Fake Currency Detection Using Deep Learning

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ABSTRACT

Fake currency is the money produced without the approval of the government, creation of it is considered as a great offence. The progression of shading printing innovation has expanded the rate of Fake currency copying notes on a large scale. Albeit electronic monetary exchanges are turning out to be more popular and the utilization of paper cash has been diminishing as of late, banknotes still remain in distribution attributable to their dependability and straight forwardness in use. Few years ago, the printing should be possible in a printing-houses, yet presently anybody can print a money paper with most extreme exactness utilizing a straightforward laser printer. As an outcome, the issue of duplicate currency rather than the authentic ones has been increases generally. India had reviled the problems like defilement and dark cash and fake of money notes is likewise a big issue to it. To handle this problem, a deep learning-based framework is proposed to identify the fake Indian currency. The MATLAB tool has been used to identify the fake currency. The outcome will classify whether the Indian currency note is Real or Fake

CHAPTER 1
INTRODUCTION

1.1 OVERVIEW:

Computers and mobile phones have become an unavoidable part of our lives. There are a lot of things which we can do with these technologies. With the rapid development of mobile phones and technologies come several services like application creation - (refers to the process of making application software for handheld and desktop devices such as personal computers and Personal Digital Assistants. Fake currency Detection is a system that can be used to overcome the limitations most of the people and our institutions of higher learning face with respect to making difference between counterfeit currencies- (is imitation currency produced without the legal sanction of the state or government, usually in a deliberate attempt to imitate that currency and so as to deceive its recipient) and real currencies. The project involves making use of Digital Image Processing Domain - Digital image processing is the use of computer algorithms to perform image processing on digital images.

This has led to the increase of corruption in our country hindering the country's growth. Some of the methods to detect fake currency are watermarking, optically variable ink, security thread, latent image, techniques like counterfeit detection pens. We hereby propose an application system for detecting fake currency where image processing is used to detect fake notes. We will find out dissimilarities between the image under consideration and the prototype. CNN classifiers will be used to detect fake currency. The proposed system for fake currency detection will be simple, accurate and easy to use.

1.2 PROBLEM STATEMENT:

In exiting and ongoing concepts of different adaptations, tests and innovations had been kept for the future due to the lack of time. Few of the major problem are:

- Speed of system is slow.
- Not able to keep track of device's location through which the currency is scanned

1.3 SIGNIFICANCE AND RELEVANCE OF WORK:

- Significance of work is thus about aiming to find some intrinsic value in one's work- related activities that make them worth doing, it is a general evaluation of "the value or worth of one's work"
- The devices to test currency's authenticity or originality are costly and take large sum for maintenance as well. System made can be easily used, maintained with low cost and low investment with more accurate results.

1.4 OBJECTIVES:

- The main objective of fake currency detection project is to detect fake currency using deep convolutional neural network.
- To provide cheaper and accurate system to the user, which can be easily accessible and give accurate results.
- To develop a user-friendly application for currency recognition system. • To make it available for common people quicky and easily with low cost.

1.5 METHODOLOGY:

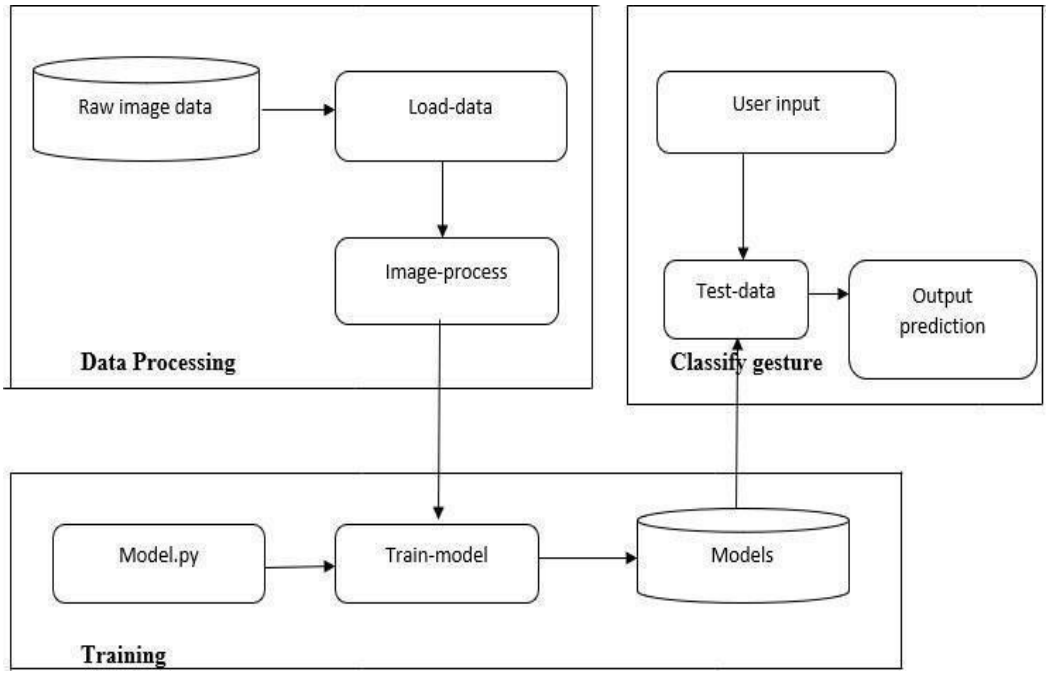


Figure 1.1: Methodology

Common split sizes for training and testing sets include 66:6%33:3%, 75%=25%, and 90%=10%, respectively. (Figure 1.2):

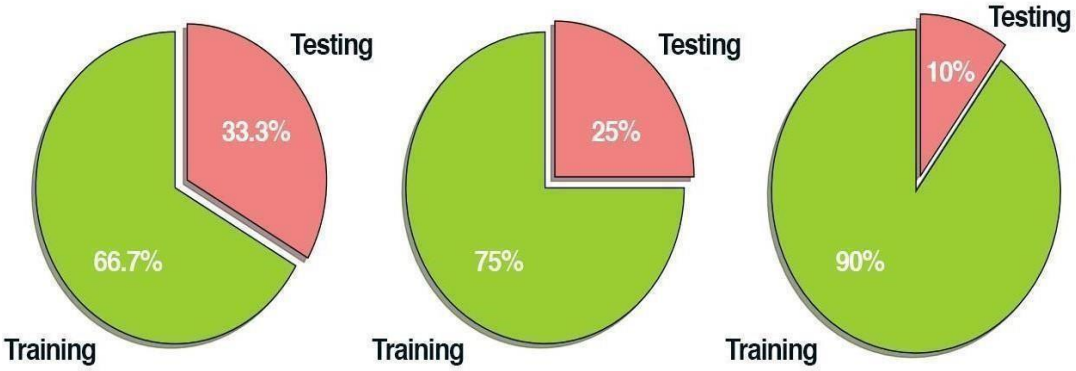


Figure 1.2: Examples of common training and testing data splits.

These data splits make sense, but what if you have parameters to tune? Neural networks have a number of knobs and levers (ex., learning rate, decay, regularization, etc.) that need to be tuned and dialed to obtain optimal performance.

We'll call these types of parameters hyperparameters, and it's critical that they get set properly. In practice, we need to test a bunch of these hyperparameters and identify the set of parameters that works the best. You might be tempted to use your testing data to tweak these values, but again, this is a major no-no! The test set is only used in

evaluating the performance of your network. Instead, you should create a third data split called the validation set. This set of the data (normally) comes from the training data and is used as "fake test data" so we can tune our hyperparameters. Only after have we determined the hyperparameter values using the validation set do we move on to collecting final accuracy results in the testing data. We normally allocate roughly 10-20% of the training data for validation. If splitting your data into chunks sounds complicrated, it's actually not.

Pre-processing

The primary target is to improve image highlights needed for additional processing. Here, the input image is converted into grayscale image for all the further preprocessing purposes. The image is then thresholded and further erosion and dilation is applied to the thresholded image. This image is used to extract the contours and extreme points.

CHAPTER 2

LITERATURE SURVEY

1.1 Counterfeit currency detection using deep convolutional neural network (2019) presented by Prof Kiran Kamble, Anuthi Bhansali, Pranali Satalgaonkar, Shruthi Alagundgi

In this relevant paper, many recognition techniques are implemented to recognize images, recognize faces, recognize car license plates, and recognize human behaviours. Currency is the primary average for circulation, and Various countries' currencies have different qualities. However, when the value of currency grows, there will be an increase in counterfeit currency. Counterfeit money might damage these nations' interests. As a result, one of the hottest subjects and a critical issue at the moment is how to use recognition technology to the genuine of money (Zhang, 2018). Visual examination was used in the past to identify and genuine money, particularly currency notes. Our eyesight cannot sense everything; sometimes, it is not easy for humans to distinguish genuine currency from auth genuine entice currency without the aid of technology.

