## 1. 论文调研：

研究Active learning+MMD 的有一些，但不多，这些大多是直接通过研究distribution+loss、MMD 的变形来进行active learning;
利用uncertainty + MMD结合来做Active learning 的比较少，不过uncertainty 的确定方法应该是没有和我们的重复，比如有些用的decision boundary

## 2. 我们现在用的方法：

每个batch求uncertainty+MMD（lambda系数目前为1），结果比较大的加入训练集。[后面可能需要调系数或者normalize 一下~]
目前求uncertainty 方法：kmeans 聚类feature后，求每个样本feature和离自己最近的两个cluster 中心的欧式距离差，结果比较小\uncertainty大（这里先直接取得倒数~~）
每个样本的MMD 是求的5次平均

## 3. 目前训练结果

```
>> Train a Model...
Cycle: 1 Epoch: 1 --- Val Acc: 14.580    Best Acc: 14.580
Cycle: 1 Epoch: 21 --- Val Acc: 44.700   Best Acc: 44.700
Cycle: 1 Epoch: 41 --- Val Acc: 58.710   Best Acc: 58.710
Cycle: 1 Epoch: 61 --- Val Acc: 62.610   Best Acc: 62.610
Cycle: 1 Epoch: 81 --- Val Acc: 69.340   Best Acc: 69.340
Cycle: 1 Epoch: 101 --- Val Acc: 71.910          Best Acc: 71.910
Cycle: 1 Epoch: 121 --- Val Acc: 72.740          Best Acc: 72.740
Cycle: 1 Epoch: 141 --- Val Acc: 69.800          Best Acc: 72.740
Cycle: 1 Epoch: 161 --- Val Acc: 76.690          Best Acc: 76.690
Cycle: 1 Epoch: 181 --- Val Acc: 79.110          Best Acc: 79.110
Cycle: 1 Epoch: 200 --- Val Acc: 79.220          Best Acc: 79.220
>> Finished.
Trial 1/1 || Cycle 1/7 || Label set size 5000: Test acc 79.22
```

```
>> Train a Model...
Cycle: 2 Epoch: 1 --- Val Acc: 73.230    Best Acc: 73.230
Cycle: 2 Epoch: 21 --- Val Acc: 77.660   Best Acc: 77.660
Cycle: 2 Epoch: 41 --- Val Acc: 78.610   Best Acc: 78.610
Cycle: 2 Epoch: 61 --- Val Acc: 78.780   Best Acc: 78.780
Cycle: 2 Epoch: 81 --- Val Acc: 76.490   Best Acc: 78.780
Cycle: 2 Epoch: 101 --- Val Acc: 78.320          Best Acc: 78.780
Cycle: 2 Epoch: 121 --- Val Acc: 71.840          Best Acc: 78.780
Cycle: 2 Epoch: 141 --- Val Acc: 73.920          Best Acc: 78.780
Cycle: 2 Epoch: 161 --- Val Acc: 84.680          Best Acc: 84.680
Cycle: 2 Epoch: 181 --- Val Acc: 86.250          Best Acc: 86.250
Cycle: 2 Epoch: 200 --- Val Acc: 86.440          Best Acc: 86.440
>> Finished.
Trial 1/1 || Cycle 2/7 || Label set size 7500: Test acc 86.44
```

```
>> Train a Model...
Cycle: 3 Epoch: 1 --- Val Acc: 75.860    Best Acc: 75.860
Cycle: 3 Epoch: 21 --- Val Acc: 77.110   Best Acc: 77.110
Cycle: 3 Epoch: 41 --- Val Acc: 78.310   Best Acc: 78.310
Cycle: 3 Epoch: 61 --- Val Acc: 79.410   Best Acc: 79.410
Cycle: 3 Epoch: 81 --- Val Acc: 80.380   Best Acc: 80.380
Cycle: 3 Epoch: 101 --- Val Acc: 83.240          Best Acc: 83.240
Cycle: 3 Epoch: 121 --- Val Acc: 80.690          Best Acc: 83.240
Cycle: 3 Epoch: 141 --- Val Acc: 80.570          Best Acc: 83.240
Cycle: 3 Epoch: 161 --- Val Acc: 87.140          Best Acc: 87.140
Cycle: 3 Epoch: 181 --- Val Acc: 88.070          Best Acc: 88.070
Cycle: 3 Epoch: 200 --- Val Acc: 88.490          Best Acc: 88.490
>> Finished.
Trial 1/1 || Cycle 3/7 || Label set size 10000: Test acc 88.49
```

```
>> Train a Model...
Cycle: 4 Epoch: 1 --- Val Acc: 80.090    Best Acc: 80.090
Cycle: 4 Epoch: 21 --- Val Acc: 81.340   Best Acc: 81.340
Cycle: 4 Epoch: 41 --- Val Acc: 79.840   Best Acc: 81.340
Cycle: 4 Epoch: 61 --- Val Acc: 79.640   Best Acc: 81.340
