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Samayapuram, Tiruchirappalli – 621 112, Tamilnadu, India.

DRUG INTERACTION CHECKER

A PROJECT SUBMITTED

Submitted by

SARATHIKANNAN R M (8115U23ME041)

in partial fulfillment of requirements for the award of the course

MGB1201 – PYTHON PROGRAMMING

in

DEPARTMENT OF MECHANICAL ENGINEERING

K.RAMAKRISHNAN COLLEGE OF ENGINEERING
(Autonomous)

SAMAYAPURAM - 621 112

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K. RAMAKRISHNAN COLLEGE OF ENGINEERING

(Autonomous Institution affiliated to Anna University, Chennai)

TRICHY-621 112

BONAFIDE CERTIFICATE

Certified that this project report on **"DRUG INTERACTION CHECKER"** is the Bonafide work of **SARATHIKANNAN R M (8115U23ME041)**who carried out the project work during the academic year 2024 - 2025 under my supervision.

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SubmittedfortheEnd Semester Examinationheldon…….

INTERNAL EXAMINER **EXTERNAL EXAMINER**

DECLARATION

I declare that the project report on **"DRUG INTERACTION CHECKER"** is the result of original work done by us and best of our knowledge, similar work has not been submitted to **"ANNA UNIVERSITY CHENNAI"** for the requirement of Degree of **BACHELOR OF ENGINEERING**. This project report is submitted on the partial fulfilment of the requirement of the completion of the course **MGB1202 - PYTHON PROGRAMMING.**

signature

SARATHIKANNAN R M

Place: Samayapuram

Date:

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE INSTITUTION

To achieve a prominent position among the top technical institutions

MISSION OF THE INSTITUTION

M1: To bestow standard technical education par excellence through state of the art infrastructure, competent faculty and high ethical standards.

M2: To nurture research and entrepreneurial skills among students in cutting edge technologies.M3: To provide education for developing high-quality professionals to transform the society.

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MISSION OF THE DEPARTMENT

M1: To provide technical exposure in the field of Computer Science and Engineering through state of the art infrastructure and ethical standards.

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Our graduates shall

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PEO2: Equip themselves for employability, higher studies and research.

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Engineering students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give

and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1:** Apply the basic and advanced knowledge in developing software, hardware and firmware solutions addressing real life problems.

- **PSO2:** Design, develop, test and implement product-based solutions for their career enhancement.

ABSTRACT

Drug interaction checkers are essential tools in modern healthcare, helping clinicians and patients identify potential adverse interactions between medications. These tools analyze various drug combinations to highlight risks such as diminished efficacy, toxic effects, or severe side effects. Implementing a drug interaction checker in Python leverages its robust libraries, such as **Pandas** for data handling and **SQLite** for database management, ensuring scalability and ease of integration with electronic health record (EHR) systems. With an emphasis on real-time data processing and user-friendly interfaces, Python-based implementations are well-suited for adapting to the evolving landscape of pharmaceutical data and clinical requirements.

This project presents a Python-based drug interaction checker designed to identify and mitigate risks in polypharmacy. The application integrates APIs from reputable drug interaction databases and employs machine learning models to predict unlisted interactions based on molecular and pharmacological data. By incorporating intuitive search functionalities, alert systems, and detailed drug interaction reports, the tool aims to enhance patient safety and streamline clinical workflows. This implementation underscores Python's versatility and its potential to improve healthcare decision-making through advanced computational methods.

ABSTRACT WITH POs AND PSOs MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
Drug interaction checkers are essential tools in modern healthcare, helping clinicians and patients identify potential adverse interactions between medications. These tools analyze various drug combinations to highlight risks such as diminished efficacy, toxic effects, or severe side effects. Implementing a drug interaction checker in Python leverages its robust libraries, such as **Pandas** for data handling and **SQLite** for database management, ensuring scalability and ease of integration with electronic health record (EHR) systems.	**PO1,PO2,PO3,PO12**	**PSO1**

Note: 1- Low, 2-Medium, 3- High

SUPERVISORHEAD OF THE DEPARTMENT

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CHAPTER 1

INTRODUCTION

1.1 Objective

Creating a drug interaction checker in Python involves building a system that can evaluate potential interactions between two or more drugs. This tool can leverage medical databases to provide critical insights for healthcare providers and patients. The checker could use publicly available APIs, like DrugBank or FDA databases, to fetch data on drug interactions, contraindications, and adverse effects. At its core, the application takes input on drugs and returns information about known interactions and severity ratings.

