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What if GPT4 Became Autonomous: The Auto-GPT Project and Use Cases

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***Abstract*— Auto-GPT is a product of an experimental project that makes the use of GPT-4 autonomous. Notably, Auto-GPT emerged and spread rapidly, while the echo of OpenAI's ChatGPT continues. However, there are insufficient studies on this new application in related literature. The purpose of this exploratory case study was to explore the different use cases and experiences of Auto-GPT users. For this purpose, 16 users with an Auto-GPT experience on the GitHub platform were interviewed. Thematic content analysis was performed on the qualitative data. AutoGPT experiences of users can be characterized by learning programs, autonomous applications, conducting research, and writing reports. The results of this study showed that content creation is the most important purpose of using Auto-GPT. As independent research functions of Auto-GPT, users also emphasize data summarization and information organization. However, the participants also pointed out the token limit (inefficiency), forgetting generated tools, and iteration as some prominent limitations of Auto-GPT. It is possible to say that Auto-GPT has a high potential to use in also in educational purpose, but it is still in the development stage.**

Keywords— Auto-GPT, GPT-4, ChatGPT, Use Cases

I. INTRODUCTION

What artificial intelligence does and can do has undoubtedly been one of the most important topics of discussion nowadays among technology developers and users. Natural language processing models have become increasingly popular in recent years and are recognized worldwide as an important milestone in the development and use of artificial intelligence [1]. A succession of fast and efficient models reshapes the way we interact with AI and the digital world. In particular, OpenAI's GPT series, with its innovative features, has led to exciting developments in the emergence of opportunities arising from the collaboration of advanced language models with human and artificial intelligence. Natural language processing is a subset of artificial intelligence which refers to the automatic computational processing of human speech, and includes systems which use human-generated text as input and systems which produce natural-sounding text as output [2].

Auto-GPT is a product of an experimental project developed to make the use of GPT-4 autonomous. Auto-GPT is a Python application that is available as an open source on GitHub [3]. Auto-GPT is powered by self-managing artificial intelligence agents that can self-request commands and execute tasks with minimal human intervention. Self-triggered prompts enable complex research to be conducted without human intervention. Given a user query, Auto-GPT performs step-by-step actions to realize the goal autonomously. In addition to reasoning about the current situation, Auto-GPT can also use past actions to improve decision making [4]. Autonomous AI can learn, think and act without continuous input from humans [5]. In this way, it aims to obtain the result by sequentially generating commands from the given basic commands and their results. While there are evidence suggesting that scaling up Large Language Models (LLM) can lead to certain level of general intelligence, there are still limitations as the lack of long-term memory, limited token length, and the lack of deterministic control over its behaviors, etc. [6].

II. IS AAI POSSIBLE?

The ChatGPT natural language processing model was publicly launched in November 2022 and scaled at an unprecedented rate, reaching 1 million users in five days compared to 300 days for Facebook, 720 days for Twitter, and 75 days for Instagram. The most important factor underlying this rapid spread is its text production and processing feature. ChatGPT can generate high-quality, plausible, human-like written responses to statistical analyses, texts, computer programs, abstracts, or introductions to scientific articles[7]. ChatGPT is able to do this by taking advantage of its extensive data stores and efficient design to understand and interpret user requests and then generate appropriate responses in early natural human language[8]. The use of ChatGPT also presents various potential problems, such as the generation of incorrect or fake information and student plagiarism, and for students it is crucial to introduce them to the limitations of ChatGPT, such as its reliance on biased data, limited current knowledge, and the potential for generating incorrect or fake information [9]. Developed using the GPT-3.5 language model, an improved version of GPT-3, ChatGPT is the result of OpenAI's ongoing work on increasingly secure and useful artificial intelligence systems [10]. In March 2023, shortly after ChatGPT was launched, the GPT 4 is available as final version. GPT-4 builds on the success of its predecessors, GPT-3 [11] and GPT-2 [12]. These models have shown significant improvements in their ability to understand and generate natural languages. With 175 billion parameters, GPT-3 sets new standards for several natural language processing tasks [13]. In the GPT-4 model, the number of parameters reached trillions, significantly increasing its capacity compared to previous models [14]. In addition to human feedback-

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supported learning, GPT-4 has a rule-based reward model approach compared with GPT-3 [15].

