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Criminal Face Generation and Detection

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ABSTRACT:

Majority of current text-to-image generation tasks are limited to creating images like flowers (Oxford 102 Flower), birds (CUB-200-2011), and Common Objects (COCO) from captions. The existing face datasets such as Labeled Faces in the Wild and MegaFace lack description while datasets like Celeb A have attributes associated but do not provide feature descriptions. Thus, in this paper we build upon an existing algorithm to create captions with the attributes provided in the CelebA dataset, which can not only generate one caption but it can also be extended to generate N captions per image. We utilise Sentence BERT to encode these descriptions into sentence embeddings. We then perform a comparative study of three models - DCGAN, SAGAN and DFGAN, by using these sentence embeddings along with a latent noise as the inputs to the different architectures. Finally, we calculate the Inception Scores and the FID values to compare the output images across different architectures.

Keywords: Criminal Face Generation And Detection , Deep Learning ,Computer Vision , Generative Model.

1. Introduction:

The project can significantly aid law enforcement agencies by generating facial composites based on partial descriptions, enhancing the speed and accuracy of criminal identification. It can improve the efficiency of surveillance systems by detecting known criminals in real-time, preventing crimes before they occur. project likely utilizes deep learning models, which are at the forefront of AI research. This includes Generative Adversarial Networks (GANs) for face generation and Convolutional Neural Networks (CNNs) for detection. he potential for real-world application in crime prevention and investigation makes this project highly relevant to current societal needs. the project could be scaled to work with larger databases and integrated with national or international criminal databases. Ensuring high accuracy in both generation and detection, which is crucial for real-world application.

2. Literature Survey:

This project focuses on developing a system that can both generate a realistic facial image based on input descriptions and detect criminal faces from images or video clips. The system uses deep learning techniques like Convolutional Neural Networks (CNNs**)** for detection and Generative Adversarial Networks (GANs) for face generation. It aims to assist law enforcement agencies in quickly identifying suspects, even with limited information, and enhance public safety through AI-powered surveillance systems.

Table1–Comparative Analysis of Research

Sr. No.	AUTHOR	TITLE	YEAR	PROS	CONS
[1]	Ian Goodf ellow et all,	Generative Adversarial Nets	2014	Introduced GANs, revolutionizing realistic image generation. Enables creation of high-quality, synthetic facial images useful for training datasets and simulation.	Training is unstable and often suffers from mode collapse.

[2]	Florian Schroff, Dmitry Kalenichenko, James Philbin	FaceNet: A Unified Embedding for Face Recognition and Clustering	2015	Achieves high accuracy in face recognition and verification.	Struggles with low-quality or occluded images
[3]	Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi,	You Only Look Once (YOLO): Unified, Real-Time Object Detection	2016	Real-time face and object detection with high speed.	Detection accuracy slightly lower than two-stage detectors in complex backgrounds.
[4]	Jiankang Deng, Jia Guo, Niannan Xue, Stefanos Zafeiriou	ArcFace: Additive Angular Margin Loss for Deep Face Recognition	2019	Improves the discriminative power of face recognition models.	Requires careful tuning of hyperparameters (like margin and scale).

3. Problem Statement:

In today's world, maintaining public safety and security is a critical challenge for law enforcement agencies. One of the most significant aspects of this challenge is identifying and apprehending criminals who often evade detection by altering their appearance or utilizing sophisticated techniques to hide their identity. Traditional methods of criminal identification, such as eyewitness accounts or manual examination of surveillance footage, are time-consuming, prone to human error, and often ineffective, particularly in cases involving large volumes of data or low-quality imagery. To address this issue, there is a growing need for advanced technological solutions that can efficiently and accurately identify potential criminals. The proposed project, Criminal Face Generation and Detection, seeks to leverage the power of deep learning and computer vision to generate realistic facial images of potential suspects based on partial or low-quality input and to detect and match these faces with existing criminal databases.

4. Objectives:

Face Generation: Create realistic images of faces that could be used for training models or to understand how different features might appear on different faces.

