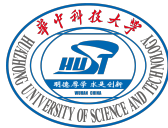


SPREADSHEETBENCH

雷翔麟

华中科技大学计算机科学与技术学院

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- ① Ideas
- ② Details
- ③ Codes
- ④ Conclusion
- ⑤ Motivation

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Five Key Ideas

- Collect high-quality **data** from real-world sources and select the questions by rigorous criteria
- Utilize GPT-4 to recreate a coherent **instruction**
- Categorize **answer positions** into sheet-level and cell-level
- Create multiple spreadsheets and develop multiple **test cases** for each instruction
- Use various methods to mitigate **data leakage**

1. Data Sourcing



2. Data Filtering

✓ Solved Problem

✓ Pure Spreadsheet

✓ Feasible & Testable

✓ Representative

3. Data Formatting

Instruction Generation

Spreadsheet Forum Post

- #1 I am looking for a formula that retrieve the data from a cell...
- #2 Maybe: =IF(E4="M", "", E4+IF...
- #3 Thanks, but I also need to add the time, e.g., K4 is 5:22:46



LLM Generated :

How can I retrieve the data from a cell
...
You also need to add the time.



Human Checked:

How can I retrieve the data from a cell
...
You also need to add the time.
e.g., K4 is 5:22:46

Answer Position Annotation

Instruction: Mark whether person is adult
Cell-Level Manipulation: D2:D6

	A	B	C	D
1	Name	Age	Gender	Adult or not
2	Ken	12	Male	no
3	Bob	31	Male	yes
4	June	22	Female	yes
5	Yang Ming	16	Male	no
6	Jun Zhu	18	Female	yes

Instruction: Delete underage users
Sheet-Level Manipulation: A2:D6

	A	B	C	D
1	Name	Age	Gender	Adult or not
2	Ken	12	Male	no
3	Bob	31	Male	yes
4	June	22	Female	yes
5	Yang Ming	16	Male	no
6	Jun Zhu	18	Female	yes

4. Testcase Construction

	A	B	C	D
1	Name	Age	Gender	Adult or not
2	Ken	12	Male	
3	Bob	31	Male	
4	June	22	Female	
5	Yang Ming	16	Male	
6	Jun Zhu	18	Female	

apply solution:

=IF(B2<18,"no","yes")



	A	B	C	D
1	Name	Age	Gender	Adult or not
2	Ken	12	Male	no
3	Bob	31	Male	yes
4	June	22	Female	yes
5	Yang Ming	16	Male	no
6	Jun Zhu	18	Female	yes

modify: cell B3, B5



	A	B	C	D
1	Name	Age	Gender	Adult or not
2	Ken	12	Male	no
3	Bob	13	Male	no
4	June	22	Female	yes
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6	Jun Zhu	16	Female	yes

5. OJ-Style Evaluation Pipeline



Figure 1: The benchmark construction pipeline and OJ-style evaluation.

1 Ideas

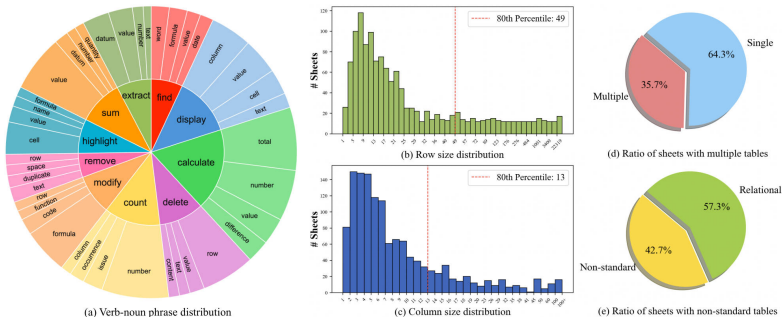
2 Details

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Figure 2: Key statistics of SPREADSHEETBENCH.



Data Leakage

Issue: Datasets initially **obtained from online** forums may be susceptible to data leakage issues, given that many LLMs are pre-trained using a vast corpus of web text.

Solutions:

- **Revise the original questions** in the posts during the Instruction Generation process.
- **modifying the original provided spreadsheets** during the Spreadsheet Modification.
- **alter the position** of the tabular data in the original spreadsheets and the corresponding answer in the resulting spreadsheets during the Answer Position Changing

Evaluation Metrics

- **Soft Restriction:**

$$S_{\text{soft}} = \frac{1}{|D|} \sum_{i=1}^{|D|} \left(\frac{1}{|T_i|} \sum_{j=1}^{|T_i|} 1_{r_i = \text{ACC}} \right)$$

- **Hard Restriction:**

$$S_{\text{hard}} = \frac{1}{|D|} \sum_{i=1}^{|D|} 1_{r_{ij} = \text{ACC}, \forall j = 1, 2, \dots, |T_i|}$$

Inference Setting

Evaluate LLMs under two distinct settings:

- **Single-Round:** present the model with the initial few rows of spreadsheet files within the prompt, allowing for **only one inference**.
- **Multi-Round:** Building on the single-round prompt setting, furnish error feedback if the code fails to execute, enabling the model to refine its code in subsequent iterations.

- 1 Ideas
- 2 Details
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GitHub Link

GitHub Link:

<https://github.com/RUCKBReasoning/SpreadsheetBench>

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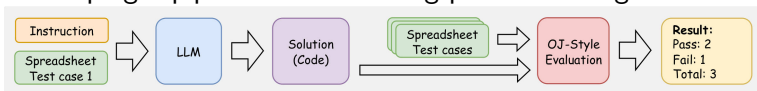
Table 2: Performance of representative models on SPREADSHEETBENCH (%).

Model	Soft Restriction (↑)			Hard Restriction (↑)		
	Cell-Level	Sheet-Level	Overall	Cell-Level	Sheet-Level	Overall
Binder (GPT-3.5)	1.58	0.05	1.17	0.00	0.00	0.00
CodeQwen (7B)	0.36	0.76	0.51	0.36	0.29	0.33
w / Multi-Round	1.49	7.14	3.66	0.89	6.29	2.97
DeepseekCoder (33B)	0.59	5.81	2.60	0.36	5.14	2.20
w / Multi-Round	3.15	8.76	5.31	1.96	6.86	3.85
Mixtral-8x7B	2.97	3.33	3.11	2.32	2.57	2.42
w / Multi-Round	3.39	4.67	3.88	2.32	3.71	2.85
Llama-3 (70B)	0.18	3.14	1.32	0.00	2.86	1.10
w / Multi-Round	1.13	7.90	3.74	0.71	7.14	3.18
GPT-3.5	1.31	3.99	2.34	0.71	3.13	1.64
w / Multi-Round	3.33	13.11	7.09	2.50	9.97	5.37
GPT-4o	15.03	23.65	18.35	11.94	19.94	15.02
w / Multi-Round	13.49	22.51	16.96	10.52	17.66	13.27
SheetCopilot (GPT-4)*	16.67	10.00	14.00	-	-	-
Copilot in Excel*	23.33	15.00	20.00	-	-	-
Human Performance	75.56	65.00	71.33	66.67	55.00	62.00

Figure 3: Performance of representative models on SPREADSHEETBENCH %.

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- The concept of constructing a benchmark:
 - Data quality
 - Data construction
 - Data diversity
- Methods to address data leakage issues
- Developing a pipeline for evaluating problems using LLMs



Thanks!