C   META-PROMPTS

C.1   META-PROMPT FOR MATH OPTIMIZATION

Now you will help me minimize a function with two input variables w, b. I have some (w, b) pairs and the function values at those points. The pairs are arranged in descending order based on their function values, where lower values are better.

input:
w=18, b=15
value:
10386334

input:
w=17, b=18
value:
9204724

Give me a new (w, b) pair that is different from all pairs above, and has a function value lower than any of the above. Do not write code. The output must end with a pair [w, b], where w and b are numerical values.

Figure 19: An example of the meta-prompt for linear regression. The blue text contains solution-score pairs; the orange text are meta-instructions.

You are given a list of points with coordinates below: (0): (-4, 5), (1): (17, 76), (2): (-9, 0), (3): (-31, -86), (4): (53, -35), (5): (26, 91), (6): (65, -33), (7): (26, 86), (8): (-13, -70), (9): (13, 79), (10): (-73, -86), (11): (-45, 93), (12): (74, 24), (13): (67, -42), (14): (87, 51), (15): (83, 94), (16): (-7, 52), (17): (-89, 47), (18): (0, -38), (19): (61, 58).
Below are some previous traces and their lengths. The traces are arranged in descending order based on their lengths, where lower values are better.

<trace> 0,13,3,16,19,2,17,5,4,7,18,8,1,9,6,14,11,15,10,12 </trace>
length:
2254

<trace> 0,18,4,11,9,7,14,17,12,15,10,5,19,3,13,16,1,6,8,2 </trace>
length:
2017

<trace> 0,11,4,13,6,10,8,17,12,15,3,5,19,2,1,18,14,7,16,9 </trace>
length:
1953

<trace> 0,10,4,18,6,8,7,16,14,11,2,15,9,1,5,19,13,12,17,3 </trace>
length:
1840

Give me a new trace that is different from all traces above, and has a length lower than any of the above. The trace should traverse all points exactly once. The trace should start with <trace> and end with </trace>.

Figure 20: An example of the meta-prompt for Traveling Salesman Problems with problem size $n = 20$. The blue text contains solution-score pairs; the orange text are meta-instructions.

C.2   META-PROMPT FOR PROMPT OPTIMIZATION

Different optimizer models work the best on different styles of meta-prompts. Figure 3 in the main paper shows the meta-prompt for `PaLM 2-L-IT`; Figure 21 shows that for pre-trained `PaLM 2-L`; Figure 22 shows that for GPT models.

Create a piece of text at the beginning of the answer to enhance the precision in solving diverse grade school math problems.

Precision: 4 <TEXT>A dime</TEXT>

Precision: 17 <TEXT>The answer is a function. It is</TEXT>

Precision: 19 <TEXT>So how can we find out what this equation means?</TEXT>

Precision: 20 <TEXT>Solutions:</TEXT>

Figure 21: An example of the meta-prompt for prompt optimization with pre-trained `PaLM 2-L` on GSM8K, where the generated instruction will be prepended to the beginning of the scorer LLM output (*A_begin* in Section 4.1).

Your task is to generate the instruction <INS>. Below are some previous instructions with their scores. The score ranges from 0 to 100.

text:
Let's figure it out!
score:
61

text:
Let's solve the problem.
score:
63

(... more instructions and scores ...)

Below are some problems.

Problem:
Q: Alannah, Beatrix, and Queen are preparing for the new school year and have been given books by their parents. Alannah has 20 more books than Beatrix. Queen has 1/5 times more books than Alannah. If Beatrix has 30 books, how many books do the three have together?
A: <INS>

Ground truth answer:
140

(... more exemplars ...)

Generate an instruction that is different from all the instructions <INS> above, and has a higher score than all the instructions <INS> above. The instruction should begin with <INS> and end with </INS>. The instruction should be concise, effective, and generally applicable to all problems above.