Chat GPT is able to accomplish with its language processing capability, which has been an important milestone in the history of artificial intelligence and made it the top of the agenda in a short time. The use of language models like ChatGPT in education appears as a potential area of interest due to their rich and wide range of applications [16]. Using these models, it will be possible to create personalized and effective learning experiences for individuals at every level of education, in line with each individual's unique learning preferences, abilities, and needs [17]. Going forward, we expect ChatGPT's performance to increase through deep learning, a promising development educators and researchers should pay attention to for its potential applications in teaching and learning [18]. However, it should be noted that ChatGPT's ability to generate highly realistic texts poses a potential risk to the integrity of online exams. Precautions should be taken to prevent this from happening [19,20] LLMs can also be used to develop more natural and sophisticated user interfaces by exploiting their ability to generate contextualized, personalized, and diverse responses to natural language questions asked by users [21]. Chat GPT performs the desired commands thanks to user prompts, that is, user instructions. A prompt is a chat message that the user sends to an LLM, such as ChatGPT, in a chat-based environment [22]. In this case, the most important step in achieving high efficiency from artificial intelligence is to write the correct prompt. With the introduction of AutoGPT, the automatic prompt generation and processing promised by autonomous artificial intelligence has caused users to turn their attention in this direction.

The autonomous transformation of AI has been a topic of discussion since the 1960s [23]. Following the launch of GPT-4 in March 2023, studies on the use of productive artificial intelligence technologies in almost every sector came to the forefront and created a big agenda in the first quarter of 2023. In natural-language processing-based generative artificial intelligence models, directing the right prompt to artificial intelligence is the key to the efficiency of autonomous artificial intelligence. AutoGPT, an open-source Python project, was created to fill an important gap in helping users reach their targeted results by generating automatic prompts from the given commands. Auto-GPT proposes the goal that attempts to make GPT-4 fully autonomous and try to solve the problem that let ChatGPT interact with the internet [24].The emergence of autonomous systems in an increasing number of domains has made it imperative for AI agents to deal with environmental uncertainty through creativity [25]. An autonomous AI application is a system that perceives an environment as part of it and works to influence what it perceives in the future in line with its goals over time. Wang [26] presents basic research on the fundamental theories, discoveries and latest developments in AAI and Symbiotic Human-Machine Intelligence. Autonomous Artificial Intelligence (AAI) is recognized as the general form of AI equivalent to human Natural Intelligence (NI), supported by intelligence science, brain-inspired systems, cognitive computers, intelligent mathematics and systems, humans, and cybernetics. However, AI agents differ from objects in object-oriented computer programs in that they are autonomous, flexible, and have their own control structures.

According to Totschnig [27], "In AI and AI applications, autonomy refers to an artificial entity's ability to act autonomously without human guidance, assuming a fixed goal or utility for evaluating its actions. However, from a philosophical point of view, this concept of autonomy seems unlikely to be implemented, but the rapid proliferation of autonomous AI applications, such as BabyAGI and AutoGPT, which emerged in 2023, proved that the pace of development of artificial intelligence should not be underestimated.

AutoGPT, which performs operations using the GPT-4 model, can work autonomously and perform the steps of thinking, planning, and taking action independently. While working with LLMs, it automatically generates prompts in line with the given command and works until it reaches the result, without the need for users to add any input. Considering that creating the correct prompt and presenting it to artificial intelligence is the most important step in achieving the desired result, AutoGPT will produce effective results by saving users from this step. While there has been growing interest in Auto-GPT-styled agents, questions remain about the effectiveness and flexibility of Auto-GPT in solving real-world decision problems [28].

