Joe Morrissey (jrm15)
**CS 445 - Project 4: Image Based Lighting**

Complete the claimed points and sections below.

| | |
|---|---|
| **Total Points Claimed** | **[120] / 210** |
| **Core** | |
| 1. Recovering HDR maps | |
| 1. Data collection | [20] / 20 |
| 2. Naive HDR merging | [10] / 10 |
| 3. Weighted HDR merging | [15] / 15 |
| 4. Calibrated HDR merging | [15] / 15 |
| 5. Additional HDR questions | [10] / 10 |
| 2. Panoramic transformations | [10] / 10 |
| 3. Rendering synthetic objects | [30] / 30 |
| 4. Quality of results / report | [10] / 10 |
| **B&W** | |
| 5. Additional results | [ ] / 20 |
| 6. Other transformations | [ ] / 20 |
| 7. Photographer & Tripod removal | [ ] / 25 |
| 8. Local tone-mapping operator | [ ] / 25 |

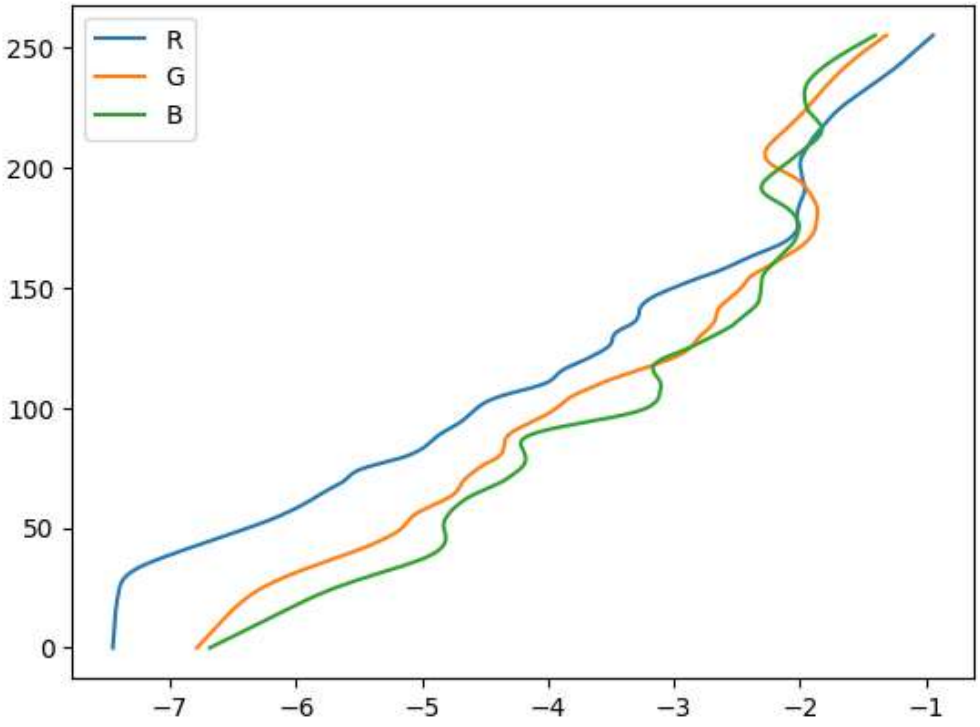
## 1. Recovering HDR maps

1/16, 1/64, and 1/256 exposure time, respectively

Figure of rescaled log irradiance images from naive method, for 1/16, 1/64, and 1/256, respectively.

Figure of rescaled log irradiance images from calibration method, for 1/16, 1/64, and 1/256, respectively.

