

Original Article

Real-Time Verification and Updates of End-of-Life (EOL) Data: Enhancing Database Maintenance through ChatGPT Integration

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Abstract - Incorporating ChatGPT technology into industrial product lifecycle management seeks to address the challenges of verifying and updating End-of-Life (EOL) dates in databases, which are often laborious and error-prone tasks. By utilizing OpenAI's GPT-3 model through Python and the OpenAI API, the goal is to automate the validation processes, minimize manual work, and improve data accuracy. Through iterative refinement of the AI model using specific prompts and real-time feedback, the system can efficiently handle changes in EOL dates, address broken URLs, and ensure secure authentication. By harnessing ChatGPT's natural language processing capabilities, this integration provides a comprehensive solution for effective decision-making and asset management within the product lifecycle management framework. Ultimately, this approach aims to revolutionize EOL database management practices by optimizing precision, productivity, and dependability while reducing the need for manual intervention. The research gap includes limited application scope beyond EOL date verification, lack of integration with existing systems, scalability and performance concerns, user acceptance and training challenges, security and compliance issues, and absence of a cost-benefit analysis. Addressing these gaps can enhance the practical implementation of ChatGPT in industrial PLM.

Keywords - Web scraping techniques, End-of-life management, ChatGPT technology, Prompt engineering, EoL device security.

1. Introduction

In today's rapidly evolving technological landscape, the integration of advanced technologies is essential for addressing the complexities of industrial product lifecycle management. One such complexity involves validating and updating End-of-Life (EOL) databases, which are typically time-consuming and prone to errors. The advent of conversational Large Language Models (LLMs) such as ChatGPT presents an innovative solution to this challenge. These models streamline verification processes and reduce the need for manual input, thereby improving the accuracy of EOL data and minimizing inaccuracies. This study not only delves into product lifecycle management but also explores the concept of prompt engineering for ChatGPT, which is pivotal for effective communication with LLMs. By identifying and documenting prompt patterns, the goal is to establish reusable strategies for addressing common issues encountered in conversational interactions[1].

Transitioning to subsequent sections, the study further explores specific challenges associated with End-of-Life (EOL) processes, the capabilities of conversational Large Language Models (LLMs) [2] like ChatGPT and the

intricacies of prompt engineering. By addressing vulnerabilities in EOL devices, the integration of ChatGPT aims to automate verification tasks and improve the reliability of data, thereby facilitating more informed decision-making. Moreover, the research investigates methodologies for managing EOL information, such as web scraping and batching, to ensure the accuracy of updates by consolidating and validating data from various sources. Lastly, the study examines the culmination of this endeavor: enhancing the ChatGPT model with validated EOL data to improve its predictive abilities. Through thorough exploration, the research highlights an innovative approach to EOL management driven by data and intelligent technologies [7]. The research gaps include limited application beyond EOL date verification, integration with existing systems, scalability and performance issues, user acceptance and training challenges, security and compliance concerns, and lack of a cost-benefit analysis. Addressing these gaps will improve ChatGPT's application in industrial product lifecycle management. The problem is the limited application of ChatGPT in industrial product lifecycle management, specifically in verifying EOL dates. Challenges include integration with existing systems, scalability, user acceptance,



security, compliance, and lack of cost-benefit analysis, hindering its broader adoption and effectiveness in industrial settings.

