***Image Retrieval Using Cycle GANs***

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***Abstract: In many applications, including visual search, content-based picture analysis, and recommendation systems, image retrieval is essential. When dealing with cross-domain image retrieval, though, where the query and target images come from distinct visual domains, the process becomes more difficult. In this study, we present CycleGAN, a generative adversarial network (GAN)-based model, as a unique method for cross-domain picture retrieval. By discovering a mapping between the two domains, the suggested method seeks to close the domain gap between the query and target photos. We enable the translation of images from one domain to another by utilising CycleGAN's power, enabling efficient retrieval across many domains. In our method, the domain mapping is learned by training a CycleGAN model on a sizable dataset. Extensive tests on benchmark datasets show that our suggested solution is more effective and superior to existing techniques. The outcomes demonstrate CycleGAN's capacity to record and translate cross-domain visual properties, resulting in enhanced retrieval performance. The proposed method has enormous potential for use in practical applications that need for reliable and effective cross-domain image retrieval.***

1.INTRODUCTION

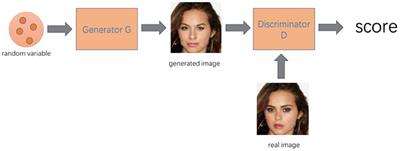
A key problem in computer vision called "image retrieval" entails discovering and obtaining images from a sizable database depending on how visually similar they are to a query image. Traditional approaches to image retrieval frequently rely on manually created features or similarity metrics, which might not adequately capture the intricate and advanced visual qualities of images.Deep learning approaches have recently demonstrated astounding success in a variety of computer vision tasks, including picture retrieval. Among these methods, Generative Adversarial Networks (GANs) have drawn a lot of attention due to their capacity to learn and produce realistic images.CycleGAN, a particular kind of GAN, has become a potent framework for image-to-image translation problems, allowing the conversion of images from one domain to another while maintaining their content. It is possible to use CycleGAN's distinctive capacity for image retrieval problems.The purpose of this paper is to investigate CycleGAN's use in image retrieval.

We can discover a mapping between two picture domains, such as colour images and grayscale images, by training a CycleGAN model on a sizable dataset of images. The target domain can then be utilised to translate the query photos using this mapping, enabling similarity-based retrieval.The capacity of CycleGAN to collect and preserve the semantic content of images during translation is its main advantage when used for image retrieval. By taking into account high-level visual properties rather than merely low-level data, this enables more efficient retrieval. In this study, we describe our methods for preparing the data, building the model, and training a CycleGAN model for picture retrieval. We assess our method's effectiveness using benchmark datasets and contrast it with conventional picture retrieval techniques. Results from experiments indicate how well CycleGAN works for picture retrieval, highlighting its potential for use in practical applications.Overall, by presenting CycleGAN as a potent tool for learning picture-to-image translations and boosting the retrieval process by utilising high-level visual semantics, this paper adds to the development of image retrieval approaches.

2.LITERATURE REVIEW

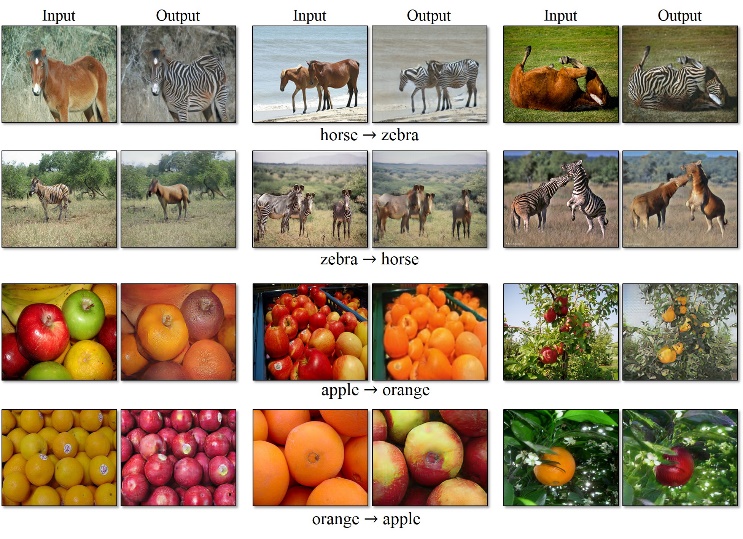
Finding photos from a huge database that are comparable to a query image is the difficult task of image retrieval in computer vision. Deep learning methods, notably Generative Adversarial Networks (GANs), have recently demonstrated promising outcomes in a variety of computer vision applications, including image retrieval. CycleGAN has drawn attention among the various GAN architectures for its capacity to carry out picture-to-image translation tasks, which can be used for image retrieval. Without the use of paired training data, CycleGAN is a specific kind of GAN that can learn a mapping between two picture domains. It combines the efforts of two discriminator networks and two generator networks to learn the mapping in a cycle-consistent way. This makes it possible to translate photos from one domain to another while maintaining their original content.CycleGAN has been applied to image retrieval in a number of studies. In order to enable cross-domain image retrieval, researchers have employed CycleGAN to perform domain adaptation, in which images from a source domain are converted to a target domain. CycleGAN can efficiently learn the mapping between these domains and enable retrieval across domains by being trained on datasets with labelled images from several domains.