Plots of g vs intensity




Intensity vs g

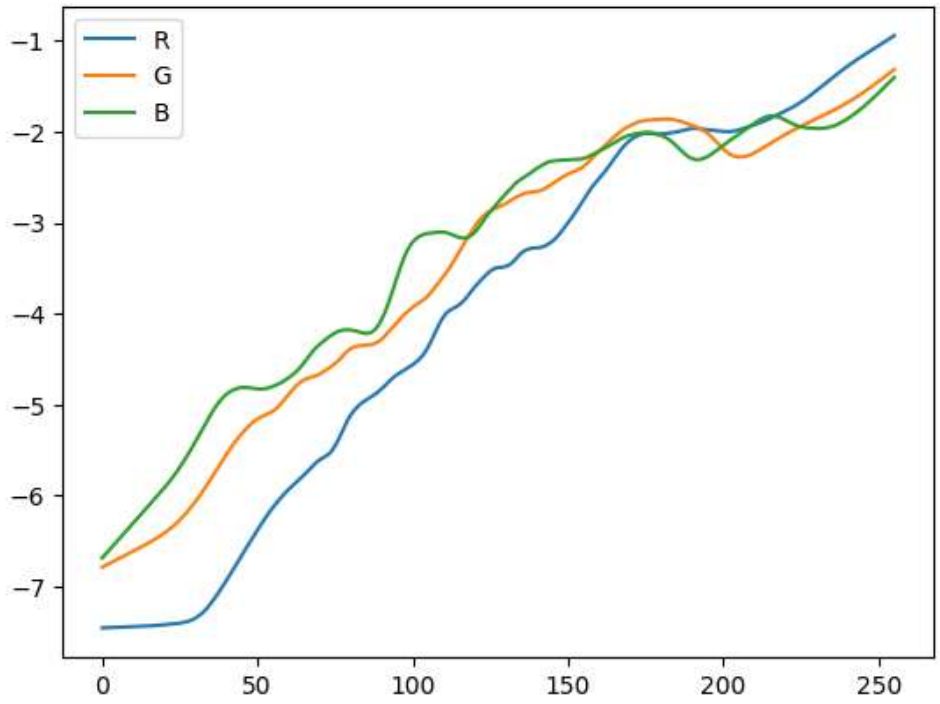



Figure comparing the three HDR methods, Naive, Weighted, and Estimation, respectively.



```
naive:      log range =  4.142     avg RMS error =  0.745
weighted:   log range =  4.175     avg RMS error =  0.718
calibrated: log range =  7.749     avg RMS error =  0.394
```

Answer these questions:

**For a very bright scene point, will the naive method tend to over-estimate the true brightness, or under-estimate? Why?**

Since it is a very bright scene, a lot of the pixels will have high intensities, which will shift the average, instead of making it relative. This is what causes the over/under estimate of the true brightness.

**Why does the weighting method result in a higher dynamic range than the naive method?**

The weighted method prevents the outlier intensities from dominating the calculated average. This results in a higher dynamic range than the naïve method.

**Why does the calibration method result in a higher dynamic range than the weighting method?**
Because the calibration method minimizes the objective function with linear least squares, while the weighting method merely tries to reduce the weight of outlier intensities.

**Why does the calibration method result in higher consistency, compared to the weighting method?**
Similar logic to above. The calibration method optimizes the objective function, while the weighting method arbitrarily assigns higher weight to more middle of the pack intensities.