Face Detection: Develop a system that can automatically identify or detect faces in images. Particularly those of criminals, based on certain features.

Accuracy and Reliability: Ensure the system is accurate and reliable I generating and detecting faces, minimizing errors, especially false identification.

5. Discussion:

The project on **Criminal Face Generation and Detection** explores the application of **deep learning**, **computer vision**, and **generative models** in the field of criminal identification and law enforcement. The system was designed to perform two major tasks:

1. Generate realistic facial images based on given features or descriptions.
2. Detect and recognize criminal faces from input images or video frames.

During the development phase, we integrated **Convolutional Neural Networks (CNNs)** for face detection and recognition tasks due to their superior performance in feature extraction and classification. For face generation, models like **Generative Adversarial Networks (GANs)** were utilized to create synthetic yet highly realistic facial images based on partial data or verbal input.

The detection module achieved a high accuracy rate in controlled environments with clear and frontal face images. However, challenges arose when detecting faces in real-world scenarios, such as poor lighting conditions, partial occlusions, variations in facial expressions, or extreme angles. To mitigate this, data augmentation techniques were applied during training to improve the model's robustness.

The generation module showcased the ability to create faces based on specified parameters such as age, gender, and ethnicity. While the generated faces were visually realistic, maintaining identity consistency based on input sketches or descriptions remains an area for improvement.

Additionally, ethical concerns about privacy, potential misuse, and bias in data sets were discussed. Proper measures, such as using legally sourced data, obtaining permissions, and building fairness checks into the model, were considered vital for responsible deployment.

In future enhancements, incorporating **3D face reconstruction**, **multi-modal input (voice + text + image)**, and **real-time alert systems** could significantly improve both generation and detection effectiveness. Collaboration with law enforcement agencies would also help in refining the model for real-world applications, ensuring it is both accurate and ethical.

Overall, this project demonstrates that integrating AI in criminal investigation workflows can significantly speed up the identification process, though continuous improvement and ethical consideration remain crucial for its practical use.

6. Conclusion:

The "Criminal Face Generation and Detection" project successfully leverages deep learning and computer vision to enhance criminal identification systems. By utilizing advanced algorithms for facial recognition and face generation, this system demonstrates potential in assisting law enforcement agencies to identify and track suspects more effectively. The implementation of facial detection techniques showed promising accuracy in recognizing and distinguishing criminal faces from large datasets, thus aiding in quicker investigations. However, challenges such as data privacy, ethical concerns, and potential biases in face recognition systems must be addressed to ensure fair and reliable usage. Future developments in refining the accuracy of detection algorithms and incorporating more diverse datasets can further improve the system's effectiveness. Overall, this project lays a strong foundation for integrating AI-driven technologies in criminal justice systems, offering new tools for efficient and reliable crime prevention and investigation.

REFERENCES:

[1] Deep Learning for Face Recognition: A Survey Guo, Y., Zhang, L., & Wang, Y. (2016). International Journal of Computer Science and Information Security, 14(5), 484-494.

[2] Facial Recognition Technology: West, J. (2012). The New Atlantis, 35, 3-21.

[3] Generative Adversarial Security versus Privacy Networks Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., … & Courville, A. (2014). Advances in Neural Information Processing Systems (NIPS), 27, 1-9.

[4] Facial Expression Recognition Using Convolutional Neural Networks: A Comprehensive Review Mollahosseini, A., Chan, D., & Mahoor, M. H. (2017). IEEE Transactions on Affective Computing, 10(1), 1-19.

[5] A Survey of Deep Learning Techniques for Face Recognition Zhang, K., Zhang, Z., Li, Z., & Qiao, Y. (2016). International Journal of Computer Vision, 119(2), 191-210.

[6] Face Generation Using Variational Autoencoders Zhang, Y., Xu, T., Li, H., & Huang, X. (2018). Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018, 1-9..

[7] Towards Robust Face Recognition with Deep Learning Chen, X., Zhang, Y., & Wang, Q. (2017). Proceedings of the IEEE International Conference on Computer Vision (ICCV), 2017, 1-10.