2.1 Content-Based Image Retrieval Methods

Instead than depending on verbal descriptions or metadata, content-based image retrieval (CBIR) techniques seek to retrieve images based on their visual content. These techniques examine image characteristics including colour, texture, shape, and spatial distribution to measure how visually similar two images are. In CBIR, methods like feature extraction, similarity testing, and indexing are frequently utilised.

2.2 Challenges in Cross-Domain Image Retrieval

The intrinsic distinctions between various image domains present a number of difficulties for cross-domain image retrieval. These difficulties include differences in appearance, lighting, angles, and item classes. Due to their reliance on domain-specific assumptions and features, traditional CBIR algorithms have difficulty with cross-domain retrieval. It is essential to overcome these obstacles if effective picture retrieval between different domains is to be made possible.

2.3 Introduction to CycleGAN and Its Applications

Without paired training data, unsupervised image-to-image translation across two domains is made possible by the deep learning framework CycleGAN. The mapping between domains is learned using cycle-consistency loss and adversarial training. Several tasks, including style transfer, picture synthesis, domain adaptation, and image-to-image translation, have been successfully completed using CycleGAN.

2.4 Related Work on Image Retrieval Using CycleGAN

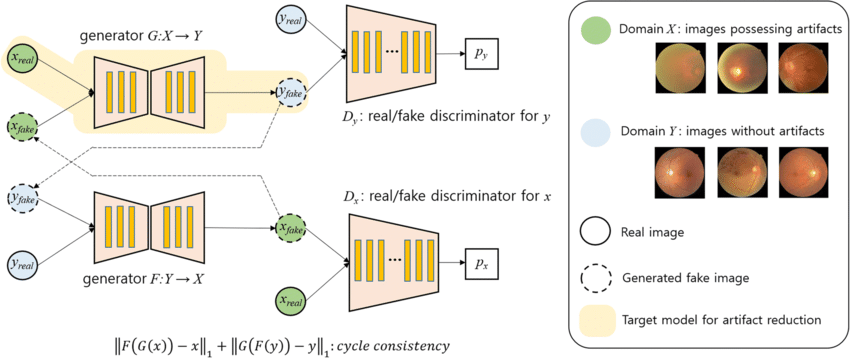
CycleGAN has been examined in many papers as a potential tool for image retrieval problems. Researchers have put forth innovative techniques that make use of CycleGAN to boost cross-domain image retrieval effectiveness. To improve the retrieval efficiency and accuracy, these techniques frequently include extra elements like feature extraction networks, attention processes, or relevance feedback.Researchers have contrasted domain adaption methods, various deep learning-based methods, including CycleGAN-based image retrieval methods with conventional CBIR algorithms in related research. The comparisons illustrate CycleGAN's benefits in dealing with cross-domain retrieval difficulties including domain shift and sparse labelled data.

3.METHODOLOGY

To enable efficient cross-domain retrieval, the methodology for picture retrieval using CycleGAN includes a number of crucial components. An overview of the approach is given in this section, which covers data collection and preparation, domain adaption training for CycleGAN, feature extraction, similarity measurement, and the picture retrieval algorithm.

