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Project Proposal for COMP4471

Part1: Problem Statement:

Person re-identification(ReID) is an image surveillance technology that identifies the same person from different cameras in a complex environment.

The basic idea of person re-identification is providing a set of images of a query person into our model so that our model can identify the query person from other images captured by the surveliance cameras.

We currently have two ideas which are different from most of the current ReID research.
First, we want to try a different approach by data augmentation to increase the impact of the face on the model prediction other than triplet loss.
Second, we want to decolorize the image to see whether the color features can be eliminated. Hence, the model can predict without too much based on the color of the clothes.

Part2: Reading Materials:

Currently we have found several reading materials that are related to person re-identification.

1. A paper published by CUHK in 2016 which gives us insights into how to approach the problem.
   http://www.ee.cuhk.edu.hk/~xgwang/PS/paper.pdf
2. The paper for current state-of-the-art model on the Market-1501 dataset.
   Centroid Triplet Loss is introduced in this paper.
   https://arxiv.org/pdf/2104.13643v1.pdf
3. An existing implementation to replace faces of people is available on GitHub.
   https://github.com/iperov/DeepFaceLab
4. An existing implementation to decolorize images available on GitHub.
   https://github.com/damondpham/decolorize-RGB2grayscale
5. More papers related to person re-identification on market-1501 data set can be found here.
   https://paperswithcode.com/sota/person-re-identification-on-market-1501

Part3: Data Collection:

We will use Market-1501 dataset which is already available on Kaggle.
https://www.kaggle.com/datasets/pengcw1/market-1501

We might also try with some other datasets available on papers with code to improve our model accuracy or do evaluation on these datasets.
https://paperswithcode.com/task/person-re-identification

Part4: Project Implementations:

Idea1: Replace the face of people
We will use some deepfake methods to generate fake images by replacing the faces for data augmentation.
DeepFaceLab : https://github.com/iperov/DeepFaceLab

With the generated fake images, we label it as “other person” and we expect that the model can automatically learn face is an important feature to reidentify to query person.

Idea2: Decolorize the image
We will use some existing online algorithm to decolorize the image from data set and hence feed the data into the training model.
Decolorize-RGB: https://github.com/damondpham/decolorize-RGB2grayscale

We expect that the model can automatically learning without the RGB color infromation to reidentify the query person.

Part5: Evaluation Metrics:

1. Cumulated Matching Characteristics (top-1/ top-5) metric.
   The plot shows the identification accuracy that whether the ground-truth label is in top k-predictions.

2. Mean Averaged Precision
   Average Precision: Area Under the Precision-Recall Curve
   Take the mean of Average Precision among all the query persons.
   We will also make the mAP a plot for easier reading.

3. Top-k matching rate
   Find the k bounding boxes that have the largest difference with the ground truth and will label the targets out in the gallery. This will be shown as a set of figures.

4. Macro, micro average metrics
   Report the macro, micro average precision, recall and F1 scores to evaluate the results between the predicted and sample cases.
   These metrics will be mainly shown as numerical numbers.