Evaluation Report on MCP Servers

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Executive Summary

- 1. There are significant differences in effectiveness and efficiency among MCP servers; using MCPs does not demonstrate a noticeable improvement compared to function call.
- 2. The effectiveness of the MCP server can be enhanced by optimizing the parameters that need to be constructed by the LLM.

1 Introduction

Model Context Protocol (MCP) [1] is an open protocol that enables AI models to securely interact with local and remote resources through standardized server implementations. Thousands of MCPs have been proposed in recent months. At the same time, several model platforms, e.g. OpenAI and Alibaba-cloud announced the support of MCP in their LLM products. The outbreak of the MCP protocol has become a reality. To study the effectiveness and efficiency of MCP servers, we selected several widely used MCP servers and conducted an experiment to evaluate them using MCPBench on their accuracy, time, and token usage. We focused on two tasks: web search and database search. The former involves searching the internet to answer questions, while the latter entails fetching data from a database. All MCP servers were compared using the same LLM and prompt in a controlled environment. We aimed to answer the following questions:

- Question 1: Are MCP servers effective and efficient in practice?
- Question 2: Does using MCP provide higher accuracy compared to function calls?
- Question 3: How to enhance the performance?

To study these questions, we propose an evaluation framework, called MCPBench, which is released at https://github.com/modelscope/MCPBench. Besides, we provide the dataset of web search and database search at the same time.

2 Tasks and Dataset

MCPs encompass several tasks, including computing, memory management, web searching, and database interaction. They can be categorized into two groups:

- Data Fetching: This group retrieves data from various sources to assist LLMs in completing tasks. The effectiveness of these MCPs is determined by the accuracy of the data fetched. For example, web search MCPs utilize search engines to obtain content from websites.
- World Changing: These MCPs alter the state of the world. Their effectiveness hinges on whether the state has been successfully modified. For instance, GitHub MCPs can commit code that changes the data in the GitHub dataset.

Evaluating world-changing MCPs presents challenges due to the difficulty in accessing the underlying status of the data sources (e.g., GitHub dataset). Therefore, our focus will be on data fetching tasks. Specifically, the evaluation report will encompass two tasks:

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Table 1: An example of web search task

Input	Tool	Result
What is the middle name of	brave_web_search {"query":"middle	Hussein
Barack Obama	name of Barack Obama"}	

Table 3: An example of database search task

Input	Tool	Result
Fetch the sales of Tesla Model S	execute_sql {"query":"Select	13402
since 2025-01	sum(sales) from sales where se-	
	ries='Tesla Model S' and datetime;	
	2025-01"}	

1) Web Search

This task takes a question as input. The LLM rewrites it into keywords or some short sentences, involving a tool that typically searches the internet and returns results to the LLM. Here is an example involving the Brave Search MCP, see Tab. 1.

To eliminate biases in the dataset, we introduce multiple data sources encompassing both Chinese and English languages across various fields.

Table 2: The datasource of web search task

Datasource	Details	Volume	Case
Frames [7]	Open-source dataset	100	"Prompt": "As of August 1,
			2024, which country hosted the
			FIFA World Cup the last time
			the UEFA Champions League
			was won by a club from Lon-
			don?", "Answer": "France"
News (Chinese)	Collected by cleaning data from	100	"Prompt": "In which city did
	daily Xinwen Lianbo transcripts		Tesla's first energy storage su-
	over the past three months and		per factory outside of the United
	processing it using reverse engi-		States officially start production
	neering techniques.		on February 11, 2025?", "An-
			swer": "Shanghai"
Knowledge	Collected by cleaning data from	100	"Prompt": "What type of fish
(Chinese)	knowledge-intensive websites like		might the family Cyprinidae and
	Wikipedia and science and tech-		the family Dace represent as
	nology reports, and processing		their primitive types?", "An-
	it using reverse engineering tech-		swer": "armored fish"
	niques.		

2) Database Search

Database search, or database interaction, is the data retrieval task with database. This task takes a question as input. The LLM retrieves data from the database through a database MCP server. Table 3 shows an example involving the MySQL MCP. We gathered datasets from various sources, see Tab 4.

Table 4: The datasource of database search task

Datasource	Details	Volume	Case
Car_bi	A synthetic dataset from an	355	"Prompt": "What is the total
	automobile manufacturer data-		number of orders in the South
	source		China region in February 2025?",
			"Answer": "0"
SQL_EVAL	Sampled from SQL_EVAL ¹ . It	256	"Prompt": Which authors have
	is based off the schema from		written publications in both the
	the Spider, but with a new set		domain "Machine Learning" and
	of hand-selected questions and		the domain "Data Science"?
	queries grouped by query cate-		"Answer": "Ashish Vaswani"
	gory.		

