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Re-Unite: Missing Children Tracking Application

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Abstract: ***The growing incidents of missing children are a cause of concern. Child trafficking and abduction are major factors that lead to missing cases. A large number of child trafficking victims are very young. When it comes to identifying missing persons or victims of disasters, one of the biggest challenges is the difficulty of obtaining accurate facial images. Often, the passage of time can cause a person's appearance to change significantly from the photos that their loved ones may have on hand. Additionally, in cases where a person has gone missing, there may be few or no photos available to use for identification purposes. This causes a need to create a system which will help find lost children through the child face aging mechanism where only limited data such as a picture (childhood picture) is available.***

The proposed system will help families find their lost or missing children by uploading their pictures and providing their information through the app. Using Face Aging Generative adversarial networks (GAN) the childhood image will be reconstructed to resemble the child's face at the present time. Additionally, users will be notified if a child goes missing in their locality or area.

Keywords: Agile Model, Dart, Face Aging, Firebase, Flutter, GAN, Missing Children, Notifier

I. INTRODUCTION

A missing person is a person who has disappeared. Every eight minutes it is estimated that a child goes missing in India, and around eight million children go missing around the world every year[9]. Statistics show that 64,851 people disappear every month in India including children.

These missing persons or children disappear for many reasons like to escape domestic violence, abuse, due to mental illness, etc., But a majority of them are victims of kidnapping and forceful abductions. While usually a missing person can be found quickly, some missing cases remain unresolved for many months and sometimes even years.

The issue of child disappearance is recognized as a major concern for the nation as these missing children end up in forced labor, slavery, and child trafficking.

Parents of these missing children undergo a harrowing ordeal every day.

At present, there is an acute shortage of data about child protection and missing children, our app REUNITE assists families in locating their missing or lost children by allowing them to upload their pictures and provide information via the app. By using Face Aging Generative Adversarial Networks (GAN), the app will be able to reconstruct a child's current face based on their childhood image. Furthermore, users will receive notifications if a child goes missing in their area or locality.

The study aims to examine the obstacles and ethical considerations related to the creation of a missing child locating system, including privacy concerns, data protection regulations, and the system's impact on the families of missing children. Additionally, the research will evaluate the accuracy and reliability of the proposed system by conducting empirical studies.

GANs, or Generative Adversarial Networks, are a deep learning technique for developing generative models. GANs are most typically used to generate synthetic images for a certain domain that are distinct and nearly indistinguishable from other actual photos.

GANs accomplish this level of realism by combining a generator that learns to produce the goal output with a discriminator that learns to differentiate true data from the generator's output. The generator attempts to mislead the discriminator, while the discriminator attempts to avoid being tricked.

The Generative Adversarial Network (GAN) is divided into two parts:

1) The generator improves its ability to generate plausible data. The instances that are generated serve as negative training examples for the discriminator.
2) The discriminator learns to discriminate between actual and bogus data generated by the generator. The generator is penalized by the discriminator for delivering improbable outcomes.

When training begins, the generator generates blatantly fabricated data, and the discriminator soon learns to recognise it (Figure 1).

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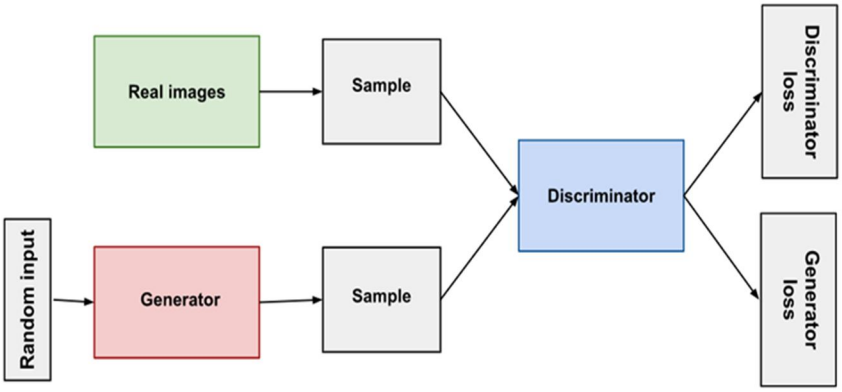


Fig 1. Generative Adversarial Network

Working of GAN:

Generative Adversarial Network is an example of unsupervised learning and consists of two sub-models: Generator and Discriminator. The generator's task is to generate fake samples or input and the discriminator's task is to take the input generated by the generator and check if it is a fake or real sample from the domain.

Taking an example of the generation of an image of a person's face to explain the application of this concept to image generation.

