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RPA and Data Science: Automating Data Collection and Preprocessing

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ABSTRACT Robotic Process Automation (RPA) is a transformative technology that enhances operational efficiency by automating repetitive tasks. In data science, where data collection and preprocessing are often time-consuming, RPA offers significant advantages. This paper explores how RPA can automate data collection, cleaning, and preprocessing, improving efficiency and ensuring consistent data quality. By employing tools like UiPath and Automation Anywhere, we automate the extraction of data from websites, databases, and APIs, streamlining workflows, minimizing human error, and freeing up data scientists for complex tasks. A case study demonstrates the successful implementation of RPA in a real-world project, highlighting improved efficiency and accuracy. The paper also discusses challenges and best practices for integrating RPA into data science workflows, underscoring its potential to revolutionize the field.

KEYWORDS: RPA, Data Collection, Automation, Data Quality, Data preprocessing, Big Data

I. INTRODUCTION

In today's data-driven world, organizations depend on data science to inform critical decisions, but the process is often hindered by time-consuming data collection and preprocessing tasks. These repetitive and error-prone tasks involve gathering, cleaning, and preparing large datasets, which can be resource-intensive. As demand for real-time insights grows, automating these processes is crucial for efficiency and accuracy.

Robotic Process Automation (RPA) offers a solution by automating tasks like data collection from websites, databases, and APIs, as well as data cleaning and transformation. This integration enhances scalability and reduces manual efforts in data science workflows. This study explores how tools like UiPath and Automation Anywhere can streamline data collection and preprocessing, reduce human error, and improve operational efficiency. Through a real-world case study, it highlights the benefits and challenges of implementing RPA in data science projects, offering insights into best practices for successful integration.

1.1 ROBOTIC PROCESS AUTOMATION(RPA)

Robotic Process Automation (RPA) is a technology designed to automate repetitive, rule-based tasks that are traditionally performed by humans. By using software bots, RPA can efficiently handle processes such as data entry, extraction, and validation across multiple systems. Popular RPA tools, such as UiPath, Automation Anywhere, and Blue Prism, enable organizations to build and deploy bots with minimal coding, making automation accessible to a wide range of industries. These tools allow for seamless integration with existing systems, automating tasks such as data collection, reporting, and even complex workflows involving multiple applications. Methodologies such as process mining and workflow automation are often employed alongside RPA to identify areas within business processes that can benefit from automation. By leveraging these tools and methodologies, RPA helps organizations improve operational efficiency, reduce human error, and free up employees to focus on more strategic and value-driven tasks.

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Advantages of RPA

1. Improved Efficiency
2. Reduced Errors
3. Cost Savings
4. Scalability
5. Enhanced Productivity
6. Better Compliance
7. Quick Implementation
8. Improved Customer Experience
9. Integration with Legacy Systems
10. Data Consistency

Applications of RPA

1. Finance and Accounting
2. Human Resources
3. Customer Service
4. Healthcare
5. Supply Chain and Logistics
6. Banking and Financial Services
7. IT and Support Services
8. Manufacturing
9. Retail and E-commerce
10. Legal and Compliance

1.2 An Overview of Data science

Data science is an interdisciplinary field blending statistics, computer science, and domain expertise to extract insights from large datasets. Its core stages include data collection, processing, analysis, and visualization, all aimed at data-driven decision-making. By leveraging algorithms and statistical models, data science uncovers patterns, predicts trends, and optimizes operations. Key components include:

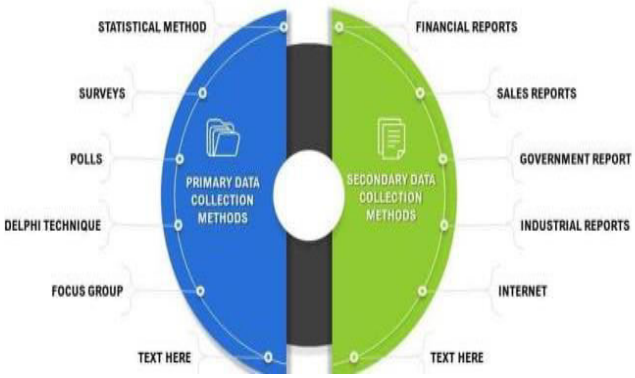
1. **Data Collection**: Gathering data from diverse sources.
2. **Data Processing**: Cleaning and transforming data for consistency and accuracy.
3. **Exploratory Data Analysis (EDA)**: Identifying patterns, trends, and anomalies.
4. **Data Modeling**: Applying models to predict or classify outcomes.
5. **Data Visualization**: Displaying insights through charts and dashboards.
6. **Insights and Interpretation**: Drawing conclusions to inform strategies and solve business problems.

