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<b>Project title</b>	Data augmentation using GANs for small image dataset
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## Description

Generative Adversarial Network (popularly known as GAN) [1] has been greatly used in the area of computer vision and image processing. This class of neural networks can generate new photo-realistic images that are indistinguishable from the original image data. One of the advantages of using such GAN network is in the area of image data augmentation. Image augmentation is necessary such that the trained machine-learning model can generalize well for varying image types. Traditionally, image data augmentation was performed via affine transformation on the original image data [2]. It is particularly useful for those applications, where the number of manual annotated labels is sparse in nature. One such application area is in cloud image analysis using ground-based sky camera images [3].

[1] Goodfellow, Ian, et al. "Generative adversarial nets." Advances in neural information processing systems. 2014.

[2] Image Preprocessing - Keras, <https://keras.io/preprocessing/image/>

[3] Cloud imaging using ground-based cameras, <https://soumyabrata.dev/cloud/>

# Core

The objective of this project is to analyse various Generative Adversarial Network (GAN) - based neural networks for the purpose of image data augmentation. Subsequently, the deep neural network will be used for artificially creating several orders of sky/cloud images, from a small dataset of nighttime sky/cloud images [4]. The network should also artificially generate the corresponding binary ground-truth images. It is important to note here that the generated ground-truth maps should visually correspond well with the RGB sky/cloud images.

[4] Dev, S., et al. "Nighttime sky/cloud image segmentation." 2017 IEEE International Conference on Image Processing (ICIP). IEEE, 2017.

# Advanced

Additional analysis on the artificially generated dataset of nighttime sky/cloud images. Such analyses include cloud image segmentation, distribution of cloud coverage in the extended dataset etc.

# Dataset

Currently, there exists a single dataset of nighttime sky/cloud images, along with the corresponding manually generated binary maps. The dataset is available for download from this link (<http://vintage.winklerbros.net/swinseg.html>). The dataset contains 115 nighttime images of dimension 500x500 pixels, along with its corresponding binary map.

# Requirements

python

P.S.: Please note that I am based in Beijing from Sep-Dec 2019, and hence, project supervision will be done mainly via Skype/e-mail exchanges during this period. I'm back to Dublin on January 2020.