The primary objective of a drug interaction checker is to enhance patient safety by identifying risks associated with combined drug usage. This tool helps reduce adverse reactions caused by polypharmacy (taking multiple medications simultaneously) by warning users about possible conflicts. In addition, the checker could classify interactions into categories, such as minor, moderate, or severe, and suggest safer alternatives when conflicts are identified.

The Python implementation of such a checker would likely involve API integration, a user-friendly interface (like a CLI or web app), and robust handling of user input to avoid errors. Advanced versions may implement natural language processing to interpret drug names or dosages entered by users. For offline functionality, the tool could use pre-downloaded datasets, with SQLite or Pandas handling the data processing efficiently.

1.2 Overview

A **Drug Interaction Checker** in Python is a tool designed to identify and analyze potential interactions between multiple drugs that a patient might be taking. It typically uses a database of drug interactions and applies algorithms to assess risks, such as adverse effects or contraindications. These tools are valuable in healthcare for ensuring patient safety and guiding clinical decisions. Python, being versatile and supported by numerous libraries like `pandas` for data handling and `requests` for API access, makes it an ideal choice for building such a system.

To implement a Drug Interaction Checker, the tool might rely on publicly available APIs, such as the Drug Interaction API from the FDA or commercial services like RxNorm or OpenFDA. These APIs provide detailed information on drugs, their active ingredients, and potential interactions. Python can retrieve this data, process it, and display the results in an interactive or automated interface. Visualization libraries like `matplotlib` or `Plotly` could enhance the presentation of interaction data, helping users understand potential risks more effectively.

Furthermore, the system can integrate with machine learning models to predict interactions for new or rare combinations not explicitly covered in existing databases. This could involve natural language processing (NLP) for parsing medical literature or training models with historical interaction data. In practice, such a checker could be part of a larger healthcare application, used by pharmacists, doctors, or patients themselves to promote safer medication practices.

1.3 Python Programming Concepts

In Python, programming concepts are fundamental building blocks for writing efficient and maintainable code. One of the primary concepts is variables, which store data that can be used and manipulated throughout the program. Variables are created dynamically in Python, meaning you do not need to declare their data type explicitly. Instead, Python infers the type of data based on the value assigned. Common data types in Python include integers, floats, strings, and booleans. Understanding how to assign and work with variables is essential for implementing logic in any Python program.

Another crucial concept is control flow, which allows a program to make decisions and repeat actions. This includes conditional statements like if, elif, and else for decision-making and loops such as for and while for iteration. Control flow enables the execution of different code paths depending on specific conditions, such as checking if a number is even or odd, or iterating through a list of values. Mastery of control flow is essential for solving complex problems where different outcomes are based on varying inputs.

Functions are an important concept in Python that allows for the creation of reusable blocks of code. Functions enable you to break down large, complex programs into smaller, manageable pieces. They can accept parameters (inputs) and return values (outputs), which make them

flexible and modular. Python supports both built-in functions, such as print() and len(), and user-defined functions. Organizing code into functions improves readability and reduces repetition, allowing you to focus on solving the problem without worrying about rewriting the same code multiple times.

Lastly, data structures such as lists, tuples, dictionaries, and sets are essential for organizing and managing data. Lists and tuples are ordered collections of elements, while dictionaries store key-value pairs and sets hold unique items. These data structures provide different ways of storing and accessing data efficiently, depending on the task. Python also supports more advanced data structures like stacks, queues, and linked lists through libraries. Understanding when and how to use these data structures effectively is key to optimizing the performance of your Python applications.

