IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, May 2022
Impact Factor: 6.252

Low-Light Image Enhancement using GAN

Prof. Prema Desai[1], Aditya Singh[2], Akash Dubey[3], Shubham Bhor[4], Someshwar Bhadange[5]
Professor, Department of Computer Science and Engineering[1]
Students, Department of Computer Science and Engineering[2,3,4,5]
Smt. Kashibai Nawale College of Engineering, Pune, Maharashtra, India

Abstract: *Owing to environmental and technological limitations, many images are captured under poor or low lighting conditions. These involve images captured at night or low or unbalanced ambient lighting conditions, or if the object is located in front of a light source, image is under-exposed during the capture of photographs. Such low or poor light images, have minimum visibility and increased noise levels, hence suffering from compromised quality and detail. Our proposed approach is to takes a low-light image as an input and creates a well-enhanced image at its output. To increase the efficiency of translating low light and night time images to daytime images, we use a Generative Adversarial Network(GANs) implementation..*

Keywords: GAN.

I. INTRODUCTION

Many images or photos are often captured under low ambient lighting conditions due to environmental and technical constraints. Generally, images captured in the low-light suffering from various visual quality degradations unexpected noise [1], including poor visibility [2],low contrast [3] etc. These include placement of object in front of a light source, low-light or unbalanced lighting conditions in the environment, and under-exposure during image capturing. Such low-light photos suffering from compromised quality and information, along with increased noise levels.

This quality affects viewers experience while loss of information leads to wrong message being communicated, such as inaccurate object or face recognition. In particular, our proposed method GANs will take a low-light image as an input and produce a well enhanced image as its output. To enhance the performance of the conversion of low light or night time images to daytime images we uses a modified version of the original Cycle Generative Adversarial Network. Using our modified Cycle GAN and attention modules from Enlighten GAN we generate an output image with a much better quality, with more information and lower noise levels.

1.1 Motivation

- When one captures pictures in low-light conditions or in night time, the pictures usually suffer from low visibility.
- This bad quality could considerably degrades the performance of the many computer vision and multimedia system algorithms that are primarily designed for high-quality inputs.
- These images will have low dynamic ranges with high noise levels that have an effect on the performance of computer vision algorithms.
- To make computer vision algorithms robust in low - lighting conditions, low-light image enhancement to improve the visibility of an image is the need of time.

II. RELATED WORKS

In today's fast-paced and well developed technical world users desire fast and simple technologies which make their lives easier and are more reliable our method allows an average smartphone or mobile user to enjoy the simple click experience while capturing a decent images without the hassle of all the related technical jargon under good or well lighting conditions there is no issue as the camera and software are intelligent enough to adjust those parameters to the users liking but in low or night light conditions even the best cameras give a poor result.

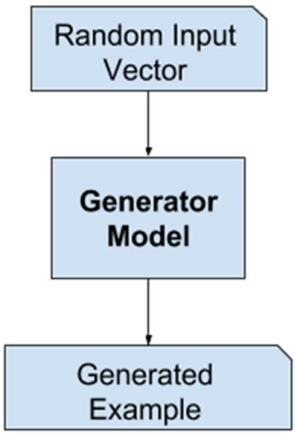
IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, May 2022
Impact Factor: 6.252

2.1 GANs

GAN is a General adversial Networks and It was developed and introduced by Ian J. Goodfellow in 2014. The GANs is a General Adversial Network that consist of two neural networks that compute with each other to become more attractive in their prediction.GANs are a powerful class of neural networks that are used for unsupervised learning.
General adversial networks are basically made up of a system of two competing neural network models which compete with each other and are able to analyze, capture the variations within a dataset.

2.2 Generator Model

The main purpose or objective of the generator is to produce a meaningful output from noisy input or from low light images. Our Generator takes low light images as input and produce output in the form of generated images.