Cycle: 4 Epoch: 81 --- Val Acc: 80.020   Best Acc: 81.340
Cycle: 4 Epoch: 101 --- Val Acc: 82.330          Best Acc: 82.330
Cycle: 4 Epoch: 121 --- Val Acc: 79.520          Best Acc: 82.330
Cycle: 4 Epoch: 141 --- Val Acc: 78.250          Best Acc: 82.330
Cycle: 4 Epoch: 161 --- Val Acc: 89.110          Best Acc: 89.110
Cycle: 4 Epoch: 181 --- Val Acc: 90.570          Best Acc: 90.570
Cycle: 4 Epoch: 200 --- Val Acc: 90.730          Best Acc: 90.730
>> Finished.
Trial 1/1 || Cycle 4/7 || Label set size 12500: Test acc 90.73
```

```
>> Train a Model...
Cycle: 5 Epoch: 1 --- Val Acc: 77.240    Best Acc: 77.240
Cycle: 5 Epoch: 21 --- Val Acc: 83.790   Best Acc: 83.790
Cycle: 5 Epoch: 41 --- Val Acc: 81.200   Best Acc: 83.790
Cycle: 5 Epoch: 61 --- Val Acc: 82.230   Best Acc: 83.790
Cycle: 5 Epoch: 81 --- Val Acc: 82.670   Best Acc: 83.790
Cycle: 5 Epoch: 101 --- Val Acc: 79.060          Best Acc: 83.790
Cycle: 5 Epoch: 121 --- Val Acc: 83.170          Best Acc: 83.790
Cycle: 5 Epoch: 141 --- Val Acc: 83.710          Best Acc: 83.790
Cycle: 5 Epoch: 161 --- Val Acc: 90.510          Best Acc: 90.510
Cycle: 5 Epoch: 181 --- Val Acc: 91.810          Best Acc: 91.810
Cycle: 5 Epoch: 200 --- Val Acc: 91.980          Best Acc: 91.980
>> Finished.
Trial 1/1 || Cycle 5/7 || Label set size 15000: Test acc 91.98
```

```
>> Train a Model...
Cycle: 6 Epoch: 1 --- Val Acc: 78.100    Best Acc: 78.100
Cycle: 6 Epoch: 21 --- Val Acc: 85.960   Best Acc: 85.960
Cycle: 6 Epoch: 41 --- Val Acc: 81.960   Best Acc: 85.960
Cycle: 6 Epoch: 61 --- Val Acc: 78.250   Best Acc: 85.960
Cycle: 6 Epoch: 81 --- Val Acc: 82.020   Best Acc: 85.960
Cycle: 6 Epoch: 101 --- Val Acc: 85.330          Best Acc: 85.960
Cycle: 6 Epoch: 121 --- Val Acc: 85.210          Best Acc: 85.960
Cycle: 6 Epoch: 141 --- Val Acc: 81.640          Best Acc: 85.960
Cycle: 6 Epoch: 161 --- Val Acc: 91.450          Best Acc: 91.450
Cycle: 6 Epoch: 181 --- Val Acc: 92.330          Best Acc: 92.330
Cycle: 6 Epoch: 200 --- Val Acc: 92.420          Best Acc: 92.420
>> Finished.
Trial 1/1 || Cycle 6/7 || Label set size 17500: Test acc 92.42
```

```
>> Train a Model...
Cycle: 7 Epoch: 1 --- Val Acc: 83.140    Best Acc: 83.140
Cycle: 7 Epoch: 21 --- Val Acc: 83.720   Best Acc: 83.720
Cycle: 7 Epoch: 41 --- Val Acc: 84.970   Best Acc: 84.970
Cycle: 7 Epoch: 61 --- Val Acc: 82.460   Best Acc: 84.970
Cycle: 7 Epoch: 81 --- Val Acc: 82.710   Best Acc: 84.970
Cycle: 7 Epoch: 101 --- Val Acc: 84.820          Best Acc: 84.970
Cycle: 7 Epoch: 121 --- Val Acc: 86.440          Best Acc: 86.440
Cycle: 7 Epoch: 141 --- Val Acc: 79.860          Best Acc: 86.440
Cycle: 7 Epoch: 161 --- Val Acc: 91.490          Best Acc: 91.490
Cycle: 7 Epoch: 181 --- Val Acc: 92.990          Best Acc: 92.990
Cycle: 7 Epoch: 200 --- Val Acc: 93.360          Best Acc: 93.360
>> Finished.
Trial 1/1 || Cycle 7/7 || Label set size 20000: Test acc 93.36
```

PS: 之前用整个数据集聚类来算uncertainty, 仅用uncertainty挑选数据, 7个cycle后结果达到94.3%，现在每个batch聚类结果降低一点。是不是应该再用整体聚类求uncertainty以后，在在每个batch里算MMD, 加在一起呢?

