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"LIVELINESS AUTHENTICATION ON PHOTO OF PHOTO VS LIVE PHOTO USING IMAGE PROCESSING"

Roshan Hyalij[1], Siddharth Oturkar[2], Atharva Kasodekar[3], Ganesh Chavan[4], Prof.Vaishali Khandave[5]

[1-4]Dept of Computer Engineering, MET Institute of Engineering, Nashik.
[5]Professor, Dept. of Computer Engineering, MET Institute of Engineering, Nashik

Abstract: In today's world, signatures are crucial for authentication and authorization in various fields. However, people may forget their signature or make mistakes while processing it. Therefore, there is a growing need for automated solutions for live person verification. Unlike traditional identification methods such as passwords, PINs, or key cards, which can be forgotten or stolen, facial features are unique to individuals and cannot be easily replicated. Live camera 3D liveliness detection technology can enhance the pictorial information of a facial image to enable human interpretation and autonomous machine perception. Digital image verification involves converting an image into an array of small integers known as pixels and processing it using computer hardware. Edge detection is an essential task in image processing because it characterizes boundaries. This project aims to simplify and improve 3D liveliness detection using advanced technologies such as artificial intelligence and machine learning to prevent illegal activities.

Key Words: machines learning, image processing

1. INTRODUCTION

With the rapid growth of digital multimedia and its susceptibility to copying, manipulation, and transformation, there is a need for new protection schemes. Image authentication is the process of assessing the integrity of image content and detecting any malicious modifications in an automatic manner. However, accessing the original image may not always be possible, making it necessary to associate additional information with the image to identify it uniquely. Facial recognition is a common form of biometrics used for fraud prevention in various industries. It uses algorithms to distinguish an individual's unique facial features from those of similar faces in a line-up. Financial institutions are increasingly using facial biometrics to balance enhanced fraud prevention with a high-quality user experience. The main challenge in converting 2D images to 3D is accurately estimating depth from a single image. Multiview stereo methods attempt to improve depth estimation by using multiple images of the same scene, automatically selecting suitable ones for depth retrieval. These methods are similar to the proposed approach, with the key difference being the use of images from a large repository instead of those showing the same scene as the query image.

1.1 Problem Statement

To detect real or fake person from the captured photo by generating Z-axis, to avoid spoofing of the important documents and frauds. Detecting Photo of photo vs. live photo by generating Z-axis, Photo Liveliness- Anti Spoofing.

1.2 Objectives

i) To filter out Real and Fake identity of a person.
ii) Generate Z-Axis to detect whether actual person is capturing photo or not.
iii) System must be able to detect actual person and mannequin.

1.3 Motivation

I. Fraud prevention: With the increasing use of digital platforms for identity verification, there has been a rise in fraudsters using manipulated photos and videos to trick systems. Developing a system that can detect the difference between a live photo and a photo of a photo can prevent such fraudulent activities.
II. Improved security: Many systems use photo authentication for security purposes, such as unlocking phones or accessing confidential information. A liveliness authentication system can improve the security of such systems by ensuring that only real, live photos are being used for authentication.

III. Better user experience: Liveliness authentication can reduce the chances of false rejections and improve the overall user experience. Users won't have to worry about using a specific type of lighting or holding their phone in a particular way to get the authentication to work correctly.

IV. Industry demand: As more industries move towards digital identity verification, the demand for liveliness authentication systems is increasing. Developing a system that can detect liveliness authentication can open up opportunities in the industry and contribute to its growth.

2. Software Requirement Specifications

2.1 Purpose
The purpose of this software is to develop a system that can differentiate between a live photo and a photo of a photo using image processing techniques.

2.2 Scope
The system will be used for liveliness authentication in various industries such as digital identity verification, security, and fraud prevention.

2.3 Definitions, Acronyms, and Abbreviations
2.3.1 SRS: Software Requirements Specification
2.3.2 Liveliness Authentication: The process of verifying that the image being used for authentication is a live photo and not a photo of a photo.

2.4 General Description

2.4.1 Product Perspective
The system will be standalone and will not require any other software to operate.

2.4.2 Product Functions
The system will be able to:
i)Capture live photos using the camera.
ii)Differentiate between a live photo and a photo of a photo using image processing techniques.
iii)Output the result of the authentication process.

2.4.3 User Characteristics

The system will be used by users who require liveliness authentication for various purposes such as digital identity verification and security.

2.4.4 Constraints

The system will require a camera for live photo capture.
The system will require adequate lighting for accurate authentication.

2.4.5 Assumptions and Dependencies

The system assumes that the user will provide a live photo for authentication.

2.5 Specific Requirements

2.5.1 Functional Requirements:

a. The system should be able to detect whether a photo is a live photo or a photo of a photo.

b. The system should use image processing techniques to analyze the image and identify the signs of liveness.

c. The system should be able to detect facial expressions, eye movements, and other factors that indicate liveness.

d. The system should be able to provide a confidence score that indicates the level of certainty that the photo is a live photo.

e. The system should be able to process images in real-time or near real-time, with minimal latency.

f. The system should be able to handle a high volume of requests concurrently.

2.5.2 Non-Functional Requirements:

a. The system should be highly accurate in detecting liveness.

b. The system should be robust and able to handle variations in lighting, camera quality, and other factors that can affect image quality.

c. The system should be secure and protect user privacy by not storing or sharing images or personal information.

d. The system should be user-friendly and easy to use, with clear instructions and feedback to users.

e. The system should be scalable and able to handle a growing number of users and requests.

f. The system should be compatible with different types of devices and platforms.

2.5.3 Performance Requirements:

a. The system should be able to process images within a few seconds.

b. The system should be able to handle a high volume of requests concurrently.

