

HOMWORK 2

PRACTICES OF LARGE LANGUAGE MODELS¹

CS 678 ADVANCED NATURAL LANGUAGE PROCESSING (FALL 2024)

<https://nlp.cs.gmu.edu/course/cs678-fall24/>

OUT: Friday, September 20, 2024

DUE: Friday, October 11, 2024

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IMPORTANT: The homework is accompanied by a Python notebook and a GitHub code repository. **For Part 1**, after copying this notebook to your Google Drive or One Drive, please paste a link to it below. To get a publicly accessible link, hit the Share button at the top right, then click “Get shareable link” and copy over the result. **For Part 2**, fork the public code repository to your own space and share a link to your code repository in the link below. When you are done, submit your completed .pdf report to Gradescope. **If you fail to do this, you will receive no credit for this homework!**

Note 1: You will only need to run lightweight code for this assignment, which can be done locally on your machine (i.e., ORC GPUs are not required).

Note 2: Both parts require using OpenAI API. Please make sure to REMOVE your private key from your notebook and code repository before submission.

Your Notebook solution for Part 1: [Colab link to Notebook](#)

Your GitHub code repository for Part 2: [GitHub Code Repository Link](#)

Graded Questions: 100 points

Bonus Questions: 20 points

Total Points Available: 120/100

Additional Notes:

- Upload the whole report PDF (including all pages, also if you’re scanning it).
- All questions only require written answers in this PDF. For coding problems, you will have to fill out all code blocks that say YOUR CODE HERE in your notebook or per instruction.
- For text-based answers, you should replace the text that says ”Write your answer here...” with your actual answer.

¹Compiled on Saturday 12th October, 2024 at 01:09

Part 1: Introduction to Prompts [50 pts]

This section uses the paired Python notebook. Below, provide the answers to the questions as generated by the completed code blocks in the similarly marked questions. Please also make sure to set up the Python environment (Task 0) before you run the notebook.

Task 1: Story Generation with Different Sampling Strategies

- (5 points) Can you use the ChatCompletion function to generate a story about an Indian student studying abroad (e.g., at George Mason University)? Please use the default setting and generate only one story.

Response: **Title: A Journey of Discovery**

Arjun Sharma stood nervously at the entrance of George Mason University, clutching the strap of his backpack tighter as he took in the sprawling campus before him. The green lawns and modern buildings teemed with students who seemed to move with purpose, laughter punctuating the crisp autumn air. He had flown halfway across the world from his home in Pune, India, to pursue a Master's degree in Data Analytics, a field that had captured his imagination ever since he had taken his first computer science class in high school.

As he walked towards the brick façade of the engineering building, memories flooded back: late nights studying with friends back in India, endless cups of chai, and the bittersweet farewell at the airport. The transition was daunting, but Arjun was excited to immerse himself in this new culture and expand his horizons.

His first week was a whirlwind of orientation sessions, new faces, and late-night assignments. He was struck by the diversity at GMU—students from all over the world brought their unique stories, and he found a common thread that connected them all: a thirst for knowledge and a desire to succeed. While Arjun was initially shy about introducing himself, he gradually made friends. He met Jamal, a charismatic student from Nigeria, and Maya, an ambitious undergraduate from California. Their study sessions became a blend of cultural exchange and late-night brainstorming that fueled Arjun's academic passion.

One evening, as the three friends sat in a campus café, Arjun shared stories of life in Pune—how they celebrated festivals like Diwali, the vibrant street food scene, and the rhythm of life amidst the chaos. In turn, Maya talked about her experience growing up in California, and Jamal spoke passionately about his family's legacy in Nigeria. They were fascinated by each other's backgrounds, drawing parallels and learning from their differences.

As the semester progressed, Arjun found himself falling in love with his coursework. His professors were approachable, and he found their passion for teaching infectious. Hours spent crunching data and analyzing trends in the lab were exhilarating, but the most transformative experience came unexpectedly.

A group project led him to work with an international organization aiming to improve educational access in underprivileged areas. They were tasked with analyzing data to identify patterns and suggest solutions. Arjun threw himself into the project, driven not only by the academic requirement but also by the chance to contribute to a cause he believed in.

Through this project, Arjun discovered the real-world implications of data analytics—how it could streamline efforts to provide educational resources to communities in need. He started interviewing people who had been impacted by educational inequities, and hearing their stories was a catalyst for Arjun. He realized that his skills could be a bridge between raw information and meaningful change.

As the year wore on, Arjun's confidence grew. He became a teaching assistant, helping fellow students with coursework, which simultaneously reinforced his own understanding. Each week, he hosted study groups, blending Indian snacks with American favorites, creating a mini culinary journey that brought a piece of home to his friends.

The campus transformed with the seasons; cherry blossoms erupted in spring, and the summer sun cast a golden glow on his late-night study sessions. And through it all, the friendships he forged became his support system. They celebrated each other's successes, leaned on one another during stressful exam weeks, and traveled together on weekends to explore the beauty of Virginia.

By the time graduation approached, Arjun felt a bittersweet ache in his heart. GMU had become a second home. He had grown not only academically but personally, embracing the growth that came with being far from everything he knew. On graduation day, as he stood alongside his classmates in his cap and gown, he felt a swell of pride. The journey had not just been about acquiring knowledge; it had been about passion, innovation, and connection.

After the ceremony, surrounded by friends, Arjun reflected on how his experience at George Mason had shaped him. Armed with a degree and a heart full of memories, he knew he would carry a piece of the university—and the friends he had made—wherever he went. As he left the campus, his mind turned towards the future, ready to use his skills to make a difference back in India and beyond. The adventure was only just beginning.

- (5 points) Now, can you do the same but try to get 2 generation outputs with “top_p” set to be 1?

The call returns 2 responses:

Response 0: **Title: A Journey Beyond Borders**

Aarav Sharma had always dreamed of studying abroad. Growing up in a small town in India, he would spend hours watching documentaries about foreign cultures, and flipping through the glossy pages of travel magazines, captivated by the photographs of iconic buildings and sprawling landscapes. When the acceptance letter from George Mason University arrived in the mail, he couldn't believe his eyes. It was as if the universe had conspired to transform his dreams into reality.

Arriving in Fairfax, Virginia, in late August, Aarav was welcomed by a sweltering heat that contrasted sharply with the cool breezes of his hometown. The sprawling campus, dotted with trees and modern buildings, buzzed with energy. It was a melting pot of cultures, with students from all over the world filling the air with an array of languages and laughter. He was excited yet nervous—the excitement of new experiences mingled with the anxiety of being thousands of miles away from home.

Aarav quickly settled into the rhythms of university life. His days were filled with lectures on Political Science and evenings spent in study groups at the library. He found himself fascinated by his professors, who were not only knowledgeable but also approachable and eager to engage with their students. Despite his initial shyness, he seized every opportunity to connect with peers. He joined the South Asian Student Association, where he connected with fellow Indian students and shared stories of festivals and food that reminded him of home.