 $^{^{1} \}rm https://github.com/defog-ai/sql-eval$

3 Overview of MCP Servers

We collected the MCP servers from GitHub² and Smithary.AI³. Due to limitations of time and cost, we selected those having more call records at April 2025.

3.1 Web Search Related MCP

• Brave Search [4]: A web and local search utilizing Brave's Search API.

Source: https://github.com/modelcontextprotocol/servers/tree/main/src/brave-search

 $Tool\ Name:\ brave_web_search$

 $Developer:\ erdnax 123$

• DuckDuckGo Search Server [11]: A Model Context Protocol (MCP) server providing web search capabilities through DuckDuckGo, with additional features for content fetching and parsing.

Source: https://github.com/nickclyde/duckduckgo-mcp-server

Tool Name: search Developer: nickclyde

• Tavily MCP Server [12]: A search engine for AI agents (search + extract) powered by Tavily.

Source: https://github.com/tavily-ai/tavily-mcp

Tool Name: tavily-search Developer: tavily-ai

• Exa Search [5]: A search engine designed for AI by Exa.

Source: https://github.com/exa-labs/exa-mcp-server

Tool Name: web_search Developer: exa-labs

• Fire Crawl Search [9]: Extracts web data using Firecrawl.

Source: https://github.com/mendableai/firecrawl-mcp-server

Tool Name: firecrawl_search Developer: mendableai

• Bing Web Search [8]: A Model Context Protocol (MCP) server for Microsoft Bing Search API integration, enabling AI assistants to conduct web, news, and image searches.

Source: https://github.com/leehanchung/bing-search-mcp

Tool Name: bing_web_search Developer: leehanchung

• **BochaAI:** A search engine for AI that provides access to high-quality global knowledge from nearly ten billion web pages and ecological content sources across various fields, including weather, news, encyclopedias, healthcare, and travel.

Source: Alibaba Cloud BaiLian Platform

Tool Name: bocha_web_search Developer: Alibaba Cloud

3.2 Web Search Related Function Calls

For comparison, we included some function calls:

- Qwen Web Search: Uses the SDK provided by Qwen-Max-0125 [13] to enable online search with extra_body={"enable_search": True}.
- Quark Search: A search engine that is particularly useful for searching unknown information such as weather, exchange rates, and current events.

Source: Official Quark Search Plugin provided by Alibaba Cloud BaiLian Platform

Tool Name: quark_search Developer: Alibaba Cloud

 $^{^2}$ http://github.com 3 https://smithery.ai

3.3 Database Search Related MCP

• XiYan MCP Server [14]: An MCP server that supports data retrieval from a database using natural language queries, powered by XiyanSQL [6] as the text-to-SQL LLM.

Source: https://github.com/XGenerationLab/xiyan_mcp_server

Tool Name: get_data Developer: XGenerationLab

• MySQL MCP Server [3]: An implementation that facilitates secure interaction with MySQL databases.

Source: https://github.com/designcomputer/mysql_mcp_server

Tool Name: execute_sql Developer: designcomputer

• PostgreSQL MCP Server [10]: A Model Context Protocol server that provides read-only access to PostgreSQL databases.

Source: https://github.com/modelcontextprotocol/servers/tree/main/src/postgres

Tool Name: query

Developer: modelcontextprotocol

4 Criteria for Evaluation

4.1 Accuracy

Accuracy is evaluated to determine the correctness of the answer. It is assessed by an LLM-based grader. We use DeepSeek-v3 [2] as the grader. The prompt is:

For the following question: {question}

Please judge whether the predicted answer is correct. It is considered correct if it addresses

the key information:

Predicted Answer: {prediction} Correct Answer: {ground_truth} Just return True or False.

The accuracy of each sample is 1 if the grader replies True, and 0 otherwise. The overall accuracy is the average of all samples. Nevertheless, issues such as network disruptions, API key limitations, and program crashes prevented the complete retrieval of every sample in the dataset. Consequently, we consider another criterion in practice: accuracy of valid samples. Valid samples are those that successfully completed the entire processing pipeline and were recorded in the logs, while any incomplete or failed samples were excluded from the analysis.

4.2 Time Consumption

We collect the end-to-end time consumption, which includes the latency of both the LLM and the MCP server. This criteria reflects the efficiency of MCP.

4.3 Token Consumption

We record the pre-fill (prompt) and completion tokens used during the experiment. The token consumption will affect the incurred costs.

4.4 Other Setups

handles questions that may require web searching.

• Input contains:

- The question that needs to be answered.
- Past search steps and their results.
- Output can be either:
 - If more search is needed: output in the format <WebSearch>search_query</WebSearch>
 - If the question can be answered: direct answer.

Example: Input question: "Who is the current President of the United States?"

- If no search has been conducted: <WebSearch>current President of United States</WebSearch>
- If sufficient information is available: "Joe Biden is the current President of the United States."

For the database search, we use MySQL database whose version is 9.2, the PostgreSQL version is 15.8.

