TRIBHUWAN UNIVERSITY

INSTITUTE OF ENGINEERING

PURWANCHAL CAMPUS

A MAJOR PROJECT PROPOSAL

ON

MEDISCAN PLUS

DRUG IDENTIFICATION USING NATURAL LANGUAGE PROCESSING

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ABSTRACT

This report details the creation and assessment of an application designed to swiftly deliver medication information via image scanning. By employing Optical Character Recognition (OCR) and Natural Language Processing (NLP) technologies, the app extracts and interprets text from images, enabling users to make well-informed decisions about medication use. It outlines project objectives, outcomes, potential uses, and challenges. Suggestions for improvement include enhancing technical scalability, refining the user interface, ensuring regulatory compliance, and localizing efforts. Despite obstacles like OCR precision and privacy concerns, the application holds promise for improving healthcare access and empowering patients.

Keywords: OCR, NLP, NER, Count Vectorizer, Cosine Similarity

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LIST OF ABBREVIATIONS

OCR : Optical Character Recognition

NLP : Natural Language Processing

NER : Named Entity Recognition

1. INTRODUCTION

1.1 Introduction

In the fast-paced realm of software development, maintaining code quality is pivotal. Introducing CoTest, a comprehensive codebase testing solution tailored to streamline testing processes and enhance code reliability. Designed to seamlessly integrate into development workflows, CoTest aims to empower teams with automated testing, code analysis, and collaboration features, ensuring faster delivery of high-quality software products.

1.2 Background

Due to the time-consuming process an artificial intelligence-based model is necessary for fast and accurate identification of the drugs. Issuing of correct prescriptions is a foundation of patient safety. Medication errors represent one of the most important problems in health care, with ‘look-alike and sound-alike’ (LASA) being the lead error. Existing solutions to prevent LASA still have their limitations. Deep learning techniques have revolutionized identification classifiers in many fields.[1]

1.3 Problem Statements

- Challenge in identifying medicines due to similar packaging and complex naming conventions
- Limited Access to Comprehensive Medicine Information

1.4 Objectives

- To identify medicines from images of their wrappers.
- To provide users with comprehensive information about the identified medicines.

1.5 Feasibility Study

1.5.1 Technical Feasibility

We used Python and Javascript as our programming language which is easy to handle. VS Code is a lightweight, cross platform editor that offers a wide range of features and extensions that can be useful for frontend and backend development. VS Code is a feasible option for our project. So, it is technically feasible.

1.5.2 Schedule Feasibility

To develop the project, a proper timeline had been projected to complete a relevant portion of the project in the scheduled time period. Most of the necessary resources were searched on the web and were available to begin research on time. Also, all the related software packages were easily available which makes it more feasible.

1.5.3 Financial Feasibility

Although few human resources were needed for this project, the hardware and software needed to create this software were not expensive. So it is economically feasible.

1.6 Technical Requirements

1.6.1 Core Functionalities

- Scan medicine and get useful information like uses and side effects.
- User-friendly interface of the cross-platform mobile app.
- Instant retrieval of information from medicine.
- The User can either scan or upload the image of the medicine.

1.6.2 Technical Infrastructure

- Mobile application accessible to any mobile device.

- Frameworks like React Native, Tesseract, spaCy, NLTK.
- Programming languages and libraries like Python, JavaScript, Pandas, NumPy, Pillow, EasyOCR, FastAPI.