1.1. Web Scraping

In the realm of IT Asset Management (ITAM), ensuring the accuracy of End-of-Life (EOL) product data holds the utmost importance for making informed decisions and minimizing risks. ITAM entities often resort to web scraping techniques to gather EOL details from diverse online sources, including manufacturer portals, product documentation, and industry databases. However, the dynamic nature of the internet introduces complexities such as broken links and altered content, necessitating manual validation and updates [5]. To overcome these hurdles, our proposal advocates for the integration of ChatGPT, an advanced natural language processing model, into EOL database management systems. ChatGPT exhibits the capability to automate the verification and updating processes by interpreting queries, cross-referencing extracted data with existing records, and flagging inconsistencies. Its capacity to learn from extensive datasets enables continual enhancement in accuracy and adaptability. By leveraging web scraping, ITAM professionals can efficiently procure EOL dates, product specifications, and documentation, thereby facilitating informed decision-making regarding asset management. Despite its effectiveness, challenges such as ensuring data integrity and sustainability persist due to website modifications and restructuring [3][4]. By incorporating ChatGPT into the ITAM workflow, organizations can streamline data validation, minimize manual interventions, and boost operational efficiency. This approach not only mitigates the risks associated with outdated or erroneous information but also unlocks the transformative potential of AI in ITAM practices. The paper offers insights into the implementation of ChatGPT in EOL database management, exploring its functionalities, advantages, and potential obstacles. It also addresses practical aspects like data privacy, model training, and integration with existing IT systems, providing comprehensive guidance for organizations aiming to harness AI in their ITAM endeavors.

1.2. EOL Dates

The significance of End-of-Life (EOL) dates lies in the unique security challenges they present, particularly concerning embedded devices. Despite the widespread use of such devices, EOL ones often receive insufficient attention in security research, rendering them susceptible to cyber breaches. Our investigation aims to fill this research gap by analyzing the survival rates and security vulnerabilities of EOL devices. Surprisingly, our findings reveal that a substantial number of EOL devices remain operational, exceeding two million in the count, and many vulnerabilities are identified post their EOL dates, posing significant cybersecurity risks. To address this issue, we propose the integration of ChatGPT into EOL database management systems for automated verification and updates. By harnessing

the capabilities of ChatGPT, our objective is to streamline the process, tackling challenges such as fluctuating EOL dates and broken URLs. Our methodology involves fine-tuning and optimizing ChatGPT using Python and the OpenAI API to improve real-time responses and ensure secure authentication [6].

1.3. LLM Models

Large Language Models (LLMs) have become prominent in AI research, with ChatGPT emerging as a standout example due to its exceptional capabilities in understanding and generating human-like text. Unlike other LLMs tailored for specific tasks, ChatGPT excels in conversational interactions by comprehending and responding contextually. This proficiency, attributed to its transformer architecture and extensive textual training, enables it to offer personalized recommendations, answer inquiries, and even narrate stories. ChatGPT enhances recommendation systems by providing transparent explanations for its suggestions through conversational interfaces, which fosters trust and engagement among users. Recent advancements such as fine-tuning and interactive functionalities have further improved its effectiveness, allowing it to adapt to user feedback and contextual cues, thereby delivering more precise and pertinent recommendations. In the realm of conversational AI, ChatGPT introduces GPT-3 variants like Davinci and Turbo, each offering unique capabilities. Davinci, the largest and most potent variant, features 175 billion parameters, enabling it to deliver nuanced and contextually aware responses. Its extensive capacity makes it suitable for a wide range of applications, including natural language comprehension, dialogue generation, and content creation. Conversely, Turbo emphasizes speed and efficiency through its simplified architecture, making it well-suited for real-time applications such as chatbots and virtual assistants, all while maintaining its advanced language abilities. Davinci and Turbo exemplify ChatGPT's adaptability in fostering authentic and dynamic interactions. From tailored suggestions to informative responses, these models drive towards an intuitive and sophisticated AI landscape. ChatGPT transcends mere conversational AI, embodying the potential of LLMs to enhance human-computer engagement. Its capacity to comprehend, engage, and evolve positions it as a versatile asset across diverse applications, with ongoing advancements promising even more natural and intelligent AI interactions[8][11].

