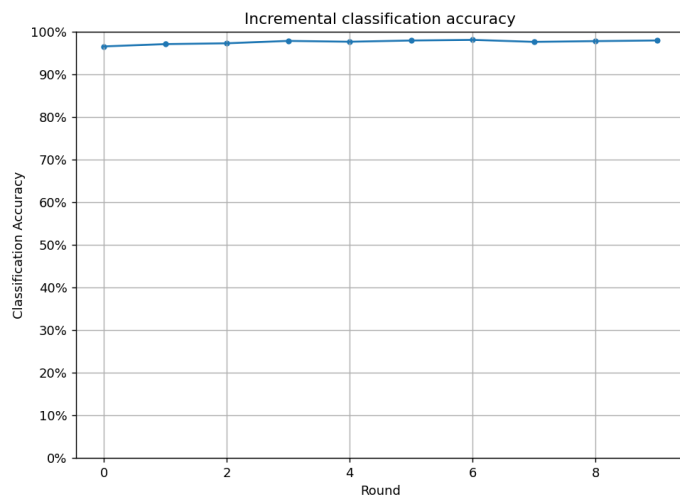
```



```

100%|
| 10/10 [00:23<00:00, 2.40s/it]
Round 2 training accuracy: 0.9601333333333333
Round 2 testing accuracy: 0.961
Round 3
100%|
| 10/10 [00:26<00:00, 2.69s/it]
Round 3 training accuracy: 0.96835
Round 3 testing accuracy: 0.9693
Round 4
100%|
| 10/10 [00:30<00:00, 3.06s/it]
Round 4 training accuracy: 0.9643166666666667
Round 4 testing accuracy: 0.9651
Round 5
100%|
| 10/10 [00:34<00:00, 3.43s/it]
Round 5 training accuracy: 0.97295
Round 5 testing accuracy: 0.9739
Round 6
100%|
| 10/10 [00:36<00:00, 3.69s/it]
Round 6 training accuracy: 0.9763
Round 6 testing accuracy: 0.9767
Round 7
100%|
| 10/10 [00:40<00:00, 4.09s/it]
Round 7 training accuracy: 0.9794833333333334
Round 7 testing accuracy: 0.9797
Round 8
100%|
| 10/10 [00:43<00:00, 4.36s/it]
Round 8 training accuracy: 0.9787833333333333
Round 8 testing accuracy: 0.9802
Round 9
100%|
| 10/10 [00:47<00:00, 4.72s/it]
Round 9 training accuracy: 0.97975
Round 9 testing accuracy: 0.9799
Round 10
100%|
| 10/10 [00:52<00:00, 5.27s/it]
Round 10 training accuracy: 0.9797333333333333
Round 10 testing accuracy: 0.9811

```



CIFAR dataset

We picked 10000 random samples from dataset as initialized dataset) then conducted a pool-based sampling approach for training and Deep Classifier for prediction. The model achieved 0.594 without active learning after applying it here are the results.

1. random sampling

```
{
  'dataset_name': 'CIFAR10',
  'n_init_labeled': 10000,
  'n_query': 1000,
  'n_round': 10,
  'seed': 1,
  'strategy_name': 'RandomSampling'}
```

```
Files already downloaded and verified
Files already downloaded and verified
Train size: 50000 , Test size: 10000
number of labeled pool: 10000
number of unlabeled pool: 40000
number of testing pool: 10000
```