CHAPTER 2
PROJECT METHODOLOGY

2.1 Proposed Work

The proposed work for a Drug Interaction Checker in Python aims to develop an application that can detect potential interactions between drugs, providing users with valuable information regarding safety and efficacy. The primary goal is to ensure patient safety by preventing harmful drug combinations that could lead to adverse effects. The application will work by comparing the medications a user is taking against a database of known drug interactions and returning a report with any potential risks.

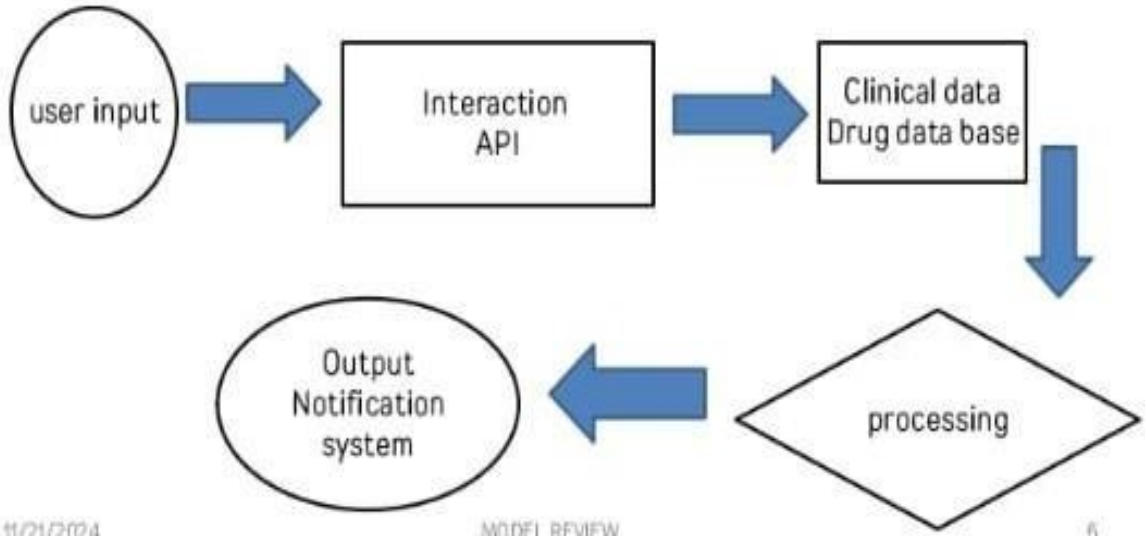
In the first phase, the project will focus on gathering and structuring the data needed for interaction checking. This involves collecting comprehensive data from reliable drug databases (e.g., DrugBank, FDA, or other open-source resources). The database will contain information on active ingredients, common drug pairs, and known interactions, classified by severity (e.g., mild, moderate, or severe). This phase will require data processing techniques to convert raw data into a structured format suitable for the interaction checks.

The second phase will involve building the core logic of the interaction checker. This logic will compare a user's list of medications with the data in the interaction database. When a user enters their medications, the application will scan the database for any known interactions. It will also calculate the risk level of the interactions, providing detailed information about the types of side effects that could occur. To ensure accuracy and reliability, this system will implement an algorithm that identifies both direct and indirect drug interactions.

In the third phase, the user interface (UI) will be developed, allowing patients, caregivers, and healthcare providers to input and manage drug information. The UI will be designed to be intuitive and user-friendly, with options for entering drug names manually, importing lists, or scanning prescriptions. The interface will also allow users to view detailed reports on potential drug interactions, including descriptions of the interaction, the severity, and possible mitigation strategies.

Finally, the proposed drug interaction checker will be thoroughly tested and optimized. This testing phase will include evaluating the system's accuracy by comparing its results with existing clinical guidelines and databases. Performance testing will ensure the application can handle large datasets efficiently, and security testing will be conducted to protect sensitive user information. After successful testing, the application will be ready for deployment as a web-based tool or mobile application, benefiting healthcare professionals and patients alike in managing safe drug regimens**.**

2.2 Block Diagram



CHAPTER 3

MODULE DESCRIPTION

3.1 Input Module:

A Drug Interaction Checker input module in Python would typically consist of a user interface that allows the user to enter the names of medications they are taking. The input module would prompt the user for a list of drugs, which can be entered manually or through a file upload (e.g., CSV). The input can be processed as a list of strings, where each string represents a drug name. The Python program would then validate these inputs to ensure that the drug names are correctly formatted, potentially using regular expressions or built-in string validation methods.

Once the input is validated, the next step is to map these drug names to a database or an API that contains information about known drug interactions. This may involve using an external service, such as the Drug Interaction API, or a pre-existing dataset of drug interactions. The input module would prepare the list of medications and send it to this database for comparison, checking for any potential adverse drug interactions based on known pharmacological information. Depending on the system design, the input module might also allow users to filter interactions by severity or types of interactions (e.g., food-drug, drug-drug).

The output of the input module is typically a list of drugs along with a report on potential interactions. After the interactions are identified, the module can present these findings to the user in an accessible way, possibly through a simple command-line output or a graphical user interface (GUI). The report would include information on which drug combinations might cause harmful effects, along with advice on what actions to take, such as consulting a healthcare provider. The input module's role is to collect, validate, and process the drug information efficiently, enabling the user to check for interactions quickly.

3.2 RxCUI Lookup Module:

A RxCUI Lookup Module is essential for checking drug interactions, as it allows integration with databases that map drugs to their respective RxCUI (RxNorm Concept Unique Identifier). RxNorm, maintained by the U.S. National Library of Medicine, provides normalized names for drugs, as well as links between these names and various coding systems. Using the RxCUI, this module can help identify drugs in a uniform way, simplifying the process of cross-referencing drug data and their potential interactions across multiple databases. The RxCUI Lookup Module typically connects with systems that retrieve and utilize the RxNorm database for accurate drug identification and interaction checks.

The core functionality of the RxCUI Lookup Module is to take in drug names (or other identifiers) as inputs and return the corresponding RxCUI identifiers. These identifiers can then be used to fetch relevant drug information, such as active ingredients, strength, dosage form, and manufacturer details. This lookup can be done via API requests to the National Library of Medicine's RxNorm service, which will provide an RxCUI code for a given drug name. By doing so, the system ensures consistent and reliable drug identification, which is crucial for accurate drug interaction analysis.

Additionally, integrating the RxCUI Lookup Module into a drug interaction checker system allows for the real-time comparison of two or more drugs to assess potential interactions. By utilizing the RxCUI, the system can pull up known interactions for the specific drug combinations. This process reduces the risk of prescribing drugs that may interact harmfully, thus improving patient safety.

3.3 Drug Interaction Checker Module:

A Drug Interaction Checker module in Python is designed to assess potential interactions between different medications. This is crucial for healthcare professionals to avoid adverse drug reactions or reduced drug effectiveness. The module works by maintaining a database of known drug interactions and utilizes algorithms to compare inputted drugs to check for compatibility. It can include information such as drug classes, active ingredients, and contraindications, using predefined rules to flag any interactions that might require medical attention.

The core of the module relies on mapping interactions between drugs, which can be categorized into various levels of severity. For instance, a high-severity interaction could indicate a life-threatening situation, while a low-severity one might just require closer monitoring. The module could use either a local database or connect to an external API that provides up-to-date interaction data. It could also be equipped with an alert system that provides the user with a list of problematic combinations, their possible effects, and recommended actions.

The module could be integrated into a larger healthcare system, such as an Electronic Health Record (EHR) system or a prescription management tool. By inputting patient data and prescribed drugs, it can serve as a preventive measure to ensure safe medication management. With advancements in machine learning, the checker can also be enhanced to predict new interactions or flag combinations that are rare but dangerous. This can help clinicians stay informed and make data-driven decisions to protect patient health.

3.4 Output Display Module:

A Drug Interaction Checker is an essential tool in healthcare systems, designed to identify and analyze potential interactions between different drugs that a patient might be prescribed or taking. The output display module of such a tool is responsible for presenting the results of these interactions in a user-friendly manner. Typically, the output will show a list of drugs that could interact with each other, categorized by the severity of the interaction, ranging from mild to severe. It may also provide additional information on the nature of the interaction, such as whether the drugs should not be taken together or if special monitoring is required.

