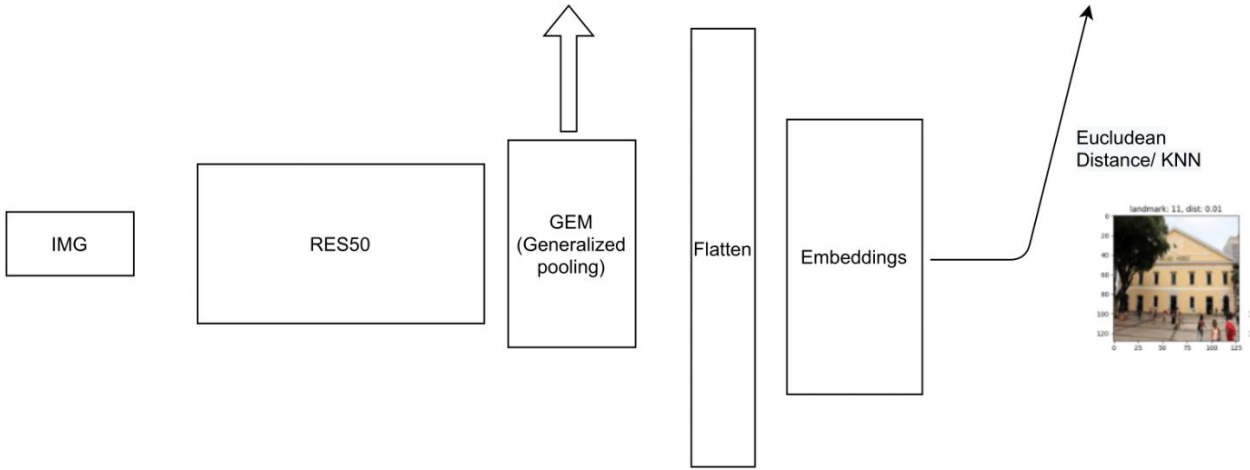
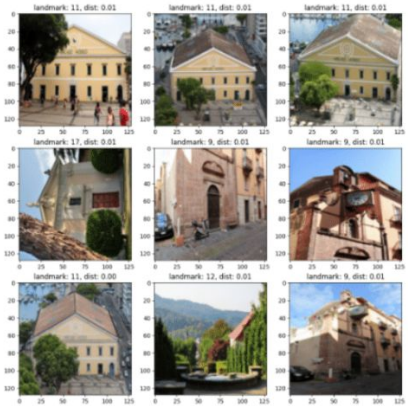
My custom model architecture for image retrieval

$$\mathbf{f}^{(g)} = [\mathrm{f}_1^{(g)} \dots \mathrm{f}_k^{(g)} \dots \mathrm{f}_K^{(g)}]^\top, \quad \mathrm{f}_k^{(g)} = \left(\frac{1}{|\mathcal{X}_k|} \sum_{x \in \mathcal{X}_k} x^{p_k} \right)^{\frac{1}{p_k}}.$$

$$d(x, y) = \sqrt{\sum_{i=1}^{n} (y_i - x_i)^2}$$





Harry - model architecture for image retrieval

Evaluation metrics:

- mAP@P
- mAP@R
- P@1
- R@1

```
## losses.CircleLoss(m=0.4, gamma=80)
Computing validation set accuracy for epoch 9
100%|| 1875/1875 [00:14<00:00,
100%|| 313/313 [00:02<00:00,
Computing accuracy
INFO:PML:running k-nn with k=1
INFO:PML:embedding dimensionality is 50
--------------------Evaluation Results--------------------
{'mean_average_precision': 4949.99495,
'mean_average_precision_at_r': 49499949.5,
'precision_at_1': 0.9899,
'r_precision': 9899.0}


### losses.TripletMarginLoss()
Computing validation set accuracy for epoch 9
100%|| 1875/1875 [00:14<00:00,
100%|| 313/313 [00:02<00:00,
Computing accuracy
INFO:PML:running k-nn with k=1
INFO:PML:embedding dimensionality is 50
--------------------Evaluation Results--------------------
{'mean_average_precision': 4936.99365,
 'mean_average_precision_at_r': 49369936.5,
 'precision_at_1': 0.9873000000000001,
 'r_precision': 9873.0}
```

```
## losses.ArcFaceLoss(10, 50, margin=28.6, scale=64)
Computing validation set accuracy for epoch 9
100%|| 1875/1875 [00:14<00:00,
100%|| 313/313 [00:02<00:00,
Computing accuracy
INFO:PML:running k-nn with k=1
INFO:PML:embedding dimensionality is 50
--------------------Evaluation Results--------------------
{'mean_average_precision': 4922.99225,
'mean_average_precision_at_r': 49229922.5,
'precision_at_1': 0.9845,
'r_precision': 9845.0}


# CosFaceLoss(10, 50, margin=0.35, scale=64)
Computing validation set accuracy for epoch 9
100%|| 1875/1875 [00:15<00:00,
100%|| 313/313 [00:02<00:00,
Computing accuracy
INFO:PML:running k-nn with k=1
INFO:PML:embedding dimensionality is 50
--------------------Evaluation Results--------------------
{'mean_average_precision': 4916.4916,
'mean_average_precision_at_r': 49164916.0,
'precision_at_1': 0.9832000000000001,
'r_precision': 9832.0}
```