1.2.1 Data Collection

Data collection involves systematically gathering raw data from various sources to support analysis, decision-making, and model development. This foundational step in the data science pipeline greatly impacts project outcomes, as data quality, volume, and relevance are essential.

Common data collection methods include surveys, manual entry, web scraping, sensor data, APIs, and database mining. Tools like SQL, Python scripts, and data integration platforms (e.g., Talend, Apache NiFi) are used for efficient data storage and management.

To ensure data quality, techniques like validation, sampling, and cleaning filter out noise, incomplete data, and errors. Effective data collection enables accurate analysis, predictive modeling, and valuable insights.



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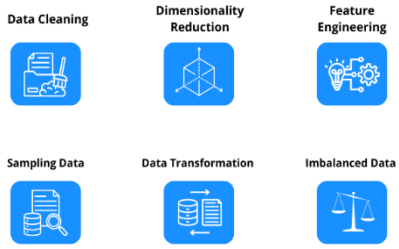
1.2.2 Data Preprocessing

Data processing transforms raw data into a usable format for analysis and modeling, ensuring accuracy, consistency, and relevance. This critical stage cleans and structures data, addressing errors, duplicates, and inconsistencies that could affect outcomes.

Key methods include:

- **Data Cleaning**: Managing missing values, outliers, and data types.
- **Data Transformation**: Converting data into the required format.
- **Data Normalization**: Standardizing data for consistency.

Tools like Python's Pandas and NumPy, Apache Spark, and ETL platforms (e.g., Talend, Informatica) facilitate processing. Techniques such as aggregation, feature engineering, and dimensionality reduction optimize data for analysis, ensuring high-quality inputs for reliable predictions and insights.



Methods for Data Collection:

1. Manual Data Entry
2. Surveys and Questionnaires
3. Web Scraping
4. APIs (Application Programming Interfaces)
5. Sensors and IoT Devices
6. Database Extraction
7. Social Media Data Mining
8. Logs and System Monitoring
9. Third-Party Data Sources
10. Mobile and App Data

Methods for Data Preprocessing:

1. Data Cleaning
2. Handling Missing Data
3. Data Transformation
4. Data Normalization
5. Data Standardization
6. Encoding Categorical Data
7. Feature Selection
8. Outlier Detection and Removal
9. Data Integration
10. Data Discretization
11. Data Reduction

1.3 Objective and Scope of the Study

The objective of this study is to explore the integration of Robotic Process Automation (RPA) with data science workflows, specifically focusing on automating the processes of data collection and preprocessing. The study aims to demonstrate how RPA can be used to streamline these traditionally manual and time-consuming tasks, reducing human intervention while enhancing efficiency and accuracy in handling large datasets. Tools such as UiPath and Automation Anywhere are examined to showcase how they can be implemented to automate repetitive data-handling tasks in real-world scenarios. The scope of this research extends across various industries that rely on data-driven decision-making, highlighting the broad applicability of RPA in data science.

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II. THE ROLE OF MANUAL DATA PREPARATION VS. AUTOMATION

Manual data preparation, a traditional practice in data science, involves cleaning, organizing, and formatting data manually, allowing for domain-specific insights but is time-consuming and error-prone, particularly with large datasets. As data size and complexity increase, manual preparation can lead to inefficiencies and bottlenecks.

Conversely, automated data preparation uses tools like Robotic Process Automation (RPA), machine learning algorithms, and ETL platforms to streamline repetitive tasks such as data cleaning, transformation, and extraction. This approach enhances speed, scalability, and accuracy while reducing human error, freeing data scientists to focus on analysis and modeling.

Key advantages of automation include:

1. **Speed and Efficiency**: Faster processing of large datasets.
2. **Scalability**: Can manage vast data volumes.
3. **Reduced Errors**: Minimizes human error.
4. **Resource Optimization**: Allows data scientists to focus on advanced tasks.

While automation excels in routine tasks, manual preparation remains valuable for cases needing deep domain insight. A hybrid approach, combining automation with manual oversight, optimizes efficiency and data quality.