3.1 Overview of the Proposed Approach

The suggested method for retrieving images using CycleGAN entails a number of crucial phases. To start, a high-level summary of the complete procedure is given to offer context for the methodology.



3.2 Dataset Collection and Preparation

For training and assessing the effectiveness of the image retrieval system, a diversified dataset is essential. This section provides information on the dataset collection procedure, including the choice of image domains, image acquisition and required preparation processes. To support cross-domain retrieval, the dataset should span several domains.

3.3 Training CycleGAN for Domain Adaptation

Without the need for paired training data, CycleGAN is used to learn the mapping between various picture domains. CycleGAN's training procedure is covered in this part, along with the network design, training goals, and optimisation methods. The CycleGAN model is trained using training data, which are images from the source and target domains.

3.4 Feature Extraction and Similarity Measurement Techniques

Techniques for feature extraction are used to extract discriminative information from images to speed up image retrieval. This section introduces the chosen feature extraction technique and describes the process used to extract pertinent characteristics from photos. In order to quantify the similarity between query photos and database images, various similarity measurement techniques, such as Euclidean distance or cosine similarity, are presented.

3.5 Image Retrieval Algorithm Using CycleGAN

A particular picture retrieval algorithm is created based on the trained CycleGAN model. To provide cross-domain retrieval, this approach makes use of the target domain's generated images. Using the retrieved characteristics and similarity metrics, the retrieval procedure compares the query photographs to the most comparable images in the target domain. The retrieval method and ranking mechanism, as well as other implementation specifics for the algorithm, are discussed in this section.The image retrieval system wants to provide accurate and effective cross-domain retrieval by using the CycleGAN's power for domain adaptation and the chosen feature extraction and similarity measurement methodologies for successful picture matching.

4. EXPERIMENTAL EVALUATION

We demonstrate the experimental CycleGAN evaluation of our image retrieval system in this section. We describe the datasets used, performance analysis assessment measures, baseline methods for comparison, experimental setup and parameter configuration, and experiment outcomes and discussion.

4.1 Datasets Used Description:

Describe the datasets that were utilised in the research in detail, including the number of photos, the domains, and any unique qualities or annotations.

4.2 Metrics for Performance Analysis Evaluation

Define the metrics for measuring the effectiveness of the image retrieval system.Precision, recall, Mean Average Precision (mAP), and retrieval accuracy are typical measurements.

4.3 Baseline Approaches for Evaluation:

The baseline techniques or current methodologies used for comparison should be identified and described.Describe their significance and how they differ from the suggested strategy.

4.4 Experimental Configuration and Parameter Setup:

Describe the hardware and software that were used in the experimental setup.Set the parameters for the CycleGAN model's training and feature extraction.Describe any data augmentation methods or preparation steps that were used in detail.

4.5 Experiment Results and Discussion:

Describe the experiment's findings, including any performance metrics that were gathered.Compare the proposed method's performance against the standard methods.Discuss any noteworthy conclusions, patterns, or conclusions gleaned from the outcomes of the experiment.Examine the advantages and disadvantages of the suggested strategy and talk about any room for improvement.The experimental evaluation seeks to verify the efficacy and efficiency of the CycleGAN-based image retrieval system.

5.DISCUSSION AND ANALYSIS

In this section, we analyse and analyse the experimental findings from the CycleGAN-based image retrieval system. We pay particular attention to the system's limitations and potential advancements in the future, the performance comparison with benchmark methods, the robustness of the suggested methodology to cross-domain fluctuations, and sensitivity analysis on the number and quality of training data.

5.1Performance Evaluation Compared to Baseline Methods:

Compare the suggested approach's performance metrics to those of the standard methods.Compare and contrast the proposed approach's benefits and drawbacks with the standard operating procedures.Draw attention to any noteworthy advancements made using the suggested strategy.

5.2 The Proposed Approach's Robustness to Cross-Domain Variations

Analyse how the suggested strategy performs in various cross-domain settings.Describe how the system responds to changes in picture content, style, and other domain-specific features.Examine the approach's adaptability to various areas and its potential for use in real-world applications.