The generator is trained to produce fake faces that are identical to real ones. For this to happen, first the discriminator is trained to recognize what a picture of a person's face looks like. Therefore, a considerable number of images of people's faces are fed to the discriminator and it is made to recognize all the attributes that make up the face, for example, the eyes or nose shape. When the discriminator is well trained to recognize real faces, the discriminator is fed with images that are not real faces and it very well discriminates them as not real. So, when the discriminator is very well trained to recognize real samples from the domain, the generator is made to produce fake samples, that is fake faces.

The generator begins by taking a random input vector or random noise and using it to create a fake face. This fake facial image is sent to the discriminator which decides if the image is real or fake generated by the generator. The answer of whether the image is real or fake is revealed to both the generator and discriminator, which update themselves accordingly. That is if the discriminator can correctly recognize the fake image, the generator will update itself to produce more realistic fake images. If the discriminator fails to recognize a fake image, it will update itself to correctly recognize the fake image. This process continues until the generator is able to generate such realistic fake faces that the discriminator cannot recognize them as fake images (Figure 2).

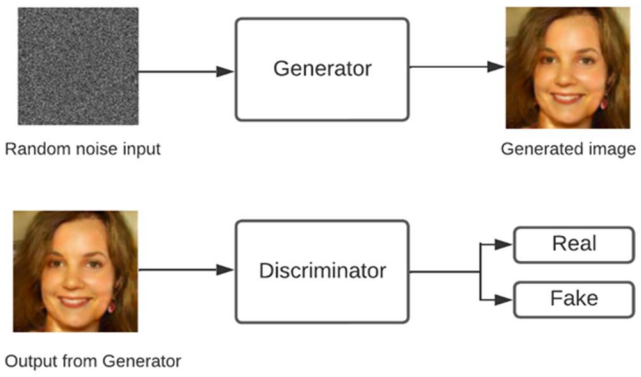


Fig 2. GAN to generate a face

II. METHODOLOGY

This research employs a mixed-method approach that combines qualitative and quantitative data to develop and evaluate the proposed system's effectiveness in locating missing children. The research methodology is structured into three phases, each with specific objectives and data collection methods.

A. Phase 1: Literature Review

The first phase of the study involved a comprehensive literature review of existing research on missing children, child trafficking and abduction, and child face ageing technology. Currently, there are many websites which contain information about missing people. These websites are usually maintained and hosted by law enforcement agencies and NGOs. Khoya Paya [1] is one such portal that allows the public to share details of missing, found or sighted children with the public at large. This platform was established by the Government of India. Apart from these portals, the Amber Alerts or Child Abduction Emergency Alert system is used to broadcast about missing children in the United States. These are distributed via cable TVs, radio stations, satellite radio etc.
WaveletGLCA-GAN [2], InterFaceGAN [3], PFA-GAN [4], Triple-GAN [5], Dubbed FaceGAN [6], were some of the pre-existing GAN models referred in order to understand the workings of Face Aging GANs.
The StyleGAN model forms the basis of our face aging feature, ensuring accurate and aesthetically pleasing changes. Real facial photos are trained to be translated into a latent space within a pre-trained unconditional GAN (such as StyleGAN) while a specified aging transformation is applied. A pre-trained age regression network is utilized to direct the encoder in producing the latent codes that correspond to the target age in order to do this. This method approaches aging as a regression job, providing fine control over the output image by taking into account the input age and the goal age. The method also learns a more disentangled and nonlinear pathway than other methods that only use the latent space and a prior controlling the age progression [7].

B. Phase 2: System Development

The second phase of the study involves developing the proposed system. Existing systems only give details about missing children. They use childhood images or photos that give limited information. For unresolved missing children these images are of very little significance as the facial structure and facial features of a child keep changing over the years. Scope of this project is to successfully identify and generate images of a missing child at the present time and alert users about such cases in their area.
This phase implements the use of a child face aging mechanism using Generative Adversarial Networks (GANs) to generate aged versions of a child's face based on their childhood pictures (Figure 3). The system is developed using programming languages such as Python, Tensorflow, Keras and Pytorch. The system's features, such as uploading pictures and providing information about missing children and the notification feature, is developed using Dart, Flutter, Firebase which resulted in an App named ‘Reunite’. The development of the system follows the Agile methodology, with an iterative approach to incorporate feedback from stakeholders and users.



Figure 3: Aging results between the ages 0 and 100

C. Phase 3: System Evaluation

The third phase of the study aims to evaluate the system's effectiveness in locating missing children. This phase will involve conducting research and testing the system in regards to the various challenges and ethical considerations involved in developing such a system, including privacy concerns, data protection regulations, and the impact of such a system on the families of missing children emphasizing the need for a collaborative effort between law enforcement agencies, governments, and non-governmental organizations.

