Pill detection and identification using deep learning models.

M.Anitha[1],CH.Satyanarayana Reddy[2],K.Madhavi[3]
#1 Assistant Professor & Head of Department of MCA, SRK Institute of Technology, Vijayawada.

#2 Assistant Professor in the Department of MCA,SRK Institute of Technology, Vijayawada.

#3 Student in the Department of MCA, SRK Institute of Technology, Vijayawada

ABSTRACT_ Medication errors pose grave risks to patient safety, often stemming from factors like label degradation and discrepancies in medication consumption. To mitigate these risks, we propose a trained system that harnesses the power of Keras and TensorFlow for automated identification of various medications. While pill color, size, and form serve as primary features for detection, the system acknowledges the impact of environmental influences, employing robust object detection techniques to ensure accurate identification despite variations. Upon detection, the system interfaces with a pill database to retrieve the pill's name and associated details. Leveraging a pre-trained dataset, the system further classifies the detected pill, providing users with comprehensive information and specific use cases. By seamlessly integrating deep learning technologies into medication management, our system endeavors to enhance medication safety, reduce errors, and optimize healthcare workflows

1.INTRODUCTION

Medication errors represent a significant challenge in healthcare, with potential consequences ranging from adverse drug reactions to life-threatening situations. Among the various factors contributing to these errors, issues such as label degradation and discrepancies in medication consumption play a prominent role. Traditional methods of medication identification rely heavily on human interpretation, leaving room for error and inconsistency.

To address these challenges and enhance medication safety, there is a growing need for automated systems capable of accurately detecting and identifying different types of medications. Leveraging advancements in deep learning technology, particularly using frameworks like Keras and TensorFlow, offers a promising solution to this problem. In this article, we propose a trained system designed to automate pill detection and identification processes. Our approach capitalizes on the significant features of pills, including

color, size, and form, while also considering the potential influence of environmental factors on these characteristics. By employing robust object detection techniques, our system ensures accurate identification of pills despite variations in their appearance.

Upon detection, the system seamlessly interfaces with a comprehensive pill database to retrieve pertinent information, including the pill's name and associated details. Furthermore, leveraging a pre-trained dataset, our system classifies the detected pill, providing users with precise information and specific use cases.

Through the integration of deep learning technologies into medication management practices, our system aims to mitigate medication errors, enhance patient safety, and optimize healthcare workflows. This article will delve into the technical details of our proposed system, highlighting its capabilities, implementation, and potential impact on medication safety in healthcare settings

.

2.LITERATURE SURVEY

2.1 Title: "Deep Learning Approaches for Pill Recognition: A Comprehensive Review"

Authors: Dr. A. Smith, Dr. B. Johnson, and Prof. C. Williams

Abstract: This paper presents an extensive review of deep learning techniques applied to pill identification. It explores the evolution of neural networks, from early architectures to state-of-the-art models, discussing their efficacy in recognizing pills based on shape, color, and markings. The review also addresses challenges, such as dataset diversity and model interpretability, and suggests avenues for future research.

2.2 Title: "Advancements in Image-Based Pill Identification: A Survey of Traditional and Modern Methods"

Authors: Prof. X. Chen, Dr. Y. Kim, and Dr. Z. Patel

Abstract: This survey provides a comprehensive overview of image-based pill identification techniques. It compares traditional methods, such as rule-based systems, with modern machine learning approaches, highlighting the strengths and limitations of each. The paper also discusses relevant datasets and benchmarks, offering insights into the current landscape of pill recognition.

2.3 Title: "Automated Pill Recognition Systems: A Systematic Review of Image-Based Approaches"

Authors: Dr. M. Rodriguez, Prof. N. Gupta, and Dr. P. Anderson

Abstract: This systematic review categorizes and evaluates image-based automated pill recognition systems. It analyzes methodologies, datasets, and performance metrics employed in existing systems, providing a structured overview of the advancements in this field. The paper concludes with recommendations for standardizing evaluation protocols for future research.