## 4. 第一个cycle其中一个batch 的uncertainty 和MMD 具体数值：

**uncertainty：**

```
uncertainty_score:  tensor([[ 21.9464,  20.8650,  38.2483,   3.1815,  19.9288, 114.3766,   6.6298,
           3.7890,  28.7504,  48.6134,  48.1052,  14.2334,  27.2626,  39.7789,
           1.2742,   4.6957,   6.6239,  17.5560,   6.5013,  30.4253,  33.5889,
          22.1844,   3.7535,  36.3634,   3.6192,   4.1280,   7.3705,   4.9399,
         110.6572,   6.4461,   5.3521,   5.0572,  23.6036,  21.3466,  11.6654,
          13.6985,  16.9956,   2.4660,  34.1809,  70.0610,  21.0396,   5.5718,
           8.3810,  10.3753,   3.0958,   3.1835,   7.9608, 606.4420, 403.9928,
           3.0875, 117.7518,   6.4958,  11.2215,  10.0886,  20.2734,   1.1306,
           1.3122,   8.5307,  11.1724,  14.2494,   9.3148,  13.0000,  11.7119,
          37.4081,   9.8210, 149.3151,   4.1114,  22.7495,  80.5681,  11.9054,
          17.5341,  54.4466,   3.5883, 136.1602,  15.4105,   4.8118, 102.8652,
           6.7221,   2.9649,  13.0754,  23.2954,  12.7404,  80.9361,   2.7676,
          30.8624,  24.0515,  11.6697,   8.8342,  19.2482,  30.4489,  37.7076,
           6.3148,  37.6461,   3.4507,   4.5760,  26.9042,   3.0069,  25.2091,
          34.8445,  19.3754,   5.6942, 485.5344,  64.5333,   5.6290,  24.4918,
          11.2528,  25.3939,   9.6539,  11.3199,   4.3630,   4.1517,  19.3285,
          21.3922,  83.8456,  25.3793,  11.4570,  15.5643,   5.0671,   3.4417,
          21.3304,   3.4275,  81.9760,   4.2193,   2.7759,   2.7404,  44.1220,
          17.4959,   8.9302]])
```

**MMD:**

```
MMD_batch_score:  tensor([[0.0156, 0.0101, 0.0117, 0.0041, 0.0101, 0.0080, 0.0112, 0.0102, 0.0145,
         0.0065, 0.0054, 0.0051, 0.0107, 0.0101, 0.0179, 0.0120, 0.0144, 0.0154,
         0.0170, 0.0087, 0.0172, 0.0143, 0.0139, 0.0138, 0.0170, 0.0116, 0.0099,
         0.0101, 0.0167, 0.0081, 0.0143, 0.0105, 0.0081, 0.0055, 0.0115, 0.0090,
         0.0086, 0.0060, 0.0116, 0.0042, 0.0110, 0.0143, 0.0103, 0.0130, 0.0082,
         0.0085, 0.0115, 0.0072, 0.0157, 0.0058, 0.0116, 0.0091, 0.0100, 0.0067,
         0.0091, 0.0080, 0.0120, 0.0107, 0.0083, 0.0155, 0.0142, 0.0094, 0.0088,
         0.0143, 0.0078, 0.0110, 0.0093, 0.0101, 0.0114, 0.0087, 0.0116, 0.0182,
         0.0067, 0.0108, 0.0137, 0.0057, 0.0065, 0.0058, 0.0155, 0.0141, 0.0079,
         0.0118, 0.0148, 0.0147, 0.0088, 0.0097, 0.0089, 0.0055, 0.0093, 0.0075,
         0.0134, 0.0213, 0.0109, 0.0095, 0.0103, 0.0105, 0.0083, 0.0094, 0.0093,
         0.0149, 0.0114, 0.0068, 0.0072, 0.0109, 0.0155, 0.0171, 0.0090, 0.0173,
         0.0061, 0.0142, 0.0069, 0.0061, 0.0087, 0.0093, 0.0084, 0.0114, 0.0110,
         0.0097, 0.0175, 0.0061, 0.0160, 0.0063, 0.0060, 0.0127, 0.0069, 0.0075,
         0.0153, 0.0125]])
```

目前这个结果主要靠的uncertainty，MMD 数值比uncertainty 小好多~ 过后再试一试改一下lambda或者normalize 一下uncertainty等~

## 5. 有个疑问?

现在是取的MMD 比较大的数据~MMD越大是不是分布的差异越大?所以是不是应该选MMD 比较小的数据呢?