## 2. Panoramic transformations

Figure of Normal Vectors

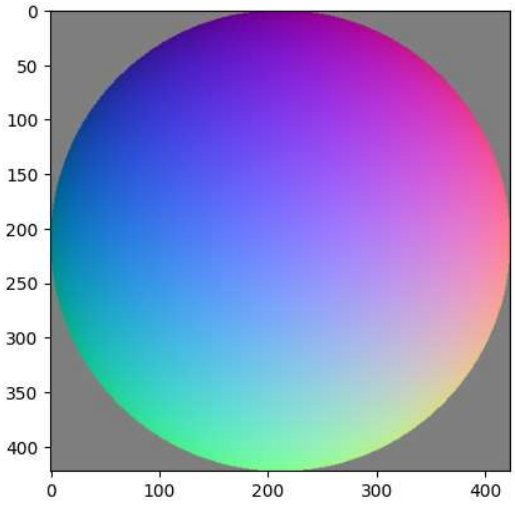
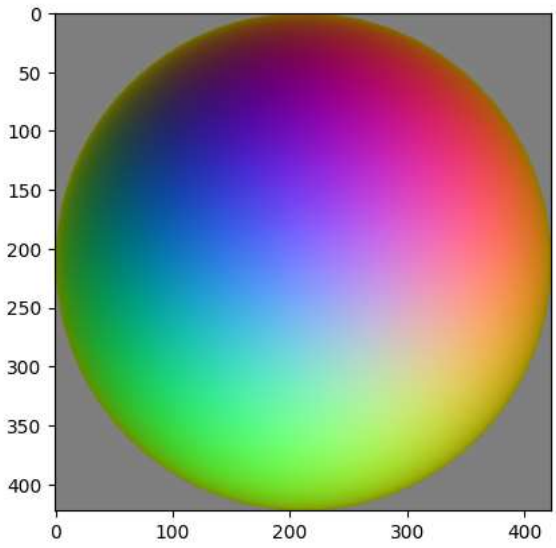
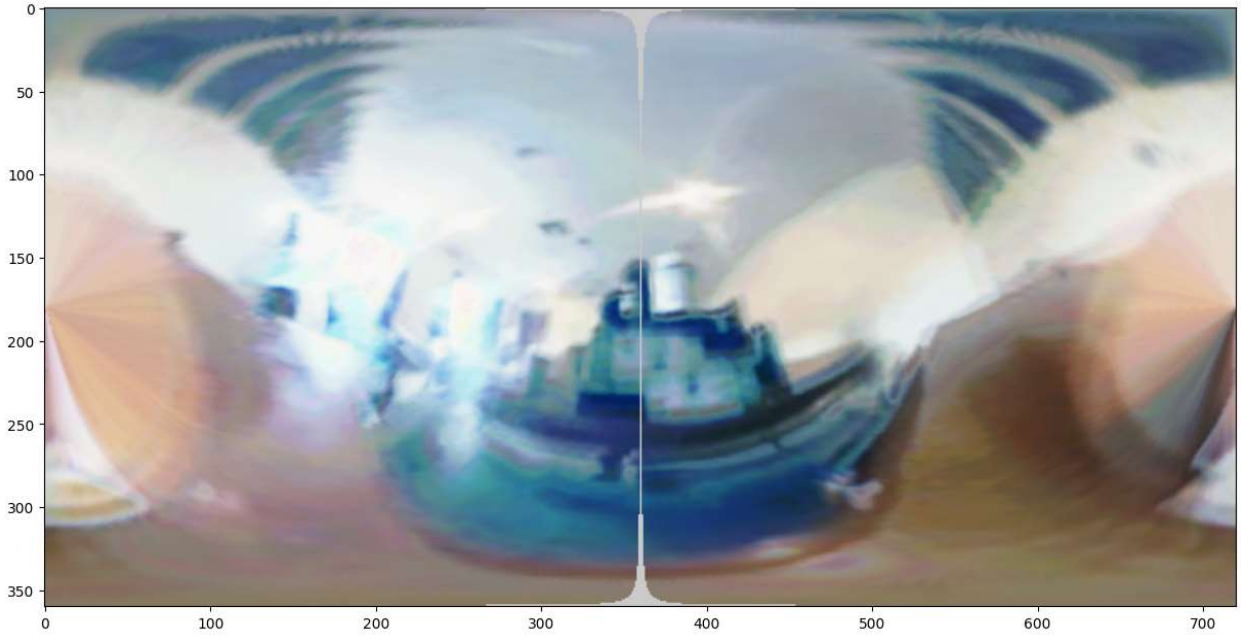