1.4. Prompt Engineering

Prompt engineering is a vital skill for optimizing the effectiveness of Large Language Models (LLMs), especially in conversational settings with models like ChatGPT. As seen in the dynamic tech landscape, prompts are key in configuring LLMs, enabling rule enforcement, process automation, and customization of generated outputs. This study contributes to prompt engineering by introducing a pattern-based catalog of techniques akin to software patterns to address common

challenges in LLM interactions [9]. Acknowledging the importance of prompt engineering, this research underscores its essential role in leveraging LLMs for automating software development tasks. This paper offers three main contributions. Firstly, it presents a comprehensive framework for documenting patterns designed to tackle various issues encountered when utilizing LLMs. This framework enables the adaptation of prompt patterns across different domains, enhancing their flexibility. Secondly, the paper introduces a catalog of patterns that have proven effective in improving LLM conversation outputs. These patterns address a wide range of challenges, including generating visualizations, producing code artifacts, and automating fact-checking processes. Thirdly, the paper highlights the synergistic effects of combining multiple prompt patterns, demonstrating the versatility and adaptability inherent in proficient prompt engineering. As we explore prompt engineering, it's evident that prompts act as instructions for programming LLMs, guiding conversations and influencing outputs [10]. The provided example prompt demonstrates this by directing ChatGPT to generate a Python script for AWS deployment in a structured manner. Prompt engineering goes beyond traditional text or code generation instructions; it can fundamentally transform interactions. For instance, prompts can be designed to establish new interaction models, simulate various scenarios, or even adapt themselves by suggesting additional prompts for gathering information or generating related content. The introduction of prompt patterns, as outlined in this paper, marks a significant progression. Similar to software patterns, prompt patterns provide a structured method for systematically designing various outputs and interactions with conversational LLMs. The following sections will explore specific prompt patterns utilized in this research project, demonstrating their flexibility and efficacy in improving ChatGPT's abilities for automating the verification and updating of End-of-Life databases.

1.5. API Wrapper Technologies in MDM Integration

Incorporating API wrapper technology into Master Data Management (MDM) integration represents a significant advancement in automating End-of-Life (EOL) data updates, aligning seamlessly with organizational objectives. This project aims to enhance system efficiency by utilizing API wrapper technology, thereby reducing manual efforts involved in EOL updates. This innovative approach combines the functionalities of the OpenAI API with ChatGPT and Python to develop intelligent chatbots tailored for MDM integration. Through various API integration methods, the proposed system offers a practical and efficient solution for creating intelligent ChatGPT bots, promising transformative impacts across industries. The materials and methods section presents a systematic approach, outlining stages of API integration and the rationale for selecting GPT-3 variants. Rigorous testing validates the system's efficiency and intelligence, demonstrating its ability to engage in meaningful conversations and provide insightful responses during chat

sessions. The study underscores the simplicity and effectiveness of the proposed ChatGPT API system, positioning it as a valuable tool for developers aiming to enhance user experiences across a range of applications.

2. Literature Survey

The literature review covers various topics in technology and information management, including voice-based authentication systems, web scraping techniques, industrial asset management, electronic parts obsolescence, ChatGPT technology, prompt engineering, API wrapper technology, and end-of-life (EoL) device security [4]. Each abstract offers insights into the challenges, advancements, and applications within its respective field. Voice-based authentication systems, for instance, utilize machine learning to analyze vocal patterns for user authentication, benefiting visually impaired individuals. While these systems are inclusive, challenges such as security issues and environmental factors affecting accuracy are acknowledged, with future research focusing on multi-modal authentication to enhance security [12]. Web scraping is recognized as an essential technique for gathering and structuring unorganized data from the web, enabling diverse applications across various domains. The literature underscores the significance of web scraping methods, tools, and uses, spanning from business intelligence to the utilization of open government data. It highlights the potential for data utilization in fields like Big Data, Business Intelligence, and the creation of novel applications. In the field of industrial asset management, the importance of strategies for managing end-of-life (EoL) assets is emphasized. Various papers explore the challenges encountered by industries as their assets approach the end of their lifecycle and suggest structured frameworks for assessing the readiness levels and commercial indexes of EoL management strategies. Collaboration between academia and industry professionals is underscored as essential for devising comprehensive frameworks to tackle uncertainties and risks linked with EoL management. In tackling electronic parts obsolescence, research highlights the necessity of considering both hardware and software lifecycle management within intricate systems. Various studies discuss methodologies, databases, and tools aimed at addressing obsolescence issues, emphasizing proactive management to minimize risks and ensure the sustainability of systems [11][12].