III. METHODOLOGY

This section outlines the process of designing and configuring RPA bots for automating data collection and preprocessing in a data science pipeline. By integrating RPA with data science, repetitive tasks such as data gathering, cleaning, and formatting can be efficiently automated, allowing data scientists to focus on higher-value tasks.

3.1 Methodology for Data Collection Automation

Designing and Configuring RPA Bots for Data Collection

RPA bots automate data collection from sources like websites, databases, and APIs using platforms such as UiPath and Automation Anywhere. Workflows are visually designed to define interactions with these sources, including tasks like web scraping, API calls, and database queries. Bots are scheduled to run at intervals, maintaining continuous, consistent data updates.

RPA enhances efficiency in data science by automating repetitive tasks like data gathering and preprocessing, allowing data scientists to focus on advanced analysis. Platforms like UiPath and Automation Anywhere streamline workflows, ensuring accurate, continuous data collection across various sources.

3.1.1 Web Scraping with RPA Bots

RPA bots can automate the extraction of data from websites using web scraping techniques. Platforms like UiPath allow the configuration of workflows that navigate through web pages and collect specific data elements, such as text, images, or tables. The extracted data can then be stored in structured formats like Excel or CSV files, making it ready for analysis. This process is particularly beneficial for gathering large amounts of data from public websites, such as product prices, stock information, or articles, without requiring manual intervention.

1. Web scrapping using Ui-Path

Web scraping of weather data using **UiPath** involves automating the extraction of information from weather websites or APIs. Here's a step-by-step guide to accomplish this:

Steps to Scrape Weather Data Using Ui-Path

1. **Set Up Ui-Path**:

a. Open UiPath Studio and create a new process.

b. Install any necessary packages such as UiPath.Web.Activities for HTTP requests and API calls.

2. **Identify the Weather Data Source**:

a. Choose a weather website (e.g., weather.com, accuweather.com) or use a weather API (e.g., OpenWeatherMap API).

b. For web scraping, ensure the website allows scraping by checking their terms of use.

3. **Design the Automation Workflow**:

a. **Open Browser**: Use the Open Browser activity to navigate to the weather website.

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b. **Data Extraction**:

- elements on the page to scrape, like selecting temperature, city names, and forecast information.
- If extracting from multiple locations or cities, set up the scraping loop to iterate over different city searches.

4. **Extract Data Using API (Optional)**:

a. If you want to use an API (e.g., OpenWeatherMap API), you can use the HTTP Request activity to fetch JSON or XML data.
b. Pass necessary parameters such as the city name, API key, and units (metric or imperial).
c. Parse the response using Deserialize JSON or Deserialize XML to extract weather data fields.

5. **Store Data**:

You can store the extracted data in a CSV, Excel file, or database using activities like Write CSV, Write Range, or Insert DataTable into a database.

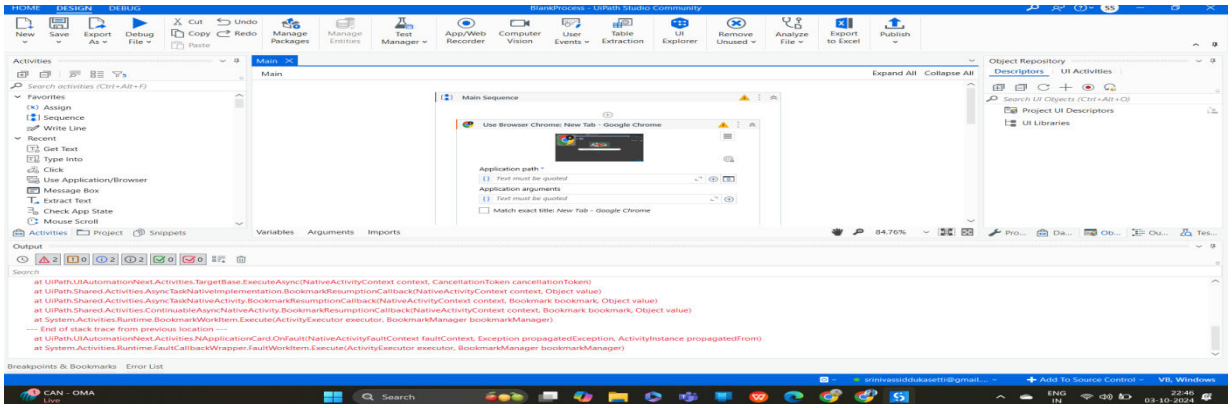
6. **End Process**:

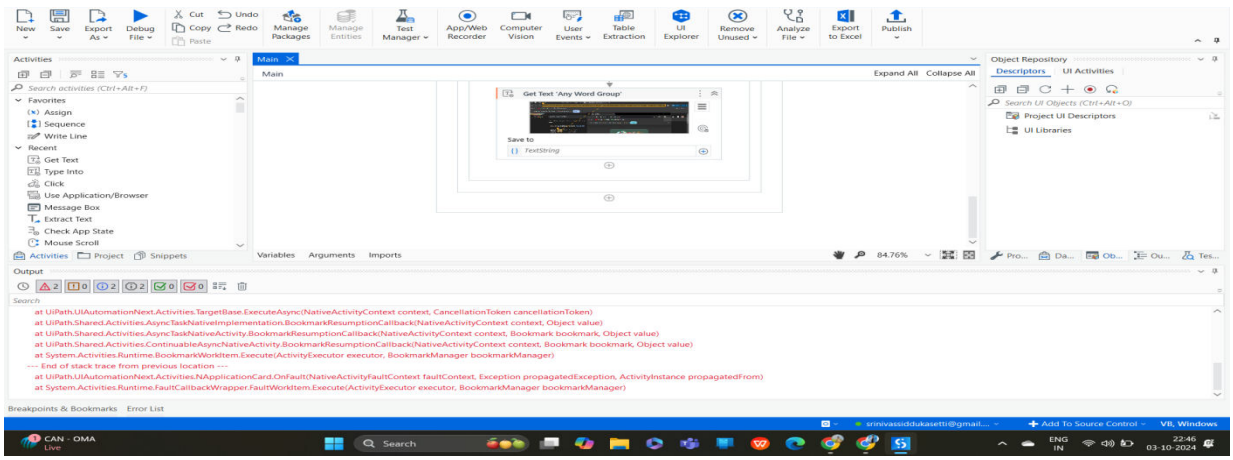
Use the Close Tab or Close Browser activity to finish the workflow.

Summary of steps

1. **Open Browser** -> Navigate to the weather website.
2. **Input City Name** -> Type a specific city name in the search bar using Type Into.
3. **Extract Data** -> Use the Data Scraping wizard to get the weather information for that city.
4. **Store Data** -> Write the extracted data to an Excel file.
5. **Repeat (Optional)** -> Loop through a list of cities for batch extraction.
6. **Close Browser** -> End the workflow.

Steps:





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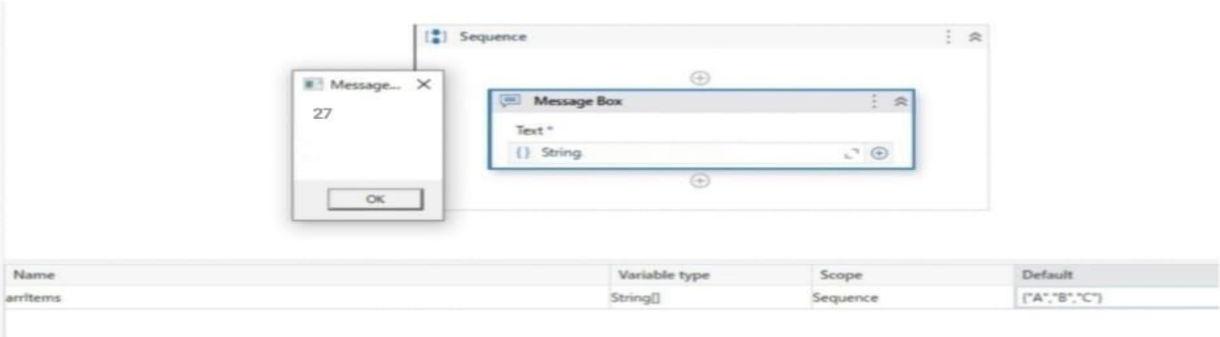

3.1.2 API Data Collection

RPA bots can automate data extraction from external platforms through API calls. Using features like the HTTP Request activity in UiPath, bots can pull data from RESTful or SOAP APIs and integrate it into internal systems. This method is useful for retrieving real-time data from sources such as financial markets, weather services, or social media platforms. Automating API calls ensures continuous and up-to-date data collection, reducing the risk of errors and minimizing manual processing time.