2.3 Encoder

The Encoder Network or EN receives a 4-dimensional array as the input which has two parts the 1st being the number of images and the second is an RGB image of resolution 256 x 256. Encoder Network (EN) is made up of 21 convolutional layers. Where each layer has a Convolution2D, Batch Normalization, LeakyReLU. Convolution 2D layer creates a convolution kernel that is convoluted with the layer input to produce a tensor of outputs. Batch normalization applies a transformation that maintaining the mean output close to zero and the output standard deviation close to one. LeakyReLU is a leaky version of Rectified Linear Unit , it allows a small gradient when the unit is inactive. The input 4-dimensional Array is processed and passed on to the Decoder.

2.4 Decoder

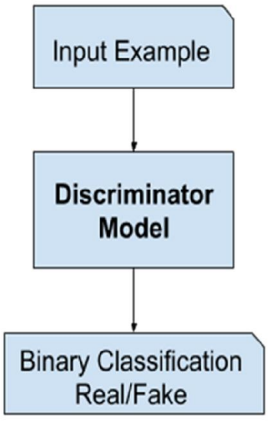
The Decoder Network receives a 4-dimensional Array from the Encoder as an input. Our Decoder Network is made up of ten convolutional layers. Where each layer has a UpSampling2D, LeakyReLU, Convolution2D, Batch Normalization. UpSampling2D increases the dimensions by the specified size, there are 2 methods of interpolation Nearest Neighbour, Bilinear transformation.

We decided to use UpSampling2D in place of Convolution2DTranspose, since it is cheap in terms of computational power or energy. Convolution2D layer creates a convolution kernel that is convolved with the layer input to produce a tensor of outputs. Batch normalization applies a transformation that maintains the mean output close to zero(0) and the output standard deviation close to one(1). LeakyReLU is a leaky version of Rectified Linear Unit (ReLU), it allows a small gradient when the unit is not active. The input 4-dimensional Array is processed and passed on to the Discriminator

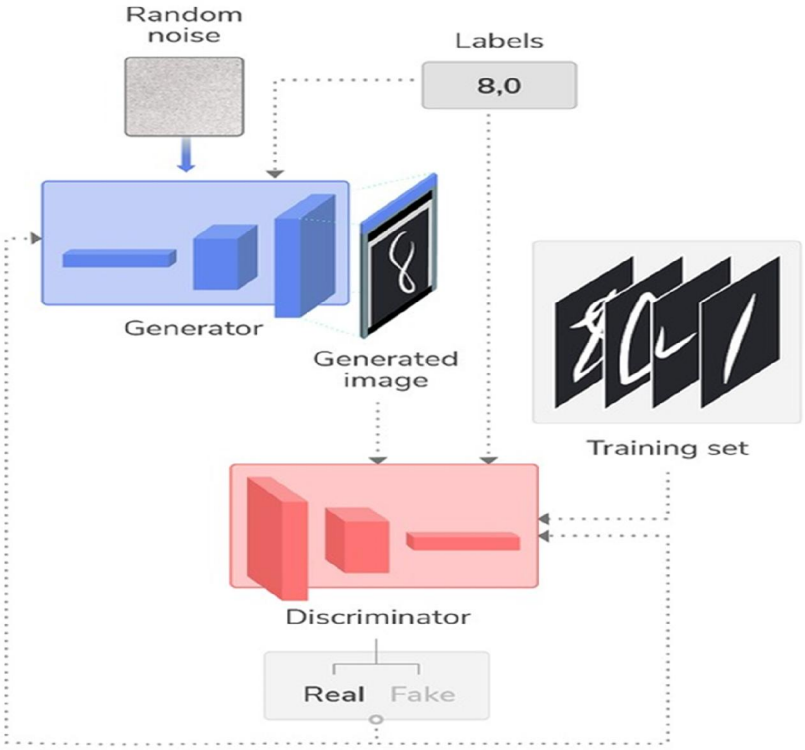
2.5 Discriminator Model

Discriminator model takes an example from the domain as input (real or generated) and predicts a binary class label of real or fake (generated).Discriminator model takes generated image as an input and gives well enhanced image as an output.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, May 2022
Impact Factor: 6.252



