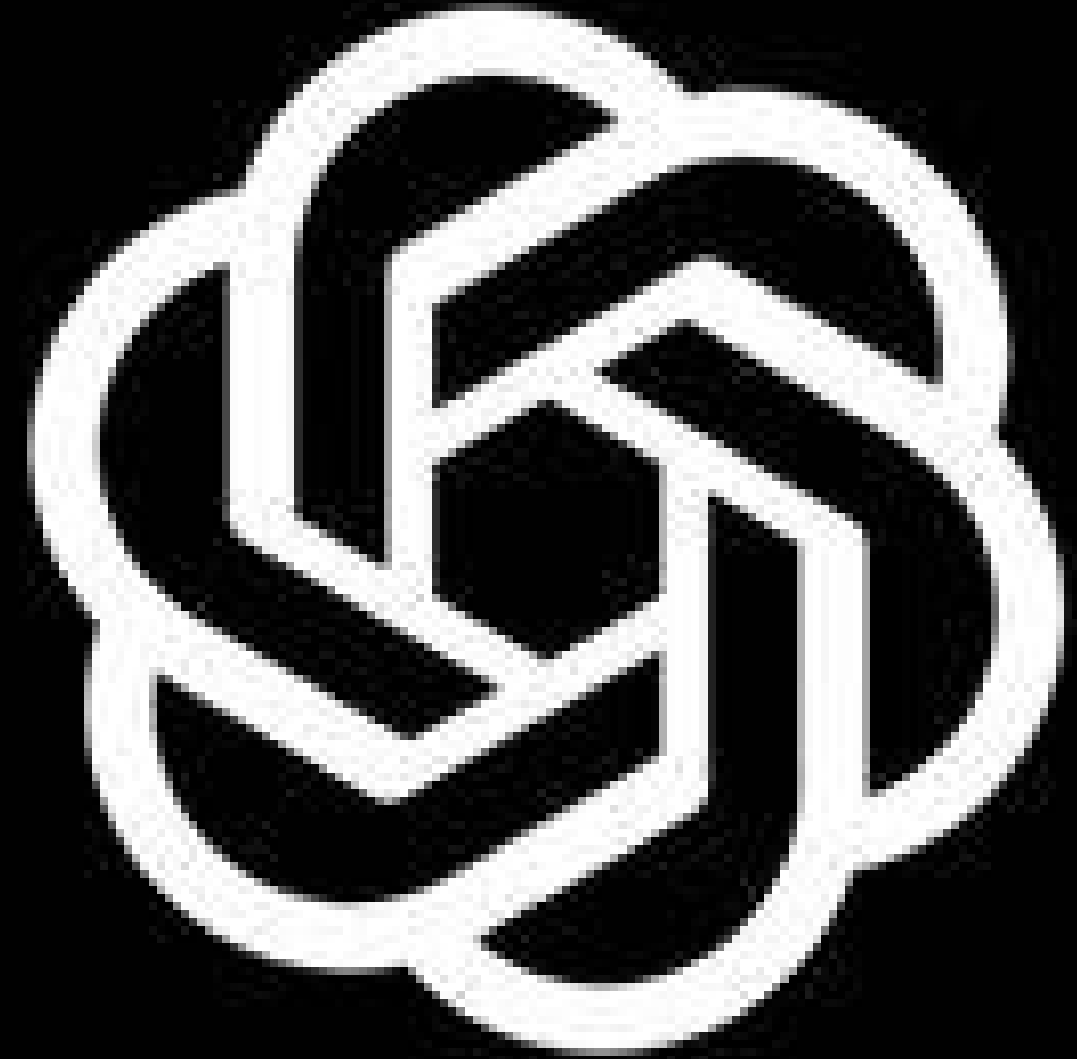GEMINI VS CHATGPT SQL ANALYSIS

TABLES

- **Models**
- **Capabilities**
- **Benchmarks**

1) What are the average scores for each capability on both the Gemini Ultra and GPT-4 models?

```sql
SELECT
    CapabilityName,
    AVG(CASE WHEN ModelID = 1 THEN ScoreGemini ELSE ScoreGPT4 END) AS Avg_Score_Gemini,
    AVG(CASE WHEN ModelID = 2 THEN ScoreGemini ELSE ScoreGPT4 END) AS Avg_Score_GPT4
FROM Benchmarks
JOIN Capabilities ON Benchmarks.CapabilityID = Capabilities.CapabilityID
GROUP BY CapabilityName;
```

▦ Results   ▥ Messages

	CapabilityName	Avg_Score_Gemini	Avg_Score_GPT4
1	AUDIO	28.85	18.35
2	CODE	74.65	70.45
3	GENERAL	90	86.4
4	IMAGE	72.9166666666667	71.9333333333333
5	MATH	73.8	72.45
6	REASONING	84.6	86.4333333333333
7	VIDEO	54.5	55.35

2) Which benchmarks does Gemini Ultra outperform GPT-4 in terms of scores?

```sql
SELECT BenchmarkName
FROM Benchmarks
WHERE ScoreGemini > ScoreGPT4;
```

	BenchmarkName
	BenchmarkName
1	MMLU
2	Big-Bench Hard
3	DROP
4	GSM8K
5	MATH
6	HumanEval
7	Natural2Code
8	MIMMU
9	VQAv2
10	TextVQA
11	DocVQA
12	Infographic VQA
13	MathVista

3) What are the highest scores achieved by Gemini Ultra and GPT-4 for each benchmark in the Image capability?

```sql
SELECT BenchmarkName,
MAX(ScoreGemini) AS High_ScoreGemini,
MAX(ScoreGPT4) AS High_ScoreGPT4
FROM Benchmarks
WHERE CapabilityID = 5
GROUP BY BenchmarkName;
```

	BenchmarkName	High_ScoreGemini	High_ScoreGPT4
1	DocVQA	90.9	88.4
2	Infographic VQA	80.3	75.1
3	MathVista	53	49.9
4	MIMMU	59.4	56.8
5	TextVQA	82.3	78
6	VQAv2	77.8	77.2

4) Calculate the percentage improvement of Gemini Ultra over GPT-4 for each benchmark?

```sql
SELECT BenchmarkName,
((ScoreGemini - ScoreGPT4) / ScoreGPT4) * 100 AS PercentageImprovement
FROM Benchmarks
WHERE ScoreGPT4 IS NOT NULL;
```

	BenchmarkName	PercentageImprovement
1	MMLU	4.16666666666666
2	Big-Bench Hard	0.601684717208183
3	DROP	1.85414091470952
4	HellaSwag	-7.86988457502623
5	GSM8K	2.60869565217392
6	MATH	0.567107750472598
7	HumanEval	11.044776119403
8	Natural2Code	1.3531799729364
9	MIMMU	4.5774647887324
10	VQAv2	0.777202072538853
11	TextVQA	5.51282051282051
12	DocVQA	2.82805429864253
13	Infographic VQA	6.92410119840213

5) Retrieve the benchmarks where both models scored above the average for their respective models?

```sql
SELECT BenchmarkName
FROM Benchmarks
WHERE (ScoreGemini > (SELECT AVG(ScoreGemini) FROM Benchmarks WHERE ModelID = 1))
  AND (ScoreGPT4 > (SELECT AVG(ScoreGPT4) FROM Benchmarks WHERE ModelID = 2));
```

	Results	Messages
		BenchmarkName
1		MMLU
2		BIG-BENCH HARD
3		DROP
4		HELLASWAG
5		GSM8K
6		HUMANEVAL
7		NATURA12CODE
8		VQAV2
9		TEXTVQA
10		DOCVQA
11		INFOGRAPHIC VQA

6) Which benchmarks show that Gemini Ultra is expected to outperform GPT-4 based on the next score?

```sql
SELECT BenchmarkName
FROM Benchmarks
WHERE ScoreGemini IS NOT NULL AND ScoreGPT4 IS NULL;
```

	BenchmarkName
1	MMLU
2	Big-Bench Hard
3	DROP
4	HellaSwag
5	GSM8K
6	MATH
7	HumanEval
8	Natural2Code