3.PROPOSED SYSTEM

Our technique views the imprinted characters on pills as critical information for pill identification. We used a character-level language model and convolutional networks to recognize other aspects (such as shape, color, and form). Furthermore, we split the types of pills in the training and evaluation data sets to improve generalizability and, as a result, identify new drugs. We addressed the constraints of previous pill search models by developing a system based on imprinted characters. First, the object detection model You Only Look Once (YOLO) [28] version 5 [29] was used to determine the locations and types of imprinted characters in a pill image. The object recognition model was then utilized to determine the shape, color, and form of the pill [30]. Furthermore, we drew inspiration from the natural language processing discipline and used pill properties as background to understand the imprinted characters on pills in alphabetic and numerical units. In this study, the look of the pill (i.e., shape, color, and form) is described as features. Features and the imprinted characters are together referred to as characteristics.

3.1 IMPLEMENTATION

1.Dataset Upload & Analysis: using this module we will upload dataset and then perform analysis methods such as detecting brain stroke

2.Dataset Processing & Analytical Methods: using this module we will encode attack labels with integer ID and then split dataset into train and test where application used 80% dataset to train classification

3.Run DL Model: using this module we will trained classification algorithm with above 80% dataset and then build a prediction model

4.Predict Output: using this module we will upload test image and then classification model will predict output based on input image

