

**Undergraduate Thesis Prospectus**

**Improving AI Agents for Shorter Response Times**  
(Technical Research Project in Computer Science)

**Opposition to Artificial Intelligence in the United States**  
(Sociotechnical Research Project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## **General Research Problem**

*How can the user experience of AI agents be improved?*

AI agents are autonomous assistants that rely on machine learning models to process user requests and perform actions in response. As technology advances, these models will become more complex, which expands the capabilities of AI agents. They would become more powerful in that they can accept and output a more variety of information. For example, GPT-4, OpenAI's most recent model, can process images along with text, whereas its predecessors could only accept text inputs. According to OpenAI, it surpasses ChatGPT, which is based on GPT-3.5, in various benchmarks and exams (2023).

However, an important aspect to consider is how humans interact with these AI agents. AI agents are created with the main purpose of helping people, so how people perceive and experience them would influence their use of AI. In a technical perspective, user experience can be improved by reducing the time needed to process user requests. Faster responses would encourage more people to interact with the agents rather than try to resolve the problem on their own because it is simpler and quicker. In a social perspective, people's opinions of AI will likely influence how they perceive AI agents and their actions, as well as their decisions of when to interact with them. Understanding the reasons for their opposition against AI and incorporating measures in response to their concerns might encourage people to view the agents as tools rather than risks.

## Improving AI Agents for Shorter Response Times

*How may the response time of task-based AI agents be improved?*

The project advisor is Haiying Shen from the Computer Science department, and it will be done in collaboration with Shiyi Liu and Tanmoy Sen, PhD students under Professor Shen.

The advanced models used for AI agents generally cannot be run locally (i.e. computer or phone) as they require much computation resources; instead, user requests are processed in the cloud. This means that for each request, the data is sent to an external infrastructure (which has satisfactory computational equipment) where the model resides, and then it is processed and sent back. This typically leads to slower response times as the request has to be sent back and forth. Furthermore, as model size increases, the time needed for the model to generate a response increases. In Fig. 1, GPT-4 has a greater response time, or slower, than the other two models under the same conditions. This is due to GPT-4 being larger, but its size allows the model to generate more accurate responses compared to the other models.

OpenAI and Azure OpenAI APIs response time (lower is better)

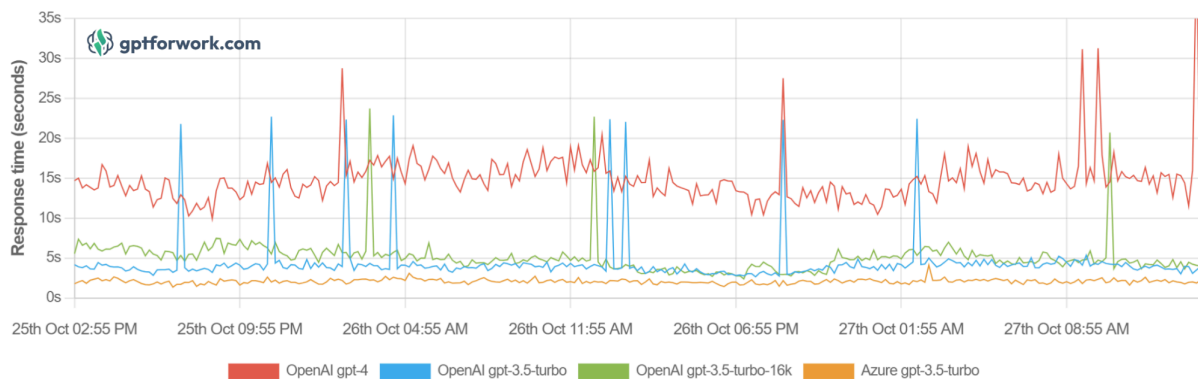


Figure 1. Comparison of response times for different GPT models (“OpenAI API”, n.d.)

The aim of the project is to create a simplified model that can be executed on devices with limited resources (i.e. phones). The current state of the art is AutoGPT, a task based AI agent that uses OpenAI’s GPT models through their API. Users can prompt the agent with a task,

such as search for a product that meets a certain requirement, and the agent will search the web and gather a list of suggested products. A major problem is that the AI agent will take several seconds, if not minutes, to reach the desired goal due to its dependence on OpenAI's GPT. Thus, the main method is to observe AutoGPT, and, based on the data gathered, build a simpler model. Looking at the agent's responses could provide insight on how the model responds to similar prompts and lead to the discovery of patterns.

### **Opposition to Artificial Intelligence in the United States**

*In the US, how have critics of AI strived to limit the hazards they perceive?*

The thought of allowing autonomous entities to make decisions on its own generates opposition from many different groups of people. The percent of the American population concerned with AI's growing role in daily life increased from 37% in 2021 to 52% in 2023 (Tyson & Kikuchi, 2023). Some reasons for their concerns include bias and prejudice, the threat of human extinction, job insecurity, and many more. Analyzing the reasons for their concerns and what they desire to contain the risks could lead to more user friendly AI agents. Then, they can better fulfill the requirements of society. In response to the rise of AI, what have critics of AI done to advance their agendas?

Research has investigated criticisms against AI in many aspects. For example, one study examines people's opinions of AI-generated artwork and specific reasons for why they prefer human generated artwork over the latter (Bellaiche et al., 2023). This provides insight on the difference between work created by AI compared to that created by humans, which can then be prioritized when improving AI. Das (2022) looked into the possibility of AI replacing human resources. He concludes that it is more likely that AI and human workers will both be used

because they are not direct substitutes. AI is not fully capable of performing the work of a human, so there is still a need for people. Finally, DeCamp and Lindvall (2023) provided insight on bias in AI systems and how to mitigate them. The authors analyze how biases in the system are created due to how clinicians and patients use AI systems and suggest methods to address them.

Two groups of critics will be analyzed. The first group is those who want to restrict AI. One participant in this group is the activist group PauseAI. They acknowledge that AI has “amazing potential” but believe that the risks it brings, such as AI-powered biological and autonomous weapons and AI machines that can “outsmart [humans] and outcompete [humans]”, are more urgent (PauseAI, n.d.). These risks need to be dealt with before further AI development, so they advocate for a global pause on AI so that people can find ways to prevent them. Another participant in this group is the Writer’s Guild of America. The president of WGAW (Writer’s Guild of America West) Meredith Stiehm (2023) claims that “AI is the replacement of human creativity with theft.” According to the president, companies “take our [the writers’] work – our words, voices, and likenesses – without our consent, without compensation, or attribution” to train AI models. These models are then used to generate content that can replace the writers. As a result, the labor union went on a strike from May to September 2023. One goal of the strike was regulating the use of AI in writing: “AI can’t write or rewrite literary material ... and MBA-covered material can’t be used to train AI” (WGA, n.d.). One last participant of this group is the Future of Life Institute (FLI). They focus on protecting the future of life from technological threats, including AI. FLI (n.d.) believes that AI “will cause our extinction” because AI systems can be unpredictable: “AI programmed to do something altruistic could pursue a destructive method to achieve that goal.” Thus, they advocate for government policies

to regulate these systems and ensure that they benefit the public, not only the corporations. One notable course of action was their open letter for a six month pause on training models more powerful than GPT-4, of which many well known people have signed in support (FLI, 2023). The letter's purpose is to temporarily stop the arms race between AI companies to consider the safety of these systems and how to improve.

The other group of participants are AI critics that want to regulate or modify current AI. One participant in this group is the Algorithmic Justice League (AJL). They believe “who code matters, how we code matters, and that we can code a better future” (AJL, n.d.). AI, if left unchecked, can embed the biases of its creator, which takes away peoples' rights and freedom. AJL is advocating for the protection of civil liberties through developing more equitable and accountable AI. To do so, they demand “inclusive and ethical practices in designing and building algorithms, [and] more transparency,” such as the data used and its sources or how system performance is measured (AJL, n.d.). The group also identifies the harmful practices through research and, based on their findings, provides principles and recommendations to create more unbiased systems. The last participant is the Office of Science and Technology Policy (OSTP). They believe that AI has “extraordinary benefits” and “hold the potential to redefine every part of our society and make life better for everyone” (OSTP, n.d.). However, these benefits should not come at the expense of civil liberties or democratic principles, which are fundamental values that the government should protect. Thus, OSTP (n.d.) published the Blueprint for an AI Bill of Rights consisting of “five principles that should guide the design, use, and deployment of automated systems to protect the American public in the age of artificial intelligence.”

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