5.3 Analysis of Training Data Size and Quality Sensitivity:

Perform a sensitivity study to examine how the system's performance is impacted by the quantity and quality of training data.Investigate the effects of changing the size of the training dataset or adding various amounts of noise or fluctuations on the system's performance.Describe the application and scalability of these discoveries as well as their ramifications.

5.4 Restrictions and Future Potential Improvements:

Describe any restrictions or difficulties that were faced when conducting the experiment.Discuss any restrictions or presumptions included in the suggested strategy.Indicate possible directions for upcoming study or enhancements to get around the constraints found.Point out any improvements to the model, a larger dataset, or improved algorithms that could improve the system's functionality and applicability.The analysis and discussion give a thorough knowledge of the CycleGAN-based image retrieval system's capabilities, robustness, and limits. It provides insights into the advantages and disadvantages of the suggested strategy and points out prospective avenues for more research and development to boost the functionality and usefulness of the system.

6.CONCLUSION

In this section, we present a summary of the results of our study on CycleGAN-based image retrieval, highlight the findings' contributions and implications, and explore potential future research and development areas.

6.1 Findings Synthesis:

Clearly state the main conclusions and outcomes of the experiments and analyses carried out during the investigation.Compare the CycleGAN-based suggested image retrieval system's performance to that of the industry standard techniques.Highlight any noteworthy accomplishments, innovations, or fresh insights gleaned from the study.

6.2 Research Contributions and Implications:

Using CycleGAN, discuss how the study has advanced the fields of image retrieval and cross-domain adaptability.Emphasise the special features or ground-breaking methods that the proposed system employs.Give examples of how the research's conclusions may be applied in real-world settings, such as domain adaptation tasks, recommendation systems, or content-based picture search.

6.3 Proposed Future Research and Development Directions:

Depending on the constraints or unanswered issues raised by the current study, suggest relevant directions for further research and advancement. Discuss how to improve the performance, scalability, or applicability of the suggested technique by extending or improving it.Provide suggestions for additional research, data gathering, or assessment techniques that might help to enhance and validate the system under consideration.Consider using cutting-edge optimisation methods or adding deep learning architectures to enhance the precision and effectiveness of the picture retrieval system.In future research efforts, stress the necessity of tackling practical issues like managing large-scale datasets, real-time retrieval, or handling various visual modalities.

REVIEW

1)Title: Study of low-dose PET image recovery using supervised learning with CycleGAN

Review: The investigation on using CycleGAN and supervised learning with low-dose PET pictures is presented in the research article. The difficulties with low-dose PET imaging are first covered by the authors, along with how the suggested approach can enhance image quality. The proposed strategy is then described in detail, and its effectiveness is assessed using a variety of measures. The study demonstrates that the suggested strategy outperforms other current methods and is successful in retrieving low-dose PET pictures. The authors also go over the method limitations and recommend future research directions

2)Title: Night-to-Day Image Translation for Retrieval-based Localization.

Review: The study report suggests employing CycleGANs for retrieval-based localization tocreate daytime images from overnight data. The authors contend that good image matching, which can be difficult when photographs are acquired at various times of day, is essential for retrieval-based localization systems, which are utilised in applications like autonomous vehicles. The suggested method is assessed using a dataset of daytime and nighttime photos, andit is contrasted with alternative image translation techniques. According to the authors, their suggested strategy performs better in terms of image quality and its capacity to raise retrieval-based localization accuracy than previous methods. Ultimately, the work shows the promise of CycleGANs for night-to-day picture translation in retrieval-based localization systems, with encouraging results for enhancing accuracy in difficult illumination circumstances.

3)Title: Learning to Sketch With Shortcut Cycle.

Review: A innovative approach for sketch-based image retrieval utilising CycleGANs is putforth in the publication &quot;Learning to Sketch with Shortcut Cycle Consistency & quot;. To enhance the learning of the generator network and include it into a pipeline for sketch-based picture retrieval, the authors introduce a shortcut cycle consistency loss. The proposed approachs uccessfully learns a mapping from sketches to realistic images, as shown by its state-of-the-art performance on two large-scale sketch datasets.

4)Title: Generative Reversible Data Hiding by Image-to-Image Translation via GANs.