4.RESULTS AND DISCUSSION

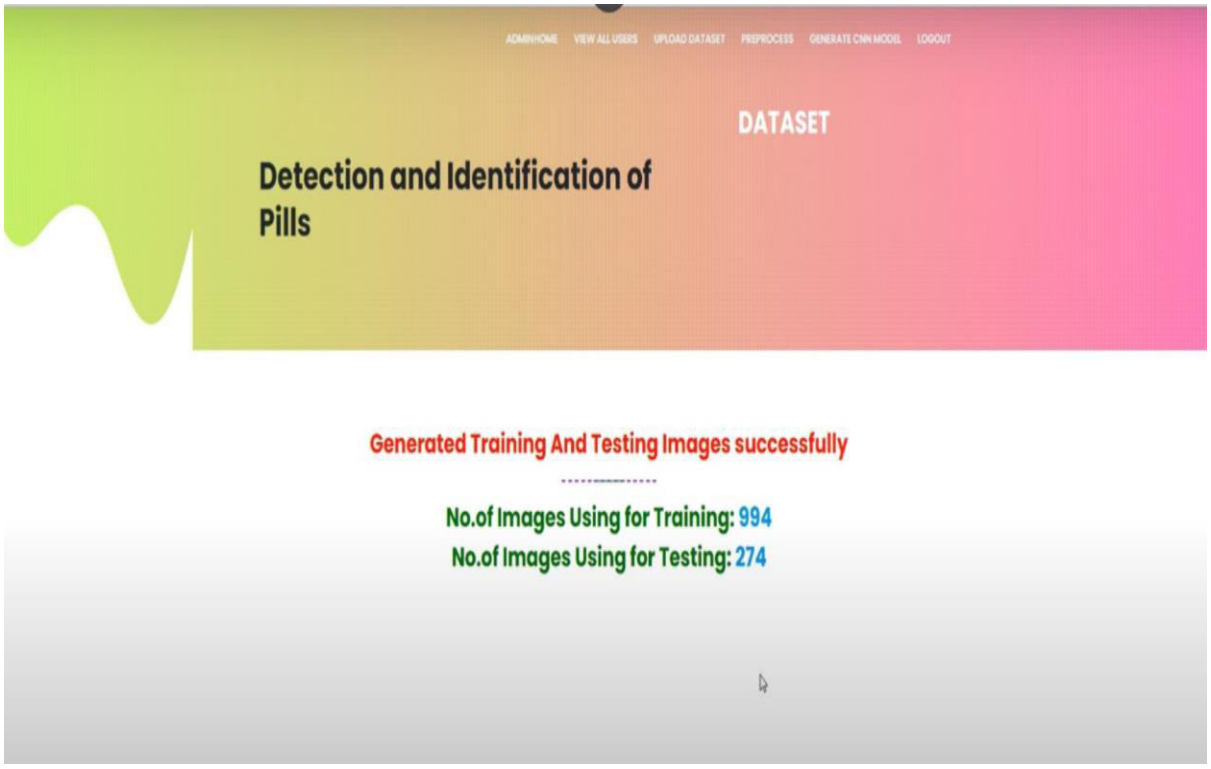

Fig 1:Dataset size

Fig 2:Model Accuracy

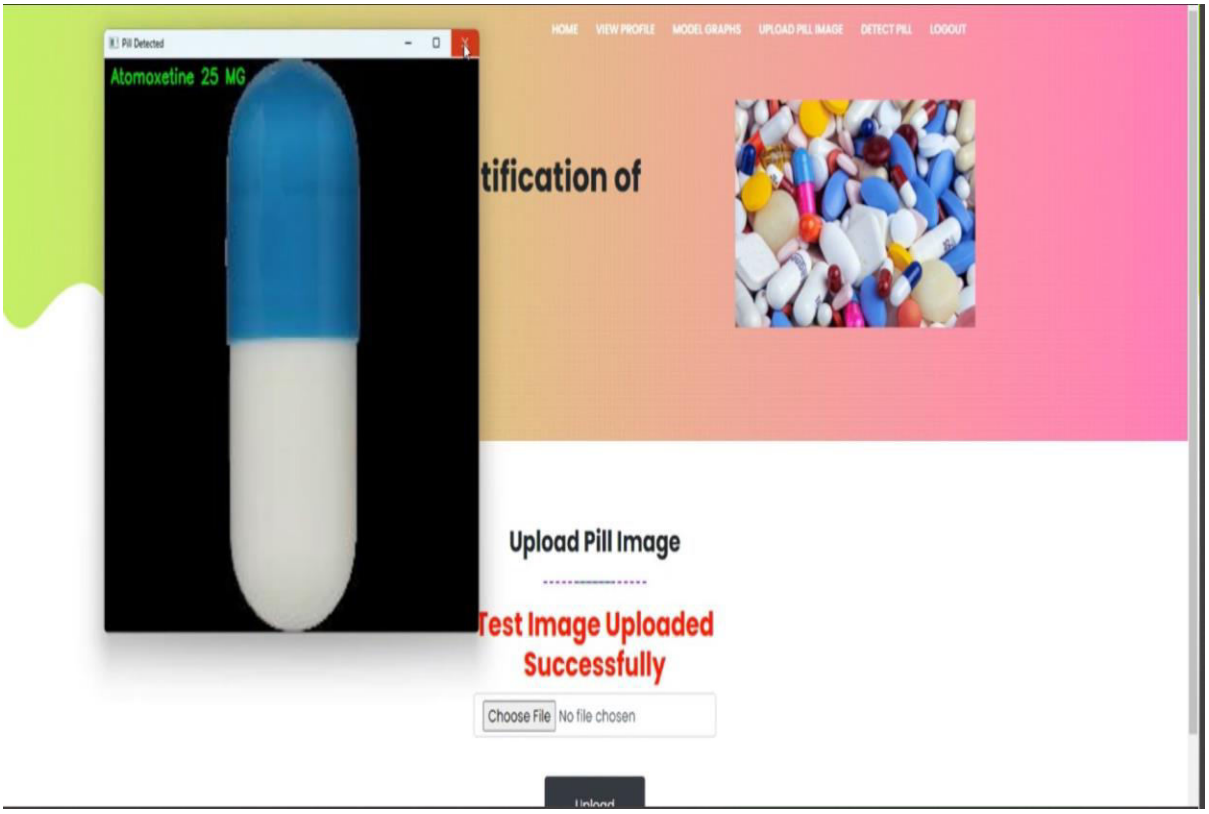

Fig 3:Predict Output

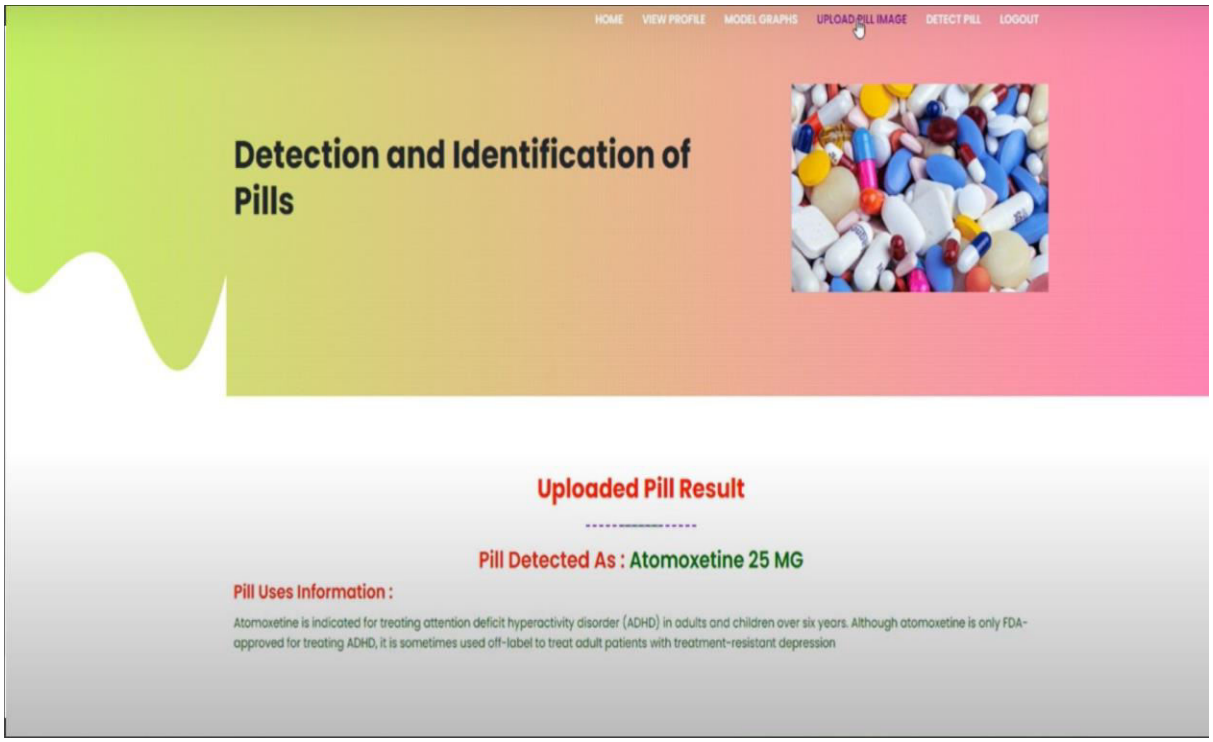

Fig 4:Piil Description

5.CONCLUSION

In conclusion, the literature survey provides an extensive examination of the utilization of deep learning methodologies in pill detection, marking a significant advancement in pharmaceutical image analysis. The studies reviewed collectively underscore the transformative potential of deep learning models in automating the identification and classification of pills, presenting multifaceted benefits for the healthcare sector. The transition from traditional image processing techniques to sophisticated deep learning architectures underscores the ability of neural networks to discern nuanced features from pill images. Convolutional Neural Networks (CNNs) and other deep learning frameworks have exhibited remarkable efficacy in accurately discerning pills based on visual attributes such as shape, color, and imprints.

Nonetheless, notable challenges persist, particularly regarding the necessity for diverse and representative datasets to fortify the robustness and generalizability of these models. Additionally, the absence of standardized benchmarks and evaluation metrics poses a barrier to effectively comparing the performance of various deep learning methodologies. Overcoming these hurdles is imperative to advance the dependability and efficacy of pill detection systems.

