



ANALYZING & RESPONDING CUSTOMER REVIEWS

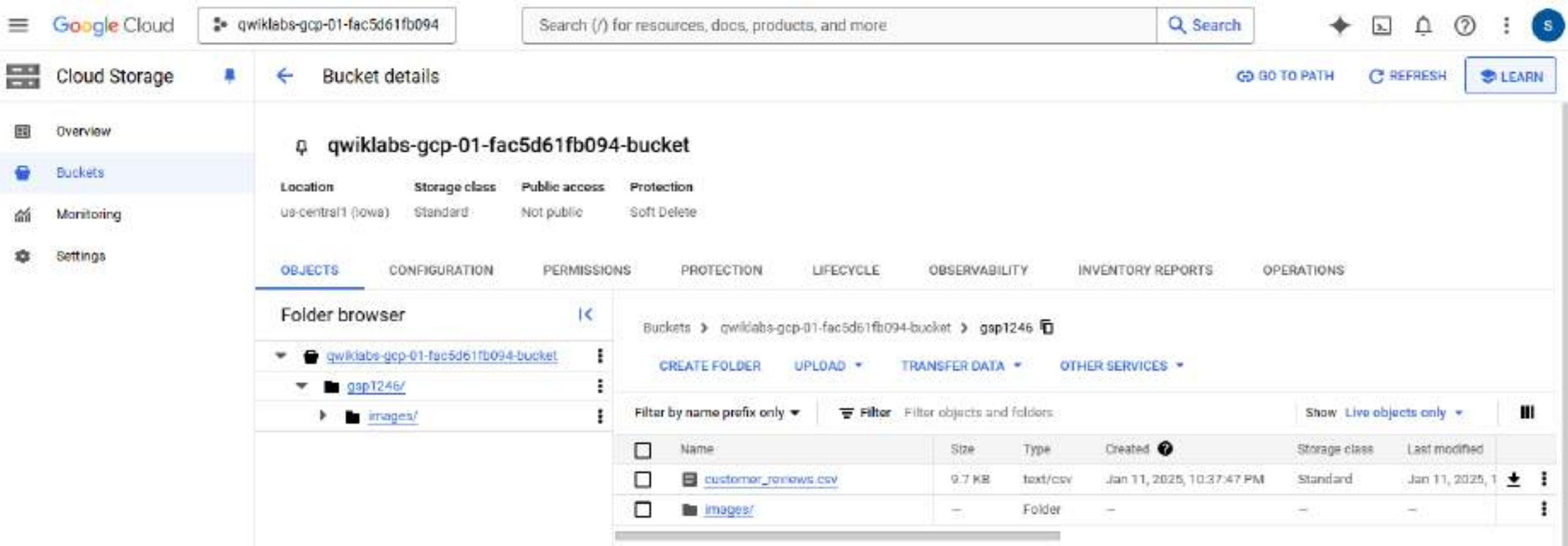
(SENTIMENT ANALYSIS)

USING SQL & GEMINI MODELS

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CREATING THE DATASET AND TABLES

- Extracting keywords, assessing customer sentiment in customer reviews, and respond to customer reviews.
- Setting up a Cloud Resource connection in BigQuery, then create the dataset and tables.

A screenshot of the BigQuery console showing the schema for the 'customer_reviews' table. The schema is displayed in a table with columns for 'Field name' and 'Type'.

Field name	Type
customer_review_id	INTEGER
customer_id	INTEGER
location_id	INTEGER
review_datetime	DATETIME
review_text	STRING
social_media_source	STRING
social_media_handle	STRING