3.1.3 Database Querying

With RPA, bots can automatically query databases such as SQL Server, MySQL, or Oracle to retrieve data without manual intervention. Database Activities in platforms like UiPath allow the bots to execute SQL queries to pull relevant data, apply necessary filters, and store the output for further use. For instance, RPA bots can regularly query a customer relationship management (CRM) database to collect customer information, enabling the organization to keep datasets updated for ongoing analysis and reporting.

3.1.4 Document and Email Extraction

RPA bots are capable of extracting information from unstructured documents and emails using technologies like Intelligent OCR and Document Understanding. These bots can read and interpret content from PDFs, invoices, or email attachments and convert the extracted information into a structured format, such as a database or Excel sheet. Automating document extraction significantly reduces manual data entry, especially for repetitive tasks like processing invoices or extracting key details from contracts and emails.

3.2 Methodology: Preprocessing Collected Data Using RPA Bots

In this methodology, Robotic Process Automation (RPA) bots are employed to automate the preprocessing of data, a critical step in data science pipelines that was traditionally managed manually by data scientists. Preprocessing involves tasks such as cleaning, formatting, deduplication, and transformation, which can be time-consuming and prone to human error when done manually. With RPA bots, these tasks are automated, making the data pipeline faster, more reliable, and highly scalable. Platforms like UiPath and Automation Anywhere are used to design workflows that can consistently apply these preprocessing steps across large and complex datasets. This automation ensures that data is ready for analysis with minimal human intervention, improving the overall efficiency and accuracy of data science projects.

Example Dataset: E-commerce Sales Data

Consider the example of an e-commerce company that collects sales data from various sources, such as customer orders from its website, transaction logs, marketing platforms, and third-party applications. This dataset could include fields like "Customer ID," "Order Date," "Sales Amount," "Payment Method," "Product Category," and "Shipping Address." The data from these sources is often inconsistent, incomplete, or contains duplicate entries, making it difficult to analyze without extensive preprocessing. RPA bots can automate this preprocessing process, saving time and ensuring data accuracy.

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Automated Preprocessing Steps:

3.2.1 Data Cleaning

Identification of Issues:

RPA bots play a crucial role in the initial phase of data cleaning by systematically scanning the dataset for discrepancies such as missing, incorrect, or inconsistent data entries. For example, when examining an e-commerce sales dataset, a bot can flag records where the "Sales Amount" field is empty or where the "Order Date" does not conform to expected formats (e.g., "MM/DD/YYYY" vs. "YYYY-MM-DD"). This automated scanning process enhances the efficiency of data validation, allowing the bots to quickly highlight entries that require further attention. By identifying these issues early, RPA bots help ensure that the data preprocessing pipeline starts on a solid foundation.

Correction Methods

Once the RPA bots have identified problematic records, they employ predefined rules and algorithms to rectify these issues automatically. For example, if a record lacks a "Sales Amount," the bot can calculate the average or median sales amount based on similar transactions within the dataset. This approach not only fills in the missing values but also maintains the dataset's statistical integrity by utilizing relevant historical data. Additionally, the bots can apply more complex logic, such as conditional replacements—where values are filled based on the characteristics of related entries (e.g., if the customer belongs to a high-spending segment, filling in with a higher average amount). By implementing these correction methods, RPA bots ensure that the dataset is comprehensive, accurate, and ready for subsequent analysis, significantly enhancing the overall quality and reliability of the data being processed.

An example for data cleaning using automation

Dataset:

num_col1	category_column	date_column
25	A	2023-01-01
35	B	2023-01-02
45	A	2023-01-03
NaN	B	2023-01-04
40	C	None
50	B	2023-01-06
NaN	None	2023-01-07
30	A	None
55	C	2023-01-09
60	A	2023-01-10

Data cleaning automation using UI path

Step 1: Prepare Data Table

Read the Data: Start by using the Read CSV or Read Range activity to load your data into a DataTable variable (e.g., dataTable).

Activity: Read CSV or Read Range

Step 2: Add For Each Row Activity

Insert the For Each Row Activity:

Drag the For Each Row activity into the workflow after the data has been read.

In the Properties panel of the For Each Row activity, set the DataTable property to your previously created variable (dataTable).