```
Round 0  
100%|██████████|  
██████████ | 20/20 [01:22<00:00, 4.14s/it]  
Round 0 training accuracy: 0.59434  
Round 0 testing accuracy: 0.5499  
Round 1  
100%|██████████|  
██████████ | 20/20 [01:29<00:00, 4.45s/it]  
Round 1 training accuracy: 0.62666  
Round 1 testing accuracy: 0.5898  
Round 2  
100%|██████████|  
██████████ | 20/20 [01:37<00:00, 4.86s/it]  
Round 2 training accuracy: 0.63734  
Round 2 testing accuracy: 0.5828  
Round 3  
100%|██████████|  
██████████ | 20/20 [01:44<00:00, 5.24s/it]  
Round 3 training accuracy: 0.44504  
Round 3 testing accuracy: 0.4255  
Round 4  
100%|██████████|  
██████████ | 20/20 [01:55<00:00, 5.77s/it]  
Round 4 training accuracy: 0.65722  
Round 4 testing accuracy: 0.6084  
Round 5  
100%|██████████|  
██████████ | 20/20 [02:03<00:00, 6.18s/it]  
Round 5 training accuracy: 0.613  
Round 5 testing accuracy: 0.5726  
Round 6  
100%|██████████|  
██████████ | 20/20 [02:09<00:00, 6.47s/it]
```

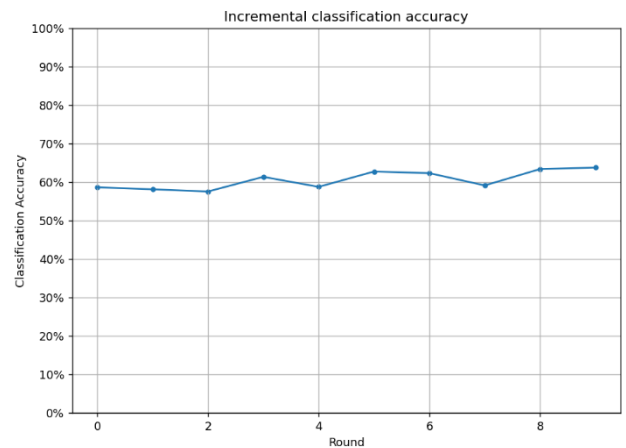

3. BALD sampling

```
{
  'dataset_name': 'CIFAR10',
  'n_init_labeled': 10000,
  'n_query': 1000,
  'n_round': 10,
  'seed': 1,
  'strategy_name': 'BALDDropout'}
```

```
Files already downloaded and verified
Files already downloaded and verified
Train size: 50000 , Test size: 10000
number of labeled pool: 10000
number of unlabeled pool: 40000
number of testing pool: 10000
```

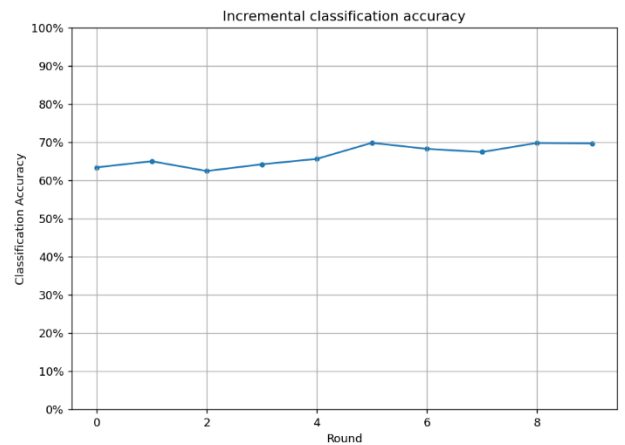
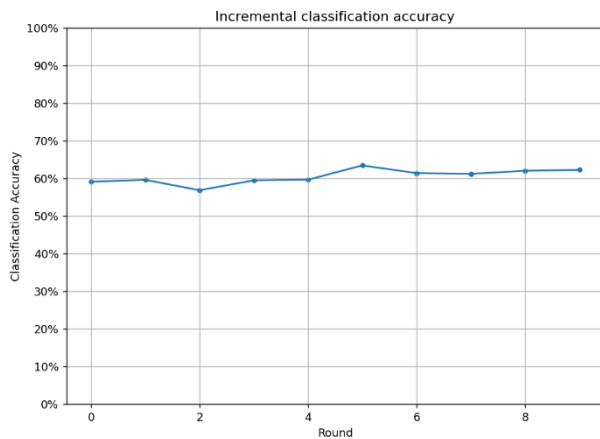
```
Round 0  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [01:22<00:00, 4.12s/it]  
Round 0 training accuracy: 0.59434  
Round 0 testing accuracy: 0.5499  
Round 1  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [01:30<00:00, 4.53s/it]  
Round 1 training accuracy: 0.63664  
Round 1 testing accuracy: 0.5862  
Round 2  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [01:37<00:00, 4.86s/it]  
Round 2 training accuracy: 0.63496  
Round 2 testing accuracy: 0.581  
Round 3  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [01:44<00:00, 5.24s/it]  
Round 3 training accuracy: 0.63522  
Round 3 testing accuracy: 0.5753  
Round 4  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [01:54<00:00, 5.71s/it]  
Round 4 training accuracy: 0.67758  
Round 4 testing accuracy: 0.6134  
Round 5  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [02:05<00:00, 6.27s/it]  
Round 5 training accuracy: 0.63958  
Round 5 testing accuracy: 0.5874  
Round 6  
100%|█████████████████████████████████████████████████████████████████████████████  
██████ | 20/20 [02:13<00:00, 6.66s/it]
```

Round 10 testing accuracy: 0.6375