III. RESULTS & DISCUSSIONS

The purpose of this project was to create an app that will assist families in locating their lost or missing children by uploading photos and providing information through the app. The childhood image will be reconstructed using Face Aging Generative Adversarial Networks (GAN) to resemble the child's face today. Additionally, users will be notified if a child goes missing in their neighborhood or area via app notifications.

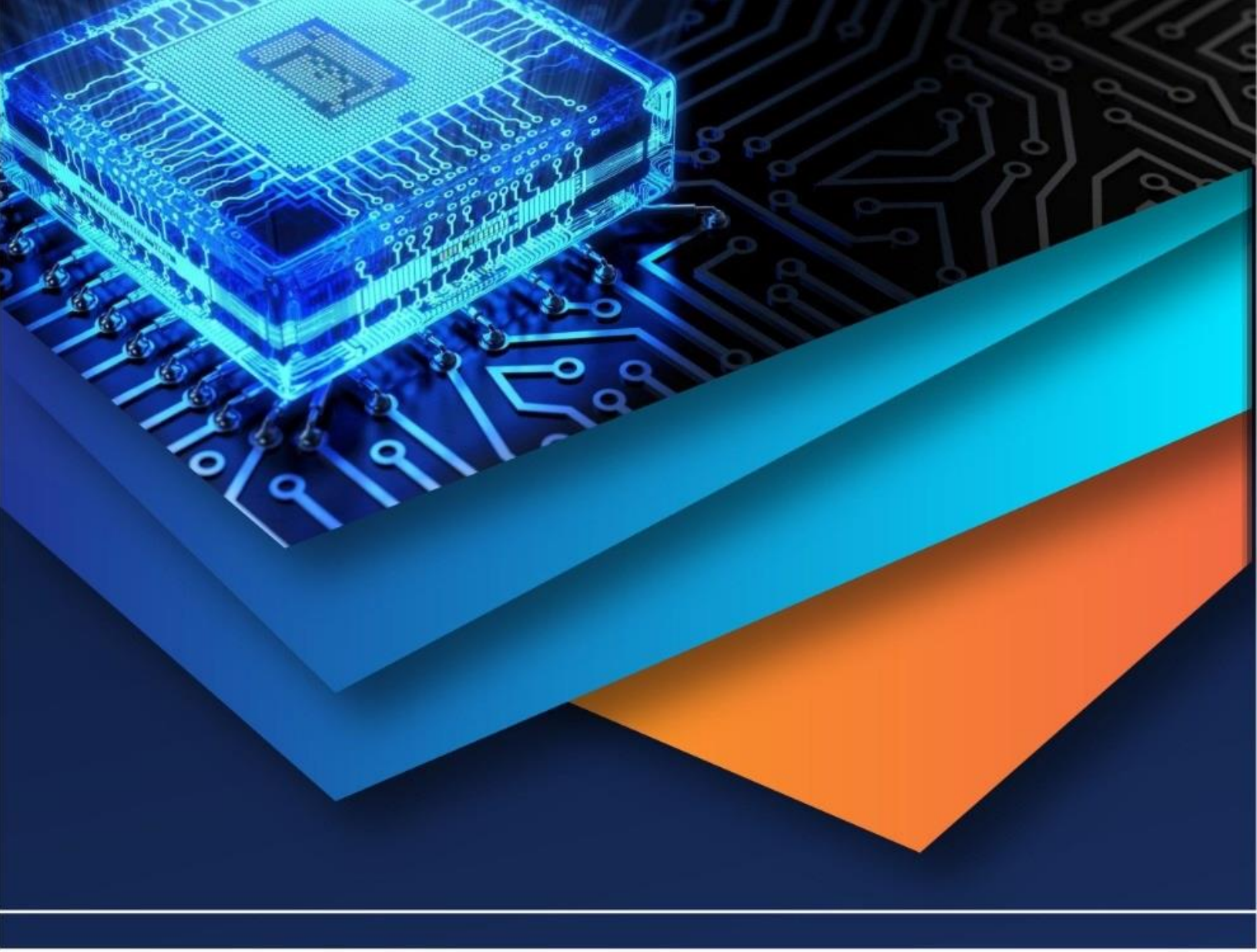
IV. CONCLUSION

This project will greatly help affected families to be reunited with their missing kin. The system's use can be enhanced further with a collaborative effort between law enforcement agencies, governments, and non-governmental organizations allowing the law enforcement authorities to prevent and decrease and solve the missing children cases.

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