# CENG 483

Introduction to Computer Vision

Spring 2018-2019

Take Home Exam 1

Content Based Image Retrieval

Student Random ID: 70

Please fill in the sections below only with the requested information. If you have additional things you want the mention, you can use the last section. Please note that all of the results in this report should be given for the **validation set**.

## 1 Grayscale Histogram

In this section, give your results only for grid level 1.

- Pick 5 different quantization levels and give your mAP results for each of them.
- What do you think caused the difference between mAP for these?

I evaluated the given queries with the dataset by using grayscale histogram with 8 different quantization levels (i.e. bin counts) for grid level 1. Mean Average Precisions (mAP) of each quantization level are below:

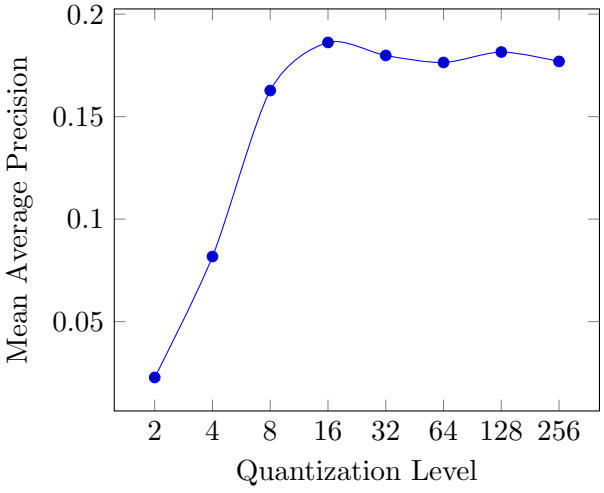


Figure 1: Mean Average Precision with different quantization levels for grid level 1 grayscale histogram

| Bin | mAP |
|---|---|
| 2 | 0.02276 |
| 4 | 0.08175 |
| 8 | 0.16273 |
| 16 | 0.18619 |
| 32 | 0.17984 |
| 64 | 0.17641 |
| 128 | 0.18151 |
| 256 | 0.17693 |

Table 1: Mean Average Precision with different quantization levels for grid level 1 grayscale histogram

It was obvious that lower quantization levels such as 1, 2, 4 would have low mAP as

# 2 3D RGB Histogram

In this section, give your results only for grid level 1.

- Pick 5 different quantization levels and give your mAP results for each of them.
- What do you think caused the difference between mAP for these?

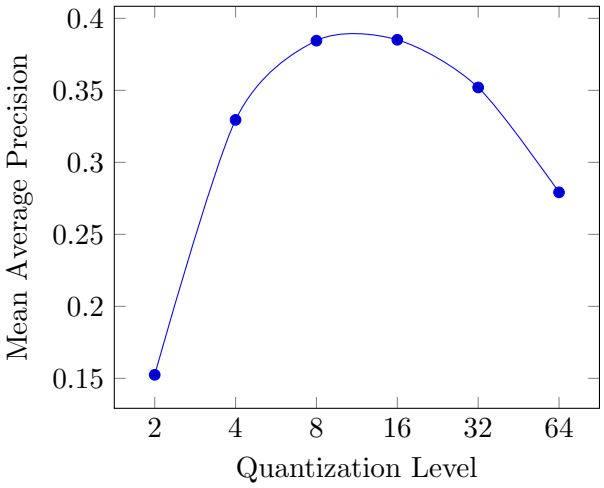


Figure 2: Mean Average Precision with different quantization levels for grid level 1 gradient histogram

| Bin | mAP |
|---|---|
| 2 | 0.15246 |
| 4 | 0.32950 |
| 8 | 0.38451 |
| 16 | 0.38512 |
| 32 | 0.35201 |
| 64 | 0.27919 |

Table 2: Mean Average Precision with different quantization levels for grid level 1 gradient histogram

# 3 Gradient Histogram

- Which method did you use for obtaining the gradients? Explain the steps of the method briefly.
- Visualize some of your intermediate results (filtered versions of the image).
- Pick 3 different quantization levels for your histogram and give your mAP results for each of them.
- What do you think caused the difference between mAP for these?

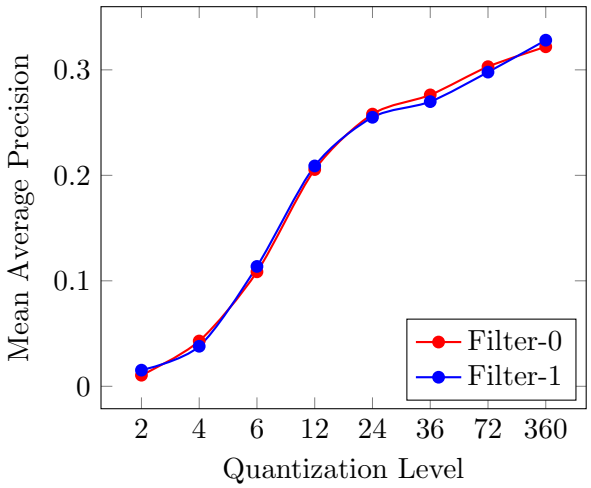


Figure 3: Mean Average Precision with different quantization levels and filters for grid level 1 gradient histogram

| Bin | Filter | mAP |
|---|---|---|
| 2 | 0 | 0.01051 |
| | 1 | 0.01530 |
| 4 | 0 | 0.04294 |
| | 1 | 0.03795 |
| 6 | 0 | 0.10854 |
| | 1 | 0.11364 |
| 12 | 0 | 0.20549 |
| | 1 | 0.20891 |
| 24 | 0 | 0.25805 |
| | 1 | 0.25502 |
| 36 | 0 | 0.27627 |
| | 1 | 0.26988 |
| 72 | 0 | 0.30302 |
| | 1 | 0.29787 |
| 360 | 0 | 0.32188 |
| | 1 | 0.32813 |

Table 3: Mean Average Precision with different quantization levels and filters for grid level 1 gradient histogram

**Before starting the next section, please pick up the best configuration for three properties above and continue with them.**

# 4 Grid Based Feature Extraction

Give your mAP for all of the configurations below.

## 4.1 level 1

- grayscale histogram:
- 3d rgb histogram:
- gradient histogram:

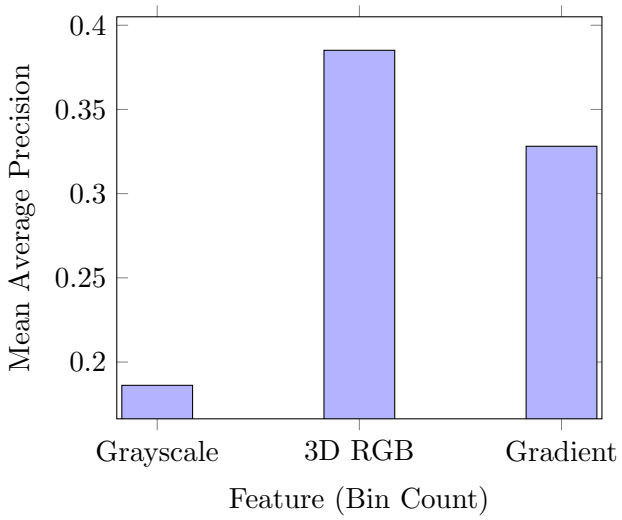


Figure 4: Best configurations of different features for grid level 1 in case of Mean Average Precision

| Bin | Feature | mAP |
|---|---|---|
| 16 | Grayscale | 0.18619 |
| 16 | 3D Color | 0.38512 |
| 360 | Gradient | 0.32813 |

Table 4: Best configurations of different features for grid level 1 in case of Mean Average Precision

## 4.2 level 2

- grayscale histogram:
- 3d rgb histogram:
- gradient histogram:

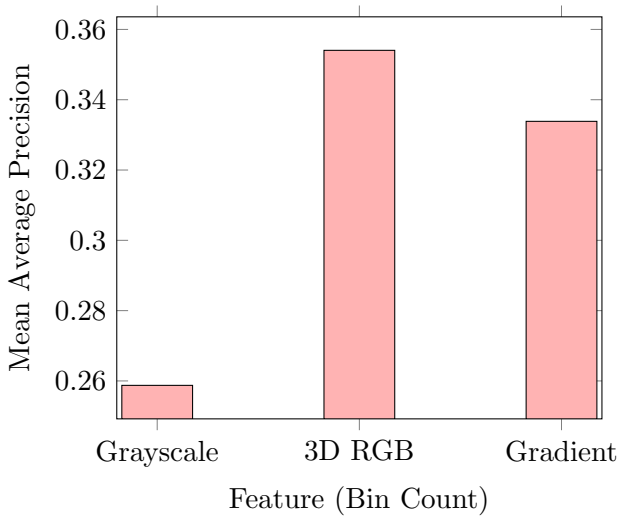


Figure 5: Best configurations of different features for grid level 2 in case of Mean Average Precision

| Bin | Feature | mAP |
|---|---|---|
| 16 | Grayscale | 0.25874 |
| 16 | 3D Color | 0.35405 |
| 360 | Gradient | 0.33385 |

Table 5: Best configurations of different features for grid level 2 in case of Mean Average Precision

## 4.3 level 3

- grayscale histogram:
- 3d rgb histogram:
- gradient histogram:

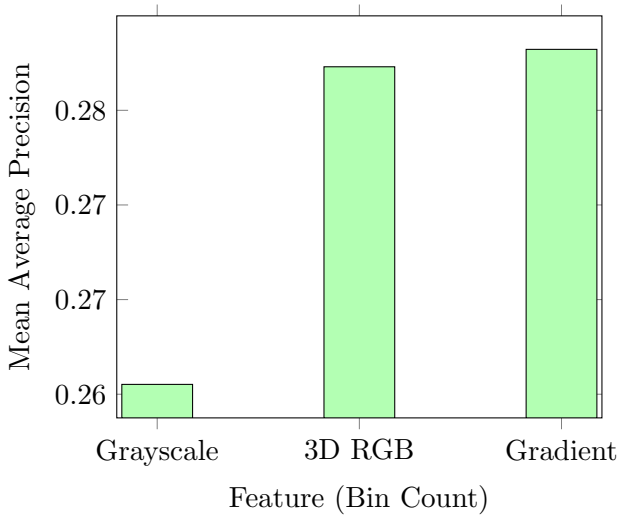


Figure 6: Best configurations of different features for grid level 3 in case of Mean Average Precision

| Bin | Feature | mAP |
|---|---|---|
| 16 | Grayscale | 0.26052 |
| 16 | 3D Color | 0.27730 |
| 360 | Gradient | 0.27822 |

Table 6: Best configurations of different features for grid level 3 in case of Mean Average Precision

## 4.4 questions

- What do you think cause the difference between the results?
- How did you combine the histograms in level 2 and 3? What would you think the difference between to simply sum them and to concatenate them?

# 5 Your Best Configuration

- You may try different combinations including changing parameters above and even combining different methods. Simply give your best mAP for the validation set:
- Explain your setup for this best mAP. How can we reproduce your result using your code?
- Give some visual ranking results:
- Explain mean average precision in your own words:

# 6 Additional Comments and References

(if there any)