```
Files already downloaded and verified
Files already downloaded and verified
Train size: 50000 , Test size: 10000
number of labeled pool: 10000
number of unlabeled pool: 40000
number of testing pool: 10000
```

```
Round 0  
100%|██████████  
    | 20/20 [01:24<00:00, 4.25s/it]  
Round 0 training accuracy: 0.59434  
Round 0 testing accuracy: 0.5499  
Round 1  
100%|██████████  
    | 20/20 [01:33<00:00, 4.67s/it]  
Round 1 training accuracy: 0.63382  
Round 1 testing accuracy: 0.5909  
Round 2  
100%|██████████  
    | 20/20 [01:39<00:00, 4.98s/it]  
Round 2 training accuracy: 0.64988  
Round 2 testing accuracy: 0.5958  
Round 3  
100%|██████████  
    | 20/20 [01:48<00:00, 5.41s/it]  
Round 3 training accuracy: 0.62428  
Round 3 testing accuracy: 0.5683  
Round 4  
100%|██████████  
    | 20/20 [01:55<00:00, 5.77s/it]  
Round 4 training accuracy: 0.64186  
Round 4 testing accuracy: 0.5945  
Round 5  
100%|██████████  
    | 20/20 [02:05<00:00, 6.26s/it]  
Round 5 training accuracy: 0.65604  
Round 5 testing accuracy: 0.5963  
Round 6  
100%|██████████  
    | 20/20 [02:13<00:00, 6.68s/it]  
Round 6 training accuracy: 0.69796  
Round 6 testing accuracy: 0.6341  
Round 7  
100%|██████████  
    | 20/20 [02:18<00:00, 6.92s/it]  
Round 7 training accuracy: 0.6823  
Round 7 testing accuracy: 0.6138  
Round 8  
100%|██████████  
    | 20/20 [02:26<00:00, 7.34s/it]  
Round 8 training accuracy: 0.67398  
Round 8 testing accuracy: 0.6117  
Round 9  
100%|██████████  
    | 20/20 [02:36<00:00, 7.81s/it]  
Round 9 training accuracy: 0.6977  
Round 9 testing accuracy: 0.62  
Round 10  
100%|██████████  
    | 20/20 [02:46<00:00, 8.31s/it]  
Round 10 training accuracy: 0.69668  
Round 10 testing accuracy: 0.6223
```



5. margin sampling

```
{'dataset_name': 'CIFAR10',
 'n_init_labeled': 10000,
 'n_query': 1000,
 'n_round': 10,
 'seed': 1,
 'strategy_name': 'MarginSampling'}
```

```
Files already downloaded and verified
Files already downloaded and verified
Train size: 50000 , Test size: 10000
number of labeled pool: 10000
number of unlabeled pool: 40000
number of testing pool: 10000
```