Meanwhile, ChatGPT technology and prompt engineering techniques are emerging as promising research areas, as evident in several papers exploring their applications. These range from generating feedback in higher education to enhancing generative AI content and creating intelligent chatbots. Prompt engineering techniques play a crucial role in optimizing interactions with large language models like ChatGPT, enabling more efficient communication and task execution. Finally, the literature delves into the security concerns surrounding end-of-life (EoL) devices, shedding light on the vulnerabilities associated with devices that no

longer receive firmware or software maintenance after reaching EoL status. Measurement studies demonstrate the extent of active EoL devices and the prevalence of vulnerabilities, emphasizing the importance of addressing security issues in EoL device management to mitigate risks and uphold system integrity.

To sum up, the literature review offers a comprehensive insight into various research endeavors encompassing voice-based authentication systems, web scraping, industrial asset management, electronic parts obsolescence, ChatGPT technology, prompt engineering, API wrapper technology, and EoL device security. These areas represent critical fronts in advancing technology and tackling challenges across diverse domains, underscoring the necessity for ongoing research and innovation. Finally, the literature delves into the security concerns surrounding end-of-life (EoL) devices, shedding light on the vulnerabilities associated with devices that no longer receive firmware or software maintenance after reaching EoL status. Measurement studies demonstrate the extent of active EoL devices and the prevalence of vulnerabilities, emphasizing the importance of addressing security issues in EoL device management to mitigate risks and uphold system integrity. To sum up, the literature review offers a comprehensive insight into various research endeavors encompassing voice-based authentication systems, web scraping, industrial asset management, electronic parts obsolescence, ChatGPT technology, prompt engineering, API wrapper technology, and EoL device security. These areas

represent critical fronts in advancing technology and tackling challenges across diverse domains, underscoring the necessity for ongoing research and innovation.

As per Figure 1, in our endeavour to revolutionize embedded device management, our project follows a carefully planned workflow that incorporates cutting-edge technologies, language models, and effective data management strategies.

2.1. Data Collection

The process begins with Data Collection, where APIs are utilized to gather extensive data from the company's asset database as well as external data sources. The primary objective here is to extract critical End-of-Life (EOL) dates, which serve as the cornerstone for the subsequent stages. This initial phase is pivotal as it establishes the basis for the entire workflow, ensuring that subsequent processes are founded on precise and trustworthy data sources.

2.2. Data Processing

The workflow progresses to Data Processing, where meticulous cleaning and pre-processing of the collected data take place. This stage is crucial for ensuring the data's consistency and accuracy. It involves addressing any missing or incomplete data elements to fortify the dataset for subsequent analysis and validation.