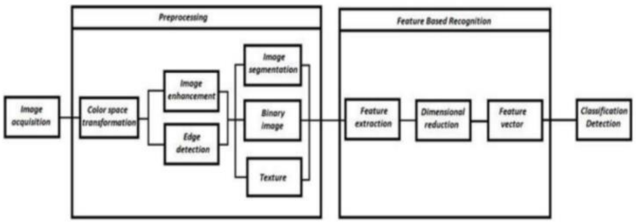
c. The system should have high availability and minimal downtime.

d. The system should be able to operate efficiently on a range of hardware and software configurations.

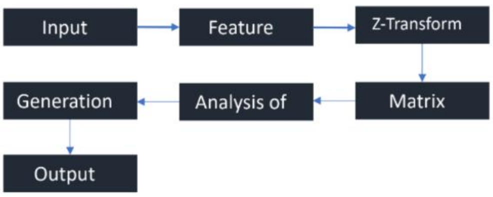
2.6 Appendices

2.6.1 Use Case Model Survey

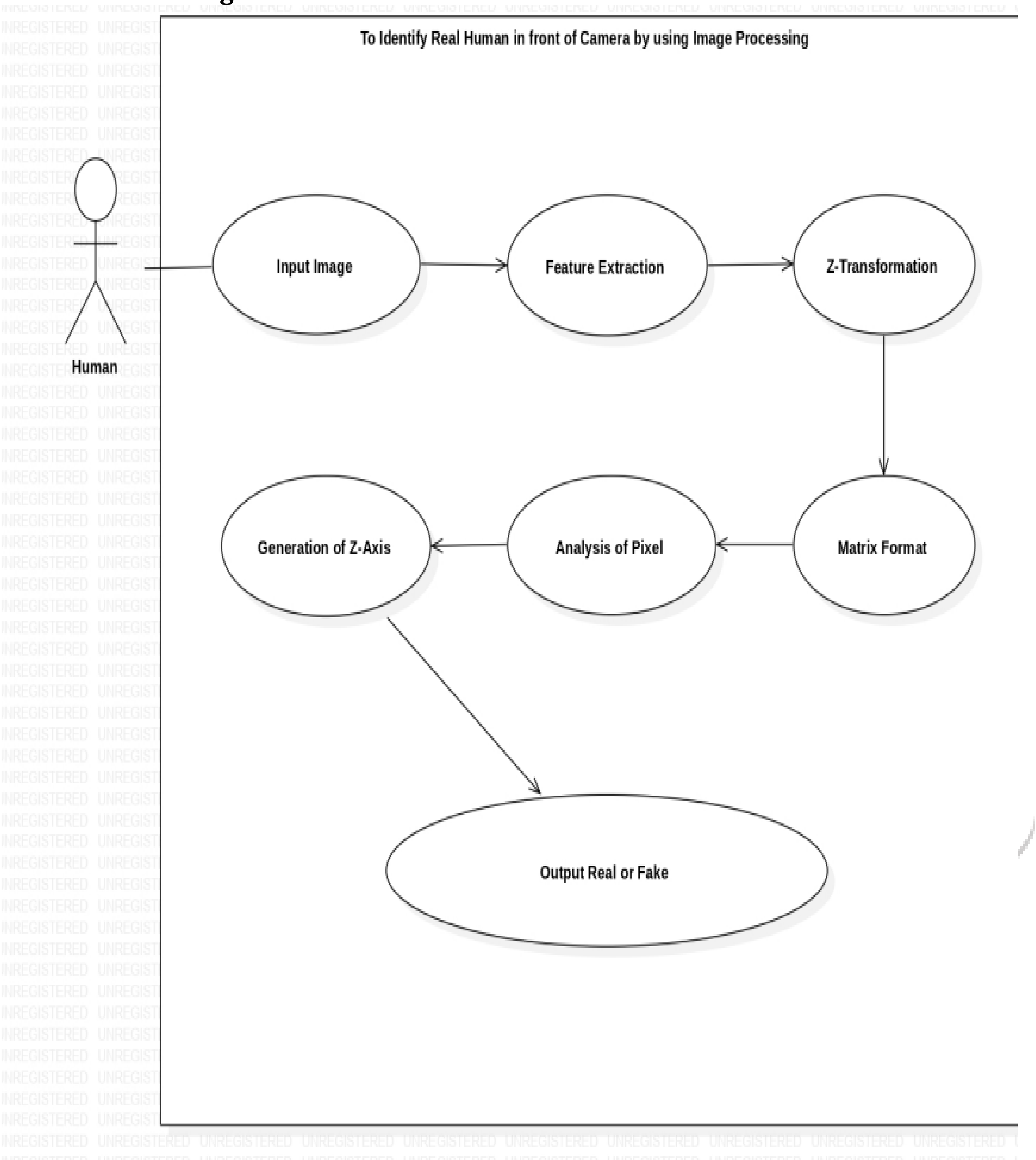
Typically, the procedure involves a series of actions that begin with capturing an image, choosing a specific color scheme, enhancing image clarity, separating the image into parts, and extracting key elements for identification. The identification phase includes various steps such as feature extraction and reducing the number of dimensions to identify the most appropriate set of features while discarding any irrelevant ones. The feature vector produced is then used for classification.



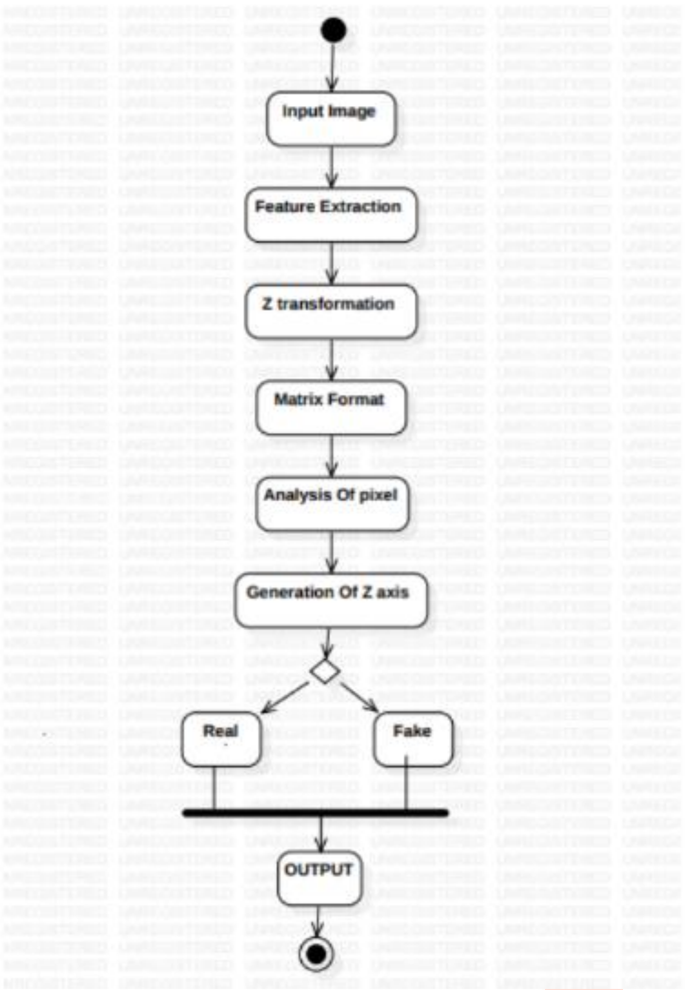
2.6.2 Block Diagram



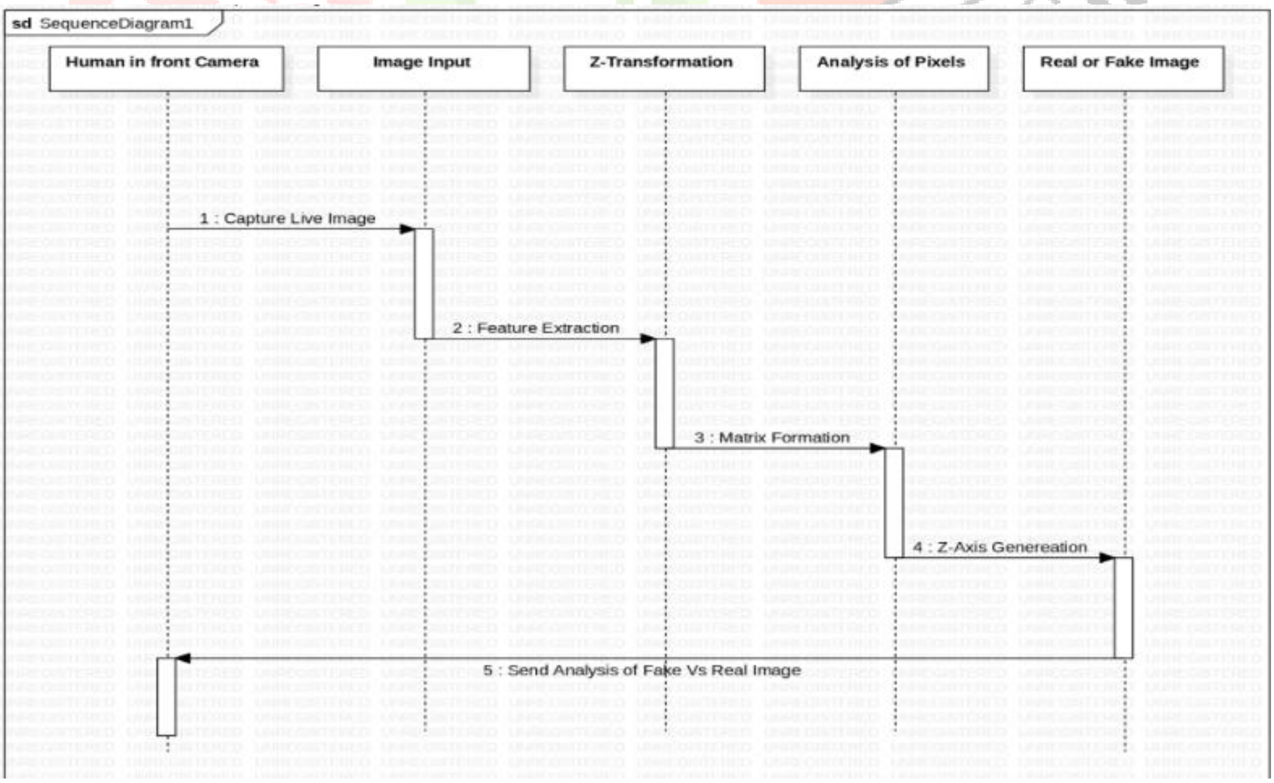
2.6.3 Use Case Diagram



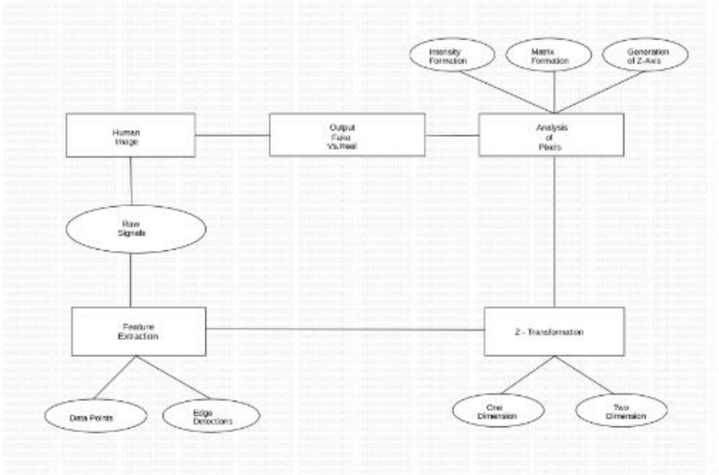
2.6.4 Activity Diagram



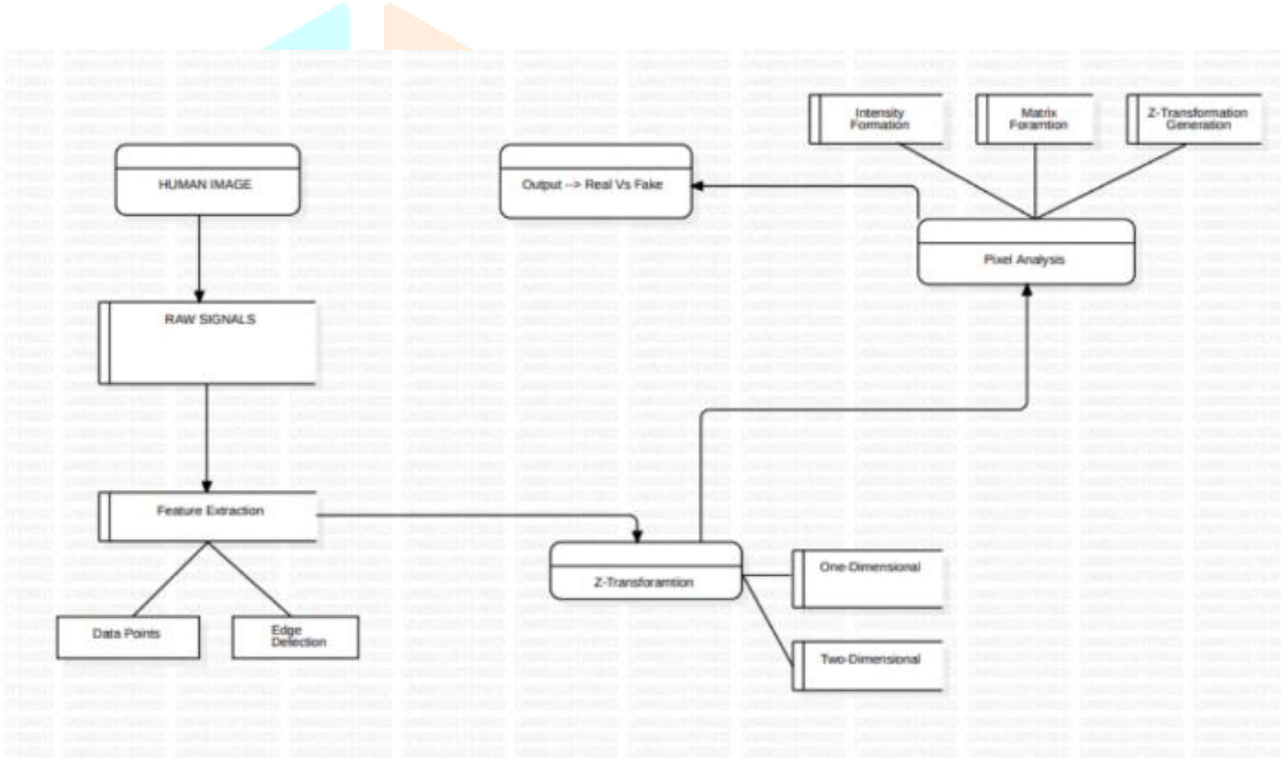
2.6.5 Sequence Diagram



2.6.6 ER Diagram



2.6.7 Data flow Diagram (DFD)

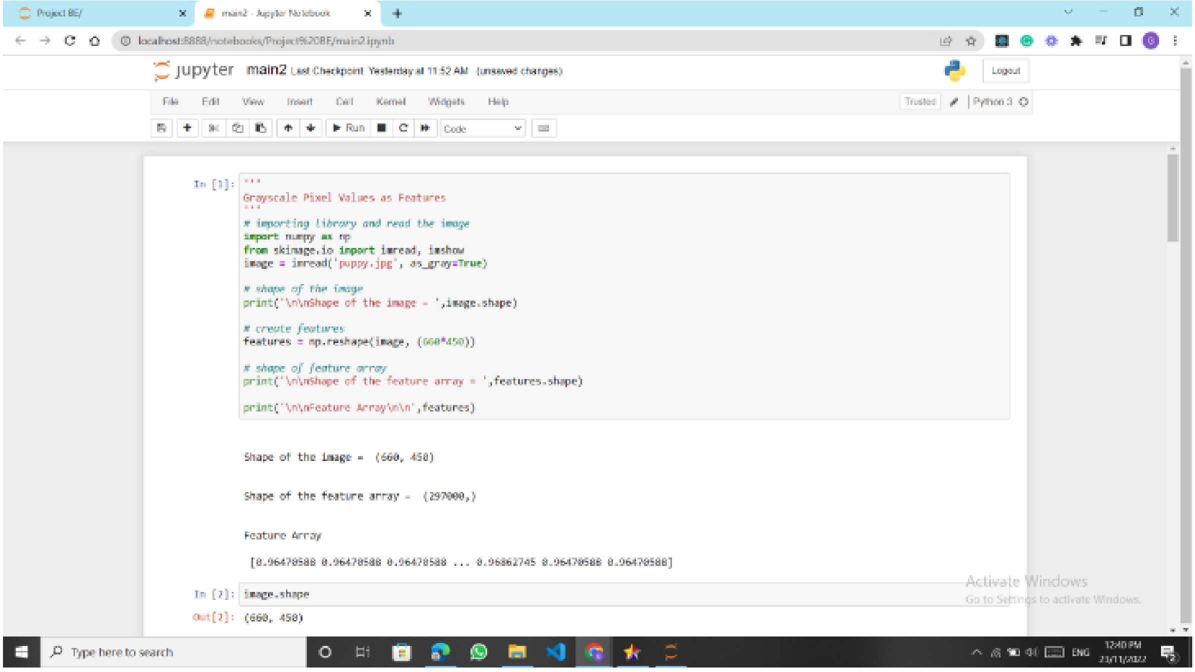