2. LITERATURE REVIEW

- X. Liu, J. Meehan(2020) explored drug labels are crucial for various operations but identifying illegal drugs is time-consuming. We introduce DLI-IT, a model combining image and text analysis using deep learning. It segments images based on text, recognizes text using OCR, and converts text into vectors for similarity comparison. Trained on 1749 opioid and 2365 non-opioid images, DLI-IT achieved 88% precision on 300 external opioid images, surpassing previous methods by up to 35%. This approach offers competitive performance in drug label identification.[2]
- H.-W. Ting, S.-L. Chung(2020) showcased the prescription errors, notably with 'look-alike and sound-alike' (LASA) drugs, are a major concern in healthcare, but existing prevention methods have limitations. This study uses deep learning to investigate LASA image confusion via a baseline deep learning drug identification (DLDI) model, aiming to propose improved solutions. With images of 250 blister packaged drugs, models trained on front-side or backside images were evaluated using the You Only Look Once (YOLO) framework, with the back-side model outperforming the frontside model in accuracy (95.99% vs. 93.72%). This deep learning-based model offers potential for pharmacists to prevent medication errors and automate drug verification, enhancing patient safety.[1]
- Razavi and S. Sharifian(2015) studied bioinformatics, an interdisciplinary field combining biology and computer science. They explored machine learning techniques, namely Support Vector Machines (SVM) and Conditional Random Fields (CRF), for drug and chemical recognition tasks known as DrugNER and DrugNEC. Using datasets from The DDI Corpus, they employed three feature groupsmorphological, lexical, and orthographic and optimized feature selection and classifier ensemble with wrapper-based methods. Comparative analysis of results from both approaches was conducted, and a novel ranked weighted majority voting algorithm was introduced to combine classifiers effectively. Keywords: Biomedical Text Mining, Drug Name Entity Recognition, Feature Selection, Ranked Weighted Majority Voting, Classifier Selection, Machine Learning, SVM, CRF.[3]

3. METHODOLOGY

3.1 Proposed Block Diagram

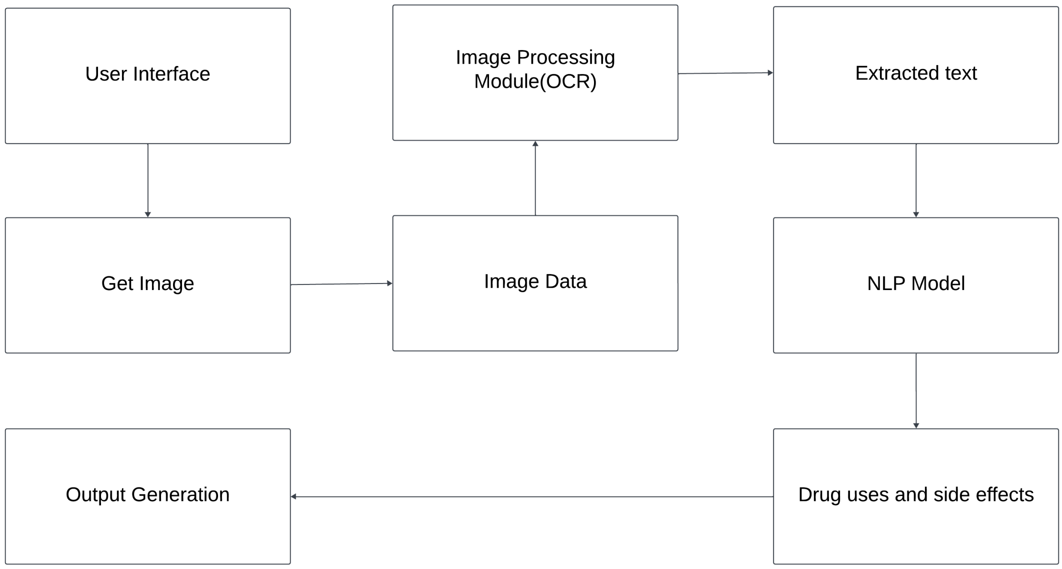

Figure 3.1: Proposed Block Diagram

4. IMPLEMENTATION

4.1 Requirements Analysis

Conduct a thorough analysis of user requirements and expectations to define the scope and features of the application. Identify key functionalities such as image scanning, text extraction, medication information retrieval, and user interface design.

4.2 Technology Selection

Choose appropriate technologies and tools for implementing OCR and NLP functionalities. Consider using established libraries or frameworks for OCR (e.g., Tesseract) and NLP (e.g., spaCy or NLTK) to streamline development.

4.3 Development Environment Setup

Set up the development environment with necessary dependencies, including OCR and NLP libraries, as well as any additional libraries or frameworks required for building the application.

4.4 Image Scanning Module

Implement the image scanning module to capture images of medicine labels or packaging using the device's camera. Integrate functionalities for image cropping, resizing, and preprocessing to enhance OCR accuracy.

