



# Identification of Additives and Preservatives in Packaged Food Using Image Processing

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**Abstract:** Food is an essential element for all living organisms. Processed foods have a very limited life, in order to preserve them for a longer time and to have good flavor, texture, and taste, food additives and preservatives are used. This study is taken to investigate the effects of food additives and preservatives on human health and did research on different Optical Character Recognition (OCR) algorithms. In this project, we propose an OCR-based algorithm to identify food additives and preservatives in packaged foods by analyzing the contents of the package and finding their effect on human health. Here, the image of the contents of the package is applied to Image enhancement techniques such as to increase the accuracy of the OCR. The Google Cloud Vision API detects text from enhanced images based on CNN with high accuracy. The extracted text is filtered to remove undesirable words using RegEX. The filtered keywords are used to search in the predefined dataset where data is taken from the Standard Food Safety Organizations such as FDA and FSSAI. By using Google Cloud Vision API, we can extract text with an accuracy of 99.1%.

**Indexterms:** Optical Character Recognition (OCR), Convolutional Neural Network (CNN), Food and Drug Administration (FDA), Food Safety and Standards Authority of India (FSSAI), Regular Expression (RegEX).

## I. INTRODUCTION

OCR, or Optical Character Recognition, is a technology that converts scanned images of printed or handwritten text into digital text that can be edited, searched, and analyzed by computers. OCR is a crucial technology for document digitization, data extraction, and text recognition applications, as it enables the conversion of paper documents into digital formats, making them easier to store, access, and share. OCR works by analyzing an image of text and identifying the individual characters, words, and lines of the text. This is done through a combination of image processing, feature extraction, and machine learning algorithms, which identify key features of the text and classify them based on their shape and context. OCR has a wide range of applications in various industries, such as healthcare, finance, legal, and more. For example, in healthcare, OCR can be used to digitize patient records and extract important information, such as diagnoses, medications, and test

results. In finance, OCR can be used to automate data entry and processing, such as converting receipts and invoices into digital formats. In legal, OCR can be used to digitize contracts and legal documents for easier storage and retrieval. Despite its many benefits, OCR still faces several challenges, such as accurately recognizing handwritten text, dealing with low-quality images, and processing multilingual text. However, ongoing research and development in OCR techniques and algorithms are addressing these challenges and improving the accuracy and efficiency of OCR systems. Overall, OCR is a critical technology for digitization and text recognition, and its applications are becoming increasingly important in the digital age.

Printed or handwritten text from scanned images into editable and searchable digital text. OCR software works by analyzing the image of the text and identifying individual characters, words, and lines of text, using image processing, feature extraction, and machine learning algorithms. The resulting digital text can be edited, stored, and OCR

stands for Optical Character Recognition, which is a technology that enables the conversion of searched electronically, making it easier to manage and process large volumes of text-based documents. OCR has a wide range of applications, including document digitization, data extraction, and text recognition in various industries.

### Advantages of OCR

- OCR technology is a tool that converts printed or scanned text into digital format. It is faster and more accurate than manual data entry, and it reduces the risk of errors. OCR technology makes information more accessible, and it can be used in different industries, such as finance, healthcare, and education. It is also cost-effective and efficient, allowing for automation of tasks, which saves money and time. OCR technology is a useful tool for businesses and organizations that want to improve their processes and productivity

## II. PROPOSED METHOD

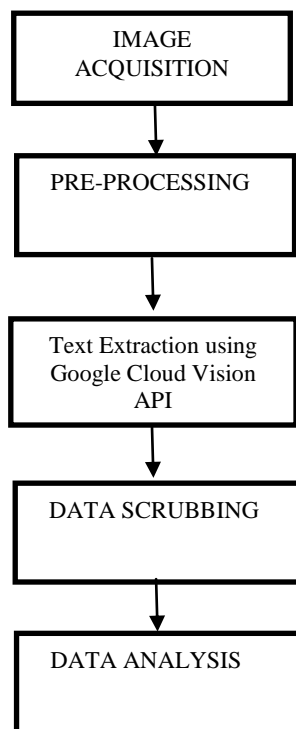


Figure1:Proposed Work

1. **Image Acquisition:**In this step the input image of contents of packaged food is taken from the front-end interface. Using the python library we are going to read image along with its path from the local computer.
2. **Pre-processing:** Image preprocessing in OCR (Optical Character Recognition) is a critical step that involves manipulating an input image to enhance the quality of the image and extract the text accurately. OCR systems rely on clean, high-quality images to recognize characters, and image preprocessing is essential to ensure that the input image meets the OCR system's requirements.
3. **Text extraction using Google cloud vision api OCR:** In this step we will extract the text from the packaged food product contents image using google cloud vision api OCR. Google Cloud Vision API provides a powerful OCR (Optical Character Recognition) service that can be used to extract text from images and PDF documents. The API uses deep learning models to recognize and transcribe text accurately, even in challenging conditions such as low-quality images or handwriting.