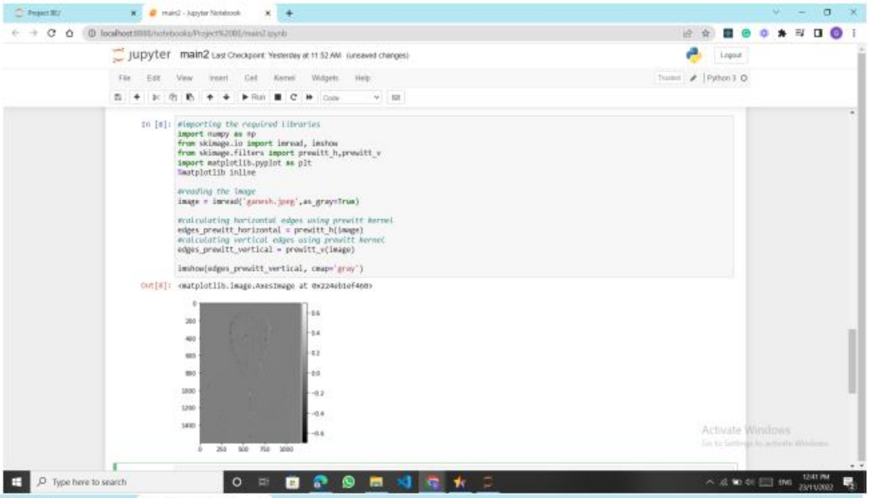
3. Implementation and Results

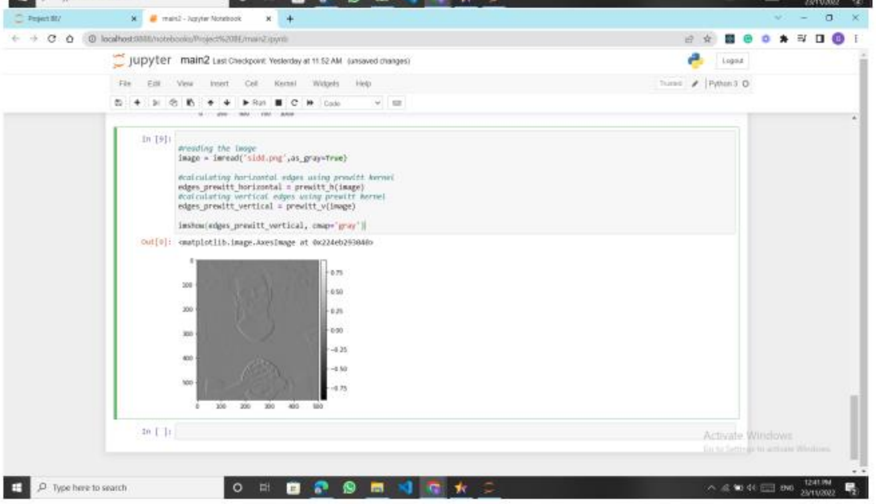
3.1 Implementation Details

3.1.1 Feature Extraction

The process typically involves several steps, including acquiring an image, choosing a preferred color space, enhancing the image quality, segmenting the image, and extracting features for recognition. The recognition process is composed of multiple stages, such as feature extraction and dimension reduction, which aim to identify the most relevant features while rejecting irrelevant ones. The resulting feature vector forms the foundation for classification. Overall, the procedure is designed to optimize the accuracy of image recognition by carefully selecting and processing image features.

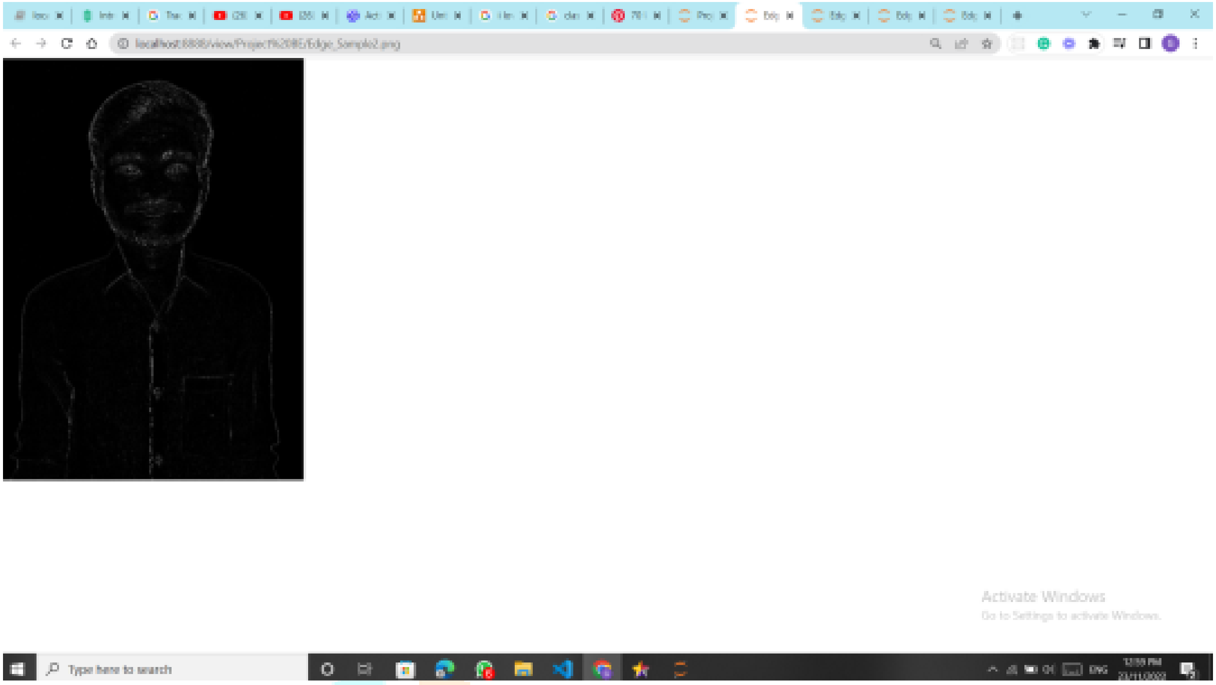






3.1.2 Edge Detection

The process for image recognition consists of several steps. These include acquiring an image, selecting a preferred color space, enhancing image quality, segmenting the image, and extracting features for recognition. The recognition process involves multiple stages, such as feature extraction and dimension reduction, which aim to identify the most relevant features and eliminate irrelevant ones. The final feature vector serves as the basis for classification. Overall, the process aims to improve image recognition accuracy by carefully selecting and processing image features.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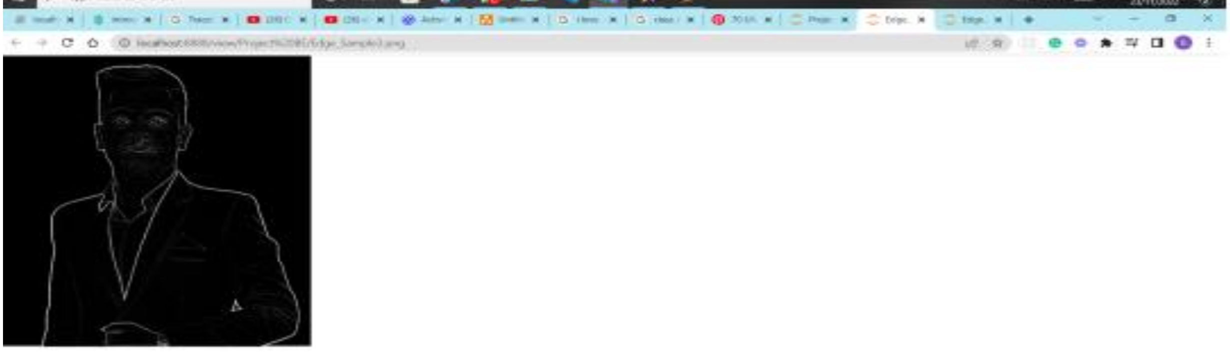

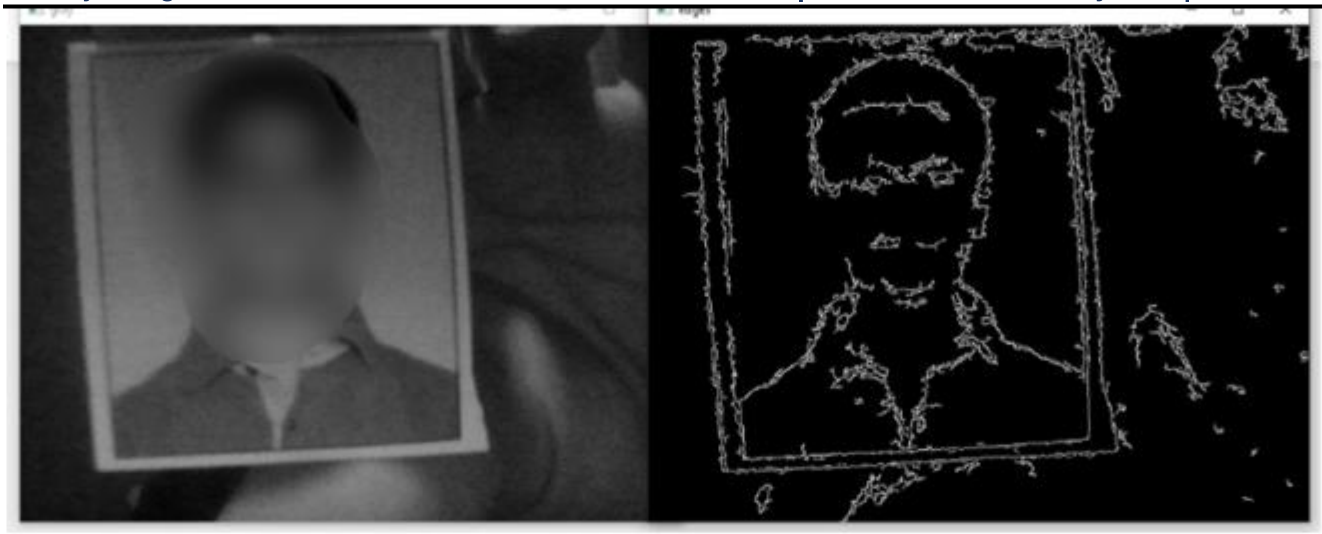

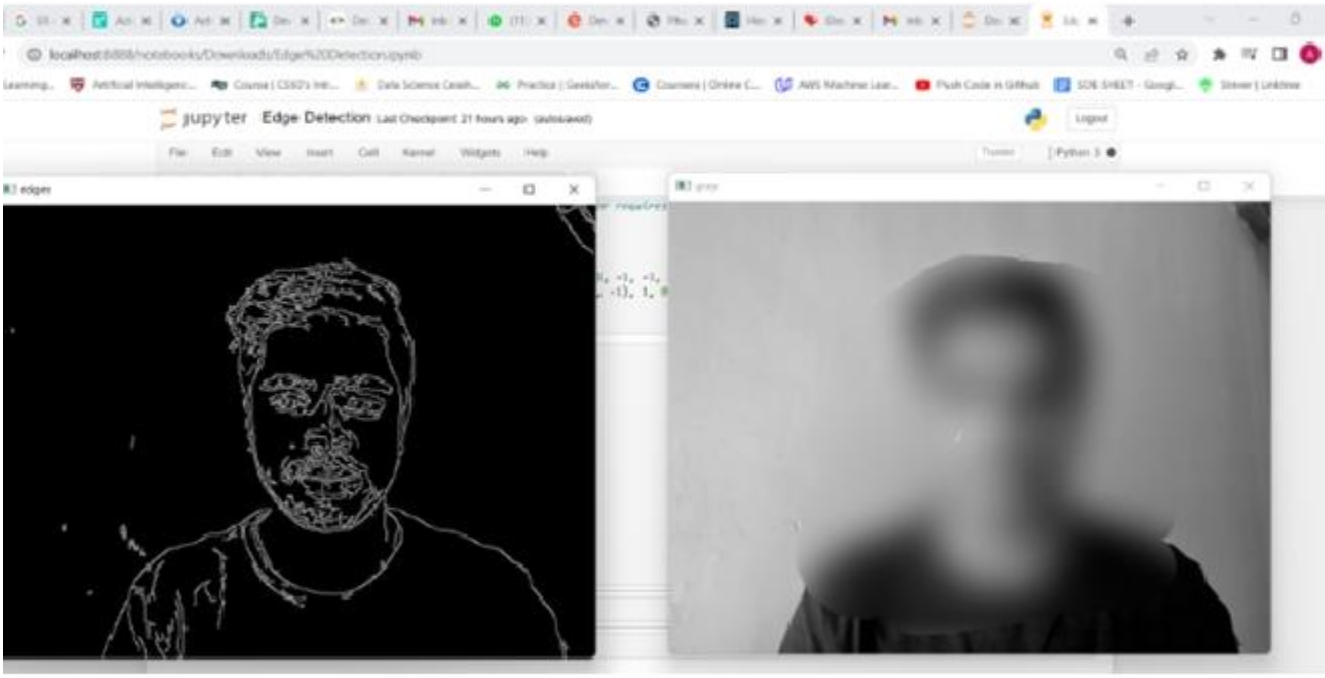
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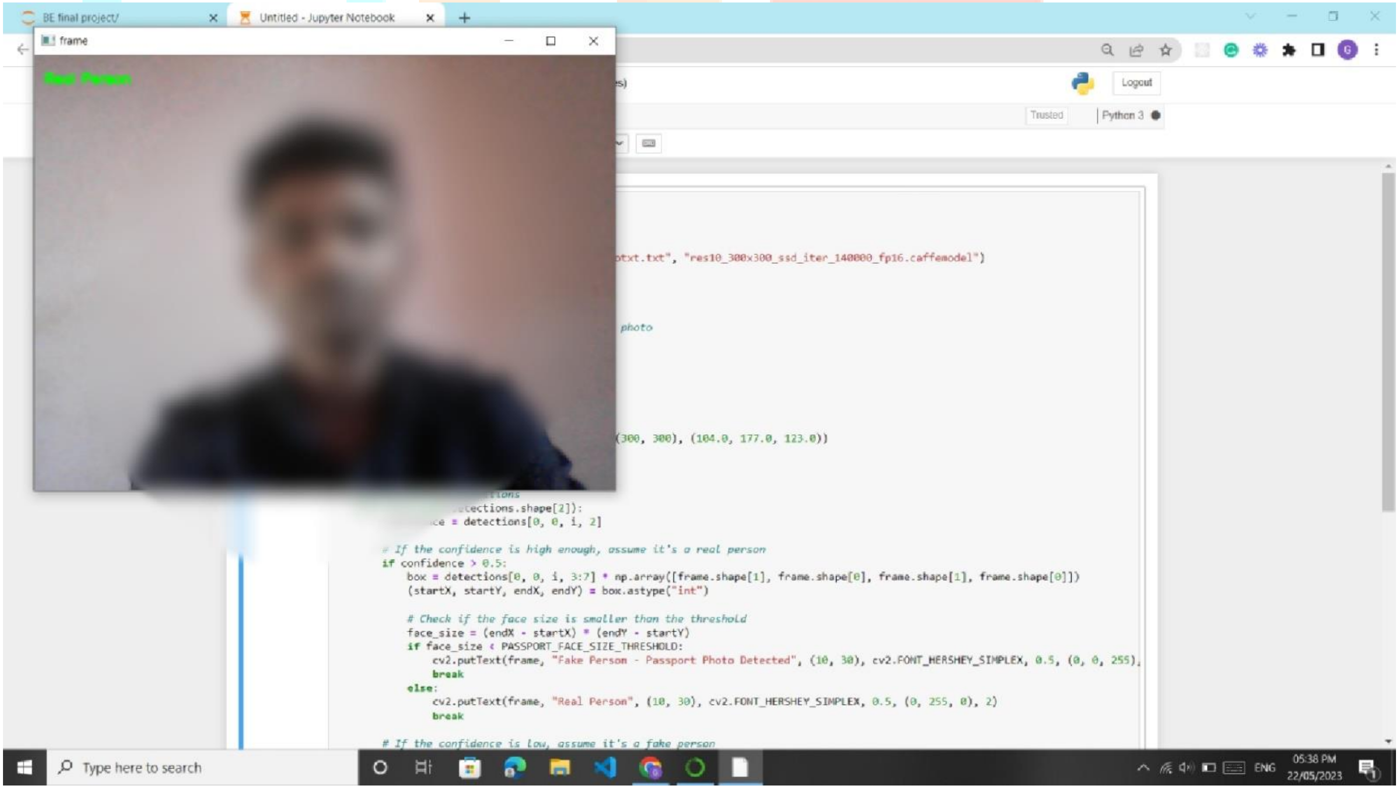
3.2 Results