While recent studies on the use of autonomous artificial intelligence in areas such as health [29], energy production [30], and genetics [31] are available in the literature, there are no studies in the field of open and distance learning. Studying the Chat GPT's ability to enhance autodidactic learning is very important for several reasons. It can identify best practices and approaches for using chatbots and other artificial intelligence (AI) tools in education as well as provide guidance for the future of education and the use of technology in learning [32]. Auto-GPT combines GPT-4's powerful natural language processing capabilities with the ability to auto-author prompts in a single framework, enabling a large number of tasks to be automated with a high level of precision and efficiency. This development shows that LLMs, which could be an important future solution tool for AI, have the potential to radically transform the way we look at business automation. Despite this, studies on Auto-GPT and its potential applications are very limited in the relevant literature. In particular, the experiences of developers using Auto-GPT can provide important insights to explore the potential of this remarkable application. Determining the potential usage areas and limitations of AutoGPT will shed light on future research in this field.

III. RESEARCH PURPOSE

In the first quarter of 2023, studies on the use of productive artificial intelligence technologies in almost every sector came to the forefront and created a significant agenda. The introduction Auto-GPT has raised questions regarding the current use of generative artificial intelligence technologies and in which areas they can be used effectively in the future. This research aims to examine various use cases and experiences of Auto-GPT users. Thus, this study aims to

identify and understand the experiences of Auto-GPT users and to reveal the potential projects and best use cases.

IV. Method

This research was designed based on the case study methodology proposed by Yin [33]. The exploratory case study method was preferred to investigate and interpret the usage areas and experiences of users on the Auto-GPT project, which is available on the GitHub platform, comprehensively and deeply. In the relevant literature, researchers have various definitions and approaches pertaining to the case study [34, 35, 36]. A case study is a method that examines a single situation or event longitudinally, systematically collecting data and examining what happens in real-world settings. Yin [37] defines case study as a research method used when the research focuses on "how" and "why" questions, when the researcher has little or no control over the events, when you study the event or phenomenon within its natural life framework, when the link between the event and real life is not clear enough. According to Yin [38], one of the features that distinguishes a case study from other designs is that it is combined with an existing theory and, depending on its outputs, three types of case studies are defined as exploratory, descriptive, and explanatory. An exploratory case study design is conducted to investigate a new situation, a topic that has not yet been sufficiently researched, and to fill the gap in the literature [39].

In the research, data analyzed were gathered from the discussion thread on the GitHub platform, where users share their experiences and usage scenarios with Auto-GPT. For the purpose of the research the open-ended question posed in the discussion was "What use cases have you found for Auto-GPT?". Sixteen users responded to this open-ended query. The participants provided voluntary consent for the use of their data anonymously. These comments were provided by 16 different users, offering diverse perspectives and potential applications. The responses from the users were subjected to content analysis. Qualitative data took advantage of thematic content analysis, a common method used to identify, analyze, and report patterns or themes in data. The thematic content analysis was conducted in five stages [40]:

1. *Familiarization*: Initially, researchers carefully read through user comments to become familiar with the data and identify patterns or themes at the outset.

2. *Coding*: Each comment was systematically coded by assigning labels to specific sections of the text that represented a particular idea, application, or experience. This process enabled the researchers to effectively organize and categorize the data.

3. *Identifying themes*: The codes were examined and compared. Similar codes were grouped into broader themes. These themes reflect the most important ideas and experiences shared by users.

4. *Review and Refine Themes*: The identified themes were reviewed and refined to ensure that they accurately represented the data. This process aims to verify that the themes are supported by coded data, and that there are clear distinctions between different themes.

5. *Identifying and Naming Themes*: The final step was to create clear and unambiguous descriptions for each theme and associated subthemes to identify and name the themes.

V. Findings

Themes were derived from the codes in the thematic content analysis. Thus, 21 themes were identified. The themes were sorted into four categories based on their common characteristics. The codes, themes, and categories obtained from the content analysis are presented together with the frequencies in Table I.