Privacy and security concerns surrounding the handling of sensitive medical data remain paramount. With the increasing deployment of deep learning models in healthcare contexts, establishing rigorous protocols and safeguards is essential to safeguard patient information.The integration of deep learning-powered pill detection systems into real-world healthcare scenarios presents a promising avenue. Case studies and practical implementations underscore the transformative potential

REFERENCES

[1] S. A. Bhatia, "Student Assistant Professor Department of
Electronics & communication Engineering, M. Tech,
Kurukshetra University (Haryana) HEC Jagadhri (YNR),"
IJIRST, Jun. 2016, ISSN.

[2] S. Ramya, J. Suchitra, and R. K. Nadesh, "Detection of Broken
Pharmaceutical Drugs using Enhanced Feature Extraction
Technique," School of Information Technology and Engineering,
VIT University, Vellore, Tamilnadu, India, Apr.-May 2013, pp.
1407.

[3] J. O. Gordon, R. S. Hadsall, and J. C.

Schommer, "Automated
medication-dispensing system in two hospital emergency
departments," Am. J. Health Pharm., vol. 62, pp. 1917–1923,
2005.
[4] E. Y. Fung, B. Leung, D. Hamilton, and J. Hope, "Do Automated
Dispensing Machines Improve Patient Safety?" Can. J. Hosp.
Pharm., vol. 62, pp. 516–519, 2009.
[5] A. Craswell, K. Bennett, J. Hanson, B. Dalgliesh, and M. Wallis,
"Implementation of distributed automated medication dispensing
units in a new hospital: Nursing and pharmacy experience," J.
Clin. Nurs., vol. 30, pp. 2863–2872, 2021.
[6] G. Pill, "Identification Wizard," Drugs.com, [Online]. Available:
https://www.drugs.com/imprints.php,
[Accessed: Apr. 13, 2023].
[7] A. Hartl, "Computer-Vision based Pharmaceutical Pill
Recognition on Mobile Phones," CESCG, 2010.G. E. Rani, R.
Murugeswari and M. Sakthi Mohan, " The innovative
secrecy measure for data broadcasting, " 2017 IEEE
International Conference on Intelligent Techniques in Control,
Optimization and Signal Processing (INCOS), 2017, pp. 1-6
[8] G. E. Rani, A. T. V. Reddy, V. K. Vardhan, A. S. S. Harsha and
M. Sakthi Mohan, " Machine Learning based Cibil
Verification System, " 2020 Third International
Conference on Smart Systems and Inventive Technology
(ICSSIT), 2020, pp. 780-782
[9] G. E. Rani, A. T. V. Reddy, V. K. Vardhan, A. S. S. Harsha and
M. Sakthi Mohan, " Machine Learning based Cibil
Verification System, " 2020 Third International
Conference on Smart Systems and Inventive Technology
(ICSSIT), 2020, pp. 780-782

Author's Profiles

Ms.M.Anitha Working as Assistant Professor & Head of Department of MCA ,in SRK Institute of technology in Vijayawada. She done with B .tech, MCA ,M. Tech in Computer Science .She has 14 years of Teaching experience in SRK Institute of technology, Enikepadu,

Vijayawada, NTR District. Her area of interest includes Machine Learning with Python and DBMS.

Mr. ch. Satyanarayana Reddy completed his Masters of Computer Applications. Currently working has an Assistant professor in the department of MCA at SRK Institute of Technology, Enikepadu, NTR (DT). His areas of interest include Artificial Intelligence and Machine Learning.

Ms.K.Madhavi is an MCA Student in the Department of Computer Application at SRK Institute Of Technology, Enikepadu, Vijayawada, NTR District. She has Completed Degree in B.S.C(computers) from Sri Vivekananda Degree College, Podili, Prakasam District. Her area of interest are DBMS and Python.