Review: Using the capabilities of Generative Adversarial Networks (GANs) for image-to-image translation, the research paper &quot ;Generative Reversible Data Hiding by Image-to-Image Translation via GANs&quot; suggests a novel method for reversible data concealing. The suggested technique entails learning a mapping function using a GAN-based encoder-decoder architectureto implant a secret message into a cover image. The main innovation of the suggested method isthat it may be reversed, enabling the extraction of the encoded information without significantly distorting the cover image. The suggested method beats current state-of-the-art methods in terms of embedding capacity and visual quality after being tested on numerous benchmark datasets. In conclusion, this paper offers a novel and encouraging method for reversible data concealment using GANs

5)Title: Indoor camera pose estimation via style-transfer 3D models.

Review: The authors of the research put out a unique technique for estimating camera postures in enclosed spaces using style-transfer 3D models. In order to produce visuals that fit the style of the input image and are also consistent with a 3D model of the indoor environment, the technique combines neural style transfer and 3D rendering. By employing a convolutional neural network to compare the output image to the input image, the camera posture is estimated. The authors test their method on a publically accessible dataset and demonstrate that it works better than cutting-edge techniques for estimating the position of interior cameras. Robotics, virtual reality, and augmented reality could all benefit from the suggested approach.

6)Title: Adaptive Lightweight License Plate Image Recovery Using Deep Learning Based on Generative Adversarial Network.

Review: In a research study titled Adaptive Lightweight Plate Image Recovery Using Deep Learning Based on Generative Adversarial Network, a generative adversarial network (GAN)-based solution for plate image recovery is proposed. According to the paper, the suggested method can restore licence plate photos that have been damaged by numerous things like low resolution, motion blur, and occlusion. The authors’ experimental findings demonstrate that their technology recovers licence plate images more accurately and quickly than other approaches currently in use. Overall, the study paper proposes an intriguing method for recovering licence plate images using deep learning, and it may find use in fields like traffic enforcement and traffic monitoring.

7)Title: Approaching-and-Centralizing Network for Zero-Shot Sketch-Based Image Retrieval.

Review :A new framework for zero-shot sketch-based image retrieval (SBIR) is suggested in thestudy &quot; Approaching-and-Centralizing Network for Zero-Shot Sketch-Based Image Retrieval & quot;(An Approaching and Centralising Network for Zero-Shot Sketch-Based Image Retrieval). The authors contend that the primary problem of zero-shot SBIR is to precisely extract the discriminative features from both sketches and photos, and they suggest a strategy that makes use of both global and local information to do this. Two stages make up the suggested strategy. A sketch feature generator network and an image feature extractor network are separately trained using triplet loss in the first stage to provide discriminative global features.

8)Title: CycleEmotionGAN Emotional Semantic Consistency Preserved CycleGAN for Adapting Image Emotions

Review: In the research paper Cycle Emotion GAN, a novel architecture for adjusting visualemotions using a cycleGAN with semantic consistency is presented. In order to preserve thesemantic content and emotional consistency of the images during the adaptation process, the authors additionally present a novel emotional semantic consistency loss. The suggested CycleEmotion GAN model surpasses current cutting-edge approaches in terms of both objective and subjective evaluations, according to experimental findings. Applications for the proposed paradigm include image retrieval, picture synthesis, and image modification.Overall,

CycleEmotionGAN is a fascinating and ground-breaking method for tackling the difficult issue of adjusting emotions across various image domains.

9)Title: Development of Road Surface Detection Algorithm Using CycleGAN-Augmented Dataset.

Review: Using a CycleGAN-based image augmentation technique, the work &quot; Development of Road Surface Detection Algorithm Using CycleGAN-Augmented Dataset & quot; suggests a novel strategy to increase the precision of road surface recognition algorithms. The lack of variation inthe existing road surface datasets, according to the authors, has a negative impact on how well detection algorithms generalise. They suggest a data augmentation technique based onCycleGAN to solve this problem and enable the creation of synthetic photos with various road surface textures .The CycleGAN-augmented dataset increased the accuracy of road surface detection compared to utilising the original dataset alone, according to the authors&#39; evaluation of the suggested technique using a cutting-edge detection methodology.