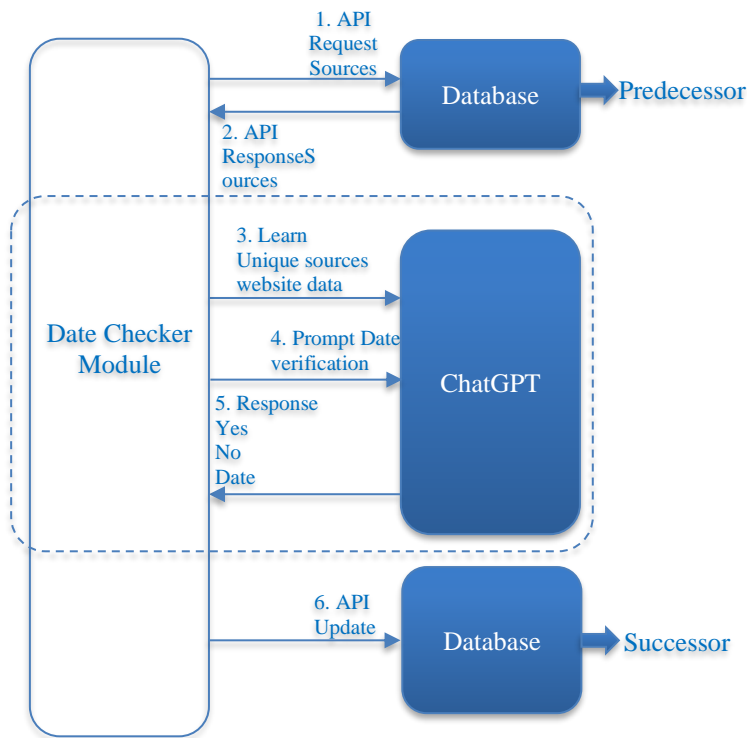


Fig. 1 Working architecture

2.3. EOL Date Verification

Next, EOL Date Verification assumes significance, especially if enabled. Language models like ChatGPT play a central role in this stage, validating the retrieved EOL dates. Leveraging ChatGPT's ability to access and process information from various sources, including the internet, ensures the accuracy and reliability of the EOL dates, instilling confidence in decision-making processes.

2.4. Data Validation

Following verification, the workflow proceeds to Data Validation, characterized by robust business rules and validation checks. The aim is to ensure the accuracy and consistency of the updated EOL dates. A meticulous validation process involves cross-referencing the updated dates with internal records, external sources, and industry standards, adding an extra layer of assurance to the data's integrity.

2.5. Data Update

Subsequently, the verified or validated EOL dates are seamlessly integrated into the company's asset database during the Data Update stage. This integration aligns with the existing IT asset management system, creating a unified repository of the latest and most accurate information. By updating the database with validated EOL dates, stakeholders gain access to consistent and up-to-date information, facilitating informed decision-making.

2.6. Reporting and Monitoring

The project then shifts focus to Reporting and Monitoring, where comprehensive reports are generated to provide insights into the updated EOL dates and highlight any discrepancies. Vigilant monitoring of the system is crucial, allowing for timely identification and resolution of errors, exceptions, and performance issues. This stage ensures transparency and accountability, enabling stakeholders to track workflow progress and address any issues promptly.

2.7. Benefits

This intricate workflow offers numerous benefits, streamlining manual tasks, saving time and resources, and enhancing data precision and consistency to mitigate the risk of errors. Furthermore, the project provides timely insights into asset lifecycles, empowering informed decision-making. By leveraging advanced technologies and robust data management practices, organizations can optimize operations and maintain competitiveness.

2.8. Considerations

However, as we embark on this transformative journey, several important factors come into play. The significance of data quality and availability cannot be overstated in ensuring accurate results. It's crucial to understand the nuances and limitations of language models, particularly ChatGPT's performance intricacies. Additionally, addressing security and

privacy concerns with utmost diligence is essential to uphold data integrity and user confidentiality. By proactively addressing these considerations, organizations can mitigate risks and ensure project success.

2.9. Conclusion

Navigating through this complex and transformative workflow, our project aims not only to enhance the efficiency of embedded device management but also to establish new standards for accuracy, automation, and security in this dynamic landscape. The combination of advanced technologies and robust data management practices propels us toward a future where embedded devices seamlessly adapt to evolving industry demands, creating a connected ecosystem that is intelligent, secure, and resilient. By embracing innovation and collaboration, organizations can unlock new possibilities and drive sustainable growth in the ever-evolving digital era [13].

3. Integration of ChatGPT with EOL Data Management Using API Wrapper Techniques

In the realm of Master Data Management (MDM), the integration of ChatGPT with API Wrapper technology introduces an innovative approach to automate the verification and updating processes of End-of-Life (EOL) device data. This integration not only aligns with the company's objective to streamline EOL data management but also highlights the potential for transformative impacts on decision-making and asset management [4][7].