5 Comparative Analysis

5.1 Question 1: Are MCP Servers Effective and Efficient in Practice?

MCP Server Accuracy Time Con-Pre-fill To-Completion sumption Con-Token (%) ↑ ken sumption Consump-(s) ↓ tion \downarrow Brave Search [4] 46.6 13.98 5802.35 236.26 DuckDuckGo Search Server [11] 13.62 64.171718.84 162.25 Tavily MCP Server [12] 47.99 95.522441.73 196.03 Exa Search [5] 15.02 231.24 2475.24190.49 BoChaAI Search 20 35.541642.71189.13 Fire Crawl Search [9] 58.33 15.441727.17 179.61 Bing Web Search [8] 64.3312.4 4060.34 206.87

Table 5: The experiment results on MCPs

The experiment results are reported in the Tab. 5, in which we can have the following observations.

- 1. The differences in effectiveness are significant. Based on the accuracy of valid samples, the highest accuracy is observed with Bing Web Search (64%), while DuckDuckGo has the lowest at just 10%, representing a difference of 54 percentage points.
- 2. The differences in efficiency are even more pronounced; regarding the average time consumed for valid samples, the fastest are Bing Web Search and Brave Search, which require less than 15 seconds, while the slowest, Exa Search, takes 231 seconds (note that valid samples are cases of normal returns without timeouts, so this value is unaffected by timeouts).
- 3. Token consumption is similar; based on the number of output tokens for valid samples, consumption generally falls between 150 and 250 tokens, indicating that the model consistently provides concise answers without unnecessary elaboration on its MCP usage.

5.2 Question 2: Does MCP Provide Higher Accuracy Compared to Function Calls?

We compared the performance of function call with the above-mentioned MCP servers. The results are shown in Figure 1 and Tab 6. We observe that both function calls (Qwen Web Search) and tool usage (Quark Search) exhibit competitive accuracy and time consumption. The accuracy of Qwen Web Search is 55.52%, surpassing that of Exa Search, DuckDuckGo, Tavily, and Brave Search. There is not much difference of time consumption of function calls (Qwen Web Search and Quark Search) compared to MCP services.

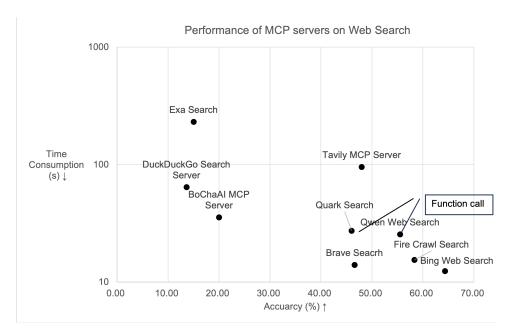


Figure 1: The performance of MCP servers in Web search

Table 6: The experiment results of MCP and Function Call

	Accuracy	Time Con-	Pre-fill To-	Completion
	(%) ↑	$\mathbf{sumption}$	ken Con-	Token
		$(\mathbf{s})\downarrow$	sumption	Consump-
			\downarrow	$\mathbf{tion}\downarrow$
Quark Search (Function Call)	46.00	27.31	1142.21	158.68
Qwen Web Search (Function Call)	55.52	25.48	1149.69	183.98
Brave Search (MCP)	46.6	13.98	5802.35	236.26

5.3 Question 3: How to enhance the performance?

Table 7: The performance of declarative interface on MySQL MCP

MCP Server	Accuracy (%)↑	Time Consumption $(s) \downarrow$	Pre-fill To- ken Con- sumption	$ \begin{array}{c} \textbf{Completion} \\ \textbf{Token} \\ \textbf{Consump-} \\ \textbf{tion} \downarrow \end{array} $
MySQL MCP Server [3]	54.73	4.64	2800	64.26
MySQL MCP Server +				
Declarative Interface				
(XiYan MCP Server) [14]	56.06	6.38	415.52	44.46

Table 8: The performance of declarative interface on PostgreSQL MCP

MCP Server	Accuracy		Pre-fill To-	Completion
	(%) ↑	${f sumption}$	ken Con-	Token
		$(\mathbf{s})\downarrow$	${f sumption}$	Consump-
			\downarrow	$\mathbf{tion}\downarrow$
PostgreSQL MCP Server [10]	58.5	5.85	6896.51	103.22
PostgreSQL MCP Server +				
Declarative Interface				
(XiYan MCP Server) [14]	80.08	12.87	434.86	97.57

To address this question, we considered the database search task. The MySQL MCP server implements a straightforward encapsulation of the database connection. After configuring the database account, password, and other information, these MCPs establish a persistent connection to the database and expose the execute_sql tool interface. When calling this tool, the model must construct a query parameter that must be an executable SQL statement. Although this simple encapsulation functions as an MCP, it assigns the most challenging part of the process—constructing the SQL query statement—to the LLM. Consequently, the success of the entire tool call heavily relies on the LLM's ability to construct SQL statements.

We introduce a Declarative Interface method to alleviate this challenge. The key idea is replace the structural parameter of MCP by a declarative interface. In other words, we use the natural language as the interface in MCP. In our experiment, we developed an updated version, called XiYan MCP server, using natural language instead of SQL. It utilizes XiYanSQL-QwenCoder-32B⁴ [6] to convert natural language queries into SQL before executing comparable to the MySQL MCP server. The experiment results are shown in Table 7. By adding a text-to-SQL model to the MCP server, it improves accuracy by 2 percentage points. In the PostgreSQL experiment, the optimization results is a 22-point increase 8.

6 Case Study

6.1 Web Search Task

For the Web Search task, we evaluate the search performance of Brave Search, BochaAI, and Qwen Web Search using the Frames dataset. The example is shown in Figure 2. To ensure aesthetic consistency, the returned results were processed by removing HTML tags and truncating long outputs while maintaining the original formatting and content. Comprehensive information is available in Appendix B.

Question: I am thinking of a movie where Hans Zimmer won a Grammy Award for his work. He won the Grammy award the same year that he did his first musical score for film director Michael Bay. Can you please tell me the name of that movie?

Ground Truth: Crimson Tide

Search Query: Hans Zimmer Grammy Award Michael Bay first collaboration

Figure 2: The issue in the Frames dataset

Brave Search provides the top ten relevant Wikipedia pages, including their titles, descriptions, and URLs, as shown in Figure 3. For clarity, only one of these results is displayed, which includes the ground truth (Crimson Tide). Nevertheless, the lack of detailed descriptions impedes the LLM's ability to effectively link the question to the pertinent search result. This forces the LLM to rely solely on its internal knowledge base, ultimately leading to an incorrect response.

Search Result:

(...omission...)

Title: Hans Zimmer discography - Wikipedia

Description: He has won two Academy Awards (The Lion King, Dune), four Satellite Awards (The Thin Red Line, Gladiator, The Last Samurai, Inception), three Golden Globe Awards (The Lion King, Gladiator, Dune), four Grammy Awards (two for The Lion King, Crimson Tide, The Dark Knight), and three Saturn Awards. URL: https://en.wikipedia.org/wiki/Hans Zimmer discography

Final Response:

Based on the information provided in the trace, the movie you're thinking of is likely **"The Rock" (1996)**. Here's the reasoning(...omission...)

Flag: False

Figure 3: The search results from Brave Search

 $^{^4} https://www.modelscope.cn/models/XGenerationLab/XiYanSQL-QwenCoder-32B-2412$

BochaAI summarized the search results and explicitly informed the LLM that the correct answer was "Crimson Tide", as shown in Figure 4. This direct approach enabled the LLM to accurately and effortlessly provide the correct answer.

Search Result:

Hans Zimmer is a renowned master of film scores, and his work is greatly loved by many music enthusiasts. Regarding the Grammy Awards mentioned in your search, Hans Zimmer has indeed received multiple nominations for this award and has won at least once.

(...omission...)

However, based on available data, "Crimson Tide" is indeed their first joint work.

Final Response:

The movie you are thinking of is *Crimson Tide* (1995). This was the first film where Hans Zimmer collaborated with director Michael Bay, and he won a Grammy Award for his work on the film's score. Answer: **Crimson Tide**

Flag: True

Figure 4: The search results from BochaAI

Qwen Web Search also attempted to analyze and summarize the search results, as shown in Figure 5. However, it produced an incorrect result and did not present the original search results to the LLM. This omission significantly impeded the LLM's ability to derive the correct answer, resulting in an almost negligible chance of answering the question correctly.

Search Result:

(...omission...)

So, to directly answer your question: No, Hans Zimmer did not win a Grammy Award in the same year he first collaborated with Michael Bay. His first Grammy win with "The Lion King" was in 1995, and his first collaboration with Michael Bay on "The Rock" happened in 1996.

Final Response:

Based on the information provided in the trace, there is no movie where Hans Zimmer won a Grammy Award in the same year he first collaborated with Michael Bay. Hans Zimmer's first collaboration with Michael Bay was on *The Rock* (1996), but he did not win a Grammy that year. His earlier Grammy win was for *The Lion King* (1994), which predates his work with Bay. Therefore, the answer to your question is: **There is no such movie.**

Flag: False

Figure 5: The search results from Qwen Web Search

In summary, the search results returned by Web Search Related MCP Servers and Web Search Related Function Calls directly influence whether LLM can accurately answer a given question. When search results are provided without any processing, LLMs must depend solely on their reasoning abilities to derive the final answer. On the other hand, when the results are analyzed and processed before being returned, LLMs can more easily obtain the answers. However, this approach places complete dependence on the server's ability to accurately respond to queries.