One evening, during a bustling cultural festival on campus, Aarav set up a booth that showcased Indian culture. Not far from him, students from various backgrounds set up their booths, each representing their heritage. Aarav proudly demonstrated how to make samosas and served them with mint chutney. To his delight, the dish became a hit! As groups of students gathered to learn about his culture, Aarav felt a warmth spread through him; he realized how food could bridge gaps and foster understanding between people.

Despite the excitement of new friendships and the thrill of being in a foreign land, homesickness lingered. He missed the smell of mom's cooking, the sight of his little brother running around the house, and the sounds of his grandmother's voice recounting tales of their ancestors. To cope, Aarav began a small tradition. Each Sunday, he would video call his family, sharing the highlights of his week and asking about their lives back home. His mother, always ready with a smile, would share recipes, and they often ended up cooking the same meal from different parts of the world.

As the semester progressed, Aarav faced challenges. There was a particularly difficult course on American Politics that left him feeling overwhelmed. One night, feeling despondent, he wandered into a quiet corner of the campus, the moon casting shadows between the tall trees. Sitting on a bench, he pulled out his phone and began scrolling through his family's photos. Each smile, each memory reminded him of why he had come to America: to learn, to grow, and to bring back stories of resilience and adaptation. With determination ignited, Aarav sought help from his professor and his classmates. They formed study sessions, and gradually, the concepts that once felt foreign began to make sense. Aarav discovered the importance of asking questions and seeking support, a lesson he took to heart.

By the time winter rolled around, Aarav had created a community of friends from diverse backgrounds. They formed a tight-knit group, celebrating holidays together, whether it was Diwali with diyas lighting up the apartment or Thanksgiving with an assortment of dishes that represented all cultures. Aarav realized that celebrations were not just about traditions but about the love and connection shared among friends.

As spring approached, Aarav received an email announcing an opportunity to present a research paper at a student conference. He had been working diligently on a project about the effects of globalization on local economies, something that resonated with him, given his own experiences. With encouragement from his friends and professors, he took a leap of faith and submitted his paper.

When the day of the conference arrived, Aarav stood nervously in front of an audience, his heart racing. But as he began to speak, he felt a calmness wash over him. He shared his insights, answering questions and engaging with fellow students. The experience was exhilarating, and when he was awarded a commendation for his work, it felt like an affirmation of his journey.

As summer approached, Aarav reflected on his time at George Mason. He had transformed from a shy student intimidated by the vastness of a new culture to a confident individual who embraced differences. He was grateful for the friendships that felt like family and for the lessons that had blossomed in the unlikelyst of places.

On the day he returned to India, Aarav felt a beautiful blend of nostalgia and excitement. He had stepped across borders and barriers, weaving stories that enriched not just his life but also those around him. With a suitcase full of clothes and a heart full of experiences, he knew this journey was just the beginning. Returning home, Aarav was determined to share his newfound perspectives, hoping to inspire others to reach beyond their own borders, just as he had. ——— *Response 1*: **Title: A Journey Beyond Borders**

Aman sat on a rickety bus, the afternoon sun pouring golden hues over the trees that lined the streets of Fairfax, Virginia. It had been nearly a month since he had stepped foot on George Mason University's sprawling campus, but it still felt surreal. Back in Mumbai, everything had been a whirlwind of visa applications, farewell parties, and endless packing. Now, in this new land, he was determined to embrace every bit of the experience before him.

As the bus rattled along, Aman's mind drifted between his responsibilities and the excitement of being a student abroad. He had come to the United States on a scholarship to pursue his master's degree in environmental science—a field close to his heart, especially after witnessing the impacts of pollution back home. He glanced at his phone, where the bright screen displayed messages from family back in India, their warm words of encouragement filling him with both comfort and homesickness.

When Aman arrived at his destination, he felt a mix of trepidation and thrill. The campus was alive with students rushing to classes, their laughter and conversations creating a vibrant atmosphere. He had been placed in a shared apartment with two other international students—Maria from Colombia and Jian from China. Their diverse backgrounds brought a richness to their interactions, and they quickly found common ground in their experiences as outsiders in a new country.

As the semester unfolded, Aman immersed himself in his studies and made an effort to engage with student organizations. He joined the Environmental Science Club, participated in workshops, and went on field trips to local conservation sites. His professors, many of whom were strongly engaged in their fields, inspired him with their passion and knowledge. He thrived in this new academic environment, where discussions flowed freely, and every opinion was valued.

One crisp fall afternoon, the club organized a local community event focused on urban gardening. Aman was excited but a bit nervous about presenting in front of people he had just met. With a deep breath, he took the stage, sharing stories from Mumbai about the struggles of urban agriculture amid rapid urbanization. He explained how rooftop gardens could transform cities back home and showed photos that illustrated his points.

To his surprise, the audience responded positively, asking questions and offering suggestions. Aman felt a sense of belonging swell within him. This was more than just academic exchange; it was a bridge of cultures.

The changing seasons mirrored Aman's growing attachment to his new home. He discovered the joy of celebrating Thanksgiving with Maria's family, who generously invited him over. As they gathered around the table, Aman marveled at the spread of food and the warmth of their shared laughter. For the first time since arriving, he felt the pangs of homesickness lessen, replaced by the comfort of friendship.

While studying late one night in their apartment, Aman received a video call from his parents. They wanted to see his surroundings and hear about his experiences. As he walked them through his messy room, showing them his textbooks and the small plants he had started caring for, he felt a sense of pride wash over him. He told them about his classes, late-night study sessions, and the local coffee shop where he had befriended the barista, who shared his love for Indian chai.

As weeks turned into months, it was time for final exams. Aman poured every ounce of energy into his studies, driven not only by the desire to succeed but also to make his family proud. On a chilly December afternoon, he sat in the library, books scattered around him like an explosion of knowledge. The pressure was on, but Aman felt an undercurrent of determination—he had come too far to falter now.

After the exams, a well-deserved holiday break approached. Aman, Maria, and Jian planned a little road trip to Washington, D.C. As they wandered through the National Mall, visiting iconic monuments and absorbing the rich history, Aman felt grateful for this experience. They laughed, enjoyed street food, and took countless photos, memories captured forever.

As the year came to a close, Aman reflected on his journey. He had come to study but found so much more—a new family, lifelong friends, and a deeper understanding of himself. He couldn't wait to return to India and share not just the knowledge he had gained but the stories of connection and resilience that transcended borders.

With every step on this new path, Aman knew he was both an Indian student and a global citizen, forever changed by his experiences at George Mason University. The world was a vast tapestry of cultures, and he was now a thread woven into its fabric.

3. (5 points) How about 2 generation outputs with “top_p” set to be 0.5?