Table I. Qualitative Findings

Categories	Themes	Code	Frequencies
Use Cases (f=14)	E-commerce	Sales, customer journeys	1
	Ticketing	Customer queries	1
	Data summarization	Open data portal, news articles	2
	Content creation	Cocktail list, Python script, podcast outline	3
	Tool generation	Programs, files	1
	Information organization	Party schools in the US, market research	2
	Investment analysis	Autonomously gather and analyze market data	1
	Product research	Best headphones	1
	Social media management	Generate content, schedule posts, customer inquiries	1
Limitations (f=4)	Token limit	Stuck at limit tokens	1
	Inefficiency	Scraping articles online	1
	Forgetting generated tools	Not using tools effectively	1
	Iteration	Airtight systems, progress after shutdowns	1
Workarounds (f=3)	Data chunking	Bypass token limit	1
	GPT-4 improvements	Better tool utilization	1
	Session continuity	Return to a session after it closes	1
User Experience (f=5)	AI enthusiasm	AI addiction, learning new technologies	1
	Learning programming	Python language	1
	AI agents	Outsource tasks to other AI agents	1
	Autonomous AI capabilities	Conduct research, write reports	2

The theme with the highest frequency among the 21 themes obtained in the study was "Content Creation". This theme is in line with the feature of producing content on different topics, which is considered the most important outputs of use of GPT models. Direct quotes from two user related to this theme are provided below.

"*I tried to let it make "tools" (programs and files) that it would use while on projects. It made a lot and even impressive*

ones i thought. … it would be cool to have it "externalize" and therefore reduce token cost."

"*I used it to come up with a pretty basic cocktail list. All the cocktails and their recipes were quite good...*"

This theme was followed by "*Data Summarization*", "*Information Organization*" and "*Autonomous AI Capabilities*" with two frequencies for each. These three themes are related to the AutoGPT's ability to conduct self-search. When prompts are given in sufficient detail and in a cyclical structure, AutoGPT's independent research feature comes to the fore. Direct quotes from two user's view on data summarization are given below.

"*Search and summarize data works pretty well. I let it write me a list of all data available in the open data portal.*"

"*I'm trying to summarize the news. But still stuck at limit tokens...*"

AutoGPT users emphasized the potential of AutoGPT for searching and summarizing data, but criticised the token limits. About "information organization", a direct quote from a user is given below.

"*I used it to find the top 10 party schools in the US... and then write each schools online application URL to a text file for easier applying. If only I had this 19 years ago when I was applying to college...*"

In this theme, users emphasized the potential of AutoGPT to organize information with the support of AI technology. Finally, here is a direct quote from a user on the topic of "*Autonomous AI Capabilities*".

"*…chunking large data into smaller bits that don't pass the token limit. I believe Auto-GPT does this when scraping articles online but its not really efficient.*"

Here in this theme, users criticize the autonomous AI capabilities with token limits that cause inefficiency. Each of the other 17 themes has one frequency.

By examining the themes in the Workarounds and User Experience categories, it is possible to gain a more detailed understanding of the user experience. There is significant interest and curiosity about AI technology among users. Users are exploring the potential of AI to learn new technologies and expressing their reliance on AI technologies in the process. The results indicate that users are turning to learning programming languages such as Python. This will increase their ability to use these tools more effectively and deepen their understanding of these technologies. Users appreciate Auto-GPT's ability to delegate tasks to other AI agents. This allows users to focus their time and energy on more strategic or creative tasks, while ensuring that routine or repetitive tasks are completed quickly and efficiently. Autonomous AI capabilities, such as conducting research and writing reports, are among the most frequently cited positive aspects by users. This demonstrates AI's ability to respond to user needs and add value.