6.2 Database Search Task

For the Database Search task, we evaluate the search performance of PostgreSQL MCP Server and XiYan MCP Server using the SQL_EVAL dataset. The example is shown in Figure 6. Detailed examinations of additional cases are provided in Appendix C.

Question: How many publications were published between 2019 and 2021? **Ground Truth**: There were 5 publications published between 2019 and 2021.

Figure 6: The issue in the SQL_EVAL dataset

The PostgreSQL MCP Server operates by receiving an SQL query generated by the LLM in response to a specific question, as shown in Figure 7. This SQL query is executed against the database, and the resulting data is returned as output. Subsequently, the LLM utilizes the database query results to formulate the final answer to the original question. In fact, the PostgreSQL MCP Server only handles database connections and executes SQL Query.

```
Search Query: SELECT COUNT(*) FROM publication WHERE year BETWEEN 2019 AND 2021;
Search Result: [{"count": "5" }]
Final Response: 5 publications were published between 2019 and 2021.
Flag: True
```

Figure 7: The search results from PostgreSQL MCP Server

Conversely, the XiYan MCP Server is designed to accept the original question directly as its input, as shown in Figure 8. Within the server, the processes of SQL generation and execution are performed internally. As a result, the output from the XiYan MCP Server is the database query result, which the LM then uses to derive the final answer.

```
Search Query: How many publications were published between 2019 and 2021?

Search Result: | count || --- || 5 |

Final Response: 5 publications were published between 2019 and 2021.

Flag: True
```

Figure 8: The search results from XiYan MCP Server

Conclusion

The evaluation of various Model Context Protocol (MCP) servers highlights significant differences in both effectiveness and efficiency. While MCPs offer distinct advantages in structuring tool usage, they do not consistently demonstrate marked improvements over non-MCP approaches, such as function calls. Our experiments showed that the most effective MCP, Bing Web Search, achieved an accuracy of 64%, whereas DuckDuckGo lagged at just 10%. Furthermore, performance varied widely in terms of time consumption, with top performers like Bing and Brave Search executing tasks in under 15 seconds, contrasted with significantly slower alternatives like Exa Search.

Importantly, we found that the accuracy of MCP servers can be substantially enhanced by optimizing the parameters that LLMs must construct. For instance, transitioning from SQL-based queries to natural language processing in the XiYan MCP server resulted in a noteworthy increase in accuracy, demonstrating that incorporating a text-to-SQL model can lead to a 22 percentage point improvement.

Overall, while MCPs provide a structured means for AI tools to interact with data, there remains considerable potential for optimization. By addressing the challenges LLMs encounter in parameter construction and enhancing the user-friendliness of tool interfaces, developers can significantly improve the performance and reliability of MCP servers. This research paves the way for further investigations into optimized MCP implementations, ultimately leading to better AI-driven search and data retrieval solutions.

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A Dataset

In this section, we will introduce the construction methods and provide example demonstrations of the non-public datasets, including News (Chinese) and Knowledge (Chinese) for the Web Search Task, and the Car_bi dataset for the Database Search Task.

News (Chinese) Dataset is collected by cleaning data from daily Xinwen Lianbo transcripts over the past three months and processing it using reverse engineering techniques. The code will be open-sourced later. Dataset examples see Figure 9.

Question: 2025年2月10日,在哈尔滨第九届亚冬会中,中国队获得的金牌总数是多少?

Answer: 6枚。

Question: 2025年春节期间,哪两个家电品类的销售增长幅度最大?

Answer: 家电、音像器材和手机等通讯器材

Question: 西藏日喀则市定日县6.8级地震截至2025年1月9日6时造成了多少人遇难?

Answer: 126人

Question: 2024年,全国检察机关共办理了多少件案件?

Answer: 409.96万件

Figure 9: Samples of the News (Chinese) Dataset

Knowledge (Chinese) Dataset is collected by cleaning data from knowledge-intensive websites like Wikipedia and science and technology reports, and processing it using reverse engineering techniques. The code will be open-sourced later. Dataset examples see Figure 10.

Question: 电影《美人之死》的编剧是谁?

Answer: 广春兰和段宝珊

Question: 1965年12月15日启程并于次日返回的载人任务是哪个?

Answer: 双子座6A号

Question: 小松餐厅因何原因在1913年(大正2年)丧失了地处名胜的地理优势?

Answer: 田户海岸因填海工程而消失。

Question: 大西洋桥施工图设计项目的中标金额是多少美元?

Answer: 4,662,352美元

Figure 10: Samples of the Knowledge (Chinese) Dataset

Car_bi (Chinese) Dataset is a synthetic dataset from an automobile manufacturer data source. Dataset examples see Figure 11.

Question: 系列B在华北区域的月度销量目标是多少?

Answer: 187

Question: 2025年1月11日的总体市场销量是多少?

