Surface normals prediction from a single image

Google Cloud coupons Leaderboard Evaluation server

Task description

Your task is to develop a system that can predict surface normals given a single image. In this challenge, each image is a synthetic figure showing one object under simple lighting. We also provide a mask (a binary png image) for each image. A pixel in the mask is white if and only if it is occupied by the object. You are free to use the mask in any way you like (e.g., as an additional input to your system). The predicted surface normals are stored as png files. You need to predict a 3D vector at each pixel. That is, for each input image, your output is a color image with three channels that represents per-pixel surface normals.

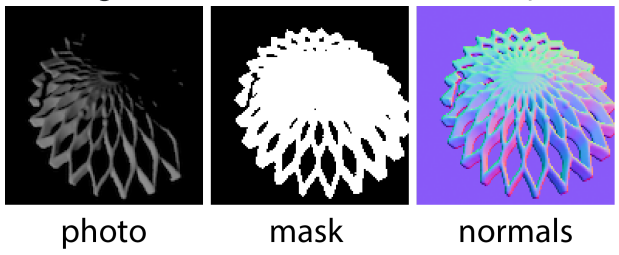


photo mask normals

We provide 20K images as the training set and 2K images as the test set. The ground truth for the training set is provided. Your task is to generate predictions for the 2K images in the test set.

This task is moderately challenging. We suggest that you start working on it once the project is released, or it is hard to get good results.

Data and evaluation script

The files can be downloaded at https://goo.gl/ByCsOk. We also provide an evaluation script in Python, which evaluates the mean angle error (MAE) of your predictions. This metric is defined as the average cosine value of the angle between the predicted normal and the ground truth normal on each pixel. Therefore, the lower the MAE, the better your predictions. A random prediction will give MAE = 1.57. Note that only pixels within the object region (as given by the mask) are evaluated. Use the following command in a Unix/Linux system to run the script. The script requires the imageio package for python.

```
python Evaluation_script_.py -p path_to_your_prediction_directory -g path_to_ground_truth_directory -m path_to_mask_directory
```

Note that the ground truth for the test set is withheld, so you are not able to run this script on your predictions on the test set. To do that you need to submit your predictions on the 2K test images to our evaluation server. The evaluation server will tell you the MAE of your predictions on a fixed subset of 1K test images (this set is called TEST-DEV), but will not tell you the result on the remaining 1K test images (this set is called TEST-MAIN).

Rules of competition

- No collaboration between teams. Sharing of code or prediction files is prohibited.
- You can use any publicly available datasets and/or source code. But you cannot use any web service (e.g. Google APIs) as part of your system. That is, your system must be able to process new images without access to the Internet.
- You can do whatever you want to the training set. But you can only use the test set to generate predictions. In particular, do not attempt to obtain the ground truth of the test set in any manner (e.g. through manual annotation).

Deadline and submission instructions

- Only the team leaders need to submit the results. The submission deadline is 11:59pm April 10. Your final predictions and source code should be submitted to Canvas, and your report to Gradescope. Submissions to the evaluation server will NOT be looked at.
- Report instructions: Your report should be a pdf that consists of 4 PowerPoint slides. Use reasonable font sizes appropriate for a PowerPoint presentation. Slide 1: your team name and members. Slide 2: a summary of your approach. Slide 3: any important details in your approach. Slide 4 (can use small fonts): a list of third party datasets, libraries or code you have used for the competition.
- Code instructions: Please submit all code you have written for the competition excluding publicly available third-party code or data.

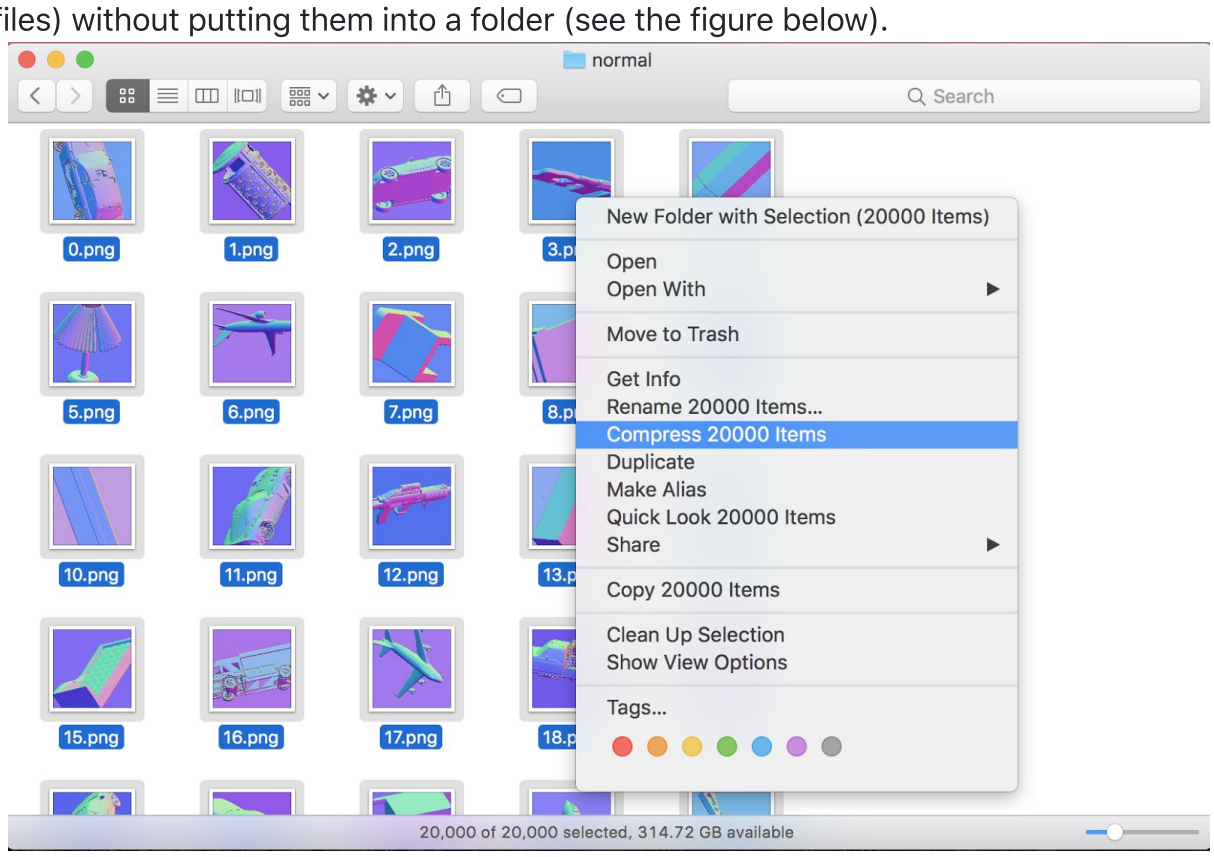
Grading

Point allocation: 20% report, 70% absolute performance, and 20% ranking of your performance in the class (a total of 110%). Your performance depends on the MAE on TEST-MAIN, calculated with your last submission on Canvas. The results on TEST-DEV are NOT used to determine your performance.

All teams that score less than 0.5 MAE on TEST-MAIN will receive full credit on absolute performance. Teams that perform worse than random (>1.57 MAE) will receive no credit on this part. We will announce the exact grading rubrics after the deadline.

Evaluation server

Click here to sign up. After registration, you will receive an email from jian@v9.eecs.umich.edu for account activation. Check your spam folder if you did not receive it. You can also reset your password. For submission, we only accept zip files. Please zip your predictions (png files) without putting them into a folder (see the figure below).



Click upload to see your performance. Wait for about 10 seconds to see your MAE score. You can see your rank among all teams. Note that this ranking is based on TEST-DEV, so is not necessarily the same as the ranking based on TEST-MAIN.

Dataset credit to Dawei Yang. Website designed by Jian Wang.