Disadvantages

- Consumes more time to produce output
- Consumes more space

1.2 Fake currency Detection using Basic Python Programming and Web Framework (2020) presented by Prof Chetan More, Monu Kumar, Rupesh Chandra, Raushan Singh

Currency duplication also known as counterfeit currency is a vulnerable threat on economy. Although fake currency is being printed with precision, the Crime Investigation Department (CID) says that they can be detected with some effort. Currency printed by local racketeers can be detected easily as they use the photographic method, hand engraved blocks, lithographic processes and computer colour scanning. In counterfeit notes, the watermark is made by using opaque ink, painting with white solution, stamping with a dye engraved with the picture of Development of an analytic tool for software-based vehicle condition analysis for resales.

Mahatma Gandhi. Tourists are the most vulnerable people to fake currencies, because they don't know the proper and precise way of finding the difference between fake and real currencies note. So automatic identification of currencies using image processing technique will be helpful to these peoples.it is also be useful at other workplaces. . The system designed to check the Indian currency note with denominations 10, 20, 50, 100, 200, 500 and 2000. It will pre-process the digital pictures and organize the prepared arrangement of information and it will distinguish in

monetary forms. This paper proposes a convenient and cheapest method for identifying Indian currencies. At the end of the process user can know whether the currency note is fake or real and its equivalent currency value into more than 150 counties

Disadvantages

- Flask web frameworks are more complex
- high maintenance cost

1.3 Identification of fake notes and denomination recognition presented by Archana MR, Kalpitha C P, Prajwal S K, Pratiksha N

Image processing is a rapidly growing area of research with application to various aspects of business. Image processing is used to convert an image to digital as well as to obtain certain types of information from the same. The image processing and processing modes include analog and digital image processing. Digital image processing techniques helps to manipulate digital images with computers. The system uses computer algorithms for image processing which is better than analog processing and prevents various processing problems such as noise and signal distortion that provides more complex algorithms and implementation of methods that are not possible in analog design. Currency is used as the medium of exchange for goods and services. Human error is a huge concern in cases where large amounts of cash transactions are conducted, leading to a push for increase in

CHAPTER 3

SYSTEM REQUIREMENTS AND SPECIFICATION

3.1 SYSTEM REQUIREMENT SPECIFICATION

System Requirement Specification is a fundamental document, which forms the foundation of the software development process. It not only lists the requirements of a system but also has a description of its major feature. An SRS is basically an organization's understanding (in writing) of a customer or potential client's system requirements and dependencies at a particular point in time (usually) prior to any actual design or development work. It's a two- way insurance policy that assures that both the client and the organization understand the other's requirements from that perspective at a given point in time. The SRS also functions as a blueprint for completing a project with as little cost growth as possible. The SRS is often referred to as the "parent" document because all subsequent project management documents, such as design specifications, statements of work, software architecture specifications, testing and validation plans, and documentation plans, are related to it. It is important to note that an SRS contains functional and non-functional requirements only.
It doesn't offer design suggestions, possible solutions to technology or business issues, or any other information other than what the development team understands the customer's system requirements.

3.1.1 Hardware Specification

- Processor: intel core i3 or above
- Processor speed: 500Mhz or above
- RAM: 4GB or above

3.1.2 Software Requirement

- Python
- Python IDLE

Software Libraries Required

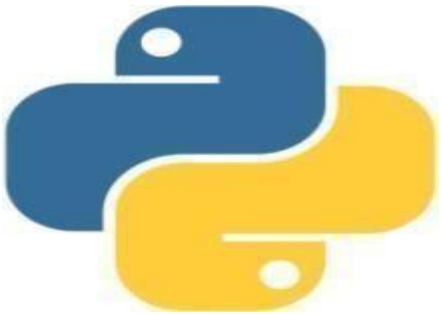
- OpenCV
- Imutils
- Numpy
- Keras
- Tensorflow
- Pillow
- Tkinter

Software Specification:

Python

Python is an interpreted high-level general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant indentation. Its language constructs as well as its object- oriented approach aim to help programmers write clear, logical code for small and large- scale projects.

Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly, procedural),object- oriented and functional programming. Python is often described as a “batteries included” language due to its comparative standard library

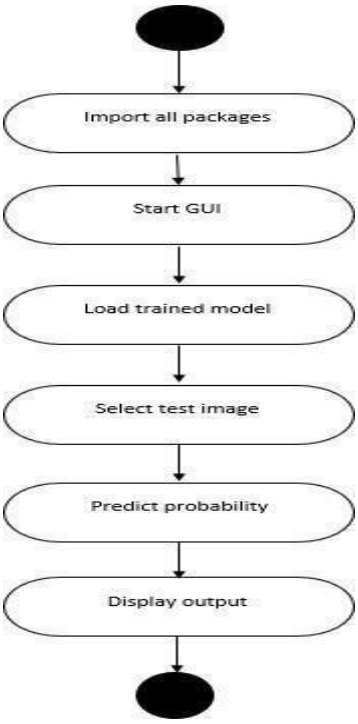


Python Idle

Every Python installation comes with an Integrated Development and Learnin

CHAPTER 5

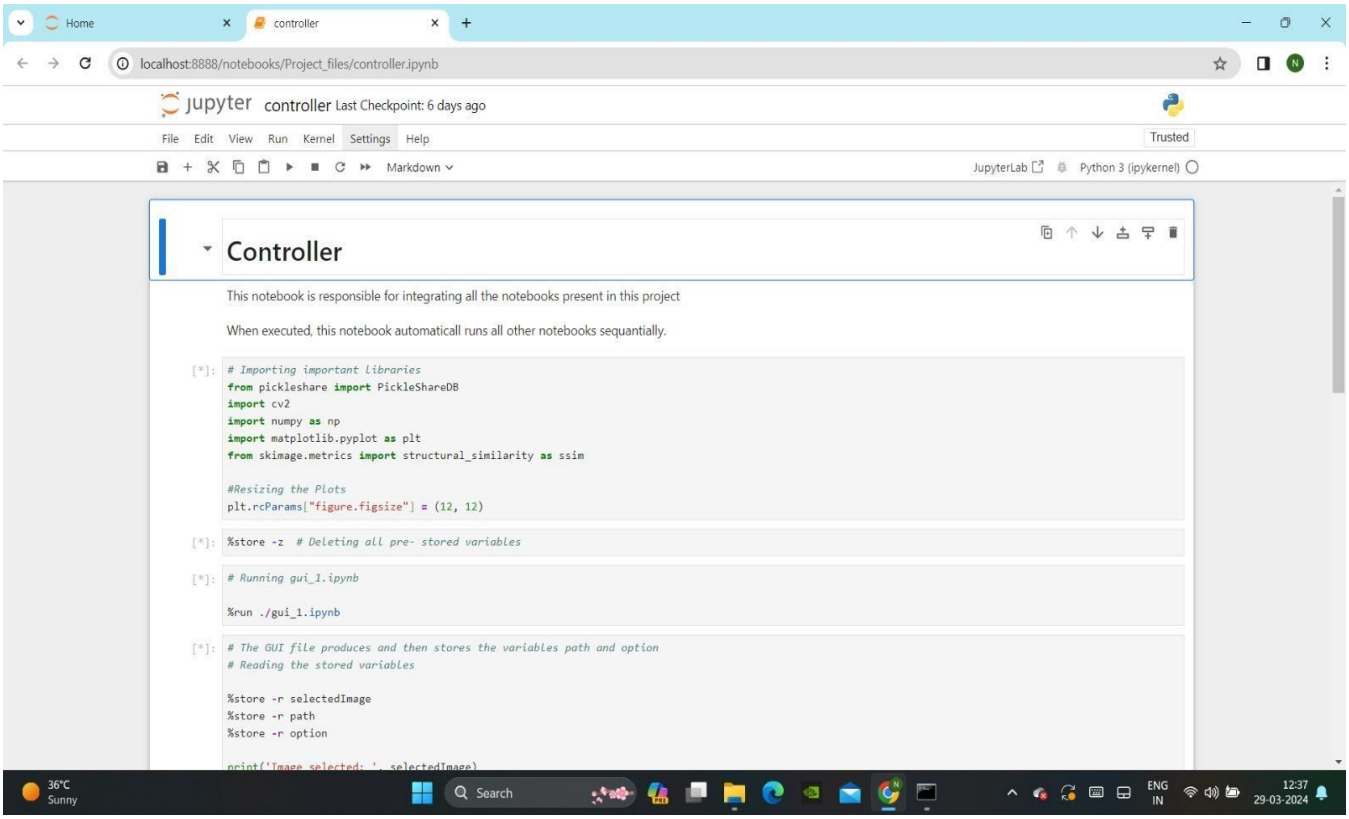
SYSTEM DESIGN

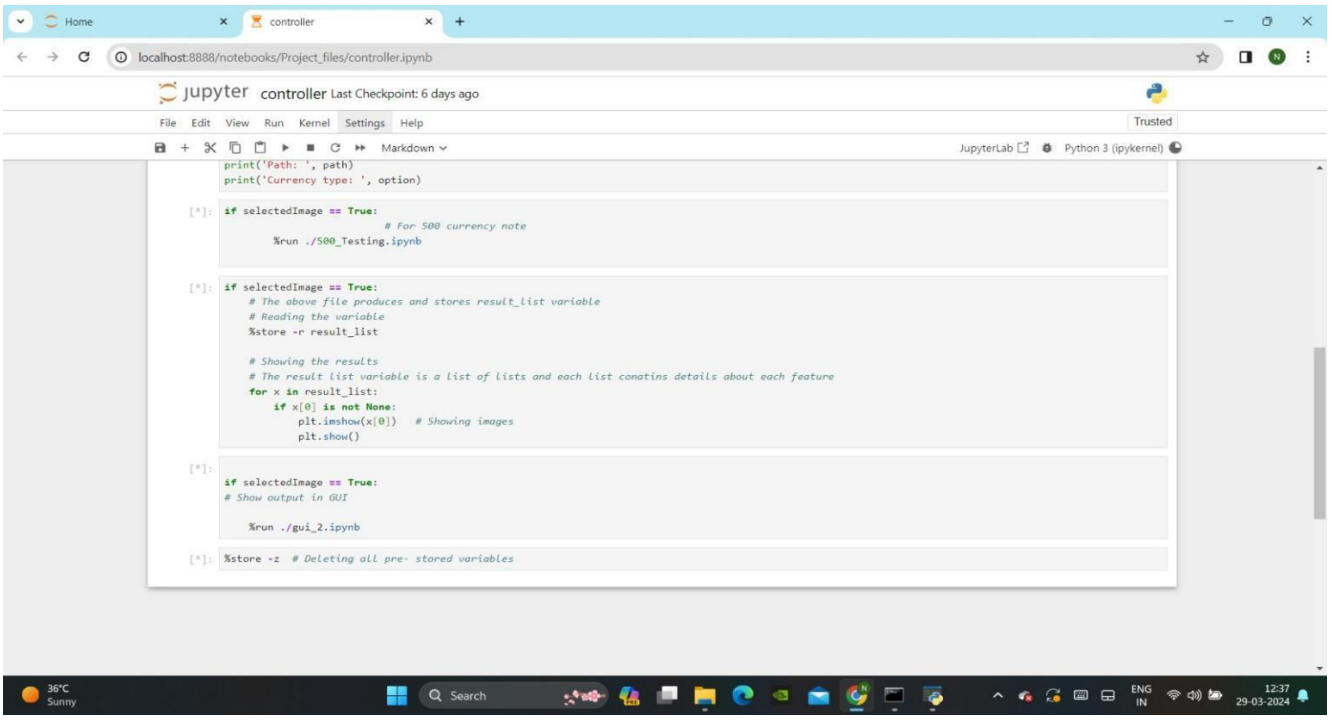


1.1 ACTIVITY DIAGRAM:

Figure 5.1: Activity diagram

We use **Activity Diagrams** to illustrate the flow of control in a system and refer to the steps involved in the execution of a use case. We model sequential and concurrent activities using activity diagrams. So, we basically depict workflows visually using an activity diagram. An activity diagram focuses on condition of flow and the sequence in which it happens. We describe or depict what causes a particular event using an activity diagram. UML models basically three types of diagrams, namely, structure diagrams, interaction diagrams, and behaviour diagrams. An activity diagram is a **behavioural diagram** i.e., it depicts the behaviour of a system. An activity diagram portrays the control flow from a sta **CODE SCREENSHOTS**