Answer: 550

Question: 飞海科技科技有限公司在2025年2月19日的竞品销量是多少?

Answer: 23

Question: 西南区域的系列D库存总数是多少?

Answer: 253

Figure 11: Samples of the Knowledge (Chinese) Dataset

The DDL of the Car_bi Dataset is shown in the Figure 12. Due to space limitations, only a portion of the DDL information is presented.

```
CREATE TABLE competitors (
                        INT UNSIGNED AUTO INCREMENT COMMENT '唯一标识符' PRIMARY KEY,
                        VARCHAR (50)
                                     NOT NULL COMMENT '竞品名称',
 competitor name
                                     NOT NULL COMMENT '车系名称',
 car series
                        VARCHAR (50)
                                     NOT NULL COMMENT '竞品销量',
 sales
                        INT
 market_share_percentage DECIMAL(5, 2) NOT NULL COMMENT '竞品市场占有率百分比',
                                     NOT NULL COMMENT '记录日期'
 record date
                        DATE
) COMMENT '存储竞品销量和市场占有率' COLLATE = utf8mb4 unicode 520 ci;
CREATE TABLE customer flow (
                 INT UNSIGNED AUTO INCREMENT COMMENT '唯一标识符' PRIMARY KEY,
 id
                               NOT NULL COMMENT '大区',
 region
                 VARCHAR (50)
 store
                 VARCHAR (50)
                              NOT NULL COMMENT '门店名称',
                              NOT NULL COMMENT '首次到店客流量',
 first_visit_flow INT
 total visit flow INT
                              NOT NULL COMMENT '总客流量',
                              NOT NULL COMMENT '访问时间',
 visit datetime
                 DATETIME
 conversion rate DECIMAL(5, 2) NOT NULL COMMENT '成交率'
) COMMENT '存储大区、门店、客流量和成交率信息' COLLATE = utf8mb4 unicode 520 ci;
CREATE INDEX idx_region_store ON customer_flow (region, store);
CREATE TABLE inventory (
              INT UNSIGNED AUTO_INCREMENT COMMENT '唯一标识符' PRIMARY KEY,
             VARCHAR(50) NOT NULL COMMENT '车系名称',
 car series
                          NOT NULL COMMENT '大区',
 region
              VARCHAR (50)
              VARCHAR(100) NOT NULL COMMENT '仓库名称',
 warehouse
                          NOT NULL COMMENT '库存数量',
 quantity
              TNT
                          NOT NULL COMMENT '最后盘点时间',
 last checked DATETIME
 series type VARCHAR(50) NOT NULL COMMENT '车系类型'
) COMMENT '存储库存信息' COLLATE = utf8mb4 unicode 520 ci;
CREATE TABLE market sales (
                        INT UNSIGNED AUTO_INCREMENT COMMENT '唯一标识符' PRIMARY KEY,
 id
  total market sales
                        INT
                                     NOT NULL COMMENT '总体市场销量',
                                     NOT NULL COMMENT '车系市场销量',
 car_series_market_sales INT
                                     NOT NULL COMMENT '记录日期'
 record date
                        DATE
) COMMENT '存储市场销量信息' COLLATE = utf8mb4 unicode 520 ci;
CREATE TABLE market share (
                        INT UNSIGNED AUTO INCREMENT COMMENT '唯一标识符' PRIMARY KEY,
                                     NOT NULL COMMENT '车系名称',
 car series
                        VARCHAR (50)
 market_share_percentage DECIMAL(5, 2) NOT NULL COMMENT '市场占有率百分比',
 record date
                                     NOT NULL COMMENT '记录日期'
                        DATE
) COMMENT '存储车系市场占有率变化' COLLATE = utf8mb4 unicode 520 ci;
```

Figure 12: The DDL of the Car_bi Dataset

B Web Search Task

In this section, we conduct a comparative analysis of search results within the Web Search task using the Frames dataset, as shown in Figure 13. Specifically, we examine the performance of various MCP Servers and Function Calls, excluding Brave Search, BochaAI, and Qwen Web Search.

Question: I am thinking of a movie where Hans Zimmer won a Grammy Award for his work. He won the Grammy award the same year that he did his first musical score for film director Michael Bay. Can you please tell me the name of that movie?

Ground Truth: Crimson Tide

Search Query: Hans Zimmer Grammy Award Michael Bay first collaboration

Figure 13: The issue in the Frames dataset

B.1 Web Search Related MCP

The DuckDuckGo Search Server returns the top ten web query results related to the question, including each webpage's title, URL, and summary, as shown in Figure 14. The results include some sub-questions related to the main question but do not contain all the information needed to solve the issue. There may even be misleading information, such as the top result being "Pearl Harbor," making it difficult for the LLM to deduce the correct answer from so much information.