Step 3: Initialize Variables for Preprocessing

Create Necessary Variables:

In the Variables Panel, create variables that you will use within the loop, such as:

numericMean (Type: Double): To hold the mean value for numeric columns.

modeValue (Type: String): To hold the mode for categorical columns.

Any other variables you may need for processing.

Step 4: Calculate the Mean of Numeric Column

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Calculate the Mean:
Add an Assign activity before the For Each Row to calculate the mean value of the numeric column (e.g., num_col1).
vb expression
numericMean = (From row In dataTable.AsEnumerable()
Where Not IsDBNull(row("num_col1"))
Select Convert.ToDouble(row("num_col1"))).Average()

Step 5: Loop Through Each Row
Inside the For Each Row Activity:
Click inside the For Each Row block to start adding activities that will execute for each row in the DataTable.

Step 6: Handle Missing Numeric Values
Check for Missing Numeric Values:
Add an If activity to check if the numeric column (num_col1) is missing:
vb expression
IsDBNull(row("num_col1"))
Then Section:
Add an Assign activity to replace the missing value:
vb
Copy code
row("num_col1") = numericMean

Step 7: Handle Missing Categorical Values
Check for Missing Categorical Values:
Add another If activity to check for missing values in a categorical column (e.g., category_column):
vb expression
IsDBNull(row("category_column"))
Then Section:
Add an Assign activity to replace it with the mode value (previously calculated).
vb expression
row("category_column") = modeValue

Step 8: Handle Missing Date Values
Check for Missing Date Values:
Add another If activity to check for missing values in a date column (e.g., date_column):
vb expression
IsDBNull(row("date_column"))
Then Section:
Add an Assign activity to replace the missing date with a default date (e.g., 2023-01-01):
vb expression
row("date_column") = "2023-01-01"

Step 9: Normalize Numeric Values
Normalize Numeric Column:
After the If activities, add another Assign activity to normalize the numeric column (e.g., num_col1):
vb expression
row("num_col1") = (Convert.ToDouble(row("num_col1")) - numericMean) / stdDev
Ensure you have previously calculated stdDev before entering the loop.

Step 10: Write Preprocessed Data
Outside the For Each Row Activity:
After the For Each Row loop, use the Write CSV or Write Range activity to save the preprocessed dataTable back to a file.
Steps:

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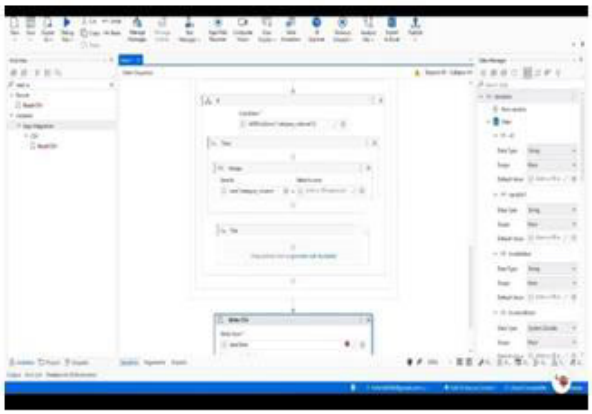
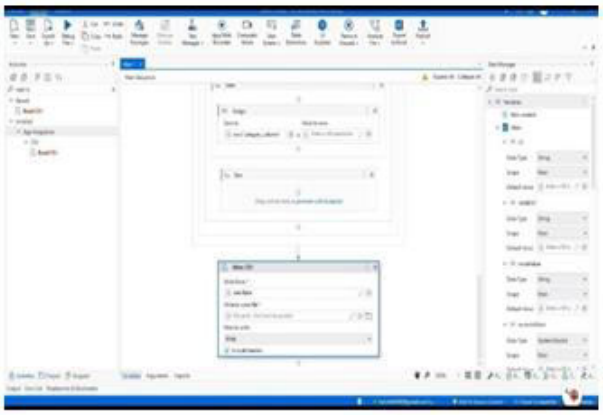
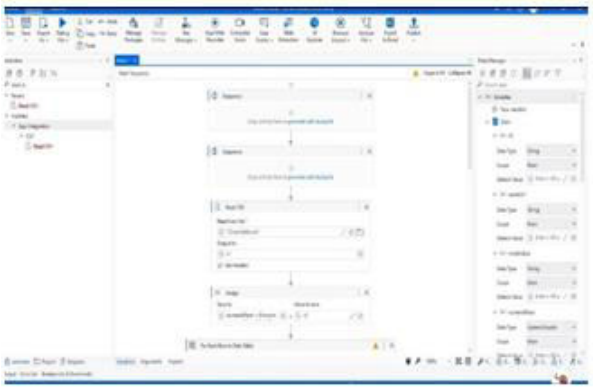
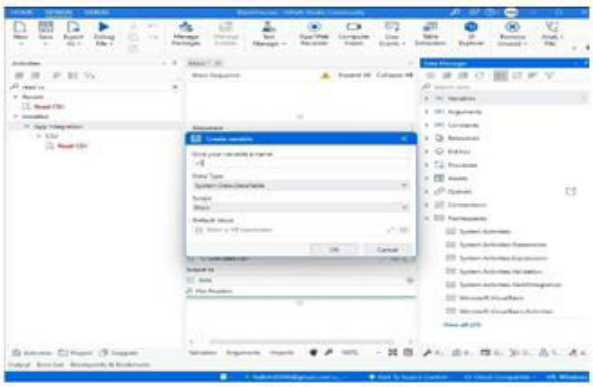
Read Data: Load data into a DataTable.
For Each Row: Loop through each row in the DataTable.
Calculate Mean: Compute the mean value for numeric columns before the loop.
Handle Missing Numeric Values: Use If conditions to check for missing values and replace them.
Handle Missing Categorical Values: Use If conditions to handle missing categorical values.
Handle Missing Date Values: Set default dates for missing date values.
Normalize Numeric Values: Normalize numeric columns.
Write Data: Save the preprocessed data to a new file.