```
Round 0
100%|████████████████████████████████████████████████████████████████████████████████| 20/20 [01:21<00:00, 4.08s/it]
Round 0 training accuracy: 0.59434
Round 0 testing accuracy: 0.5499
Round 1
100%|████████████████████████████████████████████████████████████████████████████████| 20/20 [01:30<00:00, 4.51s/it]
Round 1 training accuracy: 0.63318
Round 1 testing accuracy: 0.5899
Round 2
100%|████████████████████████████████████████████████████████████████████████████████| 20/20 [01:38<00:00, 4.92s/it]
Round 2 training accuracy: 0.63244
Round 2 testing accuracy: 0.5892
Round 3
100%|████████████████████████████████████████████████████████████████████████████████| 20/20 [01:46<00:00, 5.32s/it]
Round 3 training accuracy: 0.64122
Round 3 testing accuracy: 0.5941
Round 4
100%|████████████████████████████████████████████████████████████████████████████████| 20/20 [01:55<00:00, 5.76s/it]
Round 4 training accuracy: 0.67854
Round 4 testing accuracy: 0.6164
```


This is partly because the extra set was created by applying weakly supervised labeling to a large number of unlabeled images, which can introduce biases in the labeling process.

Overall, the SVHN dataset is not perfectly balanced and some consider unbalanced

1 Least-confidence sampling:

```
{'dataset_name': 'SVHN',  
  'n_init_labeled': 5000,  
  'n_query': 1000,  
  'n_round': 10,  
  'seed': 1,  
  'strategy_name': 'LeastConfidence'}
```

```
Using downloaded and verified file: ./data/SVHN/train_32x32.mat
Using downloaded and verified file: ./data/SVHN/test_32x32.mat
Train size: 73257 , Test size: 26032
number of labeled pool: 5000
number of unlabeled pool: 65000
number of testing pool: 26032
```

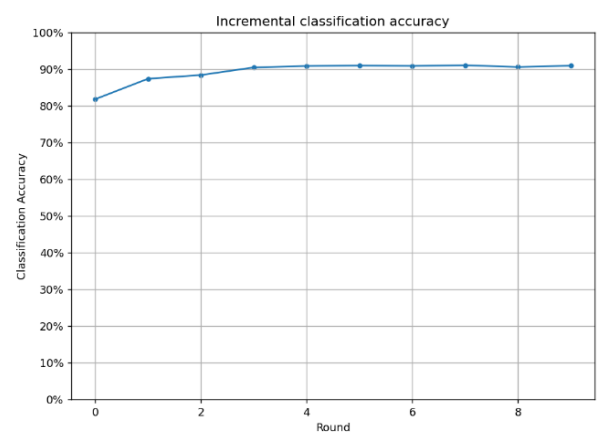
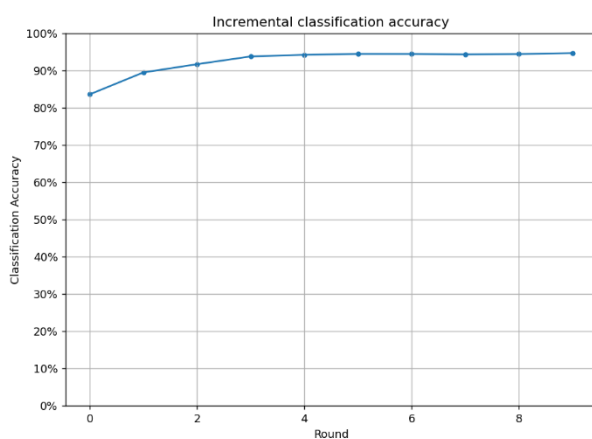
```
Round 0
100%|
| 20/20 [00:45<00:00, 2.27s/it]
Round 0 training accuracy: 0.18958571428571427
Round 0 testing accuracy: 0.19598955132145052
Round 1
100%|
| 20/20 [00:52<00:00, 2.62s/it]
Round 1 training accuracy: 0.18954285714285715
Round 1 testing accuracy: 0.19591272280270436
Round 2
100%|
| 20/20 [01:01<00:00, 3.09s/it]
Round 2 training accuracy: 0.19587142857142859
Round 2 testing accuracy: 0.20090657652120467
Round 3
100%|
| 20/20 [01:13<00:00, 3.65s/it]
Round 3 training accuracy: 0.5865571428571429
Round 3 testing accuracy: 0.6008758451137062
Round 4
100%|
| 20/20 [01:19<00:00, 4.00s/it]
Round 4 training accuracy: 0.5326857142857143
Round 4 testing accuracy: 0.5434465273509527
Round 5
100%|
| 20/20 [01:28<00:00, 4.42s/it]
Round 5 training accuracy: 0.6934571428571429
Round 5 testing accuracy: 0.6772049784880148
Round 6
100%|
| 20/20 [01:36<00:00, 4.81s/it]
Round 6 training accuracy: 0.4221714285714286
Round 6 testing accuracy: 0.4340043023970498
```