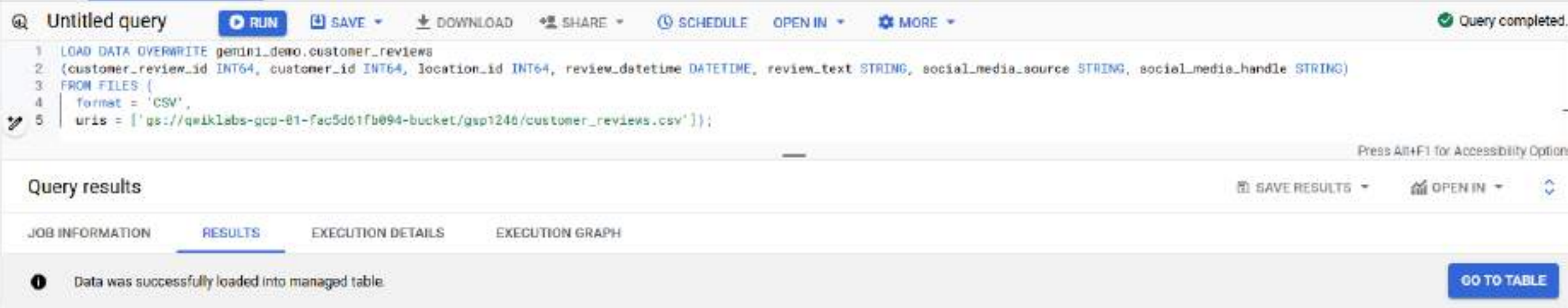
A screenshot of the BigQuery console showing the details for the 'customer_reviews' table. The details are organized into sections: 'Table info' and 'Storage info'.

Table info	
Table ID	qwiklabs-gcp-01-fac5d61fb094.gemini_demo.customer_reviews
Created	Jan 11, 2025, 11:29:00 PM UTC+7
Last modified	Jan 11, 2025, 11:29:00 PM UTC+7
Table expiration	NEVER
Data location	US
Default collation	
Default rounding mode	ROUNDING_MODE_UNSPECIFIED
Case insensitive	false
Description	
Labels	
Primary key(s)	
Tags	

Storage info	
Number of rows	50
Total logical bytes	9.76 KB

BUILDING MACHINE LEARNING MODELS

- Building the Gemini remote models in BigQuery.

- Gemini Pro

Untitled query

RUN

SAVE

DOWNLO

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CREATE OR REPLACE MODEL `gemini_demo.gemini_pro`

REMOTE WITH CONNECTION `us.gemini_conn`

OPTIONS (endpoint = 'gemini-pro')

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

i

Successfully created model named gemini_pro.

- Gemini Pro_vision

Untitled query

RUN

SAVE

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CREATE OR REPLACE MODEL `gemini_demo.gemini_pro_vision`

REMOTE WITH CONNECTION `us.gemini_conn`

OPTIONS (endpoint = 'gemini-pro-vision')

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

i

Successfully created model named gemini_pro_vision.

ANALYZING CUSTOMER REVIEWS WITH MODELS

- Prompting Gemini to analyze keywords and setiment (positive, or negative) for text based customer reviews.

```
1 CREATE OR REPLACE TABLE
2   'gemini_demo.customer_reviews_keywords' AS (
3   SELECT ml_generate_text_llm_result, social_media_source, review_text, customer_id, location_id, review_datetime
4   FROM
5   ML.GENERATE_TEXT(
6   MODEL 'gemini_demo.gemini_pro',
7   (
8   SELECT social_media_source, customer_id, location_id, review_text, review_datetime, CONCAT(
9     'For each review, provide keywords from the review. Answer in JSON format with one key: keywords. Keywords should be a list.',
10    review_text) AS prompt
11   FROM 'gemini_demo.customer_reviews'
12   ),
13   STRUCT(
14     0.2 AS temperature, TRUE AS flatten_json_output));
```

Query results

JOB INFORMATION RESULTS EXECUTION DETAILS EXECUTION GRAPH

i This statement created a new table named customer_reviews_keywords.

customer_reviews_keywords

SCHEMA DETAILS PREVIEW TABLE

Filter Enter property name or value

<input type="checkbox"/>	Field name	Type
<input type="checkbox"/>	ml_generate_text_llm_result	STRING
<input type="checkbox"/>	social_media_source	STRING
<input type="checkbox"/>	review_text	STRING
<input type="checkbox"/>	customer_id	INTEGER
<input type="checkbox"/>	location_id	INTEGER
<input type="checkbox"/>	review_datetime	DATETIME