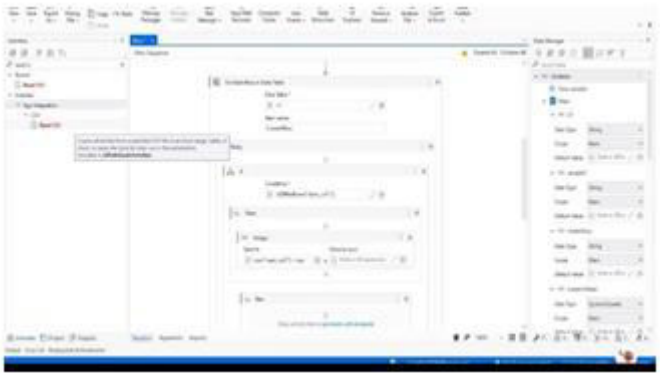
Output:











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Preprocessed Data:

	num_col1	category_column	date_column
0	-1.707825	0	2023-01-01
1	-0.731925	1	2023-01-02
2	0.243975	0	2023-01-03
3	0.000000	1	2023-01-04
4	-0.243975	2	2023-01-01
5	0.731925	1	2023-01-06
6	0.000000	0	2023-01-07
7	-1.219875	0	2023-01-01
8	1.219875	2	2023-01-09
9	1.707825	0	2023-01-10

3.2.2 Data Formatting

The e-commerce dataset is likely to have varying formats, especially when data is collected from multiple sources. RPA bots can standardize date formats (e.g., converting "MM/DD/YYYY" to "YYYY-MM-DD") or ensure consistency in currency units by converting all sales amounts to the same scale (e.g., converting values from thousands to millions). Similarly, text fields like "Payment Method" may be capitalized inconsistently (e.g., "credit card" vs. "Credit Card"), which the bot can fix by applying standardized formatting rules. This uniformity makes the dataset easier to work with and prepares it for further analysis or machine learning processes.

3.2.3 Deduplication

Duplicate entries in the dataset can skew analysis and lead to misleading results. RPA bots can automatically detect and remove duplicates by scanning for records with identical values in key fields such as "Customer ID" and "Order Date." For example, if two records show the same customer making the same order on the same date, the bot can consolidate them into one entry, ensuring that only unique data points remain in the dataset. By automating this process, the bots help improve data quality and ensure that the analysis reflects accurate and relevant information.

3.2.4 Data Transformation

RPA bots can also automate the transformation of data into formats that are easier to analyze. For example, categorical variables like "Payment Method" or "Product Category" need to be converted into numerical values for machine learning algorithms. The bot can assign numeric codes to these variables (e.g., "Credit Card" becomes 1, "PayPal" becomes 2) and apply other transformations, such as normalizing the "Sales Amount" field to ensure that the values are within a specific range. These transformations make the dataset more suitable for advanced analytics and machine learning models, improving performance and interpretability.