Figure of Reflection Vectors



The equirectangular image from your calibration HDR result

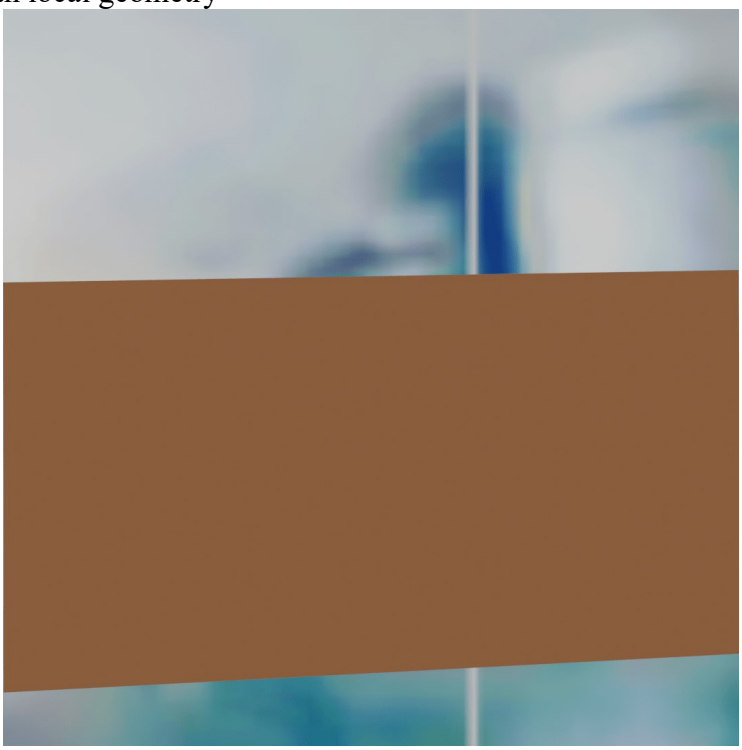



### 3. Rendering synthetic objects

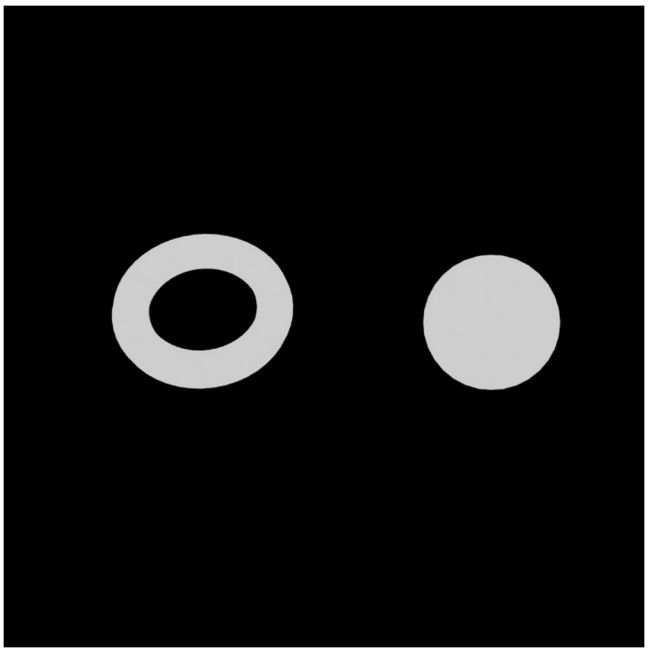
Background Image

Rendered Image With Objects

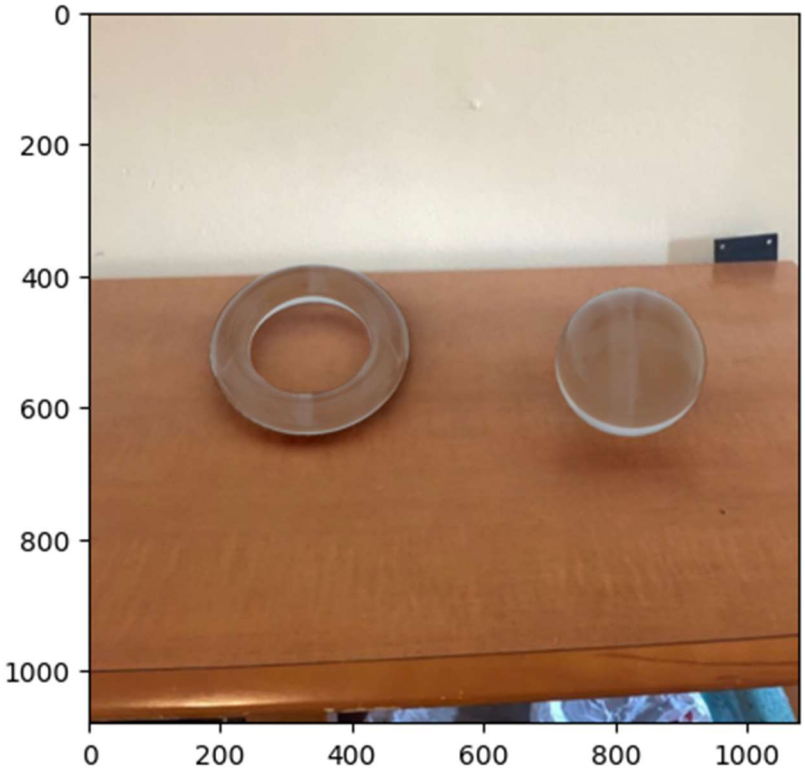
Rendered image with local geometry



Rendered mask Image



Final composited result



**4. Quality of results / report**

Nothing extra to include (scoring: 0=poor 5=average 10=great).

**Acknowledgments / Attribution**

List any sources for code or images from outside sources