Figure 22: An example of the meta-prompt for prompt optimization with GPT models (`gpt-3.5-turbo` or `gpt-4`) on GSM8K, where the generated instruction will be prepended to the beginning of the scorer LLM output (*A_begin* in Section 4.1). The blue text contains solution-score pairs; the purple text describes the optimization task and output format; the orange text are meta-instructions.
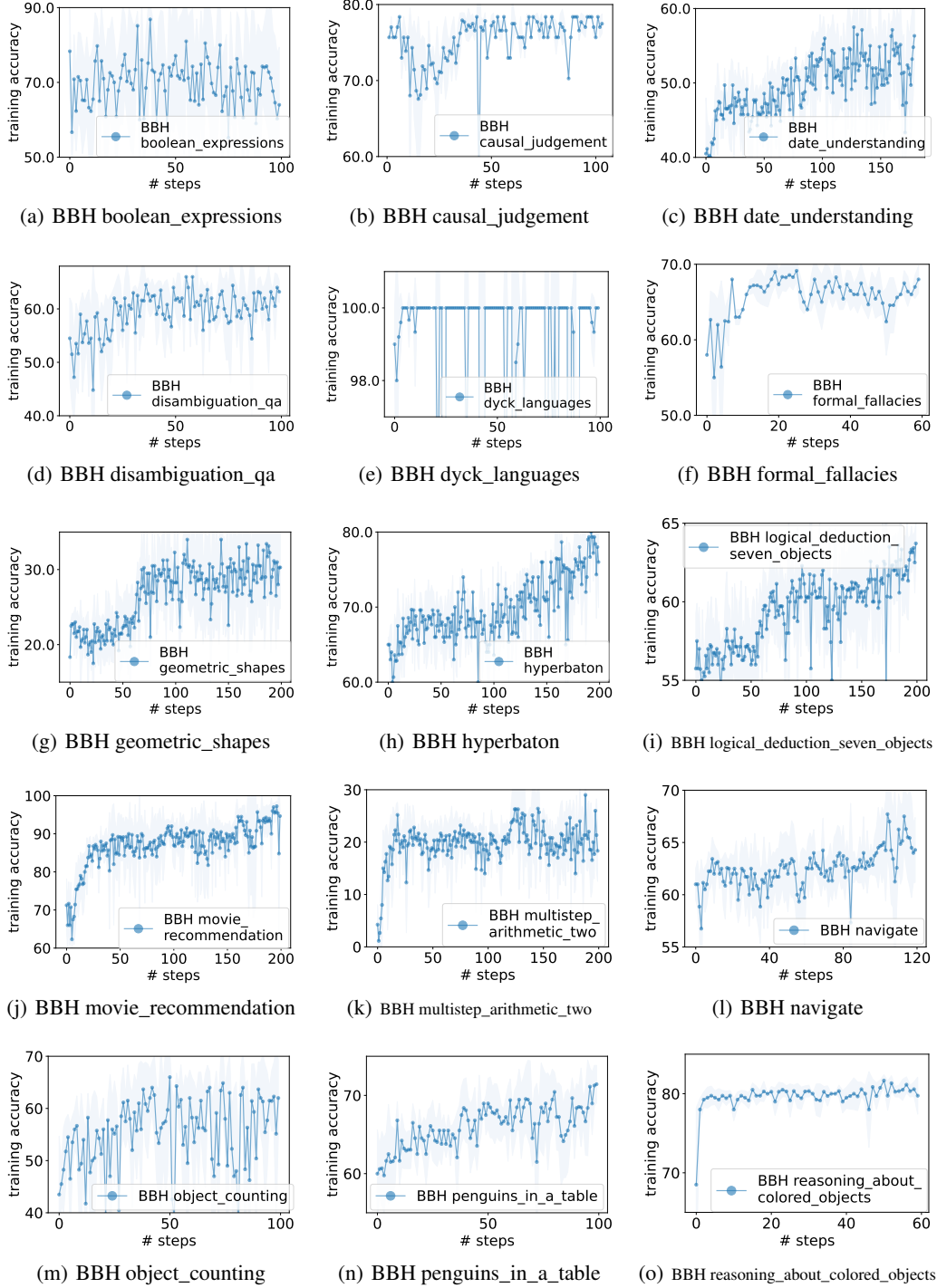
D PROMPT OPTIMIZATION CURVES ON THE REMAINING BBH TASKS

(a) BBH boolean_expressions (b) BBH causal_judgement (c) BBH date_understanding

(d) BBH disambiguation_qa (e) BBH dyck_languages (f) BBH formal_fallacies

(g) BBH geometric_shapes (h) BBH hyperbaton (i) BBH logical_deduction_seven_objects

(j) BBH movie_recommendation (k) BBH multistep_arithmetic_two (l) BBH navigate

(m) BBH object_counting (n) BBH penguins_in_a_table (o) BBH reasoning_about_colored_objects

Figure 23: Prompt optimization on 21 BBH tasks (except ruin_names and temporal_sequences already shown in Figure 6) with the `text-bison` scorer and the `PaLM 2-L-IT` optimizer, Part I. Most curves have upward trends.