```

100%|
| 20/20 [02:13<00:00, 6.66s/it]
Round 1 training accuracy: 0.8356285714285714
Round 1 testing accuracy: 0.8176475107559926
Round 2
100%|
| 20/20 [03:41<00:00, 11.07s/it]
Round 2 training accuracy: 0.8943714285714286
Round 2 testing accuracy: 0.8733866011063307
Round 3
100%|
| 20/20 [05:06<00:00, 15.30s/it]
Round 3 training accuracy: 0.9164571428571429
Round 3 testing accuracy: 0.8834895513214506
Round 4
100%|
| 20/20 [06:35<00:00, 19.77s/it]
Round 4 training accuracy: 0.9373285714285714
Round 4 testing accuracy: 0.9041180086047941
Round 5
100%|
| 20/20 [07:59<00:00, 24.00s/it]
Round 5 training accuracy: 0.9416857142857142
Round 5 testing accuracy: 0.9080746773202213
Round 6
100%|
| 20/20 [09:23<00:00, 28.16s/it]
Round 6 training accuracy: 0.9441428571428572
Round 6 testing accuracy: 0.9092655193607867
Round 7
100%|
| 20/20 [10:04<00:00, 30.23s/it]
Round 7 training accuracy: 0.9440142857142857
Round 7 testing accuracy: 0.9082667486170867
Round 8
100%|
| 20/20 [10:04<00:00, 30.23s/it]
Round 8 training accuracy: 0.9428142857142857
Round 8 testing accuracy: 0.9100722188076213
Round 9
100%|
| 20/20 [10:05<00:00, 30.29s/it]
Round 9 training accuracy: 0.9438
Round 9 testing accuracy: 0.9053856791641057
Round 10
100%|
| 20/20 [10:02<00:00, 30.10s/it]
Round 10 training accuracy: 0.9463142857142857
Round 10 testing accuracy: 0.9088813767670559

```



3 entropy sampling

```
{'dataset_name': 'SVHN',  
  'n_init_labeled': 5000,  
  'n_query': 10000,  
  'n_round': 10,  
  'seed': 1,  
  'strategy name': 'EntropySampling'}
```

```
Using downloaded and verified file: ./data/SVHN/train_32x32.mat
Using downloaded and verified file: ./data/SVHN/test_32x32.mat
Train size: 73257 , Test size: 26032
number of labeled pool: 5000
number of unlabeled pool: 65000
number of testing pool: 26032
```

```
Round 0
100%|
| 20/20 [00:47<00:00, 2.37s/it]
Round 0 training accuracy: 0.18958571428571427
Round 0 testing accuracy: 0.19598955132145052
Round 1
100%|
| 20/20 [02:13<00:00, 6.70s/it]
Round 1 training accuracy: 0.7846
Round 1 testing accuracy: 0.7672864167178857
Round 2
100%|
| 20/20 [03:41<00:00, 11.07s/it]
Round 2 training accuracy: 0.8242428571428572
Round 2 testing accuracy: 0.8070835894283959
Round 3
100%|
| 20/20 [05:10<00:00, 15.52s/it]
Round 3 training accuracy: 0.9008
Round 3 testing accuracy: 0.8798786109403811
Round 4
100%|
| 20/20 [06:39<00:00, 19.99s/it]
Round 4 training accuracy: 0.9319
Round 4 testing accuracy: 0.8999692685925015
Round 5
100%|
| 20/20 [08:08<00:00, 24.42s/it]
Round 5 training accuracy: 0.9372142857142857
Round 5 testing accuracy: 0.9039643515673018
Round 6
```