Search Result:

Found 10 search results:

1.Pearl Harbor (2001) - Awards - IMDb

URL: https://www.imdb.com/title/tt0213149/awards/

Summary: 2002 Nominee Grammy Best Song Written for a Motion Picture, Television or Other Visual Media Diane Warren

2.List of awards and nominations received by Hans Zimmer

URL: https://en.wikipedia.org/wiki/List of awards and nominations received by Hans Zimmer

Summary: Hans Zimmer is a German film score composer, he has received sever a awards and nominations throughout his career including two Academy Awards(out of twelve nominations), a BAFTA Award, two Critics'

Choice Movie Award, three Golden Globe Awards, four Grammy Awards as well as nominations for six Primetime Emmy Award and a Tony Award.

(...omission...)

Final Response:

Based on the information provided in the search results, the movie you're thinking of is likely "Pearl Harbor". Here's the reasoning: 1. From the first search, we learn that Hans Zimmer worked on "Pearl Harbor" directed by Michael Bay and won an ASCAP award for it. 2. The second search confirms that Hans Zimmer received a Grammy nomination for "Pearl Harbor" in 2002. While it doesn't explicitly state that he won a Grammy for "Pearl Harbor", this movie fits the criteria you mentioned:- It was Zimmer's first collaboration with Michael Bay.- It was around the time he was receiving Grammy nominations and awards. Given this information, "Pearl Harbor" is the most likely answer to your question. However, it's worth noting that while Zimmer was nominated for a Grammy for this work, the search results don't definitively state that he won a Grammy specifically for "Pearl Harbor".

Flag: False

Figure 14: The search results from DuckDuckGo Search Server

The Tavily MCP Server returns the top five web query results related to the question, including each webpage's title, URL, and content, as shown in Figure 15. Instead of providing the original webpage content, the Tavily MCP Server formats and summarizes the content. However, because the returned webpage content is not directly related to the original question, the LLM is unable to obtain the correct answer.

Fire Crawl Search returned the top five Wikipedia URLs, titles, and descriptions related to the question, as shown in Figure 16. Each description contains only the main information related to the title, but this information is completely insufficient for the LLM to answer the question. More information may be included in the main text, but Fire Crawl Search did not return it, so it is necessary to visit the URLs again to obtain the complete information.

Exa Search returns a JSON-formatted result that includes a requestId and results, as shown in Figure 17. The results are a list of dictionaries, each containing the id, title, url, publishedDate, author, and text of the returned item. The text provides a summary and analysis of the page. Therefore, using

Search Result:

Detailed Results:

1. Title: Michael Bay's "TRANSFORMERS: AGE OF EXTINCTION" to Feature an Original Song by the Grammy Award-Winning Band Imagine Dragons - Paramount

URL: https://www.paramount.com/press/michael-bays-transformers-age-of-extinction-to-feature-an-original-song-by-the-grammy-award-winning-band-imagine-dragons

Content: Following an early footage screening of the film, Imagine Dragons composed the original song "BATTLE CRY," which Michael Bay used during critical moments in the movie. Additionally, the band contributed original music to the scoring process by recording cues alongside Steve Jablonsky, the film's composer, and Hans Zimmer, who assisted in the endeavor. This collaboration enhanced the depth and richness of the film's sound.

(...omission...)

Final Response:

Based on the information provided in the search results, the movie you're thinking of is likely "The Lion King". Here's the reasoning: (...omission...)

Flag: False

Figure 15: The search results from Tavily MCP Server

Search Result:

URL: <u>Hans Zimmer - Wikipedia</u> Title: Hans Zimmer - Wikipedia

Description: He has won two Academy Awards for Best Original Score for The Lion King (1994) and Dune (2021). His works include Gladiator (2000), The Last Samurai (2003), and more.

URL: <u>Hans Zimmer Discography - Wikipedia</u>

Title: Hans Zimmer Discography - Wikipedia

Description: Michael Bay · Don Simpson/Jerry Bruckheimer ... Nominated for Grammy Award for Best Score S oundtrack for Visual Media. 1st collaboration with Denis Villeneuve in 2018.

(...omission...)

Final Response:

Based on the information provided in the search results, the movie you're thinking of is likely "The Rock" (1996). Here's the reasoning: (...omission...)

Flag: False

Figure 16: The search results from Fire Crawl Search

this result, the LLM can easily obtain the correct answer without needing to parse and analyze complex webpage structures.