The call returns 2 responses:

Response 0: **Title: A Journey Beyond Borders**

Aarav Mehta stood at the entrance of George Mason University, his heart racing with a mix of excitement and anxiety. The sprawling campus in Fairfax, Virginia, was a world away from his hometown of Pune, India. The lush green lawns, modern buildings, and the distant chatter of students felt both inviting and overwhelming. He had dreamt of this moment for years, and now that he was finally here, it felt surreal.

As he walked towards his first class, Aarav reflected on the journey that had brought him to this point. Growing up in a middle-class family, he had always been encouraged to pursue his education with passion. His parents had sacrificed so much to ensure he could chase his dreams. When he received his acceptance letter from George Mason, it felt like a validation of all their hard work.

His first class was Introduction to Computer Science, a subject he had always been passionate about. As he entered the lecture hall, he was greeted by a diverse group of students. He took a seat in the middle, trying to blend in. The professor, a lively woman with a thick accent, began the lecture with an engaging story about the evolution of technology. Aarav found himself captivated, taking notes furiously, his pen flying across the page.

After class, he was approached by a fellow student named Sarah. She had noticed his accent and struck up a conversation. “You’re from India, right? That’s so cool! I’ve always wanted to visit!” Aarav felt a wave of relief wash over him. Making friends in a new country was daunting, but Sarah’s warmth made it easier. They exchanged numbers and promised to meet up later.

Over the next few weeks, Aarav settled into his new life. He attended classes, explored the campus, and joined various clubs. He joined the Indian Student Association, where he met others who shared his background and experiences. They celebrated festivals like Diwali and Holi, bringing a piece of home to their new lives. Aarav felt a sense of belonging, but he also wanted to immerse himself in American culture.

One weekend, Sarah invited Aarav to a local farmers’ market. As they wandered through the stalls, Aarav marveled at the vibrant produce and artisanal goods. They sampled fresh apple cider and homemade pastries, and Aarav shared stories of his favorite Indian dishes. Sarah was fascinated and promised to try cooking some of them.

As the semester progressed, Aarav faced challenges. The coursework was rigorous, and he often found himself struggling with the fast-paced lectures. There were moments of self-doubt when he questioned if he truly belonged at George Mason. However, he sought help from professors and classmates, slowly building his confidence. He learned to embrace his unique perspective as an international student, contributing insights from his experiences in India.

One evening, Aarav attended a cultural exchange event organized by the university. Students from various countries showcased their traditions through dance, music, and food. Aarav decided to perform a traditional Indian dance, a fusion of Bharatanatyam and contemporary styles. Nervously, he stepped onto the stage, the bright lights illuminating his face. As the music began, he lost himself in the rhythm, the movements flowing naturally. The audience erupted in applause, and Aarav felt a surge of pride. He had shared a piece of his culture with others, bridging the gap between two worlds.

As the semester came to a close, Aarav reflected on his journey. He had grown in ways he never imagined. He had made friends from different backgrounds, learned to navigate a new education system, and embraced the beauty of cultural exchange. The initial fears of being an outsider had transformed into a sense of belonging.

On the last day of classes, Aarav and Sarah sat on the campus lawn, enjoying the warm sun. “I can’t believe how fast this semester went by,” Sarah said, smiling. “You’ve adapted so well! I’m so glad we met.”

Aarav grinned, feeling grateful. “Thank you for being such a good friend. I couldn’t have done it without the support of people like you.”

As they chatted about their plans for the winter break, Aarav realized that studying abroad was not just about academics; it was about building connections, understanding different perspectives, and growing as an individual. He had come to George Mason as a student, but he was leaving as a global citizen, ready to take on the world, one step at a time. ——— *Response 1*: **Title: A Journey Beyond Borders**

Aarav Sharma stood at the entrance of George Mason University, his heart racing with a mix of excitement and anxiety. The sprawling campus, with its red-brick buildings and vibrant green lawns, felt like a world away from his home in Pune, India. He had dreamed of studying in the United States for years, and now, as an international student pursuing a degree in Computer Science, that dream was finally a reality.

The first few weeks were a whirlwind of orientation sessions, new faces, and cultural adjustments. Aarav was amazed by the diversity of the student body. He met classmates from all over the globe—China, Brazil, Nigeria, and even a few from his own country. Each conversation was a window into a different culture, and Aarav relished the opportunity to learn from them.

One of his first friends was Mia, a local student who was studying Political Science. They met during a group project in their Introduction to Programming class. Mia was friendly and outgoing, and she quickly took Aarav under her wing, introducing him to the intricacies of American college life. She invited him to join her for lunch at the student center, where they shared stories about their backgrounds and aspirations.

As the semester progressed, Aarav found himself immersed in his studies. The coursework was challenging, but he thrived on the intellectual stimulation. He spent long hours in the computer lab, coding and debugging, often fueled by cups of strong coffee from the campus café. His professors were approachable and encouraged him to think critically, pushing him to explore innovative solutions to complex problems.

Despite the academic rigor, Aarav sometimes felt a pang of homesickness. He missed the warmth of his family, the spicy aromas of home-cooked meals, and the vibrant festivals that filled the streets of Pune. To cope, he began to share his culture with his friends. He organized a Diwali celebration in his dorm, inviting Mia and a few other classmates. They decorated the common room with colorful rangoli patterns and lit diyas, filling the space with laughter and the sweet scent of homemade sweets that Aarav had prepared.

The celebration was a hit, and Aarav felt a sense of pride as he explained the significance of the festival to his friends. They were fascinated by the stories he shared about the triumph of light over darkness and the importance of family and community. In return, Mia introduced him to Thanksgiving, and Aarav was invited to her family’s home for the holiday. It was a heartwarming experience, filled with gratitude, laughter, and a feast that showcased the richness of American traditions.

As the months passed, Aarav began to feel more at home in Virginia. He explored the nearby city of Washington, D.C., visiting museums, monuments, and cultural events. Each outing was an adventure, and he often took pictures to share with his family back in India. He was determined to make the most of his time abroad, balancing his studies with exploration and new experiences.

However, challenges were inevitable. Aarav struggled with the occasional language barrier and found it difficult to navigate certain social situations. One day, after a particularly tough week of exams, he felt overwhelmed and considered giving up. It was during this low point that he received an unexpected message from his younger sister back home. She had sent him a video of their family celebrating a festival, and her cheerful laughter filled the screen. In that moment, Aarav realized that he was not alone; he carried the love and support of his family with him, no matter the distance.

With renewed determination, Aarav sought help from his professors and joined study groups. He learned to ask questions and express his thoughts more confidently. He even started tutoring some of his classmates in programming, which not only reinforced his own knowledge but also built lasting friendships.

As the academic year drew to a close, Aarav reflected on his journey. He had grown in ways he never imagined, both academically and personally. He had embraced the challenges of studying abroad, forged meaningful connections, and shared his culture with others. The experience had transformed him into a more resilient and open-minded individual.