CHAPTER 7
TESTING

7.1 METHODS OF TESTING

Software testing is an examination that is carried out to offer information to stakeholders regarding the quality of the product or service being tested. Software testing can also give a corporation with an objective, unbiased picture of the software, allowing them to grasp and comprehend the risks associated with software implementation. The process of executing a programme or application with the goal of detecting software bugs is known as testing (errors or other defects). Software testing involves the execution of a software component or system component to evaluate one or more properties of interest. In general, these properties indicate the extent to which the component or system under test:

meets the requirements that guided its design and development,

- responds correctly to all kinds of inputs.
- performs its functions within an acceptable time.
- Is sufficiently usable.
- can be installed and run in its intended environments
- Achieves the general result its stakeholder's desire.

The testing steps are:

- Unit Testing.
- Validation Testing.
- Integration Testing.
- User Acceptance Testing.
- Output Testing

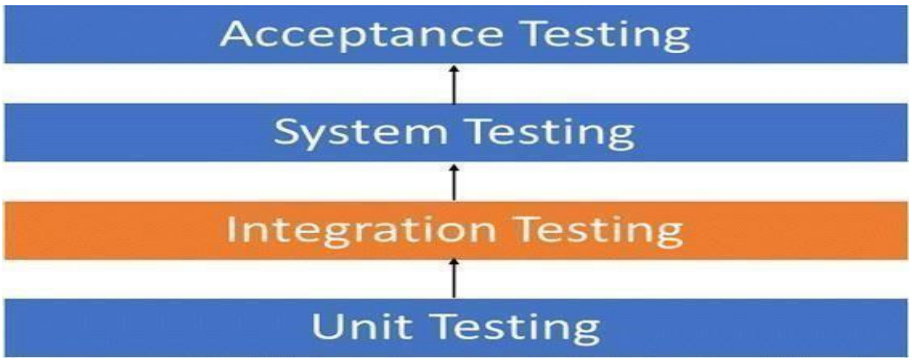


Figure 7.1: Testing

7.1.1 UNIT TESING

Individual units or components of software are tested in unit testing, which is a sort of software testing. The goal is to ensure that each unit of software code works as intended. Unit Testing is done during the development (coding phase) of an application by the developers. Unit tests are used to isolate a part of code and ensure that it is correct. A singular function, method, procedure, module, or object might be considered a unit. Unit testing is the first step in the testing process before moving on to integration testing.

Because software developers sometimes want to save time by doing limited unit testing, this is a misconception because insufficient unit testing leads to large costs in defect correction during System Testing, Integration Testing, and even Beta Testing after the programme has been constructed. It saves time if proper unit testing is done early in the development process.

Table 7.1: Unit testing

Function Name	**Tests Results**
Load the model file	Insert the trained model file to the code

CHAPTER 9

CONCLUSION

Since the monetary property highlights are discovered layer by layer, the discovery precision is often great. We've looked at the whole image of money so far, but in the future, we'll try to include all of the security features of money by using a fair fundamental structure and providing sufficient preparation information. Furthermore, clamour may be present in the captured image, which must be taken into account as a pre- handling step in the money location procedure. It is also possible to achieve recognition and phoney money recognition by using examples of cash surface as highlights for enhancing the finding precision.

As a result, the various strategies presented in this research were effectively implemented and tested by experiments on the model. Using the modules, CNN was shown to be the optimal feature for performing the approach. By doing model classification, we were able to attain a 95% accuracy rate. In addition, the detection of coins works effectively in this manner.

FUTURE ENHANCEMENT

CHAPTER 10

FUTURE ENHANCEMENT

Technology is advancing at a rapid pace these days. The proposed technique can be used to detect coins as well as recognise phoney currencies. Other countries' currencies can be added, and a comparison between them can be made. When a picture is loaded into the training folder from the outside, it does not provide 100 percent accuracy. By optimising the system, we can solve this problem.

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APPENDIX

Appendix : Abbreviation

CNN: Convolutional Neural network VGG: Visual Geometry group ReLU: Rectifier Activation function MATLAB: Matrix Laboratory
IDE: Integrated Development Environment REPL: Read-Eval-Print Loop
GUI: Graphical user interface