In addition to the advantages of AutoGPT, some limitations were also mentioned. These were identified as "*token limit*", "i*nefficiency*", "*forgetting generated tools*", and "*iteration*". When analyzing the codes related to these topics, it is observed that the inefficiency and some shortcomings of AutoGPT are emphasized. These limitations can be considered natural considering that AutoGPT is still under development. Participants made suggestions to overcome these limitations. These suggestions included session continuity, removal of the token limit, and further development of the GPT-4 model.

VI. Discussions

The rising trend in AI development has led to discussions of the reduced use of manpower in many fields. Many studies, especially after the introduction of ChatGPT, have revealed important findings regarding the breadth and diversity of its use. AutoGPT, which was created for the autonomous use of the GPT-4 model, can perform many operations such as content generation, access to web content, text summarization, decision-making, and situation analysis with the sequential commands it generates to execute the given command. While there are studies in the literature on the use of AAI agents in areas such as health [41], energy production [42], and genetics [43], it is important to determine the potential for use in education in general, and open and distance learning in particular. AutoGPT's ability to perform operations by minimizing human intervention determines the areas of use in open and distance learning, and reveals the need to draw a framework on how it can be used in this direction.

The high number of students and the diversity of programs in open and distance learning bring about the need for the effective use of AI technologies to save labor and time at many stages of teaching. Content creation, support services, assessment, and evaluation are among the areas that need the most improvement in terms of labor and time [44]. As a result of this research, AutoGPT's ability to perform more operations in fewer steps, to produce content, to summarize the content produced, and to provide guidance in line with the commands entered, reveals that it can be used effectively in these steps of open and distance learning. However, the GPT-4 has some limitations. The first is that it is paid. The fact that GPT-4 is available for a fee as of April 2023 can also be considered one of the limitations in the use of AutoGPT.

VII. Conclusions and Suggestions

This qualitative research is an exploratory case study that aims to examine use-cases and experiences of Auto-GPT users. Data were collected from the GitHub platform. Answers of users to the question of "What are your experiences on the Auto-GPT use-cases*". In response to this question, 16 comments were analyzed and 21 themes were identified. The three important findings of this study are as follows.

- Integration of Auto-GPT into business processes: The results indicate that integrating Auto-GPT into business processes can provide significant productivity gains, especially in data-driven and information management jobs. This means that companies and organizations can use Auto-GPT to optimize their business processes and become more competitive.

- Auto-GPT's limitations and areas for improvement: This research also reveals Auto-GPT's current limitations and areas for improvement. Limitations such as the token limit, inefficiency, forgetting of generated tools, and iteration have

been identified as important areas for the development and improvement of Auto-GPT. Users' suggestions for overcoming these limitations focused on session continuity, removing the token limit, and further development of the GPT-4 model.

- Potential for use in open and distance learning: The results of various use cases and experiences of Auto-GPT show that it can offer significant opportunities for open and distance learning. The effective use of Auto-GPT in areas such as content creation, support services, assessment, and evaluation can contribute to making such learning systems more efficient and user friendly [44].

The results of this study show that Auto-GPT can offer successful use cases in areas such as content creation, data summarization, knowledge organization, and AAI capabilities. In addition, it has been determined that users' experiences such as learning programs, using autonomous applications, conducting research, and writing reports stand out in their experiences. The codes and themes derived from participant opinions about Auto-GPT indicate that this application has high usage potential in open and distance learning, especially in mass teaching systems. However, both the lack of desired maturity in AI technologies and the fact that Auto-GPT is a newly emerged tool that has not yet evolved into a stable application pose challenges for its usage in sensitive areas such as education.

VIII. RECOMMENDATIONS

Continue the development of Auto-GPT and overcome existing limitations. In particular, issues such as token limits and inefficiency must be addressed.

The use of Auto-GPT in the field of education and learning technologies should be encouraged, especially considering that it can be used effectively in open- and distance-learning processes.

Platforms should be created to share experiences and use cases related to Auto-GPT among users, and users should be able to interact on these platforms. In this way, knowledge sharing regarding the potential applications and effective usage methods of Auto-GPT can be increased.

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