Results   Messages

7) Classify benchmarks into performance categories based on score ranges?

```sql
SELECT
    BenchmarkName,
    CASE
        WHEN ScoreGemini >= 90 THEN 'High'
        WHEN ScoreGemini >= 70 THEN 'Medium'
        ELSE 'Low'
    END AS PerformanceCategoryGemini,
    CASE
        WHEN ScoreGPT4 >= 90 THEN 'High'
        WHEN ScoreGPT4 >= 70 THEN 'Medium'
        ELSE 'Low'
    END AS PerformanceCategoryGPT4
FROM Benchmarks;
```

Results | Messages

	BenchmarkName	PerformanceCategoryGemini	PerformanceCategoryGPT4
4	BIG-BENCH HARD	Medium	Low
5	DROP	Medium	Medium
6	DROP	Medium	Low
7	HELLASWAG	Medium	High
8	HELLASWAG	High	Low
9	GSM8K	High	High
10	GSM8K	High	Low
11	MATH	Low	Low
12	MATH	Low	Low
13	HUMANEVAL	Medium	Low
14	HUMANEVAL	Low	Low
15	NATURA12CODE	Medium	Medium
16	NATURA12CODE	Medium	Low
17	MIMMU	Low	Low

8) Retrieve the rankings for each capability based on Gemini Ultra scores?

```sql
WITH CapabilityRankings AS
(SELECTc.CapabilityName,
b.BenchmarkName,
b.ScoreGemini,
RANK() OVER (PARTITION BY c.CapabilityID
ORDER BY b.ScoreGemini DESC) AS GeminiRank
FROM Benchmarks b
JOIN Capabilities c ON b.CapabilityID = c.CapabilityID
WHERE b.ModelID = 1)
SELECT
    CapabilityName,
    BenchmarkName,
    ScoreGemini,
    GeminiRank
FROM CapabilityRankings;
```

Results | **Messages**

CapabilityName	BenchmarkName	ScoreGemini	GeminiRank
GENERAL	MMLU	90	1
REASONING	HELLASWAG	87.8	1
REASONING	BIG-BENCH HARD	83.6	2
REASONING	DROP	82.4	3
MATH	GSM8K	94.4	1
MATH	MATH	53.2	2
CODE	NATURA12CODE	74.9	1
CODE	HUMANEVAL	74.4	2
IMAGE	TEXTVQA	82.3	1
IMAGE	INFOGRAPHIC VQA	80.3	2
IMAGE	MIMMU	59.4	3
VIDEO	VATEX	62.7	1
AUDIO	COVOST 2	40.1	1

9) Convert the Capability and Benchmark names to uppercase?

```sql
UPDATE Capabilities SET CapabilityName = UPPER(CapabilityName);
UPDATE Benchmarks SET BenchmarkName = UPPER(BenchmarkName);
```

	BenchmarkName	CapabilityName
1	MMLU	GENERAL
2	MMLU	GENERAL
3	BIG-BENCH HARD	REASONING
4	BIG-BENCH HARD	REASONING
5	DROP	REASONING
6	DROP	REASONING
7	HELLASWAG	REASONING
8	HELLASWAG	REASONING
9	GSM8K	MATH
10	GSM8K	MATH

10) Can you provide the benchmarks along with their descriptions in a concatenated format?

```sql
SELECT BenchmarkName, CONCAT(BenchmarkName, ' - ', Description) AS BenchmarkWithDescription
FROM Benchmarks;
```

	BenchmarkName	BenchmarkWithDescription
1	MMLU	MMLU – Representation of questions in 57 subjects
2	MMLU	MMLU – Representation of questions in 57 subjects
3	BIG-BENCH HARD	BIG-BENCH HARD – Diverse set of challenging tasks re...
4	BIG-BENCH HARD	BIG-BENCH HARD – Diverse set of challenging tasks re...
5	DROP	DROP – Reading comprehension (Fl Score)
6	DROP	DROP – Reading comprehension (Fl Score)

Results   Messages