# SPREADSHEETBENCH

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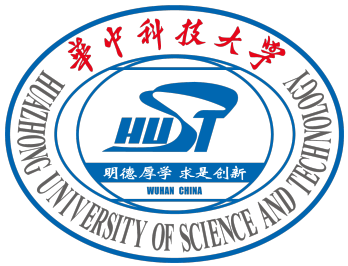


# Five Key Ideas

- 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**

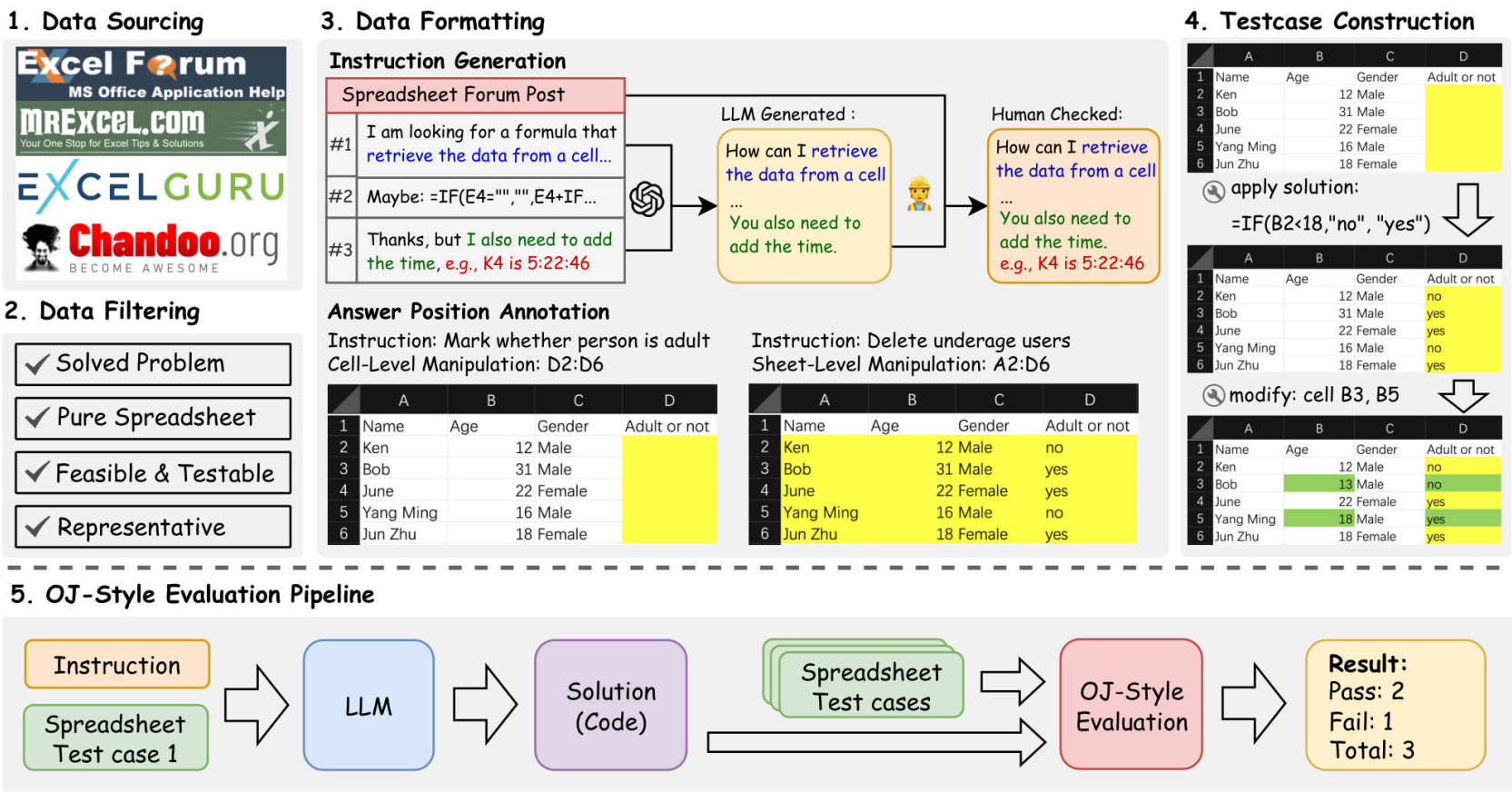
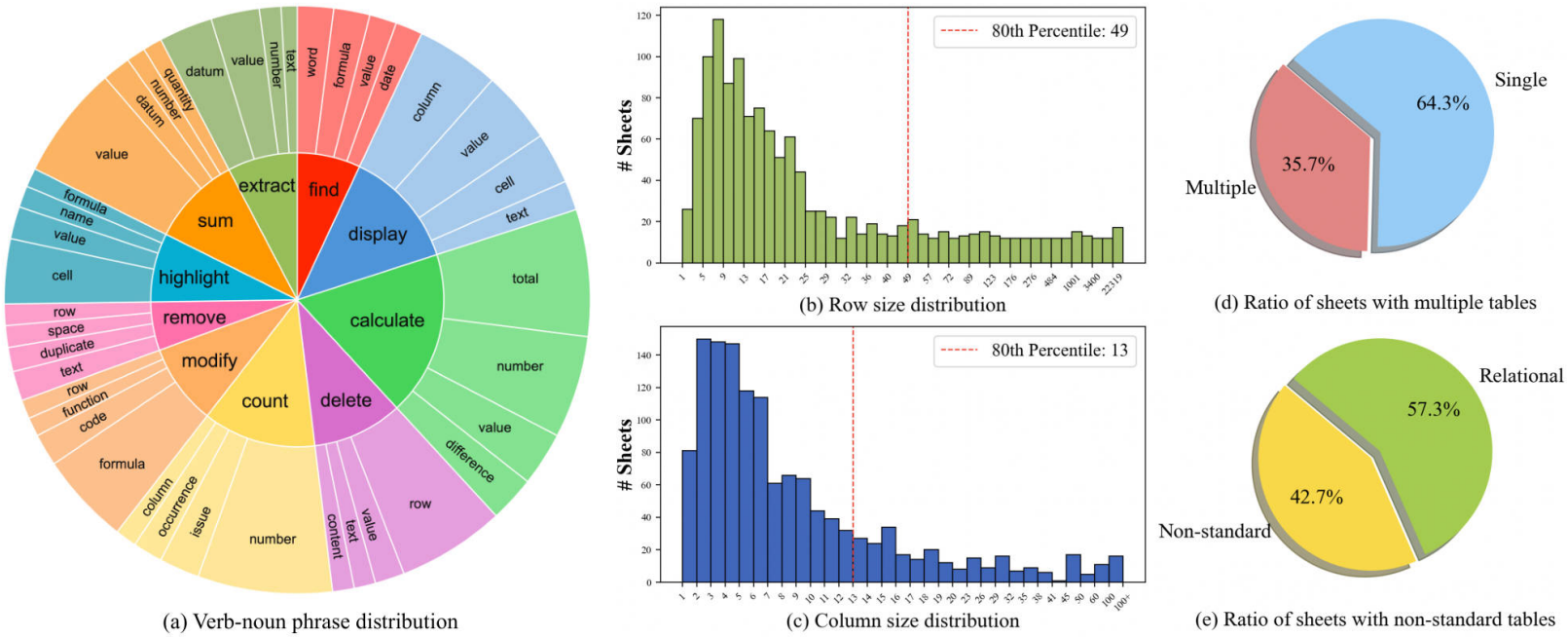



Figure 1: The benchmark construction pipeline and OJ-style evaluation.

# Data Info




(a) Verb-noun phrase distribution

(b) Row size distribution

(c) Column size distribution

(d) Ratio of sheets with multiple tables

(e) Ratio of sheets with non-standard tables

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:**

$$S_{hard} = \frac{1}{|D|} \sum_{i=1}^{|D|} 1_{rij} = ACC, \forall j = 1, 2, \ldots, |T_i|$$

# 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.

# GitHub Link

GitHub Link:
https://github.com/RUCKBReasoning/SpreadsheetBench

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 %.

*Thanks!*