- Analyzing the keywords

Query results

JOB INFORMATION RESULTS CHART JSON EXECUTION DETAILS EXECUTION GRAPH

Row	ml_generate_text_llm_result	social_media_source	review_text	customer_id	location_id	review_datetime
1	{} 'keywords': ["bad service", "overpriced",]	Yelp	Bad service and very overpriced. They seemed very unfriendly because I did not understand the menu.	7769	1	2024-11-13T00:09:10
2	{} 'keywords': ["coffee", "fresh",]	Google	I've been coming to this coffee truck for years, and I've always had a great experience. The coffee is always fresh and delicious.	7143	1	2024-04-11T08:15:10
3	{} 'keywords': ["coffee", "hot",]	Google	The coffee was hot, fresh, and delicious. I would definitely come back to this location again.	6126	1	2024-05-02T06:35:10
4	{} 'keywords': ["coffee", "friendly staff",]	Google	Great coffee, friendly staff, and a cozy atmosphere. I love coming here to relax and enjoy a cup of coffee.	4725	1	2024-05-14T03:09:10

Untitled query

Query completed.

```
1 CREATE OR REPLACE TABLE
2   'gemini_demo.customer_reviews_analysis' AS (
3   SELECT ml_generate_text_llm_result, social_media_source, review_text, customer_id, location_id, review_datetime
4   FROM
5   ML.GENERATE_TEXT(
6   MODEL 'gemini_demo.gemini_pro',
7   (
8     SELECT social_media_source, customer_id, location_id, review_text, review_datetime, CONCAT(
9       'Classify the sentiment of the following text as positive or negative.',
10      review_text, "In your response don't include the sentiment explanation. Remove all extraneous information from your response, it should be a boolean response either positive or negative."
11    ) AS prompt
12   FROM 'gemini_demo.customer_reviews'
13   ),
14   STRUT(
15     0.2 AS temperature, TRUE AS flatten_json_output)))
```

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

EXECUTION GRAPH

This statement created a new table named customer_reviews_analysis.

GO TO TABLE

- Analyzing the positive and negative sentiment

customer_reviews_analysis

Filter Enter property name or value

Field name	Type
<input type="checkbox"/> ml_generate_text_llm_result	STRING
<input type="checkbox"/> social_media_source	STRING
<input type="checkbox"/> review_text	STRING
<input type="checkbox"/> customer_id	INTEGER
<input type="checkbox"/> location_id	INTEGER
<input type="checkbox"/> review_datetime	DATETIME

Untitled query

Query results

JOB INFORMATION

RESULTS

CHART

JSON

EXECUTION DETAILS

EXECUTION GRAPH

Row	ml_generate_text_llm_result	social_media_source	review_text	customer_id	location_id	review_datetime
1	positive	Twitter	Good service, short wait time for quality coffee. Lots of seating in cozy areas away from other customers.	3383	1	2024-01-01T22:36:10
2	positive	Twitter	Great atmosphere, and drinks are always on point! Staff was very friendly and recommended some drinks for me to try out!	9574	1	2024-01-07T19:58:10
3	positive	Twitter	The wait time was short so I go...	5640	1	2024-01-10T00:05:10
4	positive	Facebook	The staff was very friendly and the coffee was great! I would definitely recommend this place to anyone looking for a good cup of coffee.	3309	1	2024-01-13T12:22:10
5	negative	Google	The service could be improved. I think it's disorganized. The staff was very friendly and attentive. But we ordered	8206	1	2024-01-16T20:00:10

```
1 CREATE OR REPLACE VIEW gemini_demo.cleaned_data_view AS
2 SELECT REPLACE(REPLACE(LOWER(ml_generate_text_llm_result), ' ', ''), ',', '') AS sentiment,
3 REEXP_REPLACE(
4   REEXP_REPLACE(
5     REEXP_REPLACE(social_media_source, r'Google(\+|sReviews|sLocal|sMy|sBusiness|sreviews|sMaps)?', 'Google'),
6     'YELP', 'Yelp'
7   ),
8   r'SocialMedia?', 'Social Media'
9 ) AS social_media_source,
10 review_text, customer_id, location_id, review_datetime
11 FROM 'gemini_demo.customer_reviews_analysis';
```

