Management of Student Card with Interface Detection and Identification by Applying Deep Learning and Python Programming Language

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ABSTRACT:

All educational institutions have certain means for student's identity. For security and safety purposes, it is necessary for all educational institutions that there must be some way for detection of the student and identification. Student identification card is a vital potential of identification for each and every student. For this concern, we developed a system that is able to detect the presence of student card with every single student that enters their respective institutes. Also, through this system we are making the students in our society aware of the basic academic rules and regulations, and also making them follow the rules of their respective institute. We are basically creating a system that has the ability to check the availability of student card with every student coming in the institute for attending classes. This system would be efficient enough to judge whether the card is of that respective institute or not, using some specific Quick Responsive (QR) code or the basic card interface.

KEYWORDS: Student card, card detection, card identification, quick responsive (QR) code

1 INTRODUCTION

1.1 Motivation

In this modern era, all academic institutions need certain ways to ensure safety and security of students because not only the technology has advanced with time, but also terrorism, crime and risks of brutality has also been increased. There are multiple reasons for the increase of fear of terrorism but that is not the domain of our project research, so that's why we are not discussing them here.

We are here to introduce our project. The main reason for developing a system that could be able to check, detect and identify the availability of student identification cards is to ensure security of institutions.

1.2 Aims and Objectives

1.2.1 Implementation of Rules and Regulations

Rules and Regulations are part of the code of ethics of every institute. Their importance is undeniable for any person. Still, it becomes difficult for institutes to maintain rules and make students implement on them. Our system will be helpful as it will bring sense and responsibility in students that student card is a must and if any student does not wear it, he/she cannot enter the premises of their institute.

1.2.2 Security Purposes

A college ought to be a protected haven for each college students and their parents, however there can be no denying that many campuses throughout the world have skilled violent assaults in current ye ars. Protecting students, college and residents of the place need to be the pinnacle precedence for any university, which is why campus safety structures are extra necess ary now than ever before.

Here are our five reasons as to why it is crucial for a university to have campus security:

1. **Relieves the issues of mother and father and incoming college students**

Safety is, and has usually been, a wide variety one issue when selecting a college. Campus protection is an essential problem today, and it's essential for campuses to have the imperative safety in location to proactively forestall any crimes from occurring, as nicely as giving absolutely everyone a feel of security. If the college has a stable safety device in vicinity that has verified to work for many years, a dad or mum is extra in all likelihood to have faith the employer and be at ease with their infant going away to that unique university. This now not solely helps the university's image, however additionally helps the mother and father and college students experience secure.

2. **Helps forestall violence of all types.**

With protection structures in place, a college can stop all types of violence on campus. Violence and sexual harassment that some college students unluckily fall sufferer to predominantly take region late at night time in places that are no longer well-lit. Patrolling protection guards grant peace of idea and are in a position to stop such assaults, as nicely as being in a position to reply proper away to any reviews or to even give up the act as it is occurring. Not each and every college is best and there will most in all likelihood be a case of violence that breaks out on campus at some point, whether or not it be minor or serious, so it is vital to have well- educated safety that are organized for the worst, if it occurs.

3. **Manages pupil variety**

College campuses are developing greater and greater numer ous at some point of the country, which is why it is vital that any anxiety or conflicts that may additionally exist amongst the pupil phys ique does no longer boost into violence. Campus protection guards can be current at some stage in any scholar protests that happen or any different campus occasions that may additionally probably lead to violence. Having protection guards at some stage in campus creates for a protected surroundings and makes positive that college students sense blissful and protected to do as they please except any fear.

4. **Makes certain first responders are geared up**

It is not going that there will be a deadly assault on campus, however in the unlucky state of affairs in which anyone is performing in an aggravated and violent way on campus, each 2nd counts and can be the distinction between lifestyles or death. Having campus safety guards on hand to reply proper away earlier than regulation enforcement does is a massive advantage and

can assist the scenario earlier than it escalates further. Security guards additionally work with the authorities to get to the bottom of the scenario as shortly and safely as possible. All safety guards are skilled to deal with these precise conditions and can be certain to reply in a suitable and well timed manner.