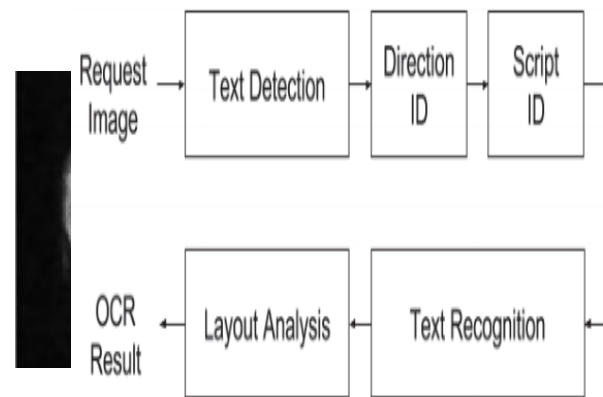


Figure 2: Google Cloud Vision API Architecture

### 4. Data Scrubbing

In this step the raw data extracted from the OCR is filtered using python library. The extracted text consists of many unwanted words and symbols. From the extracted text we only need the codes of the Food additives, chemical preservatives. In order to extract required text from the raw text we used RegEX python library. Regular expressions, also known as regex, is a powerful tool used to manipulate and search for patterns within text strings. In Python, the regex module provides a set of functions that can be used to work with regular expressions. In this project from the raw text of

ingredients we specifically search for codes of additives starting with INS, ES and number codes.

- Data Analysis:** The filtered text in the previous step is in the form of list of words. These words are now used to search from the dataset. The data set contains a list of all the food additives codes and their impacts on human health in it. Here in this step for efficient searching, first data from the dataset is converted into a dictionary datatype in python. List of filtered words are now searched from the dictionary and the data found is shown in the interface

### III. EXPERIMENTAL ANALYSIS

In this paper, for the purpose of Identification of additives and preservatives in packaged food, we have chosen food ingredients from packaged food. we are finding the food additives and chemical preservatives contained in the packaged foods and finding the different impacts of them on human health by using Google cloud vision API to process the image and extract the text from ingredient list. The proposed algorithm is developed using PyCharm.

### IV. EXPERIMENTAL EXPLANATION

In this section the code corresponding to the above discussed steps is going to be explained.

#### STEP-1:

All the necessary libraries implementation of code are installed and imported.

#### STEP-2:

The image of the ingredient contents of the packaged food is taken from the front-end user interface. All the input images are stored in a folder in the code directory folder for easy retrieval of images.

#### STEP-3:

Now the input image is used to extract text from the image using Google cloud vision API OCR. The input image is sent to the cloud-based algorithm using an API call. All the image preprocessing techniques such as binarization, deskewing, noise reduction, skew correction, segmentation, etc. are carried out in the cloud-based algorithm after that from the enhanced image text is extracted and response obtained from the API is in the form of json file.

#### STEP-4:

From the json file the raw text is taken. All the raw text is not necessary for us only the codes of additives and chemical preservatives are required hence, the text is filtered using RegEX module.

#### STEP-5:

Now these filtered keywords are in the form of a list. We need to search for these keywords in the pre-defined dataset. The dataset contains multiple columns of data such as code of the additive, Name of the additive, Impacts. If any keyword matches the data is shown in the output.

### V. EXPERIMENTAL SETUP

In this, the use of software and how the above discussed code is executed in PyCharm is going to be discussed. The pre requisites of this project are PyCharm idle, images of ingredient contents of the packaged foods and pre-defined dataset of all the food additives and their effects on human health.

Generally, after opening PyCharm idle a window will be visible as shown in Fig. 5.1.

Now we have to click on the File button which is on left side top-corner.

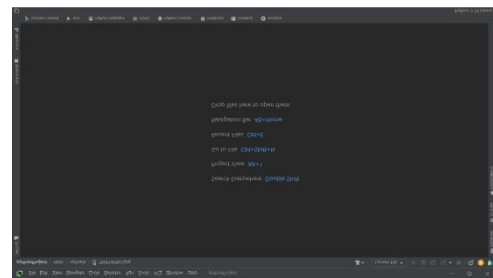


Fig 5.1: Pycharm idle

After clicking on the file new window appears as shown in the Fig.5.2. In that window click on new project.

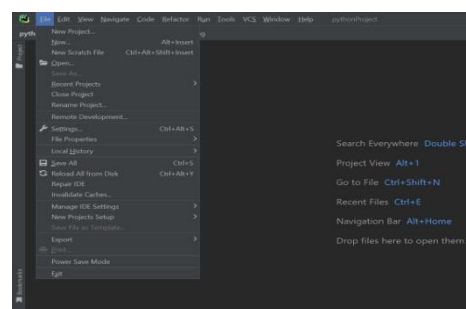


Fig 5.2: Pycharm idle file window

After clicking on the new project, a new window appears on the screen. Now uncheck the box Create a main.py welcome script and make sure new environment button is enabled then click on create.

## VI. RESULTS:

In this session we are going to discuss about the results from the execution of code discussed in previous steps.