III. System Architecture



IV. Scope

Our proposed system will enhance the low-light or night time images to a more informative or detailed image or well enhanced image, similar to the ones captured in well-light conditions. The user will be able to access our system for converting low light images to well-enhanced images through a user-friendly website. The current proposed system (GANs) works with images of resolution 256x256. Since images with a higher resolution take more time to process and train. We plan to further improve this in the future by processing higher resolution images.

V. Future Work

Future of image enhancement or processing will involve scanning the heavens for other intelligent life out in space. Also new intelligent, digital species created entirely by research scientists in different nations of the world will include advances

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, May 2022
Impact Factor: 6.252

in image processing applications. Due to advances in image processing and other technologies there will be millions and millions of robots in the world, transforming the way the world is managed. Advances in image processing and artificial intelligence6 will involve spoken commands, anticipating the information requirements of governments, tranlating languages, recognizing and tracking things, diagnosing medical conditions, performing surgery, reprogramming defects in human DNA.

With increasing energy and sophistication of modern computing, the concept of computation can go beyond the present limits and in future, image enhancement or processing technique will advance and the visual system of man can be replicated. The future trend in remote sensing will be towards improved sensors that records the same scene in different spectral channels. Graphics data is becoming increasingly important in image processing or enhancement app1ications. The future image processing or enhancement applications of satellite based imaging ranges from planetary exploration to surveillance applications. Using large scale homogeneous cellular arrays of simple circuits to perform image enhancement tasks and to demonstrate pattern-forming phenomenon is an emerging topic. The cellular neural network is an implementable or to fully connected neural networks and has involved into a paradigm for future imaging techniques. The uses of this technique has applications in the areas of silicon retina, pattern formation, etc.

VI. Conclusion

In this project we have, have proposed a method to tackle the challenging task of enhancing low-light images. The proposed method utilizes GANs architecture. We have utilized paired dataset of low-light and well enhanced images, which comprises of five datasets merged together and a custom dataset. As seen from experiment we are able to enhance images with low lighting scenarios. There is, of course, improvement in the colour accuracy department. The current model working on images of resolution 256 x 256 which can further be upgraded with the availability of better hardware system.

References

[1]. K. V. Chen, ”Learning to See in the Dark,” in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2108.

[2]. R. Cong, Zero-Reference Deep Curve Estimation for Low-Light Image Enhancement, vol. 2001.06826, 2020.

[3]. W. Cho, ”Semantic Segmentation with Low Light Images by Modified CycleGAN-Based Image Enhancement,” IEEE Access, vol. 8, pp. 93561-93585, 2020.

[4]. W. Z. Jiang, ”Enlightengan: Deep light enhancement without paired supervision,” CoRR, vol. abs/1906.06972, no. 1906.06972v1, 2019.

[5]. L. Yuan and J. Sun, “Automatic Exposure Correction of Consumer Photographs,” in Computer Vision - ECCV 2012. ECCV 2012, F. A. ., L. S. ., P. P. ., S. Y. ., and S. C. ., Eds., vol. 7575. Springer, 2012.

[6]. J.-Y. Lee, “Automatic Content-Aware Color and Tone Stylization,” IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 2470–2478, 2015.

[7]. Z. Cheng, Q. Yang, and B. Sheng, “Deep Colorization,” 12 2015, pp. 415–423. [Online]. Available: 10.1109/ICCV.2015.55

[8]. L. Li, W. Feng, and J. Zhang, “Contrast Enhancement based Single Image Dehazing via TV-l1 Minimization,” in Proceedings - IEEE International Conference on Multimedia and Expo, vol. 2014, 07 2014. [Online]. Available: 10.1109/ICME.2014.6890277