

Enhancing User Behavior Alignment by Input-Level Model Cooperation and Model-Level Parameter Optimization

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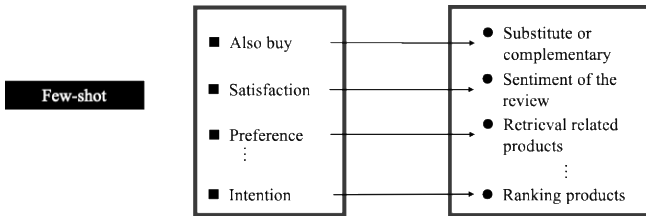
Overall Alignment task

What:

Align LLM with user preference for extract user regularity

1. Buy also buy
2. Sentiment
3. ...

From known task to unknown task.

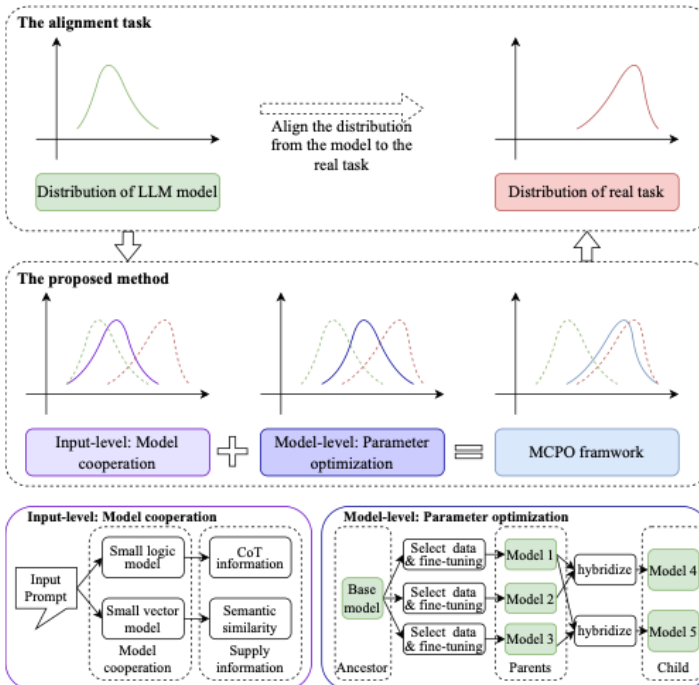


Zero-shot

Challenge: nobody knows the new task of user behavior

Challenges:

- 1) **input confusion:** Misunderstanding the task based on a concise description alone;
- 2) **process uncertainty:** Learning general knowledge make LLM uncertainty when answering specific questions.



Input-Level Model Cooperation

CoT information

MCQ:
[Question]
[Instruction: Evaluate the titles of Product 1 and Product 2 to assess their similarity and whether they are likely to be purchased or viewed together. Then, select the appropriate option.
Product 1: Cerwin-Vega XED52 Speaker 275 W PMPO 2-Way, 2 Count, Black
Product 2: Rockford R169X2 6 x 9 Inches Full Range Coaxial Speaker, Set of 2
0. Users who buy product 1 may also buy product 2.
1. The product 1 is similar with the product 2.
2. The product 1 is similar with the product 2.

[Chain of Thought]
1. Analyze the titles of both products to identify their main features and purpose.
Product 1 is a Cerwin-Vega XED52 Speaker, which is a 275 W PMPO 2-way speaker with a count of 2 and a black color. This suggests that it is a high-powered, two-channel speaker system designed for professional use in sound reinforcement applications, such as live performances, DJ setups, or home theater systems.
Product 2 is a Rockford R169X2 6 x 9 inches Full Range Coaxial Speaker, which is a set of two speakers. This indicates that it is a mid-range speaker system designed for use in vehicles, home audio systems, or as part of a home theater setup.
2. Compare the features and intended use of both products to determine their similarity. Both products are speakers, which suggests they have a similar function: to produce sound. However, they differ in their power output.