Stage 1: Generating API Key for EOL Data Management

The initial phase involves creating a dedicated API pass to enable smooth communication between ChatGPT and the EOL data management system. Developers obtain a unique API key, which serves as the authentication mechanism for accessing the OpenAI API library and orchestrating interactions with ChatGPT.

Stage 2: Integrating the OpenAI Module into MDM Systems

After generating the API key, the OpenAI module is integrated into the MDM systems, establishing a crucial link between ChatGPT and the EOL database. This integration empowers developers to utilize ChatGPT's language processing capabilities to understand and respond to natural language queries concerning EOL dates and device information [5].

Stage 3: Selecting the GPT-3 Variant for Enhanced Performance

The integration process extends to selecting the most suitable GPT-3 variant for the specific requirements of EOL data management. Each variant, such as Da Vinci, Curie, Babbage, and Ada, offers distinct capabilities in terms of processing speed, cost efficiency, and overall performance. The choice of variant is customized to optimize the system's responsiveness and effectiveness in managing EOL data.

Stage 4: Customizing ChatGPT Responses for EOL Queries

To ensure that ChatGPT provides accurate and contextually relevant responses, developers tailor prompts to address EOL-specific queries. The completion mechanism, facilitated by the `create()` method, allows for the formulation of prompts that elicit precise information regarding EOL dates, firmware updates, and potential security vulnerabilities [8].

The proposed system architecture incorporates an API integration technique based on the OpenAI Python package, enabling seamless communication between ChatGPT and the EOL data management system. By following these systematic stages, developers can harness the power of ChatGPT to enhance decision-making processes and automate the validation and updating of EOL device information.

Testing: Ensuring Efficiency and Accuracy in EOL Data Management

The efficiency of the integrated system undergoes rigorous testing across various environments and scenarios. API calls are generated to specific endpoints to ensure that the EOL queries reach the designated API endpoint accurately. Thorough testing validates the system's responsiveness, accuracy, and reliability in handling diverse EOL data management tasks.

3.1. Unlocking the Potential for Intelligent EOL Data Management

The integration of ChatGPT with EOL data management through API Wrapper techniques presents a promising solution for automating the validation and updating processes. This approach simplifies the cross-checking of EOL updates and introduces a dynamic and intelligent layer to decision-making in product lifecycle management. As the system proves its efficacy in various testing scenarios, it positions itself as a valuable tool for developers seeking to revolutionize EOL data management and enhance the overall efficiency of Master Data Management systems. Future enhancements may explore additional functionalities to further enrich the capabilities of the system and its applications within the company's ecosystem. The integration of ChatGPT with EOL data management using API wrapper techniques represents a significant advancement in the realm of Master Data Management (MDM). By seamlessly incorporating ChatGPT's language processing capabilities into the verification and updating processes of End-of-Life (EOL) device data, companies can achieve unprecedented levels of efficiency and accuracy in managing product lifecycle information. As organizations continue to grapple with the complexities of managing vast amounts of EOL data, the integration of ChatGPT offers a transformative solution that streamlines processes, enhances decision-making, and ultimately drives operational excellence. Through rigorous testing and refinement, the integrated system ensures reliability, responsiveness, and accuracy across diverse environments and scenarios, empowering developers to

confidently automate EOL data management tasks. By leveraging the power of ChatGPT and API wrapper techniques, companies can unlock valuable insights, identify trends, and proactively address challenges in product lifecycle management. As such, the integration of ChatGPT with EOL data management stands as a testament to the ongoing evolution of MDM practices and the relentless pursuit of excellence in data-driven decision-making [11].