IV. TOOLS USED

1. UiPath and Automation Anywhere

These RPA platforms are essential for designing and deploying bots that automate all of the above tasks. With drag-and-drop interfaces and pre-built components, these platforms make it easy to configure bots with the necessary logic and rules for data cleaning, formatting, deduplication, and transformation. Once the bots are set up, they can be deployed to run these preprocessing tasks on large datasets at scheduled intervals, ensuring the data is always up-to-date and accurate.

2. Python (Pandas and NumPy)

While RPA platforms like UiPath and Automation Anywhere excel at automating repetitive tasks, Python libraries such as Pandas and NumPy are integrated to handle more complex data preprocessing tasks. Pandas is particularly useful for managing structured data, such as data frames, and can be used for tasks like data transformation, grouping, or merging datasets. NumPy, on the other hand, is a high-performance library for numerical operations, making it ideal for tasks like outlier detection, data normalization, or applying mathematical transformations to large datasets. By combining RPA with Python, the preprocessing process becomes more powerful and flexible, allowing for the

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automation of advanced data cleaning and transformation steps.

V. CONCLUSION

The landscape of data preparation is rapidly evolving, with a clear distinction between manual processes and automation. While manual data preparation allows for nuanced control and domain-specific insights, it is often time-consuming, labor-intensive, and susceptible to human error. In contrast, automation—particularly through the integration of Robotic Process Automation (RPA)—offers significant advantages in speed, efficiency, scalability, and accuracy. By leveraging RPA, organizations can automate repetitive tasks such as data collection, cleaning, and preprocessing, freeing data scientists to focus on higher-value analytical tasks. Recent developments in RPA, such as enhanced decision-making capabilities, intelligent automation through machine learning, and improved data quality governance, further illustrate the transformative potential of this technology in the realm of data science. The methodologies outlined for automating data collection and preprocessing showcase how RPA can streamline workflows, ensuring that data is continuously updated and ready for analysis. Ultimately, the integration of RPA and data science fosters a hybrid approach that combines the strengths of manual oversight with the efficiencies of automation. This dual strategy not only enhances the quality and reliability of data but also accelerates insights generation, leading to better business outcomes. By embracing automation in data preparation, organizations position themselves to navigate the complexities of modern data landscapes, harnessing the full potential of their data assets for informed decision-making and strategic advantage.

REFERENCES

[1] Ui-Path. (2023). *What is RPA? Robotic Process Automation Software*. Retrieved from https://www.uipath.com

- This source provides comprehensive information on how UiPath, a leading RPA platform, is used for automating various business processes, including data collection.

[2] Automation Anywhere. (2023). *What is Robotic Process Automation (RPA)?* Retrieved from https://www.automationanywhere.com

- This website details Automation Anywhere's capabilities in RPA, including its usage in automating tasks like web scraping, API integration, and document processing.

[3] Wookey, D., & Maier, A. (2020). *Robotic Process Automation (RPA) in Data Collection: Benefits and Challenges*. *Journal of Data and Automation*, 17(3), 56-68.

- This journal article explores how RPA can streamline data collection and the challenges faced in integrating RPA bots with legacy systems and modern data pipelines.

[4] Munawar, H., & Naveed, A. (2021). *Automating Data Collection: How RPA Bots Handle Web Scraping and API Calls for Business Intelligence*. *Proceedings of the International Conference on Digital Automation*, 8(2), 89-102.

- This paper provides insights into the use of RPA bots for automating data collection through web scraping and APIs, offering case studies from the retail and finance sectors.

[5] Python Software Foundation. (2023). *BeautifulSoup Documentation*. Retrieved from https://www.crummy.com/software/BeautifulSoup/

- This is the official documentation for BeautifulSoup, a Python library used for web scraping, often integrated with RPA bots for automated data extraction from websites.

[6] Lauritzen, S., & Bogataj, K. (2022). *RPA for Data Collection and Integration in Enterprise Applications*. *Enterprise Information Systems Review*, 12(1), 45-59.

- This paper focuses on how enterprises use RPA for collecting and integrating data from multiple sources, including databases, websites.

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