[Answer]
Therefore, the answer is

1

Semantic similarity information

A user has made a query with keyword 'blue shampoo aveda'. Given the following numbered list of 5 products, please rank the products according to their relevance with the query.
Product List:
1. Organic Blue Mallow Flowers - Color-Changing Blue Herbal Tea | 100% Dried Blue Mallow Flowers - Malva sylvestris | Net Weight: 0.5oz / 15g
2. Aveda Clove Shampoo, 33.8 Oz, 33.8 Fl Oz () (0018084813553)
3. 2 New Aveda Bottle Pumps fits 1 Liter products Shampoo, Conditioner, Lotion, Etc.
4. Joico Color Balance Blue Shampoo 10.1 fl oz
5. Aveda by Aveda: Blue Malva Color Shampoo 33.8 OZ

[External information]
The following items are very important and have a strong relevance to the query, and ranked by relevance.
5. Aveda by Aveda: Blue Malva Color Shampoo 33.8 OZ
2. Aveda Clove Shampoo, 33.8 Oz, 33.8 Fl Oz () (0018084813553)
3. 2 New Aveda Bottle Pumps fits 1 Liter products Shampoo, Conditioner, Lotion, Etc.
You should output a permutation of 1 to 5 reference to the order of [External information]. There should be a comma separating two numbers. Each product and its number should appear only once in the output. Only respond with the ranking results. Do not say any word or explanations.

Answer:
5,4,2,3,1

Improvement

COT	MCQ Score (Round 1)
baseline (ecellm-M)	0.607
self-supplement	0.658
other supplement (phi-3)	0.690

Improvement

Ranking RAG	RKQ Score
baseline (llama3-70B)	0.737
+system_prompt	0.839
k = 1	0.890
k = 3	0.901
k = 5	0.888

Prompt engineering

Prompt

For each task, we design different prompt for improve the ability.

Prompt Type	Multiple Choice Task	Retrieval Task	Generation Task	Ranking Task
Baseline	0.697	0.811	0.496	0.888
Prompt1	0.704	0.834	0.608	0.901
Prompt1+Prompt2	0.710	0.838	0.622	0.905
Total Score	0.710	0.838	0.630	0.914
Prompt1+Prompt2+Prompt3	-	0.840	-	0.918

Multiple choice:

You are a real consumer, consider the shopping experience to answer this question. Please answer the following question about online shopping and follow the given instructions. Please think cautiously. The answers or reponses are very important. You should only answer a number of option. Do not say other words or explanation.

Ranking:

Based on your previous knowledge then generate the answer. You are a helpful online shopping assistant. Please answer the following question about online shopping and follow the given instructions. In this task, each question is associated with a requirement and a list of candidate items, and the model is required to re-rank all items according to how each item satisfies the requirement.

Retrieval:

Based on your previous knowledge then generate the answer. This is a retrieval question. You are a highly skilled online shopping assistant and a professional product retrieval expert. Your goal is to help consumers quickly and accurately identify products that meet their specific needs.

You provide a clear and concise list of retrieval results, including the product name, key attributes, and how they meet the requirements. Please analyze the following request and deliver accurate retrieval results.

Generation:

Based on your previous knowledge then generate the answer. You are assistant in online e-commerce. Now you need to answer the generation task based on the following instruct.

Model-Level Parameter Optimization

Model selection

Model	Score	Multiple Choice Score	Retrieval Score	Generation Score	Ranking Score
ecellm-L	0.5310	0.5543	0.4230	0.4953	0.7761
ecellm-M	0.5185	0.4970	0.4556	0.5568	0.7632
llama3-8b	0.4198	0.4549	0.3283	0.3269	0.6922
Wizard-Vicuna-30B-Uncensored-AWQ	0.3605	0.2984	0.3010	0.4844	0.6641
Qwen1.5-14B	0.2069	0.2003	0.2792	0.0267	0.5825
llama3-70B-AWQ	0.6657	0.6406	0.7667	0.5755	0.8333

Fine-tuning and hybridize

Model	Score	Multiple Choice Score	Retrieval Score	Generation Score	Ranking Score
baseline	0.665	0.640	0.766	0.575	0.833
N = 2000	0.693	0.687	0.789	0.543	0.901
N = 4750	0.710	0.692	0.826	0.584	0.883
N = 6000	0.715	0.697	0.811	0.608	0.888
N = 6100	0.699	0.680	0.795	0.586	0.897
N = 10000	0.696	0.676	0.804	0.586	0.863
N = 20000	0.695	0.700	0.768	0.551	0.873
Hybridized model (6000-20000)	0.709	0.703	0.796	0.584	0.868

Conclusion