On graduation day, as he donned his cap and gown, Aarav felt a wave of gratitude wash over him. He had come to George Mason University as a wide-eyed student, and he was leaving as a confident young man ready to take on the world. He looked out at the sea of graduates, knowing that this was just the beginning of his journey. With a heart full of dreams and a mind brimming with knowledge, Aarav was ready to step into the future, knowing that the world was his to explore. ———

4. (10 points) What did you observe from Q1 - Q3? Did the different “top_p” configurations give you the same or different results? Why?

Looking at Q1 through Q3, I noticed something interesting. Even though we changed the top_p value from 1.0 to 0.5, the stories came out pretty much the same. They had similar structures, themes, and even titles. All of them touched on common study abroad experiences like culture shock, homesickness, making friends, and dealing with school challenges. So, did the different top_p settings make a difference? Not really, at least not in this case.

Why? Well, there are a few reasons: The most likely words and phrases for study abroad stories showed up regardless of the top_p setting. Stories about international students tend to follow similar patterns. The words that got left out when we lowered top_p didn’t really change the overall story much.

The prompt itself naturally leads to certain kinds of stories, which might have overshadowed the effect of changing top_p.

In short, while top_p can usually mix things up a bit, it didn’t do much here. The study abroad theme was just too strong. If we want more variety, we might need to play with other settings or change up the prompt.

Task 2: gpt-4o-mini for Solving Mathematical Problems

5. (5 points) You are presented a mathematical problem: *Melanie is a door-to-door saleswoman. She sold a third of her vacuum cleaners at the green house, 2 more to the red house, and half of what was left at the orange house. If Melanie has 5 vacuum cleaners left, how many did she start with?* Can you use the ChatCompletion function and prompt gpt-4o-mini to work out the problem?

Response: Let x be the number of vacuum cleaners Melanie started with.

1. Sales at the Green House:
She sold a third of her vacuum cleaners at the green house:

$$\text{Sold at green house} = \frac{1}{3}x$$

After this sale, the number of vacuum cleaners left is:

$$x - \frac{1}{3}x = \frac{2}{3}x$$

2. Sales at the Red House:
Next, she sold 2 more vacuum cleaners at the red house:

$$\text{Sold at red house} = 2$$

Now, the number of vacuum cleaners left is:

$$\frac{2}{3}x - 2$$

3. Sales at the Orange House:
She then sold half of what was left at the orange house:

$$\text{Sold at orange house} = \frac{1}{2} \left(\frac{2}{3}x - 2 \right)$$

Now, we need to calculate how many vacuum cleaners are left after this sale. The remaining vacuum cleaners will be:

$$\left(\frac{2}{3}x - 2 \right) - \frac{1}{2} \left(\frac{2}{3}x - 2 \right)$$

To simplify that, we find the remaining part:

$$R = \frac{2}{3}x - 2 - \frac{1}{2} \left(\frac{2}{3}x - 2 \right)$$

We can substitute $y = \frac{2}{3}x - 2$ to handle this:

$$R = y - \frac{1}{2}y = \frac{1}{2}y = \frac{1}{2} \left(\frac{2}{3}x - 2 \right)$$

So we have:

$$R = \frac{1}{3}x - 1$$

Therefore, the number of vacuum cleaners left is:

$$\frac{1}{3}x - 1$$

4. Total Left:
According to the problem, she has 5 vacuum cleaners left:

$$\frac{1}{3}x - 1 = 5$$

Solving this equation:

$$\frac{1}{3}x = 5 + 1 = 6$$

$$x = 6 \times 3 = 18$$

Thus, the total number of vacuum cleaners Melanie started with is 18.

5. Verification:

- Initially, she started with 18 vacuum cleaners.
- Sold $\frac{1}{3} \times 18 = 6$ at the green house, leaving $18 - 6 = 12$.
- Sold 2 at the red house, leaving $12 - 2 = 10$.
- Sold half of 10 at the orange house, which is $\frac{1}{2} \times 10 = 5$, leaving $10 - 5 = 5$.

Therefore, all calculations confirm she started with 18.

Did gpt-4o-mini solve the problem correctly? If not, where did it go wrong?

gpt-4o-mini correctly identified the mathematical relationships at each stage of Melanie's sales journey. It set up the appropriate equations to model the problem. The algebraic manipulations were performed accurately. The verification step ensured the solution was consistent with the problem's conditions.

6. (10 points) Now, try to get 10 solutions from gpt-4o-mini with "top_p" set to 0.7. You may see multiple different answers produced by gpt-4o-mini. Summarize them in the table below and give one example output from gpt-4o-mini each. Did gpt-4o-mini do right in all of the solutions? If there are any mistakes, what are the common errors that gpt-4o-mini makes?

Answer	Count	Example Output
Ans1	counts out of 10	18
Ans2	counts out of 10	18
Ans3	counts out of 10	18
Ans4	counts out of 10	18
Ans5	counts out of 10	18
Ans6	counts out of 10	18
Ans7	counts out of 10	18
Ans8	counts out of 10	18
Ans9	counts out of 10	18
Ans10	counts out of 10	18

Observation: All responses correctly concluded that the number of vacuum cleaners melanie started with is $x=18$.
 Errors: Several of the responses use redundant steps which could be simplified.
 The model correctly solved all instances of the problem without any mathematical errors.

7. (10 points) Can you try other ways to prompt gpt-4o-mini to give correct solutions more stably? Be creative! Include your prompt design and the answer in the report. Why do you think it works or not?

Prompt:

problem = Problem: Melanie is a door-to-door saleswoman. She sold a third of her vacuum cleaners at the green house, 2 more to the red house, and half of what was left at the orange house. If Melanie has 5 vacuum cleaners left, how many did she start with?
 Solution: Let x be the number of vacuum cleaners Melanie started with.

1. **Sales at the Green House**: She sold a third of her vacuum cleaners:

$$\text{Remaining after green house} = x - \frac{1}{3}x = \frac{2}{3}x$$

2. **Sales at the Red House**: She sold 2 more vacuum cleaners:

$$\text{Remaining after red house} = \frac{2}{3}x - 2$$

3. **Sales at the Orange House**: She sold half of what was left:

$$\text{Remaining after orange house} = \frac{1}{2} \left(\frac{2}{3}x - 2 \right)$$

According to the problem, she has 5 vacuum cleaners left:

$$\frac{1}{2} \left(\frac{2}{3}x - 2 \right) = 5$$

4. **Solve for x** : Multiply both sides by 2:

$$\frac{2}{3}x - 2 = 10$$

Add 2 to both sides:

$$\frac{2}{3}x = 12$$

Multiply both sides by $\frac{3}{2}$:

$$x = 12 \times \frac{3}{2} = 18$$

Answer: Melanie started with 18 vacuum cleaners.

target problem = Problem: John drives for 3 hours at a speed of 60 mph and then turns around because he realizes he forgot something very important at home. He tries to get home in 4 hours but spends the first 2 hours in standstill traffic. He spends the next half-hour driving at a speed of 30 mph, before being able to drive the remaining time of the 4 hours going at 80 mph. How far is he from home at the end of those 4 hours?
 Solution: ""

Combine the prompt full $prompt = example_problem + target_problem$

Output:

: To solve the problem, we can break it down into parts based on John's journey.