10)Title: Towards Unsupervised Sketch-based Image Retrieval.

Review: A unique unsupervised method for sketch-based image retrieval is presented in the paper &quot; Towards Unsupervised Sketch-based Image Retrieval & quot;. For picture retrieval, the authors suggest a framework that makes use of both the advantages of deep neural networks and conventional hand-crafted features. They specifically employ a Scale Invariant Feature Transform (SIFT) to extract features from sketches and a Convolutional Neural Network (CNN) to extract deep features from photos. In order to enable sketch-based picture retrieval without the need for labelled data, these characteristics are then aligned in a common space using unsupervised learning approaches, such as K-Means clustering and Spectral Clustering.

# 11)Title: ForkGAN: Seeing into the Rainy Night

Review: The research paper "ForkGAN: Seeing into the Rainy Night" proposes a novel image-to-image translation framework for converting pictures taken in wet situations into their comparable pictures taken in dry settings. The difficult task of eliminating rain from photographs is covered in the study. This work is crucial for a number of computer vision applications, including surveillance, autonomous driving, and image analysis.A generator network and a discriminator network are the two primary parts of the conditional generative adversarial network (ForkGAN) that the authors propose. While the discriminator network seeks to discriminate between the generated rain-free images, the generator network learns to map rainy images to rain-free images. The outcomes show how ForkGAN may improve rainy photos and make them better suited for various computer vision applications.

# 12)Title: Historical and Modern Image-to-Image Translation with Generative Adversarial Networks

# Review: The study "Historical and Modern Image-to-Image Translation with Generative Adversarial Networks" investigates the use of GANs for image-to-image translation challenges with an emphasis on both historical and contemporary image translation.The paper offers a thorough analysis of the methods and literature currently available for GAN-based image-to-image translation. It covers the drawbacks and shortcomings of conventional picture translation techniques and emphasises the potential of GANs to address these drawbacks. The authors offer a comprehensive examination of several GAN architectures and loss functions that have been suggested for use in picture translation applications.The paper's comprehensive experimentation and evaluation are one of its strengths.

13)Title: Automated Extraction of Cerebral Infarction Region in Head MR Image Using Pseudo Cerebral Infarction Image by CycleGAN.

Review: A generative adversarial network called CycleGAN is used in the study titled "Automated Extraction of Cerebral Infarction Region in Head MR Image Using Pseudo Cerebral Infarction Image by CycleGAN" to automate the extraction of cerebral infarction regions from head MRI images. To increase the precision of infarction region segmentation, the authors suggest a novel method that makes use of artificially created images of pseudo cerebral infarction produced using CycleGAN.The detection of cerebral infarction zones with accuracy and efficiency is a critical component of diagnosing and treating stroke patients, hence the research addresses a significant issue in medical imaging analysis. The scientists want to improve segmentation performance by using CycleGAN to create fake images that closely mimic genuine cerebral infarction images.

14)Title: ColorAI – Automatic Image Colorization using CycleGAN.

Review:The fascinating research paper "ColorAI - Automatic Image Colorization using CycleGAN" examines the use of CycleGAN in the context of automatic picture colorization. The study addresses the problem of realistic and aesthetically acceptable grayscale to colour image conversion. The authors suggest a unique method for automating the colorization process that makes use of generative adversarial networks and the cycle-consistency loss.The paper's clear and succinct exposition of the approach is one of its significant strengths. The CycleGAN framework and its application to the colorization job are thoroughly explained by the authors. They include clear explanations of the network architecture, loss functions, and training process for readers who are already familiar with deep learning.

15)Title: Fake-image detection with Robust Hashing

Review: The critical issue of detecting false photos using robust hashing algorithms is covered in the research paper titled "Fake-image detection with Robust Hashing". The authors suggest a unique method for detecting altered or faked photographs that makes use of the strength of powerful hashing algorithms.The study starts out by giving a thorough summary of the escalating issue of phoney photographs in the current digital world. It draws attention to the many methods and resources employed by bad actors to produce and disseminate false pictures. The authors stress the necessity for accurate and reliable techniques to discern between real and altered photos.The primary contribution of this research is the suggestion of a reliable hashing method created especially for the identification of false images. The hashing algorithm is explained in great length by the authors.