The input image is taken from the front-end interface is used to extract text from the image using google vision cloud API. The extracted text is filtered and then searched for the matches in the pre-defined dataset. The result is then displayed through the front-end interface to the user as shown in the Fig 6.1.

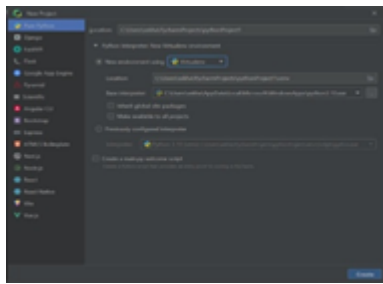


Fig 5.3: Pycharm idle new project creation

Now a project navigation bar appears on the screen. Right click on the project folder and then click on new and then click on the python file. A console will ask for the name of the python file give some name and press ENTER.

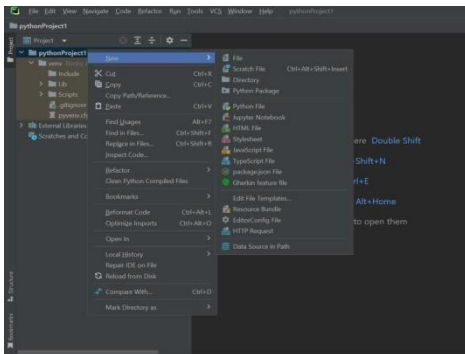


Fig 5.4: Creating new python file in Pycharm idle

Now write the python code by following previous steps and the click on run at the top-right corner. The console will ask for an image then select the image of the packaged food from the computer.

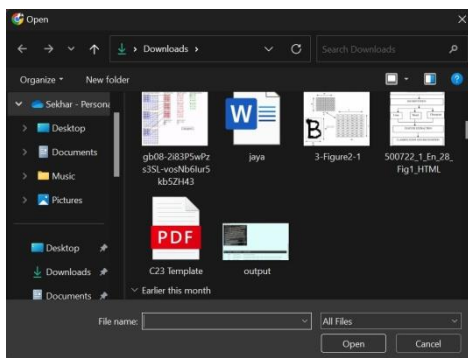


Fig 5.4: Selecting input image

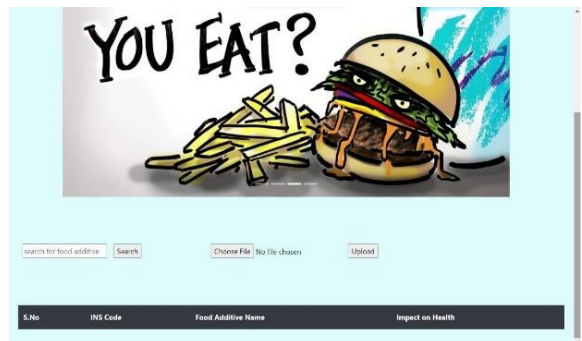


Fig 6.1: Output interface



Fig 6.2: Project Output

## CONCLUSION

It is important to carefully consider these challenges and limitations and design the system in a way that maximizes its benefits while minimizing potential risks. This may involve leveraging existing technologies, such as image processing algorithms and machine learning models, and collaborating with food manufacturers, regulators, and other stakeholders to ensure that the system provides accurate and reliable information to users, we are finding the food additives and chemical preservatives contained in the packaged foods and finding the different impacts of them on human health. This project has a lot of potential for future





development and improvement, with the aim of providing consumers with more information about the food products they consume and promoting healthy eating habits.

## REFERENCES

- [1] Xue, M., Shiva kumara, P., Zhang, C., Lu, T., & Pal, U. (2019). Curved text detection in blurred/non-blurred video/scene images. *Multimedia Tools and Applications*, 78(18), 25629-25653.
- [2] Lee, H., & Kim, C. (2014, October). Blurred image region detection and segmentation. In *2014 IEEE International Conference on Image Processing (ICIP)* (pp. 4427-4431). IEEE.
- [3] Choudhary, S., Singh, N. K., & Chichadwani, S. (2018, February). Text Detection and Recognition from Scene Images using MSER and CNN. In *2018 Second International Conference on Advances in Electronics, Computers and Communications (ICAEECC)* (pp. 1-4). IEEE.
- [4] EFSA-panel on food additives and nutrient sources added to food (ANS) (2010) Scientific opinion on the re-evaluation of brilliant blue FCF (E 133) as a food additive. *European Food Safety Authority (EFSA), Parma. EFSA J* 8, pp 1853.
- [5] Wu, S., Gong, S., Ding, Y., Huang, D., & Liu, L. (2020). An intelligent image recognition system for food additives based on deep learning. *Journal of Food Science and Technology*, 57(1), 97-106.
- [6] Lim, Y., Kim, D., & Kim, J. (2018). Classification of food additives using convolutional neural networks. *Journal of Sensory Studies*, 33(1), e12283.
- [7] Gao, J., Yang, Y., & Sun, H. (2021). Rapid and automatic detection of food additives by using a portable image-based sensing system. *Journal of Food Science and Technology*, 58(1), 83-92.