Bing Web Search returns query results for sub-questions related to the main question, including each sub-question's description (e.g. Hans Zimmer— Artist), URL, and description, as shown in Figure 18. Although they originate from the same website, they address different questions. The description provides an answer to the sub-question. However, it is important to note that Bing Web Search automatically truncates information beyond a certain point in the returned results, which may contain the correct answer.

```
Search Result:
 "requestId": "1e168f11d27ff0dacc8752019d07b307",
 "results": [
  (...omission...)
   "id": "https://en.wikipedia.org/wiki/Hans Zimmer discography",
   "title": "Hans Zimmer discography - Wikipedia",
   "url": "https://en.wikipedia.org/wiki/Hans Zimmer discography",
   "publishedDate": "2025-03-18T02:18:14.000Z",
   "author": "Contributors to Wikimedia projects",
   "text": "From Wikipedia, the free encyclopedia German composer and music producer Hans Zimmer has
composed and produced over one hundred soundtracks and film scores. (...omission...) Year - Title- Director-
Studio / Distributor- Notes 1982- Moonlighting- Jerzy Skolimowski- Miracle Films- Composed with Stanley
Myers 1984- Success Is the Best Revenge- Gaumont Film Company"
  }
]
}
Final Response:
Based on the information provided in the search results, Hans Zimmer's first collaboration with Michael Bay wa
s for the movie "The Rock" in 1996. However, this doesn't align with the year he won a Grammy Award. Looki
ng further into his discography and awards, Hans Zimmer won a Grammy Award for his work on "Crimson Tide
in 1996, which was indeed his first collaboration with Michael Bay. Therefore, the movie you're thinking of is
*"Crimson Tide"**.
Flag: True
```

Figure 17: The search results from Exa Search

```
Search Result:

15 Movies Soundtracked By Hans Zimmer: 'Lion King,' 'Dune ...

•URL: GRAMMY.com

•Description: With contributions to more than 150 soundtracks, five GRAMMYs, two Oscars, (...omission...)

The German composer first cut his teeth on the new wave scene, producing the likes of the Buggles and the Damned before lending his talents to the big screen; his film debut came with ...

Hans Zimmer | Artist

•URL: GRAMMY.com

•Description: Read more about Hans Zimmer GRAMMY History and other GRAMMY-winning and GRAMMY-nominated artists on GRAMMY.com.

(...omission...)

Final Response:

Based on the information provided, Hans Zimmer's first collaboration with Michael Bay was for the film "The R ock" in 1996. (...omission...)

Flag: False
```

Figure 18: The search results from Bing Web Search

B.2 Web Search Related Function Calls

Quark Search directly returns an answer to the question, as shown in Figure 19. Quark Search itself handles the analysis of the search results and responds to the query, allowing the LLM to use the returned results without needing to perform its own reasoning. However, when Quark Search makes an error in its analysis, the LLM cannot access the original search results, making it almost impossible to obtain the correct outcome.

Search Result:

Hans Zimmer,这位著名的电影配乐家,曾获得过两次奥斯卡奖、三次金球奖、五次格莱美奖(Grammy Award)、一个美国音乐奖和一个托尼奖。虽然他与导演斯蒂芬·斯皮尔伯格有多次合作,但与迈克尔·贝(Michael Bay)的合作较少。首次合作是在《珍珠港》(Pearl Harbor)这部电影中。根据搜索结果,没有直接提到汉斯·季默(Hans Zimmer)与迈克尔·贝(Michael Bay)的具体首次合作信息。但可以推测,由于迈克尔·贝以动作大片见长,而汉斯·季默以其震撼的音乐风格闻名,他们的合作可能是为了创造一部视觉和听觉效果俱佳的动作电影。如果你对这两位艺术家的特定合作感兴趣,可能需要查阅更详细的资料或采访记录来确认他们首次联手的项目详情。

Final Response:

The movie you are thinking of is *Pearl Harbor*. Hans Zimmer won a Grammy Award for his work on this film, and it was also his first collaboration with director Michael Bay.

Flag: False

Figure 19: The search results from Quark Search

C Database Search Task

In this section, we compare the performance of the MySQL MCP Server and the XiYan MCP Server on the car_bi dataset. The example is shown in Figure 20.

Question: 2025年2月19日记录的竞品名称是什么?

Ground Truth: 飞海科技科技有限公司

Figure 20: The issue in the car_bi dataset

The purpose of the MySQL MCP Server is to connect to the database and execute database queries, as shown in Figure 21. For this issue, the LLM needs to generate an SQL query that addresses the problem and provide it as input to the MySQL MCP Server. The server executes the SQL query and returns the results, and the LLM generates the final answer based on those query results.

Search Query: select competitor name from competitors where record date = '2025-02-19';

Search Result: competitor_name 飞海科技科技有限公司

Final Response:飞海科技科技有限公司

Flag: True

Figure 21: The search results from MySQL MCP Server

The input to the XiYan MCP Server is the original question, and the output is the final answer, as shown in Figure 22. XiYan MCP Server can generate SQL queries from original questions and execute database queries to obtain the final results, and then return to the LLM.

Search Query: 2025年2月19日记录的竞品名称是什么?

Search Result: | competitor_name || --- || 飞海科技科技有限公司

Final Response: 根据已有的搜索结果,2025年2月19日记录的竞品名称是"飞海科技科技有限公司"。

Flag: True

Figure 22: The search results from XiYan MCP Server