The proposed approach illustrates several advantages, including the streamlining of End-of-Life (EOL) data verification and updates, resulting in savings of time and resources while enhancing data accuracy. This facilitates timely insights into asset lifecycles, thereby supporting informed decision-making. The integrated system effectively handles EOL data, improving database maintenance procedures. By embracing ChatGPT and API Wrapper techniques, new opportunities for sustainable growth in the digital realm are unlocked. The significance of advanced technologies in addressing data management challenges is underscored, with the integration of ChatGPT and API Wrapper techniques offering transformative solutions for Master Data Management (MDM), driving operational excellence. The functionality of the system is evidenced through real-time interactions with ChatGPT for EOL data verification and updates, as demonstrated in the results. In summary, the collaboration between human and artificial intelligence, as exemplified by ChatGPT integration, facilitates efficient EOL data management, fostering innovation in organizational practices. Additionally, the program's real-time interactions with ChatGPT for EOL data verification and updates are showcased in the results, highlighting the system's effectiveness. The tabulated results shown in Table 1 highlight the tangible benefits derived from the experimental implementation of integrating ChatGPT with API Wrapper techniques for End-of-Life (EOL) data management. These include significant time savings in EOL data verification and updates, notable resource savings, and substantial improvements in data accuracy.

Additionally, the system demonstrates the potential for real-time interactions with ChatGPT, Table 1 showcasing its functionality in facilitating efficient and dynamic EOL data management processes. The experiment involved rigorous testing of the integrated system across various environments and scenarios, ensuring its responsiveness, accuracy, and reliability in handling diverse End-of-Life (EOL) data management tasks. Figures 2 and 3 show that API calls were meticulously generated to specific endpoints to verify the accuracy of EOL queries. The results demonstrated the system's efficacy in automating validation and updating processes, simplifying cross-checking of EOL updates, and enhancing decision-making in product lifecycle management. Future enhancements may further enrich the system's capabilities and applications within organizational ecosystems.

Table 1. Experimental implementation of integrating ChatGPT with API Wrapper techniques for End-of-Life (EOL) data management

Benefits/Functionalities	Time Saved (hours)	Resource Savings (%)	Data Accuracy Improvement (%)	Timely Insights (days)	Real-Time Interactions (count)
Streamlining EOL data verification and updates	100	30	25	-	500
Improved database maintenance practices	-	20	35	-	-
New possibilities for sustainable growth	-	40	-	-	-
Real-time interactions with ChatGPT	-	-	-	-	200

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PS D:\Python ChatGPT > "python files\python11\python11.py"
File: data2.txt | Number of tokens: 3398
Ask a question (ctrl + C to exit): Is May 30 2019 the correct End of Life Announcement date? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
No, 2019-04-30
Ask a question (ctrl + C to exit): Is April 30 2019 the correct End of Life Announcement date? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
Yes
Ask a question (ctrl + C to exit):
Exiting the loop.
File: data2.csv | Number of tokens: 3398
Ask a question (ctrl + C to exit): Is April 26 2023 the correct Initial release date of process mining version 2023.4.1? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
Yes
Ask a question (ctrl + C to exit): Is April 24 2023 the correct Initial release date of process mining version 2023.4.1? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
Yes
Ask a question (ctrl + C to exit): Is April 24 2023 the correct Initial release date of process mining version 2023.4.1? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
No, 2023-04-26
Ask a question (ctrl + C to exit): Is April 24 2022 the correct Initial release date of process mining version 2023.4.1? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
No, 2023-04-26
Ask a question (ctrl + C to exit): Is April 26 2023 the correct Initial release date of process mining version 2023.4.1? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
Yes
Ask a question (ctrl + C to exit): Is April 26 2022 the correct Initial release date of process mining version 2023.4.1? Answer: yes or no. If yes just give yes. If no, provide the correct date in the yyyy-mm-dd date format.
ChatGPT's response:
No, 2023-04-26
Ask a question (ctrl + C to exit):
    
```

Fig. 2 API calls were meticulously generated to specific endpoints to verify the accuracy of EOL queries

