Deep Learning Workshop

Project Proposal

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End Product

Beaches are one of the most popular destinations for tourists and locals alike. Unfortunately, they are also one of the most heavily impacted ecosystems, with a significant amount of waste and pollution causing damage to both the natural environment and local communities.

Our project aims to build a web application where a user can upload a picture of a beach scenery, and given the user's choice, the application will output an AI-generated image which is a re-imagination of the user's image as a polluted beach scenery or a clean beach scenery.

By allowing users to visualize the impact of their actions on beaches, our app can encourage them to make more environmentally conscious decisions. The ability to show a cleaner or a more polluted beach environment through our app is also an interesting way to showcase the impact of beach cleanups and other conservation efforts. Additionally, it can serve as a tool for environmental education, as it can illustrate the impact of littering and other pollution sources on the environment in a tangible way.

Model and Methods

We intend to make use of one of the following open-source architectures:

UNIT – An unsupervised image-to-image translation architecture proposed by NVIDIA in 2018. This model provides a one-to-one conversion.

MUNIT – A multimodal unsupervised image-to-image translation architecture proposed by NVIDIA in 2018. This model provides a one-to-many conversion.

CycleGAN - An unsupervised image-to-image translation architecture proposed by researchers from UC Berkley in 2020. This model provides a one-to-one conversion.

Using one of the above, we intend to train a model using several open-sourced datasets of both clean and polluted beach sceneries (See "datasets"). We then will evaluate the performance of the model in one of the following manners:

- Manually inspecting the generated images of a holdout dataset.
- Using an existing open-source image classification model to classify our generated output to test the model's integrity.
- Specifically training an image classification model (using similar datasets to those used to train the generative model) to use for evaluation.

Datasets

We will use the following open-sourced datasets:

[Source 1](#) – 631 images of clean beaches

[Source 2](#) – 76 images of polluted beaches and 76 images of clean beaches

[Source 3](#) – 1000 images of clean beaches

[Source 4](#) - 1287 images of clean beaches captured from a drone. Some of the images may not be usable, and we will manually filter them out.

[Source 5](#) - 3500 images of polluted beaches. Some images capture clean beaches, and thus we will classify the images manually.

[Source 6](#) - landscape images which include approximately 500 beaches. We will filter the relevant images manually.

To use the above images in the chosen model, we will also apply a re-fitting of them to fit the correct input standards required by the model.

After preprocessing all the data as detailed above, we will enrich our existing data by splitting, mirroring, and tilting the images, as-well as adjusting the images' brightness. The result images will also be used in the training and evaluation of the model.

Computational Resources

The following resources will be required for our project:

- A server used to run the web-application on.
- A GPU used to train the chosen model and infer on new data.