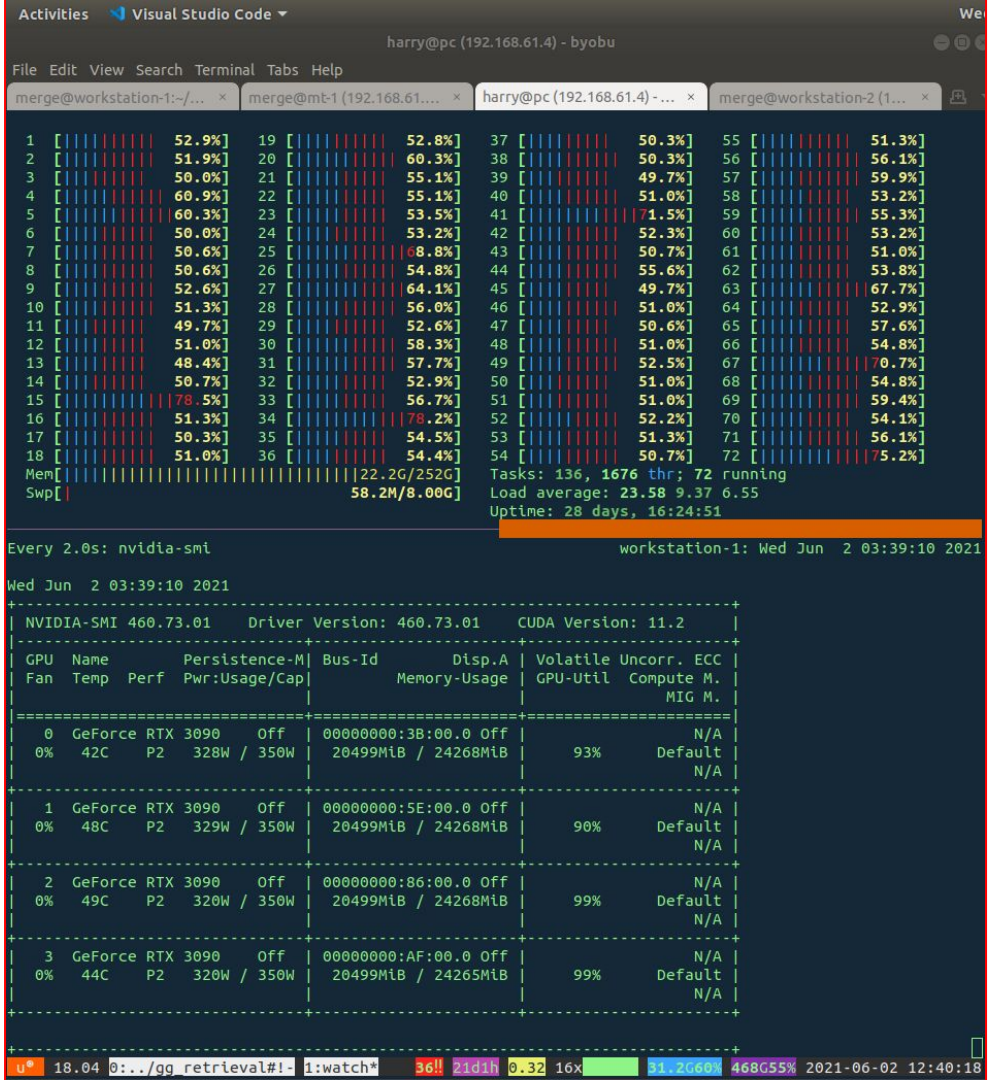
Arcface Loss - 14 epochs

```
244/465 [==============>.............] - ETA: 28:44 - loss: 0.1081 - acc: 0.9665 - top_5_accur
245/465 [==============>.............] - ETA: 28:36 - loss: 0.1083 - acc: 0.9664 - top_5_accur
246/465 [==============>.............] - ETA: 28:28 - loss: 0.1084 - acc: 0.9664 - top_5_accur
247/465 [==============>.............] - ETA: 28:21 - loss: 0.1083 - acc: 0.9664 - top_5_accur
248/465 [==============>.............] - ETA: 28:13 - loss: 0.1083 - acc: 0.9665 - top_5_accur
249/465 [==============>.............] - ETA: 28:05 - loss: 0.1085 - acc: 0.9664 - top_5_accur
250/465 [==============>.............] - ETA: 27:57 - loss: 0.1085 - acc: 0.9664 - top_5_accur
251/465 [==============>.............] - ETA: 27:49 - loss: 0.1085 - acc: 0.9664 - top_5_accur
252/465 [==============>.............] - ETA: 27:41 - loss: 0.1087 - acc: 0.9662 - top_5_accur
253/465 [==============>.............] - ETA: 27:34 - loss: 0.1085 - acc: 0.9663 - top_5_accur
254/465 [==============>.............] - ETA: 27:26 - loss: 0.1083 - acc: 0.9664 - top_5_accur
255/465 [==============>.............] - ETA: 27:18 - loss: 0.1084 - acc: 0.9663 - top_5_accur
256/465 [==============>.............] - ETA: 27:10 - loss: 0.1086 - acc: 0.9662 - top_5_accur
257/465 [==============>.............] - ETA: 27:03 - loss: 0.1085 - acc: 0.9663 - top_5_accur
258/465 [==============>.............] - ETA: 26:55 - loss: 0.1086 - acc: 0.9663 - top_5_accur
259/465 [==============>.............] - ETA: 26:47 - loss: 0.1087 - acc: 0.9662 - top_5_accur
260/465 [==============>.............] - ETA: 26:40 - loss: 0.1087 - acc: 0.9662 - top_5_accur
261/465 [==============>.............] - ETA: 26:32 - loss: 0.1087 - acc: 0.9661 - top_5_accur
262/465 [==============>.............] - ETA: 26:24 - loss: 0.1087 - acc: 0.9662 - top_5_accur
263/465 [==============>.............] - ETA: 26:16 - loss: 0.1091 - acc: 0.9660 - top_5_accur
264/465 [==============>.............] - ETA: 26:09 - loss: 0.1091 - acc: 0.9661 - top_5_accur
acy: 0.9992
```

Circle Loss - 2 epochs

Circle Loss converges faster!

```
127/128 [============================>.] - ETA: 8s - loss: 29.6233 - acc: 0.5582 - top_5_accuracy
128/128 [==============================] - ETA: 0s - loss: 29.6020 - acc: 0.5583 - top_5_accuracy
128/128 [==============================] - 1453s 11s/step - loss: 29.6020 - acc: 0.5583 - top_5_a
ccuracy: 0.7797 - val_loss: 119.3862 - val_acc: 0.0000e+00 - val_top_5_accuracy: 0.9661
```



- Top 3 solution on Kaggle -> 3 - 4 days (it requires TPU).
- My model architecture -> 25-27h (~1 day).