Query results

JOB INFORMATION RESULTS EXECUTION DETAILS EXECUTION GRAPH

This statement created a new view named cleaned_data_view. [GO TO VIEW](#)

- Creating a view to sanitize the records

cleaned_data_view QUERY

SCHEMA DETAILS TABLE EXPLORER

Filter Enter property name or value

<input type="checkbox"/>	Field name	Type
<input type="checkbox"/>	sentiment	STRING
<input type="checkbox"/>	social_media_source	STRING
<input type="checkbox"/>	review_text	STRING
<input type="checkbox"/>	customer_id	INTEGER
<input type="checkbox"/>	location_id	INTEGER
<input type="checkbox"/>	review_datetime	DATETIME

- Ensuring all letters are made lower case, and extreanous characters like extra spaces or periods are removed.

Untitled query

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MORE

1 SELECT * FROM gemini_demo.cleaned_data_view

2 ORDER BY review_datetime

Query results

JOB INFORMATION

RESULTS

CHART

JSON

EXECUTION DETAILS

EXECUTION GRAPH

Row	sentiment	social_media_source	review_text	customer_id	location_id	review_datetime
1	positive	Twitter	Good service, short wait time for quality coffee. Lots of seating in cozy areas away from other customers.	3383	1	2024-01-01T22:36:10
2	positive	Twitter	Great atmosphere, and drinks are always on point! Staff was very friendly and recommended some drinks for me to try out!	9574	1	2024-01-07T19:58:10
3	positive	Twitter	The wait time was short so I go...	5640	1	2024-01-10T00:05:10
4	positive	Facebook	The staff was very friendly and the coffee was great! I would definitely recommend this place to anyone looking for a good cup of coffee.	3309	1	2024-01-13T12:22:10
5	negative	Google	The service could be improved. I think it's disorganized. The staff was very friendly and attentive. But we ordered	8206	1	2024-01-16T20:00:10

Load more

- Creating a report of positive and negative review counts.

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```
1 SELECT sentiment, COUNT(*) AS count
2 FROM `gemini_demo.cleaned_data_view`
3 WHERE sentiment IN ('positive', 'negative')
4 GROUP BY sentiment;
```

Query results

JOB INFORMATION		RESULTS	CHART	JSON
Row	sentiment	count		
1	negative	9		
2	positive	40		

- Creating a count of positive and negative reviews by social media source.

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```
1 SELECT sentiment, social_media_source, COUNT(*) AS count
2 FROM `gemini_demo.cleaned_data_view`
3 WHERE sentiment IN ('positive') OR sentiment IN ('negative')
4 GROUP BY sentiment, social_media_source
5 ORDER BY sentiment, count;
```

Query results

JOB INFORMATION		RESULTS	CHART	JSON	EXECUTION DETAILS
Row	sentiment	social_media_source	count		
1	negative	Yelp	1		
2	negative	Google	2		
3	negative	Twitter	6		
4	positive	Tiktok	1		
5	positive	TripAdvisor	1		
6	positive	Google	6		
7	positive	Instagram	6		
8	positive	Twitter	8		
9	positive	Facebook	18		

RESPONDING TO CUSTOMER REVIEWS

- Generating marketing suggestions based on the review text (positive sentiments) and then stores the results in a new table.

Untitled query

Query completed

```
1 CREATE OR REPLACE TABLE
2 'gemini_demo.customer_reviews_marketing' AS (
3   SELECT ml_generate_text_llm_result, social_media_source, review_text, customer_id, location_id, review_datetime
4   FROM
5   ML_GENERATE_TEXT(
6     MODEL 'gemini_demo.gemini_pro',
7     {
8       SELECT social_media_source, customer_id, location_id, review_text, review_datetime, CONCAT(
9         'You are a marketing representative. How could we incentivise this customer with this positive review? Provide a single response, and should be simple and concise, do not include emojis.
10        Answer in JSON format with one key: marketing. Marketing should be a string.', review_text) AS prompt
11      FROM 'gemini_demo.customer_reviews'
12      WHERE customer_id = 5576
13    },
14    STRUCT(
15      0.2 AS temperature, TRUE AS flatten_json_output));
```

