Vertix Ai Model:

```
# BQML: Create weekly aggregated 3-year training table.
SELECT
  store_number,
  store_name,
  item_number,
  item_description,
  sum(sale_dollars) as sale_dollars,
  sum(bottles_sold) as bottles_sold,
  sum(volume_sold_liters) as volume_sold_liters,
  sum(volume_sold_gallons) as volume_sold_gallons,
  category,
  category_name,
  pack,
  LAST_DAY(date, WEEK) AS fsc_end_week_dt
FROM `csce5214-p1.csce5214_iowa_sales.sales`
WHERE EXTRACT(YEAR from date) > 2018
GROUP BY
  store_number,
  store_name,
  item_number,
  item_description,
  category,
  category_name,
  pack,
  fsc_end_week_dt
ORDER BY fsc_end_week_dt ASC
# BQML: Create ARIMA+ model from training dataset.
CREATE MODEL `csce5214-p1.csce5214_iowa_sales.sales_wk_aggregate_model`
  OPTIONS (
    MODEL_TYPE = 'ARIMA_PLUS',
    TIME_SERIES_TIMESTAMP_COL = 'fsc_end_week_dt',
    TIME_SERIES_ID_COL = ['store_number', 'item_number'],
```

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      TIME_SERIES_DATA_COL = 'bottles_sold',
      HORIZON = 12,
      AUTO_ARIMA = TRUE,
      HOLIDAY_REGION = 'US',
      DATA_FREQUENCY = 'WEEKLY'
    )
  AS
  SELECT fsc_end_week_dt, store_number, item_number, bottles_sold FROM
`csce5214-p1.csce5214_iowa_sales.sales_wk_aggregate_train`
  # BQML: Create forecast for a 12 week horizon.
  SELECT * FROM
  ML.FORECAST(MODEL `csce5214-
p1.csce5214_iowa_sales.sales_wk_aggregate_model`, STRUCT(12 as horizon, 0.8
as confidence_level))
  # BQML: Calculate evaluation metrics against held-out test set.
  WITH preds AS (
      SELECT
          CAST(p.forecast_timestamp AS DATETIME) AS timestamp,
          CAST(p.item_number AS STRING) AS time_series_id,
          CAST(p.item_number AS STRING) AS item_number,
          CAST(p.store_number AS STRING) AS store_number,
          CAST(a.bottles_sold as NUMERIC) AS actual_values,
          CAST(p.forecast_value as NUMERIC) AS forecast_values,
          CAST(a.bottles_sold as NUMERIC) - CAST(p.forecast_value as NUMERIC)
as actual_minus_forecast
      FROM `csce5214-p1.csce5214_iowa_sales.bqml_dw_2022_predictions` as p
      JOIN `csce5214-p1.csce5214_iowa_sales.sales_wk_aggregate_test` AS a ON
          a.item_number = p.item_number AND a.store_number = p.store_number
AND CAST(p.forecast_timestamp AS DATETIME) = CAST(a.fsc_end_week_dt AS
DATETIME)
  ),
  wape AS (
      SELECT SUM(ABS(actual_minus_forecast)) / (SUM(ABS(actual_values))) AS
wape
      FROM preds
  ),
```

```
mae AS (
    SELECT AVG(ABS(actual_minus_forecast)) AS MAE
    FROM preds
),
rmse AS (
    SELECT SQRT(SUM(POWER(actual_minus_forecast, 2))/COUNT(*)) AS rmse
    FROM preds
),
bias AS (
    SELECT SUM(actual_minus_forecast) / (SUM(actual_values)) AS bias
  FROM preds
)

SELECT * FROM wape CROSS JOIN rmse CROSS JOIN mae CROSS JOIN bias
```