# 16)Title: A WAVENET(CYCLEGAN(CQT(AUDIO))) PIPELINE FOR MUSICAL TIMBRE TRANSFER.

# Review: In the research paper "TIMBRETRON: A WAVENET(CYCLEGAN(CQT(AUDIO))) PIPELINE FOR MUSICAL TIMBRE TRANSFER", an original method for musical timbre transfer is presented utilising a pipeline that combines WaveNet, CycleGAN, and Constant-Q Transform (CQT) methods.The paper presents the idea of timbre transfer, which describes the process of changing a musical sound's timbre or tonal quality while maintaining other elements like pitch and rhythm. To ensure excellent timbre transmission, the suggested pipeline makes use of deep learning models.The necessary audio features are initially extracted from the input musical signal by the authors using the Constant-Q Transform (CQT). Both the spectral content and timbral aspects of the audio are captured by these features. They then use the CycleGAN model to figure out how the CQT features map to one another.

# 17)Title: High-Quality Facial Photo-Sketch Synthesis Using Multi-Adversarial Networks

# Review: The research paper "High-Quality Facial Photo-Sketch Synthesis Using Multi-Adversarial Networks" suggests a technique for creating high-quality facial sketches from related images. In order to preserve the identity of the face in the generated sketches and capture the fine features, the study offers a unique framework based on multi-adversarial networks.The suggested method uses the strength of generative adversarial networks (GANs) to discover the mapping between doodles and photos. To assure the creation of realism and aesthetically pleasing sketches, it integrates numerous adversarial learning stages, including global-level adversarial training and local-level adversarial training.This paper's strengths come from its successful application of GANs to the difficult job of photo-sketch synthesis. The dual global structure is better captured by the multi-adversarial training technique. & regional specifics

# 18)Title: A Steganography Algorithm Based on CycleGAN for Covert Communication in the Internet of Things

Review: In the context of the Internet of Things (IoT), the study "A Steganography Algorithm Based on CycleGAN for Covert Communication in the Internet of Things" suggests a novel strategy for information concealment using CycleGAN. By utilising the strength of generative adversarial networks, the authors meet the requirement for secure communication in IoT applications.The notion of steganography and its uses in IoT are presented in detail in this study. The authors stress the benefits of employing CycleGAN for covert communication while outlining the drawbacks of conventional steganography methods. They go into great depth about the proposed algorithm's architecture and operation, with step-by-step explanations and pertinent equations.The authors' experimental analysis indicates the efficiency of their strategy for concealment.

19)Title: Geometry-Consistent Generative Adversarial Networks for One-Sided Unsupervised Domain Mapping.

Review: The research paper "Geometry-Consistent Generative Adversarial Networks for One-Sided Unsupervised Domain Mapping" suggests a novel method for unsupervised domain mapping using GANs with an emphasis on preserving geometric consistency between source and target domains. Without paired data for supervision, the research addresses the problem of picture mapping from one domain to another.The authors present a two-stage framework made up of a discriminator network and a geometry-consistent generator. While maintaining geometric features like shapes, edges, and structures, the generator seeks to learn the mapping across domains. To help the generator work better, the discriminator is trained to differentiate between genuine and created images.The experiments done for the paper show that the suggested strategy works well.

20)Title: Adaptive Weighted Multi-Discriminator CycleGAN for Underwater Image Enhancement

Review: The article "Adaptive Weighted Multi-Discriminator CycleGAN for Underwater Image Enhancement" describes a novel method for improving the calibre of underwater photographs using an adaptive weighted multi-discriminator CycleGAN. The authors suggest a methodology that effectively addresses the issues of underwater image degradation and improves visual quality by utilising CycleGAN and multiple discriminators with adjustable weights.Overall, the method presented in the study "Adaptive Weighted Multi-Discriminator CycleGAN for Underwater Image Enhancement" offers hope for overcoming the difficulties posed by underwater image degradation. With more investigation and enhancement, the technology has the potential to considerably advance underwater imaging applications, spanning from scientific study to underwater photography and videography. The results show appreciable increases in image quality.

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