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

EXECUTION GRAPH

This statement created a new table named customer_reviews_marketing

GO TO TABLE

customer_reviews_marketing

SCHEMA

DETAILS

PREVIEW

TABLE E

Filter

Enter property name or value

<input type="checkbox"/>	Field name	Type
<input type="checkbox"/>	ml_generate_text_llm_result	STRING
<input type="checkbox"/>	social_media_source	STRING
<input type="checkbox"/>	review_text	STRING
<input type="checkbox"/>	customer_id	INTEGER
<input type="checkbox"/>	location_id	INTEGER
<input type="checkbox"/>	review_datetime	DATETIME

Untitled query

1 SELECT * FROM 'gemini_demo.customer_reviews_marketing'

Query results

JOB INFORMATION

RESULTS

CHART

JSON

EXECUTION DETAILS

EXECUTION GRAPH

Row	ml_generate_text_llm_result	social_media_source	review_text	customer_id	location_id	review_datetime
1	```json { "marketing": "Thank you for your positive review! We're thrilled to hear that	Tiktok	The location was clean and inviting. I also like that there is a variety of seating because sometimes I want to cuddle up with my	5576	1	2024-04-18T06:39:10

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🔍 Untitled query

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🕒 SCHEDULE

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1 CREATE OR REPLACE TABLE

2 ``gemini_demo.customer_reviews_marketing_formatted` AS (`

3 `SELECT`

4 `review_text,`

5 `JSON_QUERY(RTRIM(LTRIM(results.ml_generate_text_llm_result, "```json"), "```"), "$.marketing") AS marketing,`

6 `social_media_source, customer_id, location_id, review_datetime`

7 `FROM`

8 ``gemini_demo.customer_reviews_marketing` results)`

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

EXECUTION GRAPH

📘

 This statement created a new table named customer_reviews_marketing_formatted.

customer_reviews_marketing_formatted			
SCHEMA			
DETAILS			
PREVIEW			
TABLE EXPLORE			
Filter Enter property name or value			
<input type="checkbox"/>	Field name	Type	Mode
<input type="checkbox"/>	review_text	STRING	NULLABLE
<input type="checkbox"/>	marketing	STRING	NULLABLE
<input type="checkbox"/>	social_media_source	STRING	NULLABLE
<input type="checkbox"/>	customer_id	INTEGER	NULLABLE
<input type="checkbox"/>	location_id	INTEGER	NULLABLE
<input type="checkbox"/>	review_datetime	DATETIME	NULLABLE

🔍 Untitled query

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📄 SAVE

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👤 SHARE

🕒 SCHEDULE

🔗 OPEN IN

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1 SELECT * FROM ``gemini_demo.customer_reviews_marketing_formatted``

Query results

JOB INFORMATION

RESULTS

CHART

JSON

EXECUTION DETAILS

EXECUTION GRAPH

Row	review_text	marketing	social_media_source	customer_id	location_id	review_datetime
1	The location was clean and inviting. I also like that there is a variety of seating because sometimes I want to cuddle up with my	"Thank you for your positive review! We're thrilled to hear that you enjoyed the cleanliness, inviting atmosphere, and	Tiktok	5576	1	2024-04-18T06:39:10

- Designing automate customer service responses to customer reviews (negative sentiments) and generating appropriate responses and action plans.

Untitled query

▶ RUN

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🕒 SCHEDULE

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Query completed.

```
1 CREATE OR REPLACE TABLE
2 'gemini_demo.customer_reviews_cs_response' AS (
3 SELECT ml_generate_text_llm_result, social_media_source, review_text, customer_id, location_id, review_datetime
4 FROM
5 ML_GENERATE_TEXT(
6 MODEL 'gemini_demo.gemini_pro',
7 {
8   SELECT social_media_source, customer_id, location_id, review_text, review_datetime, CONCAT(
9     'How would you respond to this customer review? If the customer says the coffee is weak or burnt, respond stating "thank you for the review we will provide your response to the location that you did not like the coffee and it could be improved." Or if the review states the service is bad, respond to the customer stating, "the location they visited has been notified and we are taking action to improve our service at that location." From the customer reviews provide actions that the location can take to improve. The response and the actions should be simple, and to the point. Do not include any extraneous or special characters in your response. Answer in JSON format with two keys: Response, and Actions. Response should be a string. Actions should be a string.' review_text) AS prompt
10 FROM 'gemini_demo.customer_reviews'
11 WHERE customer_id = 8844
12 },
13 STRUCT(
14   0.2 AS temperature, TRUE AS flatten_json_output));
```

Query results

📄 SAVE RESULTS

🔗 OPEN IN

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JOB INFORMATION

RESULTS

EXECUTION DETAILS

EXECUTION GRAPH

ⓘ This statement created a new table named customer_reviews_cs_response.

GO TO TABLE

customer_reviews_cs_response

🔍

SCHEMA

DETAILS

PREVIEW

TABLE EDIT

Filter

Enter property name or value

<input type="checkbox"/>	Field name	Type
<input type="checkbox"/>	ml_generate_text_llm_result	STRING
<input type="checkbox"/>	social_media_source	STRING
<input type="checkbox"/>	review_text	STRING
<input type="checkbox"/>	customer_id	INTEGER
<input type="checkbox"/>	location_id	INTEGER
<input type="checkbox"/>	review_datetime	DATETIME

1

SELECT * FROM 'gemini_demo.customer_reviews_cs_response'

Query results

JOB INFORMATION

RESULTS

CHART

JSON

EXECUTION DETAILS

EXECUTION GRAPH

Row	ml_generate_text_llm_result	social_media_source	review_text	customer_id	location_id	review_datetime
1	{ "Response": "Thank you for the review. We will provide your response to the location that you did not	Google	I had a very disappointing experience at this coffee truck. The service was terrible - the staff were rude and inattentive, and we had	8844	1	2024-02-12T09:03:10


```
1 CREATE OR REPLACE TABLE
2 'gemini_demo.customer_reviews_cs_response_formatted' AS (
3 SELECT
4   review_text,
5   JSON_QUERY(RTRIM(LTRIM(results.ml_generate_text_llm_result, " '{}'json"), "''"), "$.Response") AS Response,
6   JSON_QUERY(RTRIM(LTRIM(results.ml_generate_text_llm_result, " '{}'json"), "''"), "$.Actions") AS Actions,
7   social_media_source, customer_id, location_id, review_datetime
8 FROM
9   'gemini_demo.customer_reviews_cs_response' results )
```

Query results

JOB INFORMATION	RESULTS	EXECUTION DETAILS	EXECUTION GRAPH
<div><div></div><div>This statement created a new table named customer_reviews_cs_response_formatted.</div></div>			

customer_reviews_cs_response_formatted

Filter Enter property name or value

<input type="checkbox"/>	Field name	Type	Mode
<input type="checkbox"/>	review_text	STRING	NULLABLE
<input type="checkbox"/>	Response	STRING	NULLABLE
<input type="checkbox"/>	Actions	STRING	NULLABLE
<input type="checkbox"/>	social_media_source	STRING	NULLABLE
<input type="checkbox"/>	customer_id	INTEGER	NULLABLE
<input type="checkbox"/>	location_id	INTEGER	NULLABLE
<input type="checkbox"/>	review_datetime	DATETIME	NULLABLE

```
1 SELECT * FROM 'gemini_demo.customer_reviews_cs_response_formatted'
```

Query results

SAVE RESULTS

JOB INFORMATION		RESULTS	CHART	JSON	EXECUTION DETAILS		EXECUTION GRAPH			
Row	review_text		Response		Actions		social_media_source	customer_id	location_id	review_datetime
1	I had a very disappointing experience at this coffee truck. The service was terrible - the staff were rude and inattentive, and we had	✓	"Thank you for the review. We will provide your response to the location that you did not like the coffee and it could be		"The location can take the following actions to improve: 1. Train staff on better customer service. 2. Improve the quality of the		Google	8844	1	2024-02-12T09:03:10

GENERATING KEYWORDS FROM IMAGE ANALYSIS

- The Gemini Pro Vision model processing the image,
- The result is rows for each review image are displayed with the uri (the CloudStorage location of the review image) and a JSON result including the summary and keywords.

