

# Drug Pill Recognition System Using Deep Learning

Sudarshan Borude<sup>1</sup>, Sakshi Patil<sup>2</sup>, Roshni Bhoirkar<sup>3</sup>, Isheeta Shirsath<sup>4</sup>

<sup>1</sup>Mr. Sudarshan S. Borude, Dept. of Information Technology, All India Shri Shivaji Memorial Society Institute Of Information Technology, Pune, Maharashtra, India

<sup>2</sup>Miss. Sakshi D. Patil, Dept. of Information Technology, All India Shri Shivaji Memorial Society Institute Of Information Technology, Pune, Maharashtra, India

<sup>3</sup>Miss. Roshni C. Bhoirkar, Dept. of Information Technology, All India Shri Shivaji Memorial Society Institute Of Information Technology, Pune, Maharashtra, India

<sup>4</sup>Miss. Isheeta M. Shirsath, Dept. of Information Technology, All India Shri Shivaji Memorial Society Institute Of Information Technology, Pune, Maharashtra, India

\*\*\*

**Abstract** - — Loss of abilities like vision or memory are typical characteristics of ageing, which is a natural process. These changes make it harder for senior adults to perform daily tasks, which can occasionally put them in danger. One of the most pertinent is connected to incorrect medication consumption or even forgetfulness. The health and life of the elderly are seriously endangered by mistakes of this nature. Furthermore, the technological solutions that are currently being considered for this issue are created for professionals or the general public without taking the needs of the elderly into consideration. Therefore, in order to address this lack of support, an image processing tool that serves as the foundation for a larger set of aging-friendly tools currently under development will be presented. The steps taken by this proposal include acquiring images and classifying pills according to their size, shape, and color. These features enable the system to describe and save information about pills on a local database during the learning phase. Later, during the recognition phase, the same features are chosen and compared to a database in order to give the user pertinent data regarding the pill being recognized.

**Key Words:** Health care, visually impaired, drug pill recognition, image processing, CNN.

## 1. INTRODUCTION

Aging also results in the loss of abilities like vision and memory, which puts elderly people in perilous situations. Medication is one that is frequently mentioned. Elderly people frequently forget to take their medications properly or fail to do so, which can have a serious negative impact on their health. However, when they become aware of the circumstance, their self-assurance is undermined, necessitating the need for support to change the situation. The disparity between taxpayers and beneficiaries will continue to widen annually given the situation in Europe. The fact that this support comes from the healthcare system is extremely unavailability. As a result, a different approach based on current technological developments, namely mobile devices, is suggested for this system. This solution is a part of a larger, still-under-development tool support for

the elderly. It uses computer vision techniques to assist elderly people with the task of pill identification with the goal of boosting confidence and autonomy.

Elderly people who are blind or visually impaired tend to take the wrong medications or forget to take them. The study also mentioned the topic. As a result, it is anticipated that patients who use drugs incorrectly and who are visually impaired will suffer significant medical losses. However, these patients may not have access to adequate support in this area. We take into account the requirement for a method of medication pill recognition for visually impaired chronic patients in order to solve this issue. The suggested system can help ensure that chronic patients with visual impairments take their medications safely.

The review for visually impaired people's ability to identify drug pills is stated in the paper. Introduces the topic and provides an overview in section I. In section II, a literature review of a select few papers and datasets created for recognition are taken into account, and in section III, a proposed system for the system is presented.

## 2. LITERATURE REVIEW

By various researchers, various approaches have been presented. Here, we've discussed a few of the techniques. Many related tools have been created and evaluated to provide related functionalities (such as drug pill recognition and medication reminders) to aid in safe medication use.

(1). D. Ushizima, A. Carneiro, M. Souza, and F. Medeiros.

"Investigating pill recognition methods for a new national library of medicine image dataset" [1]

Correct pill identification has grown to be essential to patient care and safety. This paper examines descriptors for pill detection and characterization using the recently released National

Library of Medicine (NLM) pill image database.[1] The authors discuss their work on developing algorithms to

automatically segment images of NLM pills and extract various features to assemble pill groups with priors based on FDA recommendations for physical characteristics of pills. We make three contributions to the automation of pill recognition: we rate the 1,000 most popular prescription drugs in the US, we offer masks and feature matrices for the NLM reference pill images to ensure the reproducibility of results, and we talk about how to best organise data for effective content-based image retrieval.

(2). Z. Yaniv, J. Faruque, S. Howe, K. Dunn, D. Sharlip, A.

Bond, P. Perillan. "The national library of medicine pill image recognition challenge: an initial report "[2]

A challenge competition was announced by medicine, encouraging the creation and discovery of high-quality In its authoritative RxIMAGE collection,[2] the U.S. National Library released algorithms and software in January 2016 that rank how closely consumer images of prescription drugs correspond to reference images of drugs. The demand for a simple way for medical professionals and the general public to recognize unidentified prescription medications inspired this challenge. When the prescription medication changes from a brand to a generic or for any other reason the shape and color of the pill changes, this capability may prove useful in situations where the medication and documentation have been separated, such as during a disaster or emergency. It may also prove useful in situations where the medication has changed shape or color. This is a first, encouraging step toward creating an NLM software system and application programming interface that makes pill identification easier.

(3). R. A. Calix, R. Gupta, M. Gupta, and K. Jiang. "Deep granulator: Improving precision in the classification of personal health experience tweets with deep learning" [3]

Pharmacovigilance is one of the key areas of health surveillance, which keeps tabs on events affecting human health. The safe use of pharmaceutical products is tracked and monitored by pharmacovigilance. Given that users post their personal health-related experiences online, Twitter data can be used for this task. However, one issue with Twitter data is that it has a lot of noise in it. So, a strategy to reduce the noise is required. In this study, classifiers that can assist in identifying these Personal Experience Tweets are created using a variety of machine learning algorithms, including deep neural networks (PETs). Finally, we suggest a technique that enhances outcomes, the Deep Granulator.[3] The analysis's findings are presented and discussed.

(4). W.J. Chang, L.-B. Chen, C.-H. Hsu, C.-P. Lin, and T.-C. Yang. "A deep learning-based intelligent medicine recognition system for chronic patients "[4]

In this study, ST-Med-Box, a deep learning-based intelligent medicine recognition system, is proposed.[4] In addition to

providing other medication-related functionalities like reminders to take medications on time, medication information, and chronic patient information management, the proposed system can help chronic patients take multiple medications correctly and avoid taking the wrong medications, which may cause drug interactions. The proposed system consists of a deep learning training server, a mobile app running on an Android platform, an intelligent medicine recognition device, and a cloud-based management platform. Currently, the proposed system can distinguish between 80 different medications.

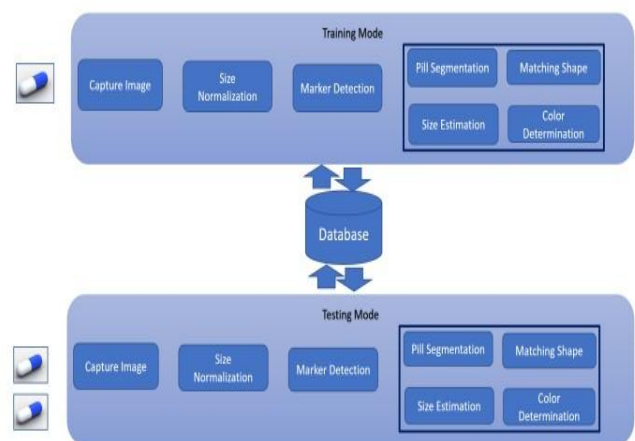
(5). M. Ervasti, M. Isomursu, and I. I. Leibar. "Touch- and audio-based medication management service concept for vision impaired older people "[5]

By giving them tools to identify medications and retrieve personal medication information, the service concept enables older users with vision impairments to manage their daily medications independently. An early prototype known as Blind NFC was put into use to show that the idea could work. It is an NFC enabled PDA with the fundamental ability to read the name and dosage of a medication by touching the medication package.[5] Results showed that older users picked up and used the essential features of touch- and audio-based systems quite easily. In addition to using their own self-recorded audio messages for marking objects, they discovered potential value in the technology for tagging and identifying other common physical objects besides medicine packages.

### 3. SYSTEM ARCHITECTURE

This proposal's methods entail taking an image and classifying a pill according to its size, shape, and color. These features are utilized by the system during the learning phase to describe and catalogue pill information on a local database.

The same features are later determined and compared against a database during the recognition



The learning of pill detection is divided into two steps:

- 1) In Step 1, an image of multiple pills was used as the training data for detecting the pill area.
- 2) In Step 2, an image of a single pill was used as the multi-class training data.

#### 4. CONCLUSION

For chronic visually impaired patients, we have proposed a deep learning system for drug pill recognition. A mobile app, a cloud-based intelligence (AI), a pair of wearable smart glasses, and other components make up the proposed system, which is intended to support safe medication use. The proposed system uploads medication data to the information management platform, an intelligent drug pill recognition box powered by artificial cloud-based management platform to create medication use records, enabling family members or caregivers to chronic visually impaired patients. To track the medication status of chronic impaired patients using a mobile device app. Therefore, the suggested system can effectively reduce the problem of drug.

#### ACKNOWLEDGEMENT

We would like to express our special thanks of gratitude to the faculty to allow us to do this wonderful informative project on the topic "A Mobile Application for Drug Pill Recognition" which also helped us in doing a lot of research and we came to know about so many new things for which I am really thankful them.

I would like to extend my sincere thanks to Dr. Meenakshi A. Thakor for their guidance and constant supervision as well as for providing necessary information regarding the project and also for their support in completing the project.

#### REFERENCES

- [1] Ushizima, Daniela, Allan Carneiro, Marcelo Souza, and Fatima Medeiros. "Investigating pill recognition methods for a new national library of medicine image dataset." In *International Symposium on Visual Computing*, pp. 410-419. Springer, Cham, 2015.
- [2] Yaniv, Ziv, Jessica Faruque, Sally Howe, Kathel Dunn, David Sharlip, Andrew Bond, Pablo Perillan, Olivier Bodenreider, Michael J. Ackerman, and Terry S. Yoo. "The national library of medicine pill image recognition challenge: An initial report." In *2016 IEEE Applied Imagery Pattern Recognition Workshop (AIPR)*, pp. 1-9. IEEE, 2016.
- [3] Calix, Ricardo A., Ravish Gupta, Matrika Gupta, and Keyuan Jiang. "Deep granulator: Improving precision in the classification of personal health-experience tweets

with deep learning." In *2017 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, pp. 1154-1159. IEEE, 2017.

- [4] Chang, Wan-Jung, Liang-Bi Chen, Chia-Hao Hsu, Cheng-Pei Lin, and Tzu-Chin Yang. "A deep learning-based intelligent medicine recognition system for chronic patients." *IEEE Access* 7 (2019): 4444144458.
- [5] Ervasti, Mari, Minna Isomursu, and Igone Idigoras Leibar. "Touch-and audio-based medication management service concept for vision impaired older people." In *2011 IEEE International Conference on RFID-Technologies and Applications*, pp. 244-251. IEEE, 2019.
- [6] Ou, Y.-Y., Tsai, A.-C., Zhou, X.-P. and Wang, J.-F. (2020), Automatic drug pills detection based on enhanced feature pyramid network and convolution neural networks. *IET Comput. Vis.*, 14: 9-17. <https://doi.org/10.1049/iet-cvi.2019.0171>
- [7] L. S. Cordeiro, J. S. Lima, A. I. Rocha Ribeiro, F. N. Bezerra, P. P. Rebouças Filho and A. R. Rocha Neto, "Pill Image Classification using Machine Learning," *2019 8th Brazilian Conference on Intelligent Systems (BRACIS)*, 2019, pp. 556-561, doi: 10.1109/BRACIS.2019.00103.
- [8] W. Chang, L. Chen, C. Hsu, J. Chen, T. Yang and C. Lin, "MedGlasses: A Wearable Smart-Glasses-Based Drug Pill Recognition System Using Deep Learning for Visually Impaired Chronic Patients," in *IEEE Access*, vol. 8, pp. 17013-17024, 2020, doi: 10.1109/ACCESS.2020.2967400.
- [9] Urja Patel, "Machine Learning-based Pharmaceutical Tablet Inspection and Recognition Techniques - A Review", *2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS)*, pp.220-222, 2021.
- [10] S. Bashyal, R. K. Subba, S. Adhikari and L. Wagle, "Medication utilization problem among blind population in Nepal", *Int. J. Pharmaceutical Sci. Res.*, vol. 10, pp. 1959-1965, Apr. 2019.

#### BIOGRAPHIES



Mr. Sudarshan S. Borude.  
 Dept Of Information Technology,  
 All India Shri Shivaji Memorial  
 Society Institute Of Information  
 Technology, Pune, Maharashtra,  
 India.



Miss. Sakshi D. Patil.  
Dept Of Information Technology,  
All India Shri Shivaji Memorial  
Society Institute Of Information  
Technology, Pune, Maharashtra,  
India



Miss. Roshni C. Bhoirkar.  
Dept Of Information Technology,  
All India Shri Shivaji Memorial  
Society Institute Of Information  
Technology, Pune, Maharashtra,  
India



Miss. Isheet M. Shirsath.  
Dept Of Information Technology,  
All India Shri Shivaji Memorial  
Society Institute Of Information  
Technology, Pune, Maharashtra,  
India