4.5 OCR Implementation

Develop the OCR module to extract text data from the scanned images. Configure OCR parameters and preprocessing techniques to improve accuracy, considering factors such as image quality, font type, and language.

4.6 NLP Analysis

Implement the NLP module to analyze the extracted text data and identify relevant information about medicine uses and side effects. Utilize NLP algorithms for text classification, entity recognition, and sentiment analysis to extract meaningful insights.

4.7 User Interface Design

Design an intuitive and user-friendly interface for the application, incorporating features such as the home page, camera interface, and output page. Ensure compatibility with mobile devices and optimize for responsiveness and usability.

4.8 User Interface Design

Integrate the OCR, NLP, and user interface modules into a cohesive application framework. Conduct comprehensive testing to validate the functionality, accuracy, and performance of the application under various scenarios and input conditions.

5. DATA SOURCE

5.1 Primary Data Source

Primary data refers to the first hand data gathered by the researchers themselves using observations, experiments, surveys, questionnaires, personal interviews, etc. It is reliable real time data which has been used instead of already available past data sets. The data from the secondary data source might not contain some generic medicine which is only available in Nepal. Such data was collected via local pharmacies.

5.2 Secondary Data Source

The Natural Language Processing Model was trained and tested using a dataset consisting of various medicine data , along with their corresponding labels and information about their uses and side effects. Additionally, publicly available datasets and custom-collected images was used to enhance the model's performance and robustness.

The data was collected primarily from the internet from site such as: `1mg.com` and `nepmeds.com.np`

6. EXPECTED OUTCOME

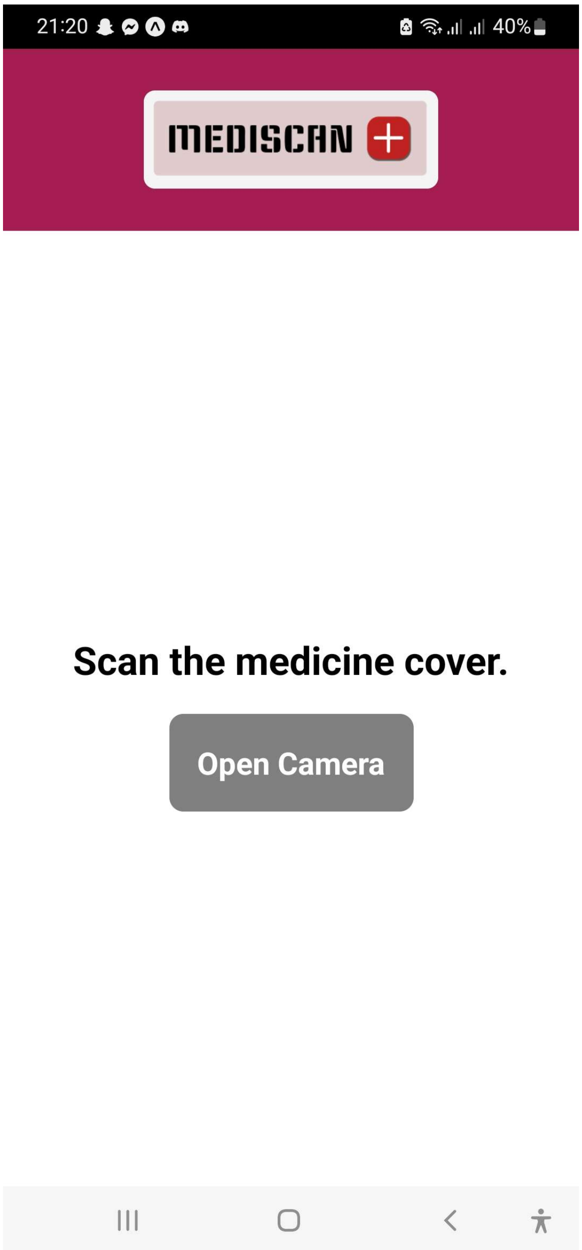

Figure 6.1: Home page interface

We have a simple UI where we have provided a button to the end users that can be clicked and it will access their primary camera to scan the image of the medicine.

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[3] Razavi and S. Sharifian, “Comparison of wrapper based feature selection and classifier selection methods for drug named entity recognition,” *Emu.edu.tr*, 2015.