Untitled query

RUN

SAVE

DOWNLOAD

SHARE

SCHEDULE

OPEN IN

MORE

Query completed

```
1 CREATE OR REPLACE TABLE
2   'gemini_demo.review_images_results' AS (
3   SELECT
4     uri,
5     ml_generate_text_llm_result
6   FROM
7     ML.GENERATE_TEXT( MODEL 'gemini_demo.gemini_pro_vision',
8     TABLE 'gemini_demo.review_images',
9     STRUCT( 0.2 AS temperature,
10    'For each image, provide a summary of what is happening in the image and keywords from the summary. Answer in JSON format with two keys: summary, keywords. Summary should be a string,
11    keywords should be a list.' AS PROMPT,
12    TRUE AS FLATTEN_JSON_OUTPUT));
```

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

EXECUTION GRAPH

This statement created a new table named review_images_results.

GO TO TABLE

review_images_results

QUERY

SCHEMADETAILSPREVIEWTAB

Filter

Enter property name or value

<input type="checkbox"/>	Field name	Type
<input type="checkbox"/>	uri	STRING
<input type="checkbox"/>	ml_generate_text_llm_result	STRING

Untitled query

RUN

SAVE

DOWNLOAD

1 SELECT * FROM 'gemini_demo.review_images_results'

Query results

JOB INFORMATION		RESULTS	CHART	JSON
Row	uri	ml_generate_text_llm_result		
1	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_7230.png	```json { "summary": "A man is standing in front of a coffee cart on a city street." }		
2	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_5492.png	```json { "summary": "A white cup of espresso sits on a table scattered with coffee" }		
3	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_1462.png	```json { "summary": "A young woman is standing in front of a coffee truck. She is		

Untitled query

RUN

SAVE

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SHARE

SCHEDULE

OPEN IN

MORE

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CREATE OR REPLACE TABLE

gemini_demo.review_images_results_formatted

 AS (

SELECT

uri,

JSON_QUERY(RTRIM(LTRIM(results.ml_generate_text_llm_result, " ``json"), "``"), "\$.summary") AS summary,

JSON_QUERY(RTRIM(LTRIM(results.ml_generate_text_llm_result, " ``json"), "``"), "\$.keywords") AS keywords

FROM

gemini_demo.review_images_results

 results)

Query results

JOB INFORMATION

RESULTS

EXECUTION DETAILS

EXECUTION GRAPH

This statement created a new table named review_images_results_formatted.

review_images_results_formatted

SCHEMA

DETAILS

PREVIEW

T

Filter

Enter property name or value

	Field name	Type	Mode
<input type="checkbox"/>	uri	STRING	NULLABLE
<input type="checkbox"/>	summary	STRING	NULLABLE
<input type="checkbox"/>	keywords	STRING	NULLABLE

Untitled query

RUN

SAVE

DOWNLOAD

SHARE

SCHEDULE

1

SELECT * FROM gemini_demo.review_images_results_formatted

Query results

JOB INFORMATION	RESULTS	CHART	JSON	EXECUTION DETAILS	EXECUTION
Row	uri	summary	keywords		
1	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_1462.png	"A young woman is standing in front of a coffee truck. She is wearing a black leather jacket and holding a coffee cup."	["woman","coffee truck","coffee ...		
2	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_1474.png	"A young woman is drinking coffee and looking away from the camera."	["woman","coffee","drink","lookin...		
3	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_5492.png	"A white cup of espresso sits on a table scattered with coffee beans."	["coffee","cup","espresso","beans...		
4	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_769.png	"A woman is holding a cup of c...	["woman","coffee","cup"]		
5	gs://qwiklabs-gcp-01-fac5d61fb094-bucket/gsp1246/images/image_7230.png	"A man is standing in front of a coffee cart on a city street. He is wearing a suit and holding a coffee cup."	["man","coffee cart","city street",...		