5. **Addresses problems with college students**

Colleges are acknowledged for nightlife things to do and on some nights matters can get out of hand, particularly on the weekends. It is usually a desirable concept to have protection guards downtown or patrolling the perimeter or campus to deal with many of these issues, such as when alcohol, capsules or violence are involved. Having safety guards in the downtown place will restriction any point less troubles that should occur due to intoxication, as properly as stop any unsafe things to do from occurring. A university's popularity is everything, and with the proper safety structures put in area the campus will now not solely appear awesome to potential co llege students and parents, however additionally extensively minimize the possibility of troubles in the future.

1.2.3 Student card detection

This system would be efficient enough to judge or check the existence of recognized and unrecognized students by detecting their identification cards.

The system would have the ability to detect if a student is wearing the student card or not, because we will make our simulation sensitive to the wear action of student card, otherwise it would not detect student cards.

1.2.4 Card Identification

The system will be able to identify the student cards which are recommended and provided according to the institute itself. It will only detect authorized cards otherwise it would be a drawback if the system only detects cards and any student could fool the system by showing any other card. And it could cause serious risks to the security of institutions.

1.3 Research Questions

1- What could be possible drawbacks of using Student card identification software?

2- Is there any other way more appropriate than this, to ensure security in academic institutions?

3- How to overcome the detected drawbacks from question-1 by using our proposed method?

1.4 Thesis Outline

The organization of this project documentation will be as follows:

Chapter 1: We start with brief introduction about student card checking, detection and identification, motivation for research and aims and objectives of the implementation of this project.

Chapter 2: Background of the ways to represent of student card detection and identification with relation to availability of card.

Chapter 3: Analysis and designing of the card detection system. Versatile methodologies used in the process and system model.

Chapter 4: Worked Simulation and results of the experimentation. Choice of programming language and environment analysis.

Chapter 5: Conclusion.

Chapter 6: References

2 BACKGROUND

2.1 Student Card Detection

2.1.1 Features of Student Card

The student ID contains vital information such as the ***student's name, photo, and a unique number***. Student IDs can also have barcodes or smart cards for additional identification.

The goal of student ID cards is to provide an authoritative document that can quickly and easily be examined. In some instances, a person may have to inspect dozens or even hundreds of these IDs in a very short span of time. That is why the layout of the card should be clear and uncluttered, and the design should use easy-to-read fonts and appropriately sized text. The goal is to make the essential information contained on the card simple to understand and quick to comprehend regardless of who is looking at the card.

It is up to you to decide if your student ID cards need to have technology like a magnetic stripe or a barcode built in. If students won't be suing the cards to open doors or gain entry to the cafeteria, it might not be necessary. But the benefits of linking a card to a broader technical system are significant, and they solve a lot of common problems with one simple solution. As you are evaluating your needs, investigate the total cost of this kind of technology, and be sure to think about the way your needs will evolve in the future.

2.1.2 Types of Cards

1. Credit card
2. Debit Card
3. ATM card
4. Charge card
5. Prepaid card
6. Student Identification Card
7. CNIC Card

3 SYSTEM ANALYSIS AND DESIGN

3.1 Introduction

System analysis and layout is a manner that many corporations use to assess particular commercial enterprise conditions and develop approaches to improve them thru extra best methods. Groups can also use this procedure to reshape their organization or meet enterprise objectives associated with increase and profitability. System evaluation and layout also typically emphasize how systems act, their relationships to different subsystems and the capacity of both to meet a specific aim. This frequently involves studying a system's overall performance and the fine of its output.

System analysis refers back to the process of collecting facts, decoding information, identifying troubles and the usage of the effects to suggest or broaden viable system enhancements. All through

this stage, agencies can also evaluate future enterprise wishes and how upgrades might also solution them. Device design entails the process wherein an organization, in the appropriate state of affairs, develops a newer machine or approach to complement or replace a present one. This layout and improvement cycle includes planning, analysis, layout, implementation and preservation.

