ChartPoint: Guiding MLLMs with Grounding Reflection for Chart Reasoning
# Supplementary Material

A. Example Visualization


```
{
"Question": "What was the population value in 2012
according to the line chart?",
"Answer": "39865",
"Steps": [
        {
        "action": "Identify the year 2012 on the
        X-axis.",
        "type": "Grounding",
        "pos": [580, 558, 68, 33]
        },
        {
        "action": "Locate the corresponding data
        point on the line chart for the year
        2012.",
        "type": "Grounding",
        "pos": [586, 511, 52, 38]
        },
        {
        "action": "Read the Y-axis value
        associated with the identified data point
        for 2012.",
        "type": "Grounding",
        "pos": [7, 502, 112, 53]
        },
        {
        "action": "Confirm that the Y-axis value
        for 2012 is ?",
        "type": "Reasoning"
        }
],
"Size": [1000, 600]
}
```

```
{
"Question": "What is the percentage of
unclassified businesses according to the
horizontal bar chart?",
"Answer": "0.9%",
"Steps": [
        {
        "action": "Identify the category
        'Unclassified businesses' on the Y-axis.",
        "type": "Grounding",
        "pos": [346, 38, 197, 26]
        },
        {
        "action": "Locate the corresponding bar
        value for 'Unclassified businesses'.",
        "type": "Grounding",
        "pos": [545, 33, 48, 35]
        },
        {
        "action": "Read the value of the bar for
        'Unclassified businesses' on the X-axis.",
        "type": "Grounding",
        "pos": [534, 523, 87, 61]
        },
        {
        "action": "The value is ? since the
        context implies percentages.",
        "type": "Reasoning"
        }
],
"Size": [1000, 600]
}
```

Figure 7. The detail of PointCoT and the display of the chart after BBox rendering (part 1).
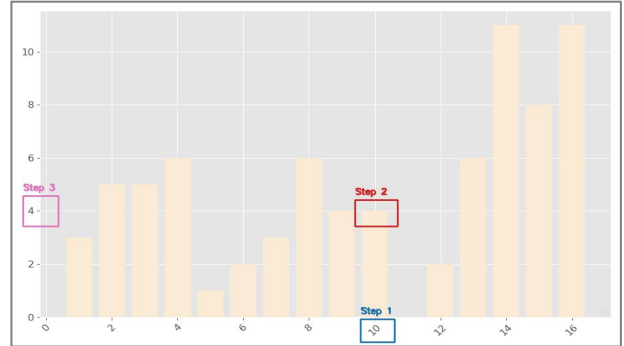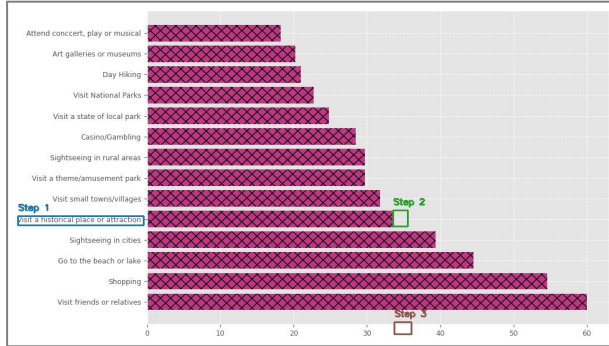
```
{
"Question": "What is the percentage of people who
chose 'Visit a historical place or attraction' as
their activity?",
"Answer": "33.6%",
"Steps": [
        {
        "action": "Identify the category 'Visit a
        historical place or attraction' on the Y-
        axis.",
        "type": "Grounding",
        "pos": [16, 373, 206, 16]
        },
        {
        "action": "Locate the corresponding value
        on the X-axis for 'Visit a historical
        place or attraction'.",
        "type": "Grounding",
        "pos": [631, 363, 24, 28]
        },
        {
        "action": "Note the value is ?",
        "type": "Grounding",
        "pos": [633, 558, 28, 21]
        },
        {
        "action": "Recognize that the values
        represent percentages since they are
        likely representing survey results or
        statistical data.",
        "type": "Reasoning"
        },
        {
        "action": "Conclude that the percentage
        is ?.",
        "type": "Reasoning"
        }
],
"Size": [1000, 600]
}
```

```
{
"Question": "What is the value of y when x equals
10?",
"Answer": "4",
"Steps": [
        {
        "action": "Identify the x-axis and locate
        the position for x = 10.",
        "type": "Grounding",
        "pos": [573, 553, 56, 40]
        },
        {
        "action": "Identify the corresponding bar
        height for x = 10.",
        "type": "Grounding",
        "pos": [564, 345, 70, 46]
        },
        {
        "action": "Read the y value from the
        chart where x = 10.",
        "type": "Grounding",
        "pos": [18, 338, 58, 53]
        },
        {
        "action": "The value read is ?",
        "type": "Reasoning"
        }
],
"Size": [1000, 600]
}
```

