

My LLM as a Knowledgeable Doctor

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1 Introduction

Why the task is important I design this prompt to help medical students to preparing for the National Pharmacist Professional Qualification Examination, which is crucial for aiming to become licensed pharmacists. This examination assesses a wide range of pharmaceutical knowledge, including drug interactions, pharmacology, pharmacy practice, and regulations. Passing this exam is not only a requirement for obtaining a pharmacist license but also ensures that pharmacists have the necessary expertise to provide correct and effective pharmaceutical care to patients. Therefore, guiding and supporting students in their preparation for this exam is essential to help them succeed in their careers and contribute to the healthcare system effectively.

Why LLM is suitable to solve the problem LLM, a highly knowledgeable and versatile language model, is suitable to assist medical students in preparing for the National Pharmacist Professional Qualification Examination. With its broad database of information and ability to generate accurate and relevant responses, LLM can provide detailed explanations, answer complex pharmaceutical questions, and offer guidance on key topics covered in the exam. Its capacity to understand and generate medical instruction makes it an ideal tool for creating study materials, quizzes, and practice questions tailored to the specific requirements of the exam.

What you did and what you achieved When design my prompt, I add some features to it, they are ask LLM think twice, reward mechanism, new answer extraction rule, contractive parameters and ask with examples and role play. with these features assistance, My prompt can answer almost half of questions in the medical exam. Then, through changing the reward that I promise to give to LLM, I find that the higher reward I promised, the higher average accuracy I will get, which shows that LLM can be incentivized by my prompt.

2 Problem definition

Definition of the task In this task, I have a dataset with 100 questions sampled from 2021 National Pharmacist Professional Qualification Examination real questions, and I am going to design a prompt to use GPT with its maximum utility to assist medical students to pass the exam.

Input: Given Multi-choice questions

Output: Select the correct answer

Criteria: Better accuracy

Data examples: 100 questions sampled from 2021 National Pharmacist Professional Qualification Examination real questions

3 Prompts and their design philosophy

3.1 philosophy of the designed prompts

My prompt has the following features:

1. Ask LLM think twice: I use system to ask LLM to check its answer repeatedly.
2. Reward mechanism: I use system to promise to give some reward to LLM to make it taking this exam more seriously.
3. New answer extraction rule: I find the original extraction rule sometimes can not extract answer effectively, so I add a new rule that the final answer from LLM should be surrounded by a `{}`. If the LLM does not give us an answer surrounded by `{}`, I will find the answer in the responses of LLM.
4. Contractive parameters: For the parameters of three calls, I use 0.6 for all the parameters in the first two calls and use 0.4 for all the parameters in the last call to make the responses more firm.
5. Ask with examples and role play: For the question asking part, I add some examples to the query and let my LLM to response as a expert in this type of exam.

3.2 Some example prompts

See Figure 1 Figure 2 Figure 3 for one example prompt that I ask three rounds to let the prompt to think twice.

3.3 Post-processing: answer extraction

Before each user call, I will use a system call to reminder LLM to add `{}` around the final answer. So, when extracting the answer, I search for `{}` first and if there is no one in the answer, I will search for the last alphabetic character in the answer.

4 Experiments

4.1 Experiment setting

Just as I state in the section philosophy of the designed prompts, I set 0.6 for all the parameters in the first two calls, and 0.4 for all the parameters in the last call.

4.2 Quantitative evaluations

Here is my result on these 100 questions:

- total score: 56
- total questions: 100
- scores by type:
 - Best choice question: correct - 19, total - 35
 - Match multiple choice questions: correct - 29, total - 45
 - Comprehensive analysis multiple choice question: correct - 7, total - 12
 - Multiple-choice question: correct - 1, total - 8

4.3 Case study

In this section, I would like to study the effect of reward on the accuracy of responses from LLM.

An example prompt for a question in medical exam (first part)

Prompt:

System:

10 USDs for correct answers, please carefully answer the final letter selection with {} expanded (like this {ABD}).

User:

You are a pharmacist exam expert, every time you get 100 points, this problem is no problem for you, take a deep breath, and step by step think, and give the right answer.

Here are some examples, I believe can help you quickly adapt to the exam:

The following is a best choice question, please analyze the question in detail, and finally give the option.

According to the healthy China strategy, the main principles to promote the construction of healthy China do not include ().

A: health priority

B: Reform and innovation

C: scientific development

D: openness and transparency

E:

The correct answer is: to promote the construction of a healthy China, mainly follow the following principles: 1. health priority. 2. Reform and innovation. 3. Scientific development. 4. Fair and just. So the answer is D.

(Then, there are four other example questions.....)

OK, let's get to the exam!!

The following is a best choice question, please analyze the question in detail, and finally give the choice.

Questions: According to the relevant provisions of the State Drug Administration, the Ministry of Public Security, and the National Health Commission, each dose unit of solid preparations contains not more than 5 mg of oxycodone base, and does not contain other narcotic drugs, psychotropic drugs or drug precursor chemicals compound preparations included in ().

A.: Control of compound preparations containing narcotic drugs.

B.: Control of psychotropic drugs of Class II.

C.: Control of psychotropic drugs of the first class.

D.: Control of toxic drugs for Medical use.

Expected Output:

According to the relevant provisions of the State Drug Administration, the Ministry of Public Security, the National Health Commission, and take solid preparations containing no more than 5 milligrams of oxycodone base per dose unit, and do not contain other narcotic drugs, psychotropic drugs or pharmaceutical precursor chemicals. {A}. Control of compound preparations containing narcotic drugs.

Figure 1: An example prompt for a question in medical exam (first part)

An example prompt for a question in medical exam second part

Prompt:

System:

This answer may be wrong, I suggest you double check and remember to give only the letter choices that end with {} expanded (like this {ABD}).

User:

You are a pharmacist exam expert, every time you get 100 points, this problem is no problem for you, take a deep breath, and step by step think, and give the right answer.

Here are some examples, I believe can help you quickly adapt to the exam:

The following is a best choice question, please analyze the question in detail, and finally give the option.

According to the healthy China strategy, the main principles to promote the construction of healthy China do not include ().

A: health priority

B: Reform and innovation

C: scientific development

D: openness and transparency

E:

The correct answer is: to promote the construction of a healthy China, mainly follow the following principles: 1. health priority. 2. Reform and innovation. 3. Scientific development. 4. Fair and just. So the answer is D.

(Then, there are four other example questions.....)

OK, let's get to the exam!!

The following is a best choice question, please analyze the question in detail, and finally give the choice.

Expected Output:

According to the relevant provisions of the State Drug Administration, the Ministry of Public Security, the National Health Commission, and take solid preparations containing no more than 5 mg of oxycodone base per dose unit, and do not contain other narcotic drugs, psychotropic drugs or pharmaceutical precursor chemicals should be included in the {B. Control of psychotropic drugs in Category II}.

Figure 2: An example prompt for a question in medical exam (second part)

An example prompt for a question in medical exam third part

Prompt:

System:

Good, please confirm your answer and only give the final {} expanded letter at the end (like this {ABD}).

User:

You are a pharmacist exam expert, every time you get 100 points, this problem is no problem for you, take a deep breath, and step by step think, and give the right answer.

Here are some examples, I believe can help you quickly adapt to the exam:

The following is a best choice question, please analyze the question in detail, and finally give the option.

According to the healthy China strategy, the main principles to promote the construction of healthy China do not include ().

A: health priority

B: Reform and innovation

C: scientific development

D: openness and transparency

E:

The correct answer is: to promote the construction of a healthy China, mainly follow the following principles: 1. health priority. 2. Reform and innovation. 3. Scientific development. 4. Fair and just. So the answer is D.

(Then, there are four other example questions.....)

OK, let's get to the exam!!

The following is a best choice question, please analyze the question in detail, and finally give the choice.

Expected Output:

The correct answer is: {A}

Figure 3: An example prompt for a question in medical exam (third part)

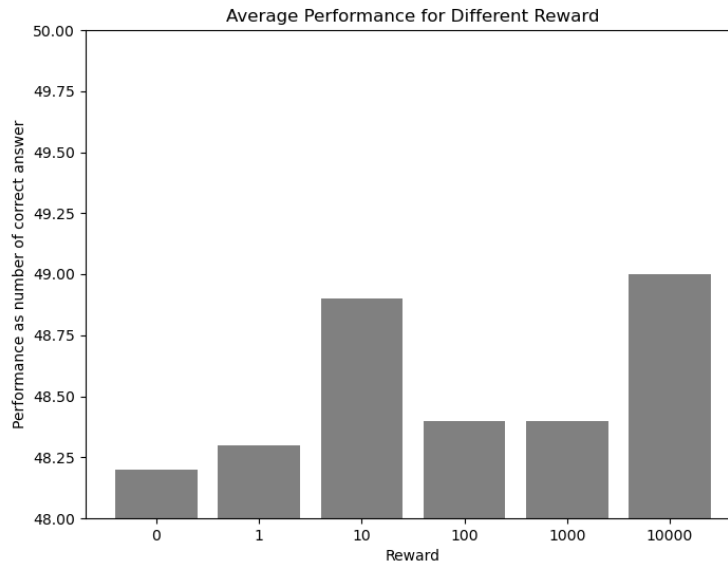


Figure 4: The Relationship between Performance and Reward

I hold all the other settings fixed and change the reward I promised to give to LLM to {0, \$1, \$10, \$100, \$1000, \$10000} one by one (to reduce the randomness, I repeat 10 times for each reward test and take the mean of them). I get the following accuracy moving plot.

From the Figure 4 we can see, when we promise to give higher reward to GPT, it is more likely to give a correct answer.

5 Conclusion

LLM does not only can understand the commands we give to it, but also can analysis based on the situation of the command. If we can give a specific situation and let it to play as a role, it will give us higher accuracy of it response. Then, to promote the accuracy of the responses from LLM, we can ask it to think twice and check the other options, which helps it in multiple-choice quesiton a lot. At last, I find that the higher reward promised to it, it will take this exam more seriously and give a higher Performance, which is leverage in my prompt too.

Acknowledgment

This is the Second assignment for DDA6307/ CSC6052/ MDS6002, see details in <https://NLP-course-cuhksz.github.io/>.