3.2 Research Methodology

Traditionally, structures evaluation and layout methodologies had been used as a manual in software development. Such strategies offer shape to software program engineers of their efforts to create pleasant solutions in the actual world of data systems. This article appears at the factors that constitute a structures evaluation methodology and examines the ancient improvement of systems analysis in software improvement. It concludes with observations on the strengths and weaknesses of 4 methodologies and the country of the artwork of practice nowadays.

The steps of research methodology are following:

3.2.1 Identification of objectives

- Very important; if the correct objectives are not identified, the correct problem will not be solved!
- consult others
- use multi-disciplinary team
- may have multiple objectives
- Determine your client - usually person paying the bill!
- establish the needs of the client - sometimes difficult to establish
- identify the clients single most important objective
- choose a measure of effectiveness
- discuss the project objective with the client
- insure that the client clearly understands and agrees with the project objective

3.2.2 Quantification of objectives

- Identify and write objective function - this is a quantitative expression of the goals or objectives of the project
- objective function might take on the form F=G(X1, X2, X3, ..., Xn) where Xi's are independent variables and represent values of parameters under the control of the systems analyst
- Constraint set should be identified; the constraint set consists of equations that define the domain of feasible solutions. For example, in determining the optimum mix of corn and soybeans to plant on a 450 hectare farm, a constraint on the amount of land that can be used might be written as: Corn Hectares + Soybean Hectares <= 450.

3.2.3 Development of a system model

- most often this is the responsibility of the systems analyst or engineer
- keep in mind that the model is an abstraction of the system
- a two stage process is sometimes used:
- Model decoupling - simplifying step where system components are modeled and analyzed as subsystems. This can be helpful in better understanding the system.
- model integration - entire system is modeled (e.g., the subsystem components are integrated)
- many types of model are available for use
- the type of model chosen depends on system, the objectives, perspective (time scale) of models
- one should select the most "appropriate model" - by the end of the semester you should have a better feel for this

3.2.4 Evaluation of alternatives

- goal is to find an optimum solution

- identify alternative solutions
- gather as much information about alternative solutions as possible - may require searching the literature, obtaining technical and cost data on equipment, operation, maintenance, and other pertinent information
- perform sensitivity analysis to determine response to change in model parameters
- verification - computer code reproduces model chosen
- validation - model of system faithfully reproduces the actual system

3.2.5 Detailed design and development

- complete the design and necessary actions

3.3 System Analysis

Systems analysis is "the procedure of analyzing a technique or enterprise to pick out its aim and purposes and create structures and methods a good way to efficaciously acquire them". Some other view sees device analysis as a hassle-solving method that breaks down a system into its factor portions, and how well the ones elements work and have interaction to perform their motive.

The sector of machine analysis relates closely to necessities evaluation or to operations studies. It's also "an express formal inquiry carried out to help a decision maker discover a better route of action and make a better decision than they may otherwise have made."

Machine analysis is used in every field where something is advanced. Evaluation also can be a chain of additives that perform natural capabilities together, inclusive of gadget engineering. Machine engineering is an interdisciplinary subject of engineering that makes a specialty of how complex engineering projects need to be designed and managed.

3.3.1 Analysis of Proposed System

In our system the student would be verified by checking whether he / she is wearing the university card or not. It would tell the institution whether the student is following the institutions' rules or not. This system will create an ease for the management to implement the management rules in the institution. It will also improve the management. The security of the institution will also increase.

To achieve these aims and motives the system is built. It is done by applying simulation to the project and machine learning using python programming. First the data set is collected for the system to achieve its maximum perfection and efficiency. And this data set was labeled. After this it is trained. This enhanced the working of the proposed system.

3.3.2 Advantages of Proposed System

The most common advantage of system analysis and design is improving upon a previous system and enjoying increased operational efficiency. Here's a list of other advantages:

- → Enabling comprehension of complicated structures
- → Allowing for better management of any business changes
- → Aligning the organization with its environment and strategic priorities
- → Minimizing IT issues and reducing the workload of IT employees

- → Reducing costs in certain areas, saving the organization money and resources for use in other departments
- → Identifying potential risks and threats to the processes before they arise
- → Improving the overall quality of the system
- → Improving the usability of the system by employees
- → Increasing productivity and customer satisfaction

3.4 System Model

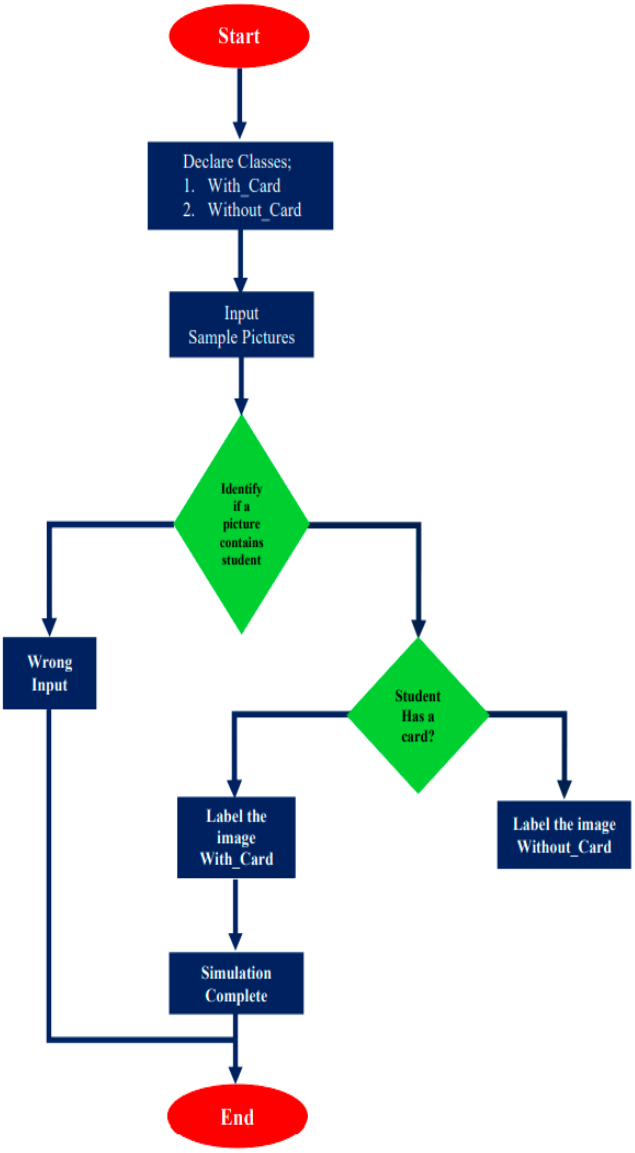

Figure 1: System Model Analysis

4 SYSTEM EXPERIMENTATION

4.1 Introduction

Experimentation is one scientific lookup method, possibly the most recognizable, in a spectrum of strategies that additionally consists of description, comparison, and modeling (see our Description, Comparison, and Modeling modules). While all of these techniques share in frequent a scientific approach, experimentation is special in that it entails the mindful manipulation of sure elements of an actual gadget and the remark of the results of that manipulation.

Dataset:

We collected **505-600** images containing students with or without cards. Some pictures were solo and some were group photos. Also, in some pictures, there were combinations of students who were or weren't wearing student cards.

Following are some of the pictures that we used for our dataset:

Figure 2: Dataset Image

Figure 3: Dataset Image

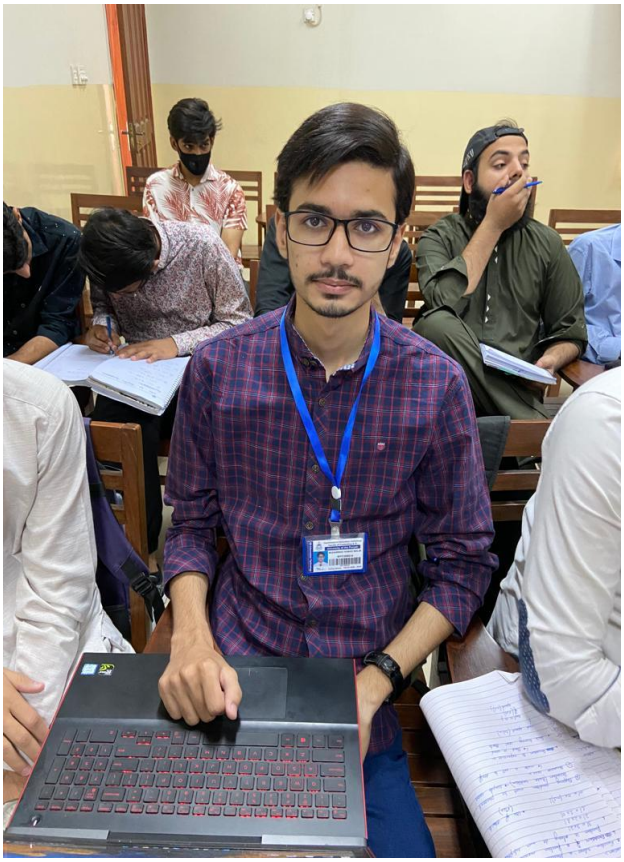

Figure 4: Dataset Image

Figure 5: Dataset Image

Figure 6: Dataset Image

Labelling:

We labeled all the 500+ images using ***Labelimg Software***. This software generated some binary code file against each image, which was necessary for training of software.

Training:

We performed the steps of training using Google Collab. The training process completed in almost 2 days. And then it showed the accuracy of the system to be ***81.4%***.

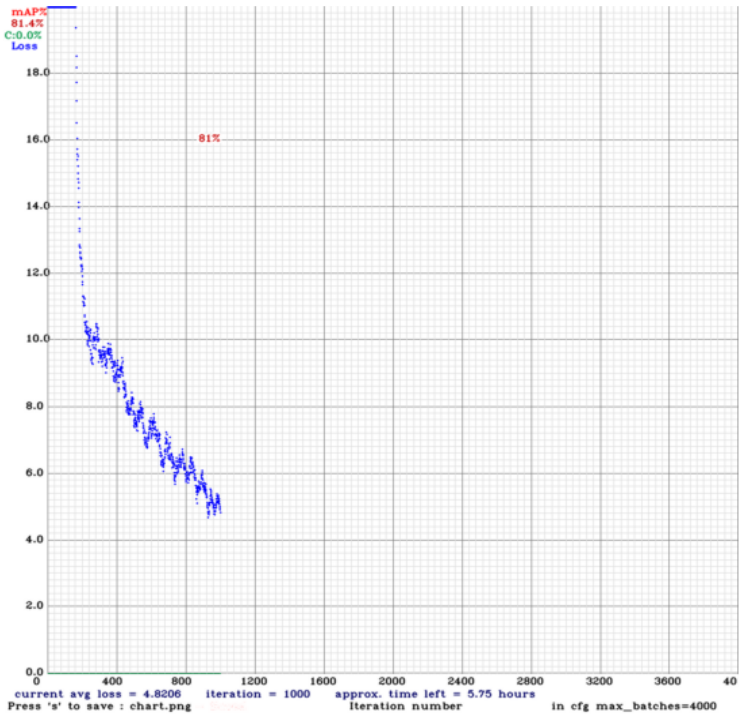

Figure 8: Mean Average Precision Chart

4.2 Choice of Programming Language

We have chosen ***Python*** for programming our system. One of the motives for the recognition of the Python programming language is its broad vary of applications. Learning a programming language, you have to understand its uses. Python's simplicity, portability, extensibility, embeddable nature, an extensive library, etc. make it desired as a preference to develop.

Let's no longer wait and take a peek into Python applications.

Applications of Python

1. Web Development

Python is broadly used in internet development. It makes use of easy code
to construct a lovely and purposeful webs ite. It has associated libraries and modules like HTTP, XML, JSON, IMAP, POP, FTP, etc. These assist in storage in databases, content material management, and interfacing with net protocols.

It additionally has frameworks built-in with it like Django, Flask, Pyramid, and Bottle.

2. Artificial Intelligence and Machine Learning

ML fashions are constructed the usage of Python. Data analysts use it too. The crucial motive for this is the availability of many equipment and libraries unique to these applications. Some of them include:

- Pandas for Data Manipulation and Analysis.
- NumPy and SciPy for mathematical computations.
- Seaborn and Matplotlib for visualization.
- Scikit learn, Tensor Flow, Keras for algorithms.

3. Game Development

- One of the fascinating functions of the Python Programming language is to construct video games like egg catcher, snake game, etc.

  Python comes with programs like Pygame and Pykyra to construct notable games.

- It allows the improvement of 3D video games with respective libraries. It is additionally used for scripting in many sport engines.

- Famous video games like Battlefield 2, World of Tanks, Toontown Online, and Civilization four are additionally cons tructed the use of Python.

4. Desktop GUI Development

Its simplicity and platform independence nature make it a top desire for GUI applications. Though Tkinter is the trendy library for GUI development, there are different aiding libraries like:

- Wx Python
- Kivy PyQt, PySide
- PyGUI

4.3 Programming Environment

Python is accessible on a huge range of structures along with Linux and Mac OS X. Let's recognize how to set up our Python environment.

Getting Python

The most up to date and cutting-edge supply code, binaries, documentation, news, etc., is reachable on the reliable internet site of Python *https://www.python.org/*
You can down load Python documentation from https://www.python.org/doc/. The documentation is reachable in HTML, PDF, and PostScript formats.

Installing

Python distribution is on hand for an extensive range of platforms.
You want to down load solely the binary code relevant for your platform and installation Python.

If the binary code for your platform is now not available, you want a C compiler to assemble the supply code manually.

Running Python

There are three one of a kind methods to begin Python.

Interactive Interpreter

You can begin Python from UNIX, DOS, or any different machine that affords you a command-line interpreter or shell window.

4.4 System Implementation

Systems implementation is a set of techniques carried out to whole the sketch (as necessary) contained in the authorized structures diagram record and to test, install, and commence to use the new or revised Information System. Figure 7.1 depicts structures implementation as the fifth main step in the improvement of an Information System.

Testing of system:

We tested our system using some different pictures and the system showed multiple Mean Average Precision (mAP) percentages.

Following are some tested images:

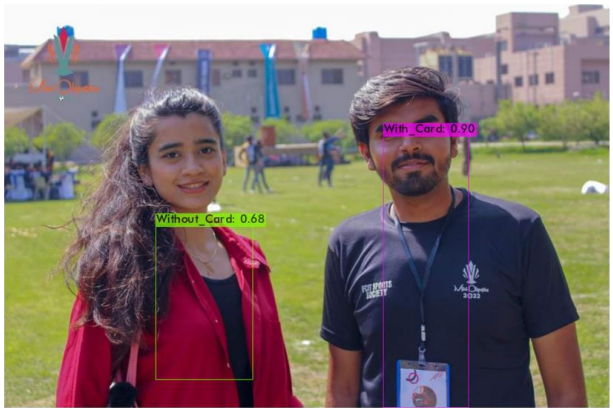

Figure 10: Tested Image

Figure 9: Tested Image:

Figure 11: Tested Image

Figure 12: Tested Image

5 CONCLUSION AND FUTURE WORK

We have an extra-ordinary project which is able to serve various academic institutes and organizations in order to maintain law and order in them.

We have tugged Yolov4 algorithms to prepare this system. It is able to create a healthy, safe sound and secure environment, and it can also make students and people responsible. The accuracy of the model is **81.4%.** We will enhance the accuracy by applying some advanced methodologies and techniques of deep learning in future. This research is also a great contribution towards Higher Education Commission (HEC) Pakistan, as it is serving educational institutes and maintaining law and order.

Limitation:

1. This system can detect the existence of student cards even from a distance.
2. It worked well even in situations where students were present in crowd or group.
3. In the vast majority of cases, it successfully detected the presence of student card wore by students who were not facing cameras.