Figure 8. The detail of PointCoT and the display of the chart after BBox rendering (part 2).

B. Prompt Details

Prompt to Generate Chain of Thought

Given a chart plot code, please propose a **question** based on the code and provide the **answer** to this question. Additionally, provide detailed reasoning steps for arriving at the answer, categorizing each step as either Grounding or Reasoning.

Requirements for the Question:
1. Focus on specific elements within the chart, such as the chart title, data values for specific categories, or identifying peak values.
2. **Do not** ask descriptive or summary questions, like describing trends or summarizing the chart's message.
3. **Do not** ask about visually non-distinguishing details, such as font type or size of the title.

Requirements for Thinking Steps:
1. Categorize each step into two types: Grounding and Reasoning.
2. Grounding steps involve locating elements within the chart, such as identifying positions on axes or legend entries.
3. Reasoning steps involve logical deductions based on information gathered from previous grounding steps.

Output Format Requirements:
1. Do not include any extraneous text unrelated to the content.
2. Strictly follow the JSON format for the response.
3. Refer to the example provided below for the expected structure.

Example:
{#EXAMPLE_HERE}

Now, given the chart plot code, please provide the **Question**, **Answer**, and **Steps**. Output strictly in the given example format.

Chart Plot Code

{*#CODE_HERE*}

Your should provide:

Prompt for Code Editing

You are provided with Python code that generates a chart and a specific instruction related to an element within this chart that needs to be highlighted. Your task is to amend the plotting code by adding an '@' symbol at the location specified in the instruction.

Requirements:
1. Chart Plot Code: The original Python code for generating the chart.
2. Instruction: A directive specifying which chart element should be highlighted (e.g., "Locate the bar corresponding to '2018' and 'Domestic'.", "Circle the highest sales month").
3. **Modification**: Integrate an '@' symbol into the chart. This symbol should be centered on the element as indicated – for instance, in the middle of a title, legend, or label, or at the top of a bar.
4. **Output**: Deliver the updated code that correctly places the '@'.

Output Format:
1. Provide only the modified code as output.
2. Exclude any text not pertinent to the response content.
3. Ensure the modified code preserves all original chart features while incorporating the specified '@'.

Example:
{#EXAMPLE_HERE}

Now, given the **chart plot code** and **instruction**:

Instruction: {#INST_HERE}.

Chart Plot Code

{#CODE_HERE}

Your should provide:

Match Style Prompt Engineering

User:
You are a professional data analyst with expertise in interpreting various types of charts and graphs. When presented with a question about a given chart, your response should adhere to the following guidelines.

Guidelines:
1. **Initial Assessment**: Begin by carefully examining the provided chart. Note the type of chart (e.g., bar chart, pie chart, line graph), the labels on the axes (if applicable), the title, and any legends present. Identify the key data points relevant to the question.
2. **Step-by-Step Reasoning**: Break down the process of answering the question into clear, logical steps. Explain each step in detail, referencing specific data from the chart. Use phrases like "First, we look at...", "Next, we calculate...", "Then, we compare...".
3. **Final Answer**: Conclude your response with the final answer presented in the format \box{answer}, where "answer" is either a single number or a percentage. Do not include any units. Ensure that the answer is accurate based on your analysis.
4. **BBox**: Output bboxes whenever possible to support your understanding of the chart elements.

Question: {#QUESTION_HERE}.

Assistant: