Analysis of Different Networks for Sparse Cross-Domain Correspondence

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I. Description of Problem

For this project, we have gained inspiration from the "Neural Best Buddies: Sparse Cross-Domain Correspondence" paper. We will use different pre-trained networks and datasets to find cross-domain correspondences, and use it for morphing between pets and their owners. The paper defines sparse cross-domain correspondence as "a more general and challenging version of the sparse correspondence problem, where the object of interest in the two input images can differ more drastically in their shape and appearance, such as objects belonging to different semantic categories (domains)."

II. Project Datasets and Software Packages

We are not training any data, we'll be using pre-trained classifiers and testing their performance. For testing the image correspondence, we will compare the Labeled Faces and dogs In the Wild dataset by the University of Massachusetts, Stanford's Dogs dataset, Cifar-100, and a small custom dataset to morph dogs to their owner's face. The authors of the paper use PyTorch to implement their algorithm. We will also use the PyTorch library to implement the different networks because it has faster deep learning training.

III. Implementation

The paper uses VGG19 pre-trained network to find correspondences between images in the Pascal 3D+ dataset. We will implement the algorithms of the paper on VGG19, ResNet50, and InceptionV3.

IV. Set of Experiments

Run cross-domain correspondences on the general dataset (cifar-100). Run cross-domain correspondences on faces & dogs datasets. Create morphing using images of owners and their dogs from our custom dataset.

V. Measuring Success

We plan to compare and contrast different pre-trained networks to the VGG19 one used on the paper to see which would give the best results for cross-domain correspondence problem and has the ability to morph images the best. We will base our success measures off of how the paper evaluates their results, "visually compare NBB-based key point selection" with other NBB-based key point selections of other networks, we will evaluate our methods on different objects as well as objects of similar categories. We will analyze which network performs the best cross-domain correspondences.

VI. Knowledge Gained By Members

- **A.** Adriana wants to acquire knowledge in implementing code using PyTorch. She hopes to learn about algorithm implementations that can be added to trained networks to construct further applications of deep learning networks.
- **B.** Jorge also wants to gain knowledge working with PyTorch. Also, most of his assignments with machine learning has been with training and testing networks, so experimenting with trained networks is something interesting he wants to learn.
- **C.** Mehrdad doesn't have much experience about data science or artificial intelligence algorithms, so he hope to learn about more algorithms so he can apply them in the future through PyTorch or other libraries.

D. Carlos is interested in gaining a very strong foundational knowledge in deep neural nets as well as learning how to use a deep learning framework effectively (PyTorch, in this case).

Initial Set of Tasks as requested by the instructor:
We will all begin by grasping an understanding of the paper's algorithms and implement the VGG19 network used in the paper. After we all have understood and replicated results from the paper, we will split up in two groups (group 1: Adriana and Jorge, group 2: Carlos and Mehrdad) and one group will implement the ResNet50 network while the other implements the InceptionV3 network for cross-domain correspondence. After we are done with the implementation, we will test our results, and get together to share our findings. At the end, we will all use our custom dataset and the new networks implemented to morph dogs to their owners.