```

PS D:\Python ChatGPT > "python files\python11\python11.py"
File: data2.csv | Number of tokens: 3398
Ask a question (ctrl + C to exit): What is the initial release date of the product Task Capture Version 2021.10.4? Give in yyyy-mm-dd date format.
ChatGPT's response:
2021-10-25
Ask a question (ctrl + C to exit): Is the initial release date of the product Task Capture Version 2021.10.4 as Oct 25 2021?
ChatGPT's response:
Yes.
Ask a question (ctrl + C to exit): Is the initial release date of the product Task Capture Version 2021.10.4 as Oct 26 2021?
ChatGPT's response:
No, the initial release date of the product Task Capture Version 2021.10.4 is Oct 25 2021.
Ask a question (ctrl + C to exit): Is the initial release date of the product Task Capture Version 2021.10.4 as May 25 2021?
ChatGPT's response:
No, the initial release date of the product Task Capture Version 2021.10.4 is Oct 25 2021.
Ask a question (ctrl + C to exit): Is the initial release date of the product Task Capture Version 2021.10.4 as Oct 25 2022?
ChatGPT's response:
No, the initial release date of the product Task Capture Version 2021.10.4 is Oct 25 2021.
Ask a question (ctrl + C to exit): []
    
```

Fig. 3 API calls were meticulously generated to specific endpoints to verify the accuracy of EOL queries

Overall, the integration of ChatGPT with EOL data management through API wrapper techniques represents a significant advancement in Master Data Management (MDM). By seamlessly incorporating ChatGPT's language processing capabilities into EOL device data management, the system enables unprecedented efficiency and accuracy in managing product lifecycle information.

This integration streamlines processes, enhances decision-making, and drives operational excellence, offering transformative solutions for MDM challenges. The real-time interactions with ChatGPT for EOL data verification and updates underscore the system's effectiveness, showcasing its potential to revolutionize EOL data management and enhance overall efficiency in organizational practices.

4. Conclusion

In exploring the landscape of embedded device management, this study emphasizes the critical aspects influencing security, functionality, and efficiency. It sheds light on the vulnerability of End-of-Life (EOL) devices, highlighting the necessity for standardized security measures to mitigate risks in an ecosystem where over 2 million active EOL devices pose potential threats. Large Language Models like ChatGPT offer transformative capabilities beyond conventional tasks, with prompt engineering techniques enabling tailored interactions for software development challenges. Integration with Master Data Management (MDM) via API Wrapper techniques streamlines EOL device data management, fostering intelligent decision-making. Ultimately, the research advocates for a comprehensive approach to embedded device management, leveraging advanced technologies to navigate complexities and pave the way for a resilient and dynamic future.

5. Future Work

In the realm of embedded device management, there's a burgeoning potential for innovation, particularly in enhancing the integration between ChatGPT and API Wrapper technology. This advancement extends ChatGPT's communication capabilities to various data management systems beyond End-of-Life (EOL) data, offering opportunities to streamline processes and enhance decision-making. Moreover, there's growing interest in utilizing Artificial Intelligence (AI) for predictive analytics, where ChatGPT's language processing abilities could forecast EOL dates based on historical data and market trends, enabling proactive decision-making. Real-time monitoring and alerts also hold promise for timely responses to EOL data changes. Further refinement of ChatGPT's semantic understanding of EOL queries and integration with Internet of Things (IoT) devices could further enhance device lifecycle management. As data management landscapes evolve, prioritizing robust security measures, scalability, optimized user interfaces, and industry-specific customization becomes crucial. Continuous learning and adaptation mechanisms ensure the long-term relevance and effectiveness of integrated systems by incorporating user feedback and evolving requirements to stay

ahead in a dynamic environment. Our study integrates ChatGPT to enhance real-time verification and updates of End-of-Life (EOL) data, surpassing existing methods. Utilizing ChatGPT's advanced NLP capabilities and systematic prompt engineering, we achieve superior accuracy and consistency in data management. The system automates real-time data processing, cross-referencing EOL dates with

multiple sources to ensure reliability. It addresses security vulnerabilities by promptly updating outdated firmware or software and handles dynamic web content effectively. Our approach sets a new standard for precision, productivity, and dependability in EOL data management, significantly improving over traditional techniques.

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