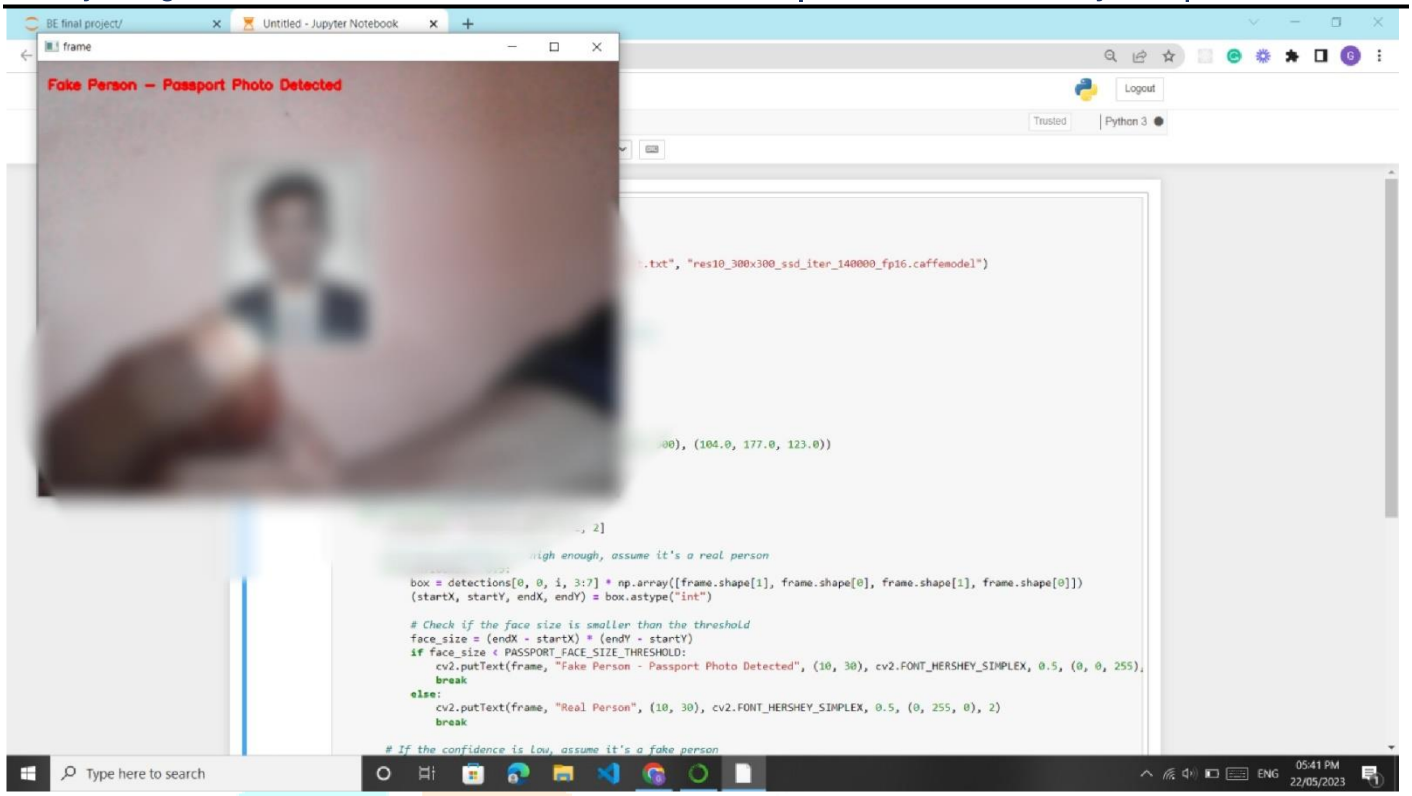
"In this project, we aimed to develop a model capable of distinguishing between real photos and photos of photos, such as passport photos. Our model achieved an accuracy of 75% on the test dataset. While this accuracy demonstrates a reasonable level of performance, there is still room for improvement.

The results indicate that our model can successfully differentiate between real photos and photo-like images with a significant level of accuracy. However, it is important to note that the remaining 25% of misclassifications might have implications for real-world applications. Further investigation and refinement of the model could potentially increase its accuracy and make it more reliable in practical scenarios.

It is worth considering that the complexity of distinguishing between real photos and photo-like images poses inherent challenges. Factors such as lighting conditions, image quality, and variations in photo manipulation techniques can affect the model's performance. Addressing these challenges through data augmentation, exploring more advanced deep learning architectures, or incorporating additional features could be potential avenues for future research.

Despite the current accuracy, our project provides a valuable foundation for further exploration into detecting manipulated or forged images. It serves as a starting point for future investigations in this domain, offering insights into the feasibility and challenges of developing models for image forensics. The findings of this project can be utilized by researchers, developers, and practitioners in the field to inform and guide future advancements in image authenticity verification."





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