In the Python implementation of a Drug Interaction Checker, the output display module plays a crucial role in ensuring that users, including healthcare professionals and patients, can easily interpret the results. The module will be designed to display interaction details clearly, using color-coding or warning signs to indicate the level of risk associated with each drug pair. In addition, it might offer a description of the possible side effects or health risks posed by the interaction. To make the tool more accessible, it may include sorting and filtering options, allowing users to focus on specific drug classes or types of interactions.

The design of the output display should prioritize clarity and simplicity. This could involve presenting the interaction data in tabular format with key columns like drug names, interaction type, severity level, and recommendations. The user interface can be further enhanced with visual aids, such as graphs or icons, that highlight critical interactions.

3.5 Logging and Error Handling Module:

A Logging and Error Handling module in a Drug Interaction Checker is essential for tracking the execution flow and identifying issues that arise during the process of analyzing drug interactions. The logging component provides a way to record system activities, including the inputs, outputs, and intermediate steps, which is crucial fordebugging and monitoring the software. The logs can help developers understand the state of the application at any given moment, pinpoint errors, and track the sources of those errors. This is especially important in healthcare applications, where an accurate record of interactions can be critical for patient safety.

The error handling aspect of the module ensures that the system can gracefully manage unexpected situations, such as invalid user input, connection issues, or incorrect drug data. In the context of a drug interaction checker, errors may occur when the data for a particular drug is incomplete or when two drugs interact in an unexpected way. A robust error handling mechanism can catch these issues and provide clear error messages to the user, allowing them to understand what went wrong and how to resolve it. Proper error handling also prevents the program from crashing or behaving unpredictably.

CHAPTER 4

RESULTS AND DISCUSSION

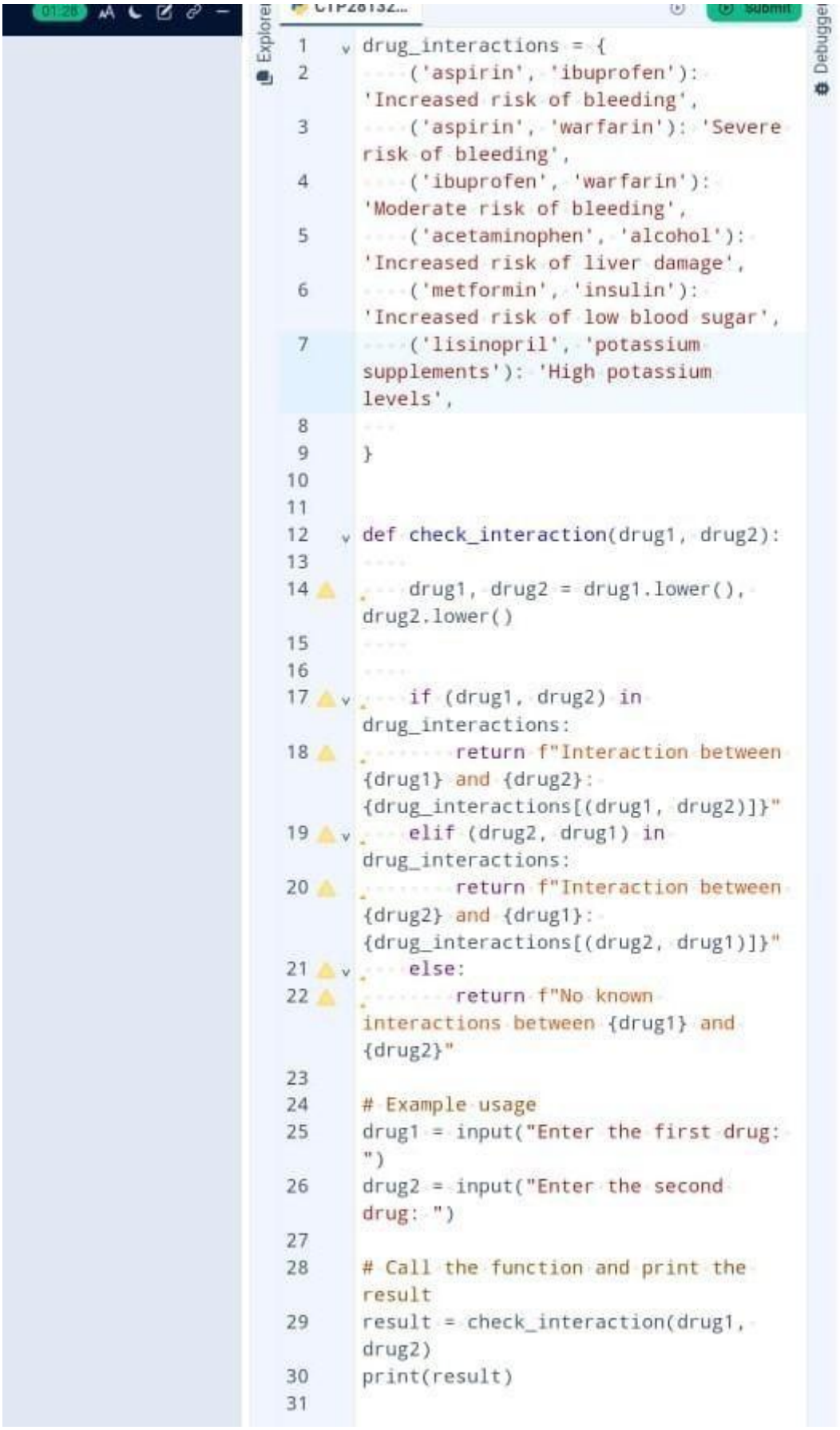
```
drug_interactions = {
    ('aspirin', 'ibuprofen'): 'Increased risk of bleeding',
    ('aspirin', 'warfarin'): 'Severe risk of bleeding',
    ('ibuprofen', 'warfarin'): 'Moderate risk of bleeding',
    ('acetaminophen', 'alcohol'): 'Increased risk of liver damage',
    ('metformin', 'insulin'): 'Increased risk of low blood sugar',
    ('lisinopril', 'potassium supplements'): 'High potassium levels',

}


def check_interaction(drug1, drug2):

    drug1, drug2 = drug1.lower(), drug2.lower()


    if (drug1, drug2) in drug_interactions:
        return f"Interaction between {drug1} and {drug2}:
```



```python
drug_interactions = {
    ('aspirin', 'ibuprofen'): 'Increased risk of bleeding',
    ('aspirin', 'warfarin'): 'Severe risk of bleeding',
    ('ibuprofen', 'warfarin'): 'Moderate risk of bleeding',
    ('acetaminophen', 'alcohol'): 'Increased risk of liver damage',
    ('metformin', 'insulin'): 'Increased risk of low blood sugar',
    ('lisinopril', 'potassium supplements'): 'High potassium levels',

}


def check_interaction(drug1, drug2):

    drug1, drug2 = drug1.lower(), drug2.lower()


    if (drug1, drug2) in drug_interactions:
        return f"Interaction between {drug1} and {drug2}: {drug_interactions[(drug1, drug2)]}"
    elif (drug2, drug1) in drug_interactions:
        return f"Interaction between {drug2} and {drug1}: {drug_interactions[(drug2, drug1)]}"
    else:
        return f"No known interactions between {drug1} and {drug2}"

# Example usage
drug1 = input("Enter the first drug: ")
drug2 = input("Enter the second drug: ")

# Call the function and print the result
result = check_interaction(drug1, drug2)
print(result)

```

```
11
12  def check_interaction(drug1, drug2):
13      
14      drug1, drug2 = drug1.lower(), drug2.lower()
15      
16      
17      if (drug1, drug2) in drug_interactions:
18          return f"Interaction between {drug1} and {drug2}: {drug_interactions[(drug1, drug2)]}"
19      elif (drug2, drug1) in drug_interactions:
20          return f"Interaction between {drug2} and {drug1}: {drug_interactions[(drug2, drug1)]}"
21      else:
22          return f"No known interactions between {drug1} and {drug2}"
23
24  # Example usage
25  drug1 = input("Enter the first drug: ")
26  drug2 = input("Enter the second drug: ")
27
28  # Call the function and print the result
29  result = check_interaction(drug1, drug2)
30  print(result)
31
```

```
$ python CTP28132.py drug
Enter the first drug: Aspirin
Enter the second drug: ibuprofen
Interaction between aspirin and ibuprofen: Increased risk of bleeding
=== YOUR PROGRAM HAS ENDED ===
```

CHAPTER 5

CONCLUSION

A Drug Interaction Checker is a tool designed to identify potential interactions between different medications that a person may be prescribed. These interactions can either increase the risk of side effects, alter the effectiveness of drugs, or cause harmful reactions in the body. Drug interaction checkers are especially important for individuals taking multiple medications, as the effects of one drug can be altered when combined with others. These tools are commonly used by healthcare professionals, patients, and caregivers to ensure drug safety and to avoid dangerous combinations.

When developing a drug interaction checker in Python, the first step would be to access a reliable database of drug information, including potential interactions. Publicly available databases like the National Institutes of Health's DailyMed or commercial API services can be used for this purpose. The system can then check a list of prescribed drugs against the database to identify possible interactions based on the chemical properties, mechanisms of action, and known side effects of each drug.

The checker can be implemented using Python libraries such as requests for API access, pandas for organizing data, and numpy for data manipulation. By inputting the drug names, the program can query the database and output a list of potential interactions. These interactions can be categorized based on their severity—ranging from mild to life-threatening—helping users assess the risk. A more advanced version could involve machine learning to predict interactions based on historical data or trends in drug use.

A Drug Interaction Checker also needs to provide actionable advice. For example, it could suggest alternative medications, advise on adjusting dosages, or recommend consulting with a healthcare provider. Ensuring the tool is user-friendly and regularly updated is key to its effectiveness.

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APPENDIX

(Coding)

Input;

```
# Define a dictionary to store known drug interactions.
# The keys are tuples containing pairs of drugs, and the values are descriptions of the interactions.
drug_interactions = {
    ('aspirin', 'ibuprofen'): 'Increased risk of bleeding',
    ('aspirin', 'warfarin'): 'Severe risk of bleeding',
    ('ibuprofen', 'warfarin'): 'Moderate risk of bleeding',
    ('acetaminophen', 'alcohol'): 'Increased risk of liver damage',
    ('metformin', 'insulin'): 'Increased risk of low blood sugar',
    ('lisinopril', 'potassium supplements'): 'High potassium levels',
}

# Define a function to check the interaction between two drugs.
def check_interaction(drug1, drug2):
    # Convert drug names to lowercase to ensure case-insensitive comparison
    drug1, drug2 = drug1.lower(), drug2.lower()

    # Check if the drug pair exists in the dictionary and return the interaction info
    if (drug1, drug2) in drug_interactions:
        return f"Interaction between {drug1} and {drug2}:
{drug_interactions[(drug1, drug2)]}"

    # If the pair is not found, check for the reverse pair (order doesn't matter)
    elif (drug2, drug1) in drug_interactions:
        return f"Interaction between {drug2} and {drug1}:
```

```
{drug_interactions[(drug2, drug1)]}"

    # If no interaction is found, notify the user
    else:
        return f"No known interactions between {drug1} and {drug2}"

# Example usage of the function:
# Prompt the user to enter two drug names.
drug1 = input("Enter the first drug: ")
drug2 = input("Enter the second drug: ")

# Call the check_interaction function with the user's input and print the result.
result = check_interaction(drug1, drug2)
print(result)
```

APPENDIX

(OUTPUT)

```
Enter the first drug: aspirin
Enter the second drug: ibuprofen
Interaction between aspirin and ibuprofen: Increased risk of bleeding

=== Code Execution Successful ===
```