DELG instructions

These instructions can be used to reproduce the results from the DELG paper for the Revisited Oxford/Paris datasets.

Install DELF library

To be able to use this code, please follow these instructions to properly install the DELF library.

Download datasets

```
mkdir -p ~/delg/data && cd ~/delg/data

# Oxford dataset.
wget http://www.robots.ox.ac.uk/~vgg/data/oxbuildings/oxbuild_images.tgz
mkdir oxford5k_images
tar -xvzf oxbuild_images.tgz -C oxford5k_images/

# Paris dataset. Download and move all images to same directory.
wget http://www.robots.ox.ac.uk/~vgg/data/parisbuildings/paris_1.tgz
wget http://www.robots.ox.ac.uk/~vgg/data/parisbuildings/paris_2.tgz
mkdir paris6k_images_tmp
tar -xvzf paris_1.tgz -C paris6k_images_tmp/
tar -xvzf paris_2.tgz -C paris6k_images_tmp/
mkdir paris6k_images
mv paris6k_images_tmp/paris/*/*.jpg paris6k_images/

# Revisited annotations.
wget http://cmp.felk.cvut.cz/revisitop/data/datasets/roxford5k/gnd_roxford5k.mat
wget http://cmp.felk.cvut.cz/revisitop/data/datasets/rparis6k/gnd_rparis6k.mat
wget http://cmp.felk.cvut.cz/cnnimageretrieval/data/test/roxford5k/gnd_roxford5k.pkl
wget http://cmp.felk.cvut.cz/cnnimageretrieval/data/test/rparis6k/gnd_rparis6k.pkl
```

Download model

This is necessary to reproduce the main paper results. This example shows the R50-DELG model, pretrained on GLD; see the available pre-trained models here, for other variants (eg, R101, trained on GLDv2-clean).

```
# From models/research/delf/delf/python/delg
mkdir parameters && cd parameters

# R50-DELG-GLD model.
wget http://storage.googleapis.com/delf/r50delg_gld_20200814.tar.gz
tar -xvzf r50delg_gld_20200814.tar.gz
```

Feature extraction

We present here commands for R50-DELG (pretrained on GLD) extraction on `roxford5k`.

- To use the R101-DELG model pretrained on GLD, first download it as mentioned above; then, replace the below argument `delf_config_path` by `r101delg_gld_config.pbtxt`
- To use the R50-DELG model pretrained on GLDv2-clean, first download it as mentioned above; then, replace the below argument `delf_config_path` by `r50delg_gldv2clean_config.pbtxt`
- To use the R101-DELG model pretrained on GLDv2-clean, first download it as mentioned above; then, replace the below argument `delf_config_path` by `r101delg_gldv2clean_config.pbtxt`
- To extract on `rparis6k` instead, please edit the arguments accordingly (especially the `dataset_file_path` argument).

Query feature extraction

For query feature extraction, the cropped query image should be used to extract features, according to the Revisited Oxford/Paris experimental protocol. Note that this is done in the `extract_features` script, when setting `image_set=query`.

Query feature extraction can be run as follows:

```
# From models/research/delf/delf/python/delg
python3 extract_features.py \
  --delf_config_path r50delg_gld_config.pbtxt \
  --dataset_file_path ~/delg/data/gnd_roxford5k.mat \
  --images_dir ~/delg/data/oxford5k_images \
  --image_set query \
  --output_features_dir ~/delg/data/oxford5k_features/query
```

Index feature extraction

Run index feature extraction as follows:

```
# From models/research/delf/delf/python/delg
python3 extract_features.py \
  --delf_config_path r50delg_gld_config.pbtxt \
  --dataset_file_path ~/delg/data/gnd_roxford5k.mat \
  --images_dir ~/delg/data/oxford5k_images \
  --image_set index \
  --output_features_dir ~/delg/data/oxford5k_features/index
```

Perform retrieval

To run retrieval on `roxford5k`, the following command can be used:

```
# From models/research/delf/delf/python/delg
python3 perform_retrieval.py \
  --dataset_file_path ~/delg/data/gnd_roxford5k.mat \
  --query_features_dir ~/delg/data/oxford5k_features/query \
  --index_features_dir ~/delg/data/oxford5k_features/index \
  --output_dir ~/delg/results/oxford5k
```

A file with named `metrics.txt` will be written to the path given in `output_dir`, with retrieval metrics for an experiment where geometric verification is not used. The contents should look approximately like:

```
hard
  mAP=45.11
  mP@k[ 1  5 10] [85.71 72.29 60.14]
  mR@k[ 1  5 10] [19.15 29.72 36.32]
medium
  mAP=69.71
  mP@k[ 1  5 10] [95.71 92.   86.86]
  mR@k[ 1  5 10] [10.17 25.94 33.83]
```

which are the results presented in Table 3 of the paper.

If you want to run retrieval with geometric verification, set `use_geometric_verification` to `True`. It's much slower since (1) in this code example the re-ranking is loading DELF local features from disk, and (2) re-ranking needs to be performed separately for each dataset protocol, since the junk images from each protocol should be removed when re-ranking. Here is an example command:

```
# From models/research/delf/delf/python/delg
python3 perform_retrieval.py \
  --dataset_file_path ~/delg/data/gnd_roxford5k.mat \
  --query_features_dir ~/delg/data/oxford5k_features/query \
  --index_features_dir ~/delg/data/oxford5k_features/index \
  --use_geometric_verification \
  --output_dir ~/delg/results/oxford5k_with_gv
```

The `metrics.txt` should now show:

```
hard
  mAP=45.11
  mP@k[ 1  5 10] [85.71 72.29 60.14]
  mR@k[ 1  5 10] [19.15 29.72 36.32]
hard_after_gv
  mAP=53.72
  mP@k[ 1  5 10] [91.43 83.81 74.38]
  mR@k[ 1  5 10] [19.45 34.45 44.64]
medium
  mAP=69.71
  mP@k[ 1  5 10] [95.71 92.   86.86]
  mR@k[ 1  5 10] [10.17 25.94 33.83]
medium_after_gv
  mAP=75.42
  mP@k[ 1  5 10] [97.14 95.24 93.81]
  mR@k[ 1  5 10] [10.21 27.21 37.72]
```

which, again, are the results presented in Table 3 of the paper.