1. **Initial Journey to His Destination**: John drives for 3 hours at a speed of 60 mph. The distance he covers in this time can be calculated as:

$$\text{Distance} = \text{Speed} \times \text{Time} = 60 \text{ mph} \times 3 \text{ hours} = 180 \text{ miles}$$

2. **Return Journey (Total Time: 4 hours)**: John turns around and tries to get home in 4 hours but faces standstill traffic.

- **First 2 Hours in Standstill Traffic**: In the first 2 hours, John does not cover any distance:

$$\text{Distance} = 0 \text{ miles}$$

- **Next Half-Hour at 30 mph**: In the next half-hour (0.5 hours), he drives at 30 mph:

$$\text{Distance} = \text{Speed} \times \text{Time} = 30 \text{ mph} \times 0.5 \text{ hours} = 15 \text{ miles}$$

- **Remaining Time Driving at 80 mph**: The total time John has been traveling so far is:

$$2 \text{ hours (traffic)} + 0.5 \text{ hours (30 mph)} = 2.5 \text{ hours}$$

This means he has:

$$4 \text{ hours} - 2.5 \text{ hours} = 1.5 \text{ hours}$$

left to drive at 80 mph. The distance he covers in the remaining 1.5 hours is:

$$\text{Distance} = 80 \text{ mph} \times 1.5 \text{ hours} = 120 \text{ miles}$$

3. **Calculating the Total Distance from Home**: Now we calculate the total distance John has traveled back towards home: He travels back a total of:

$$15 \text{ miles (from 30 mph)} + 120 \text{ miles (from 80 mph)} = 135 \text{ miles}$$

4. **Distance from Home at the End**: John started 180 miles away from home. After his return journey, the distance from home can be calculated by subtracting the distance he traveled back:

$$\text{Distance from home} = 180 \text{ miles} - 135 \text{ miles} = 45 \text{ miles}$$

Answer: John is 45 miles from home at the end of the 4 hours.

Findings: I designed the prompt by including two solved example problems before presenting the target problem. This method, known as few-shot prompting, guides the model to follow the same reasoning process.

Why did this work so well? A few reasons:

The AI could see the pattern in how to solve these problems. It got a clear roadmap for how to think through each step. It understood how detailed I wanted the answer to be. Following this method helped cut down on silly mistakes.

Basically, by showing examples first, the AI knew exactly what I was looking for. This way, we get not just the right answer, but also see how the AI got there.

Part 2: Build an LLM Agent with Gentopia [50 pts + 20 bonus pts]

In this part, we will switch to an extended topic called “LLM agents”. In Part 1, we have mainly used gpt-4o-mini as a question-answer system, but an LLM can be formulated to be a “vivid” agent who learns to use tools and helps us in broader tasks, just like a virtual assistant!

To this end, we will be using an open-source LLM agent implementation framework, called “Gentopia” [2]. The original code repository can be found at <https://github.com/Gentopia-AI>, but note that for this assignment, we will use this adapted “Gentopia-Mason” version at <https://github.com/LittleYUYU/Gentopia-Mason/tree/main>.

Prerequisite: Library Installation

As the first step, please make sure to install all required Python packages following the instructions on README. More specifically, it means to run the following lines of code:

```
1 # Clone the repository
2 git clone git@github.com:LittleYUYU/Gentopia-Mason.git
3 cd Gentopia-Mason
4
5 # Create a conda virtual environment
6 conda create --name gentenv python=3.10
7 conda activate gentenv
8 pip install -r requirements.txt
9
10 # Set up global environment
11 export PYTHONPATH="$PWD/Gentopia:$PYTHONPATH"
12
13 # Set up OpenAI API key
14 cd GentPool
15 touch .env
16 echo "OPENAI_API_KEY=<your_openai_api_key>" >> .env
```

Task 3: Build a Vanilla LLM Agent

In this task, you will follow the instructions at <https://github.com/LittleYUYU/Gentopia-Mason/tree/main?tab=readme-ov-file#quick-start-clone-a-vanilla-llm-agent> to create a vanilla LLM agent. This agent is essentially the same question-answer model you have tried in Part 1.

The agent, under the framework of Gentopia, is configured as follows (with annotations):

```
1 # ./GentPool/gentpool/pool/<your_agent_name>/agent.yaml
2 # Vanilla agent template
3
4 name: <your_agent_name>
5 version: 0.0.1
6 type: vanilla
7 description: A plain gpt-4 LLM. # this is a brief description of the agent
8 target_tasks:
9   - anything to do with an LLM
10 llm:
11   model_name: gpt-4 # indicating the API version
12   params:
13     temperature: 0.0 # both temperature and top_p are used to control the
14       sampling diversity
```

```

14     top_p: 0.9
15     repetition_penalty: 1.0 # this is for preventing repetitive tokens
16     max_tokens: 1024 # maximum generation length
17 prompt_template: !prompt VanillaPrompt # this is prompt we used for this agent,
    see ./Gentopia/gentopia/prompt/vanilla.py

```

8. (10 points) **Change the "model_name" field from "gpt-4" to "gpt-4o-mini".** Successfully run this agent, and copy its responses for the following conversations below:

User: Hi! Tell me something about George Mason NLP group!

jarvis: *The George Mason University Natural Language Processing (NLP) Group is a research group focused on various aspects of natural language processing and computational linguistics. The group is part of the university's Department of Computer Science and often collaborates with other departments and research centers.*
Research areas within the group typically include:

1. **Text Mining:** Extracting useful information from unstructured text data.
2. **Machine Learning:** Applying machine learning techniques to improve NLP tasks.
3. **Sentiment Analysis:** Understanding and classifying emotions expressed in text.
4. **Information Retrieval:** Developing systems to find relevant information from large datasets.
5. **Dialogue Systems:** Creating systems that can engage in conversation with users.

The group often publishes research papers in top-tier conferences and journals, contributing to advancements in the field of NLP. They may also engage in projects that apply NLP techniques to real-world problems, such as healthcare, social media analysis, and more.
For the most current information about their research, projects, and publications, it's best to visit their official website or check their latest publications in academic databases.

User: Who is/are leading the group?

jarvis: *Could you please provide more context or specify which group you are referring to? This will help me give you a more accurate answer.*

What problems did you see from the second response?

The second response shows a problem with context awareness. The assistant failed to recognize that "the group" referred to the George Mason NLP group discussed in the previous interaction. Instead of providing information about the leaders of that group, it unnecessarily asked for clarification despite the context being clear.

9. (10 points) Now, let's do a trick here. Instead of asking two questions, let's ask a combined one. And similarly let's also try the second question asking about facts:

User: Who is/are leading George Mason NLP group?

jarvis: *As of my last update in October 2023, the George Mason University Natural Language Processing (NLP) group is led by Dr.Mark E.Nissenbaum and Dr.D.Scott McDonald. However, faculty and research group leadership can change, so I recommend checking the official George Mason University website or the specific NLP group's page for the most current information.*

User: Find papers written by Ziyu Yao at George Mason University

jarvis:
If you need help with a specific topic or paper, feel free to ask! I don't have direct access to databases or the internet to search for specific papers or authors. However, you can find papers written by Ziyu Yao at George Mason University by following these steps:

1. **Google Scholar:** Go to Google Scholar and enter "Ziyu Yao George Mason University" in the search bar. This should bring up a list of publications associated with that name and institution.
2. **University Repository:** Check George Mason University's institutional repository or library website. Many universities have a digital archive of faculty publications.
3. **ResearchGate or Academia.edu:** These platforms allow researchers to share their publications. You can search for Ziyu Yao on these sites.
4. **Academic Databases:** Use academic databases like PubMed, IEEE Xplore, or JSTOR, depending on the field of study, to search for publications by Ziyu Yao.
5. **Contact the Author:** If you have difficulty finding the papers, consider reaching out directly to Ziyu Yao via email or through their university profile.

If you need help with a specific topic or paper, feel free to ask!

How do the responses look now? (Hint: you may want to verify the agent output.) Why would this situation happen? Describe your observations and findings below:

Language models like this assistant can generate plausible but inaccurate information. This occurs when the model lacks specific knowledge but attempts to provide a helpful answer. Key points:

- Inaccurate specifics: The assistant may provide false details, like incorrect names or roles.
- Plausible fabrication: Generated information often seems believable but may be incorrect.
- Knowledge limitations: Even with a stated knowledge cutoff, information may be outdated or inaccurate.
- Verification needed: Users should fact-check the assistant's output, especially for specific claims or factual data.

This underscores the importance of critical evaluation when using AI-generated information.

Till now, you probably have realized that an LLM alone will be facing various problems, including not being able to access the latest knowledge. Therefore, we'd like to try something called "tool-augmented LLM agent", where an LLM agent can be equipped with external tools for tasks. This is what we will do in Task 4!

Task 4: Build a Tool-Augmented LLM Agent

Now, we will follow the instructions at <https://github.com/LittleYUYU/Gentopia-Mason/tree/main?tab=readme-ov-file#implement-a-scholar-llm-agent-with-tool-augmentation> and create a tool-augmented LLM agent. In particular, this agent, called a “scholar agent”, has been equipped with tools to access Google Scholar.²

This tool use does not come for free; it relies on Python implementation using the “scholarly” library,³ which can be found within the gentopia source code at https://github.com/LittleYUYU/Gentopia-Mason/blob/main/Gentopia/gentopia/tools/google_scholar.py.

Again, change the “model_name” field to “gpt-4o-mini”.

10. (10 points) Now, let’s the same query for Prof. Ziyu Yao’s papers again:

User: Find papers written by Ziyu Yao at George Mason University
scholar-agent: Here are some papers written by Ziyu Yao at George Mason University:
 1 Unifiedskg: Unifying and multi-tasking structured knowledge grounding with text-to-text language models
 • Publication Year: 2022 • Venue: arXiv preprint arXiv:2201.05966 • Citations: 280
 2 CoaCor: Code Annotation for Code Retrieval with Reinforcement Learning
 • Publication Year: 2019 • Venue: The Web Conference 2019 • Citations: 117
 3 Stage: A systematically mined question-code dataset from stack overflow
 • Publication Year: 2018 • Venue: Proceedings of the 2018 World Wide Web Conference • Citations: 102
 4 Model-based interactive semantic parsing: A unified formulation and a text-to-SQL case study
 • Publication Year: 2019 • Venue: 2019 Conference on Empirical Methods in Natural Language Processing (EMNLP'19) • Citations: 75
 5 Reinforced dynamic reasoning for conversational question generation
 • Publication Year: 2019 • Venue: arXiv preprint arXiv:1907.12667 • Citations: 55
 If you need more information or additional papers, feel free to ask!

Does the response look reasonable now? Based on the meta information that popped out through the agent’s responding process, can you describe how the agent made it right this time?

The Response has improved significantly. It now offers accurate details about Ziyu Yao’s publications at George Mason University, including specific paper titles, publication dates, and citation information. This improvement likely stems from the it’s ability to use specialized tools which are used as plugins that can access current databases or resources. By tapping into these external sources, it can provide up-to-date and precise information, rather than relying solely on its potentially limited or outdated internal knowledge. This tool-augmented approach has effectively addressed previous accuracy issues, resulting in a more reliable and detailed response. It demonstrates how model can enhance its performance by leveraging external data sources to complement its built-in capabilities.

11. (5 points) Look at the configuration file of your scholar agent at `./GentPool/gentpool/pool/<your_agent_name>/agent.yaml` and see what other functions are supported. Try a few other things you found interesting! Some examples to consider: *Can you summarize the paper titled “Gentopia: A collaborative platform for tool-augmented llms”?*, *What papers have cited “Gentopia: A collaborative platform for tool-augmented llms”*, etc.

User: Can you summarize the paper titled “Unifiedskg: Unifying and multi-tasking structured knowledge grounding with text-to-text language models”
scholar-agent: Summary:
 Structured knowledge grounding (SKG) utilizes structured knowledge to fulfill user requests, such as semantic parsing over databases and question answering over knowledge bases. Traditionally, SKG tasks have been studied separately by different research communities due to the heterogeneous nature of their inputs and outputs, which has limited systematic and compatible research in this area.
 To address this limitation, the authors propose the UnifiedSKG framework, which consolidates 21 SKG tasks into a unified text-to-text format. This approach aims to enhance the systematic study and compatibility of SKG tasks, promoting more integrated research in the field.
 For more details, you can access the full paper here.
User: Find papers that cite the paper titled “Unifiedskg: Unifying and multi-tasking structured knowledge grounding with text-to-text language models”
scholar-agent: Here are some papers that cite the paper titled “Unifiedskg: Unifying and multi-tasking structured knowledge grounding with text-to-text language models”:
 1. A comprehensive overview of large language models • Authors: H Naveed, AU Khan, S Qiu, M Saqib, S Anwar • Year: 2023 • Abstract: Large Language Models (LLMs) have recently demonstrated remarkable capabilities in natural language processing tasks and beyond. This success of LLMs has led to a large... • Read more
 2. A survey of knowledge enhanced pre-trained language models • Authors: L Hu, Z Liu, Z Zhao, L Hou, L Nie • Year: 2023 • Abstract: Pre-trained Language Models (PLMs) which are trained on large text corpus via self-supervised learning method, have yielded promising performance on various tasks in... • Read more
 3. Qlora: Efficient finetuning of quantized llms • Authors: T Dettmers, A Pagnoni, A Holtzman • Year: 2024 • Abstract: We present QLoRA, an efficient finetuning approach that reduces memory usage enough to finetune a 65B parameter model on a single 48GB GPU while preserving full 16-bit... • Read more
 4. A survey of large language models • Authors: WX Zhao, K Zhou, J Li, T Tang, X Wang, Y Hou • Year: 2023 • Abstract: Language is essentially a complex, intricate system of human expressions governed by grammatical rules. It poses a significant challenge to develop capable AI algorithms for... • Read more
 5. Instruction tuning with gpt-4 • Authors: B Peng, C Li, P He, M Galley, J Gao • Year: 2023 • Abstract: Prior work has shown that finetuning large language models (LLMs) using machine-generated instruction-following data enables such models to achieve remarkable zero-shot... • Read more

²<https://scholar.google.com/>

³<https://pypi.org/project/scholarly/>

12. (15 points) You may have realized that the current scholar agent still fails to answer general questions such as “Tell me something about George Mason NLP group”, though they are also relevant to “scholar”. In addition, it cannot read PDFs for summarizing papers either, so it cannot provide answers to specific questions about the paper details. Can you figure out a way for the agent to do Google Search (5 pts) and PDF reading (10 pts), and present a few examples below? (Hint: Google Search has been provided in Gentopia’s source code, whereas you could opt for any Python tools you like, e.g., PyPDF2,⁴ for PDF reading.)

User: Find me research paper related to "A Multi-Agent Conversational Recommender System"

scholar-agent: Here are some research papers related to "A Multi-Agent Conversational Recommender System":

1 A multi-agent conversational recommender system • Authors: J Fang, S Gao, P Ren, X Chen, S Verberne • Published: 2024 • Abstract: Due to strong capabilities in conducting fluent, multi-turn conversations with users, Large Language Models (LLMs) have the potential to further improve the performance of conversational recommender systems. • Citations: 6

2 A large language model enhanced conversational recommender system • Authors: Y Feng, S Liu, Z Xue, Q Cai, L Hu, P Jiang • Published: 2023 • Abstract: Conversational recommender systems (CRSs) aim to recommend high-quality items to users through a dialogue interface. It usually contains multiple sub-tasks, such as user intent understanding. • Citations: 20

3 Rethinking the evaluation for conversational recommendation in the era of large language models • Authors: X Wang, X Tang, WX Zhao, J Wang, JR Wen • Published: 2023 • Abstract: The recent success of large language models (LLMs) has shown great potential to develop more powerful conversational recommender systems (CRSs), which rely on natural language processing. • Citations: 66

4 Customized Conversational Recommender Systems • Authors: S Li, Y Zhu, R Xie, Z Tang, Z Zhang, F Zhuang • Published: 2022 • Abstract: Conversational recommender systems (CRS) aim to capture user's current intentions and provide recommendations through real-time multi-turn conversational interactions. • Citations: 5

5 Leveraging large language models in conversational recommender systems • Authors: L Friedman, S Ahuja, D Allen, Z Tan • Published: 2023 • Abstract: A Conversational Recommender System (CRS) offers increased transparency and control to users by enabling them to engage with the system through a real-time multi-turn dialogue. • Citations: 82 Feel free to explore these papers for more insights into the topic!

User: Read from pdf url "https://arxiv.org/pdf/2402.01135"

scholar-agent: The paper titled "A Multi-Agent Conversational Recommender System" presents a novel approach to enhancing Conversational Recommender Systems (CRS) using Large Language Models (LLMs). The authors propose a system called Multi-Agent Conversational Recommender System (MACRS), which addresses key challenges in controlling dialogue flow and incorporating user feedback to improve recommendations.

Key Contributions:

- Multi-Agent Framework:** MACRS employs a multi-agent act planning framework consisting of four LLM-based agents. This framework generates various candidate responses based on different dialogue acts (asking, recommending, chit-chatting) and selects the most appropriate response to guide the conversation effectively.
- User Feedback-Aware Reflection Mechanism:** The system incorporates a reflection mechanism that utilizes user feedback to adjust dialogue act planning dynamically. This mechanism operates on two levels:
 - Information-Level Reflection:** Summarizes user feedback into higher-level user profiles, capturing user preferences and browsing history.
 - Strategy-Level Reflection:** Analyzes past interactions to deduce reasons for recommendation failures and provides corrective experiences to improve future recommendations.
- Experimental Validation:** The authors conducted extensive experiments using a user simulator to demonstrate the effectiveness of MACRS in enhancing user interaction experiences and improving recommendation accuracy compared to traditional and LLM-based CRS methods. Results:
 - MACRS outperformed existing methods in terms of success rate, average turns, and hit ratio for recommendations.
 - The multi-agent approach allowed for more diverse dialogue act selection, leading to a more engaging user experience.

Conclusion: The proposed MACRS framework significantly improves the performance of conversational recommendation systems by effectively managing dialogue flow and leveraging user feedback. The findings suggest that integrating multi-agent systems with LLMs can enhance the capabilities of conversational recommender systems in real-world applications. For further details, you can refer to the full paper here.

User: Read conclusion from paper titled "A Multi-Agent Conversational Recommender System"

scholar-agent: In this paper, we introduced Multi-Agent Conversational Recommender System (MACRS), an LLM-only multi-agent Conversational Recommender System (CRS) that leverages several different agents to tackle the dialogue flow planning and integrate the user feedback to optimize the dialogue planning dynamically. We first propose a novel multi-agent dialogue planning module to separately model each dialogue act using LLM-based responder agents and schedule these responder agents according to the dialogue strategy and user feedback by using the planner agent. Then we propose a user feedback-aware reflection module that conducts the reflection on both information-level and strategy-level to produce high-level user preference descriptions and dialogue strategy suggestions for the subsequent dialogue. These two modules can collaborate to optimize the dialogue flow and increase the user experience and recommendation accuracy. Experiments conducted on a benchmark CRS dataset demonstrate that our proposed MACRS can boost the performance of recommendations significantly and have a better and more engaging user experience than with the existing CRS methods.

Bonus: Build Your Own Agent! (20 pts)

We will provide up to 20 points to students who implement a different tool-augmented LLM agent for positive use (i.e., the agent cannot be designed for unethical purposes). To claim bonus points, the agent needs to be substantially different from the scholar agent and others included in Gentopia’s agent pool. Be creative! Partial credits may be provided based on student effort.

Agent Functionalities : wellness-agent

Mindfulness Exercise Provider

A tool that offers various mindfulness exercises, such as breathing exercises or guided meditation, based on the type of exercise specified by the user.

Nutritional Information Provider

A tool that supplies nutritional details or insights based on a user’s query, which could be a specific food item or any nutrition-related question.

Text-to-Speech Generator

A tool that converts text into speech, allowing users to listen to the spoken version of any input text.

⁴<https://www.geeksforgeeks.org/working-with-pdf-files-in-python/>

User	Can you give me vegetarian meal options for the whole week with high protein value? Also, don't repeat the meals. If possible, mention protein value.
Wellness Agent	<p>Here's a high-protein vegetarian meal plan for a week, with each meal featuring a different dish and its estimated protein content:</p> <p>Day 1 • Breakfast: Greek Yogurt with Chia Seeds and Berries, Protein: 20g • Lunch: Quinoa Salad with Black Beans, Corn, and Avocado, Protein: 15g • Dinner: Lentil Soup with Spinach and Whole Grain Bread, Protein: 18g</p> <p>Day 2 • Breakfast: Scrambled Tofu with Spinach and Tomatoes, Protein: 22g • Lunch: Chickpea Salad Sandwich on Whole Grain Bread, Protein: 18g • Dinner: Stuffed Bell Peppers with Brown Rice and Kidney Beans, Protein: 20g</p> <p>Day 3 • Breakfast: Overnight Oats with Almond Butter and Flaxseeds, Protein: 15g • Lunch: Edamame and Quinoa Bowl with Sesame Dressing, Protein: 20g • Dinner: Vegetable Stir-Fry with Tempeh and Brown Rice, Protein: 25g</p> <p>Day 4 • Breakfast: Cottage Cheese with Pineapple and Walnuts, Protein: 20g • Lunch: Spinach and Feta Stuffed Portobello Mushrooms, Protein: 18g • Dinner: Black Bean and Sweet Potato Tacos, Protein: 15g</p> <p>Day 5 • Breakfast: Protein Smoothie with Spinach, Banana, and Pea Protein, Protein: 25g • Lunch: Lentil and Quinoa Salad with Lemon Dressing, Protein: 20g • Dinner: Zucchini Noodles with Pesto and Chickpeas, Protein: 18g</p> <p>Day 6 • Breakfast: Peanut Butter Banana Toast on Whole Grain Bread, Protein: 12g • Lunch: Falafel Wrap with Hummus and Mixed Greens, Protein: 15g • Dinner: Vegetable Curry with Paneer and Brown Rice, Protein: 22g</p> <p>Day 7 • Breakfast: Chia Seed Pudding with Almond Milk and Berries, Protein: 10g • Lunch: Grilled Vegetable and Quinoa Bowl with Tahini Sauce, Protein: 18g • Dinner: Baked Eggplant Parmesan with a Side Salad, Protein: 20g</p>
User	Give me some mindfulness exercises for a computer science individual that can be done at any time of the day.

Wellness Agent	<p>Here are some mindfulness exercises suitable for a computer science individual that can be done at any time of the day:</p> <ol style="list-style-type: none"> Breathing Exercise (5 minutes) • Sit comfortably in your chair. • Close your eyes and take a deep breath in through your nose, allowing your abdomen to expand. • Hold your breath for a moment, then slowly exhale through your mouth. • Repeat this process for five minutes, focusing solely on your breath. Body Scan (10 minutes) • Find a quiet place to sit or lie down. • Close your eyes and take a few deep breaths. • Start at the top of your head and slowly move your attention down your body, noticing any sensations or tension. • Continue this process down to your toes, taking your time with each part of your body. Mindful Walking (10 minutes) • Take a short walk, either indoors or outdoors. • Focus on the sensation of your feet touching the ground and the rhythm of your breath. • Notice the sights, sounds, and smells around you without judgment. Gratitude Journaling (5 minutes) • Take a few minutes to write down three things you are grateful for. • Reflect on why you are grateful for these things and how they positively impact your life. Guided Visualization (10 minutes) • Sit comfortably and close your eyes. • Imagine a peaceful place, such as a beach or a forest. • Visualize the details of this place, including the sounds, smells, and sights. • Spend a few minutes immersing yourself in this visualization.
User	Provide guided meditation for a beginner.
Wellness Agent	<p>Here's a simple guided meditation for beginners that you can follow. This meditation is designed to help you relax and focus, and it can be done anywhere, even during a break at work.</p> <p>Guided Meditation for Beginners (10 Minutes) Preparation (1 minute) 1. Find a quiet and comfortable place to sit or lie down. 2. Close your eyes gently and take a deep breath in through your nose, filling your lungs completely. 3. Hold your breath for a moment, then slowly exhale through your mouth.</p> <p>Body Awareness (2 minutes) 4. Bring your attention to your body. Notice how it feels against the surface you are on. 5. Start at the top of your head and slowly scan down to your toes. 6. As you focus on each part of your body, consciously relax any tension you may feel.</p> <p>Breath Focus (3 minutes) 7. Now, shift your focus to your breath. 8. Inhale deeply through your nose, counting to four. Hold for a count of four. 9. Exhale slowly through your mouth for a count of six. 10. Repeat this breathing pattern: Inhale (4), Hold (4), Exhale (6). 11. If your mind wanders, gently bring your focus back to your breath.</p> <p>Visualization (3 minutes) 12. Imagine a peaceful place, such as a beach, forest, or garden. 13. Visualize the details: the colors, sounds, and scents of this place. 14. Spend a few moments enjoying this peaceful scene, allowing yourself to feel calm and relaxed.</p> <p>Closing (1 minute) 15. Slowly bring your awareness back to the present moment. 16. Wiggle your fingers and toes, and when you're ready, open your eyes. 17. Take a moment to notice how you feel before returning to your day.</p>

User	Convert above response into speech.
Wellness Agent	I have converted the response into speech. You can listen to it here. If you need anything else, feel free to ask.

Acknowledgment

The mathematical problems used in this assignment come from the GSM8k dataset [1], and the source code of Gentopia comes from the referred EMNLP'23 paper [2].

References

- [1] Karl Cobbe, Vineet Kosaraju, Mohammad Bavarian, Mark Chen, Heewoo Jun, Lukasz Kaiser, Matthias Plappert, Jerry Tworek, Jacob Hilton, Reiichiro Nakano, et al. Training verifiers to solve math word problems. *arXiv preprint arXiv:2110.14168*, 2021.
- [2] Binfeng Xu, Xukun Liu, Hua Shen, Zeyu Han, Yuhan Li, Murong Yue, Zhiyuan Peng, Yuchen Liu, Ziyu Yao, and Dongkuan Xu. Gentopia.AI: A collaborative platform for tool-augmented llms. In *Proceedings of the 2023 Conference on Empirical Methods in Natural Language Processing: System Demonstrations*, pages 237–245, 2023.