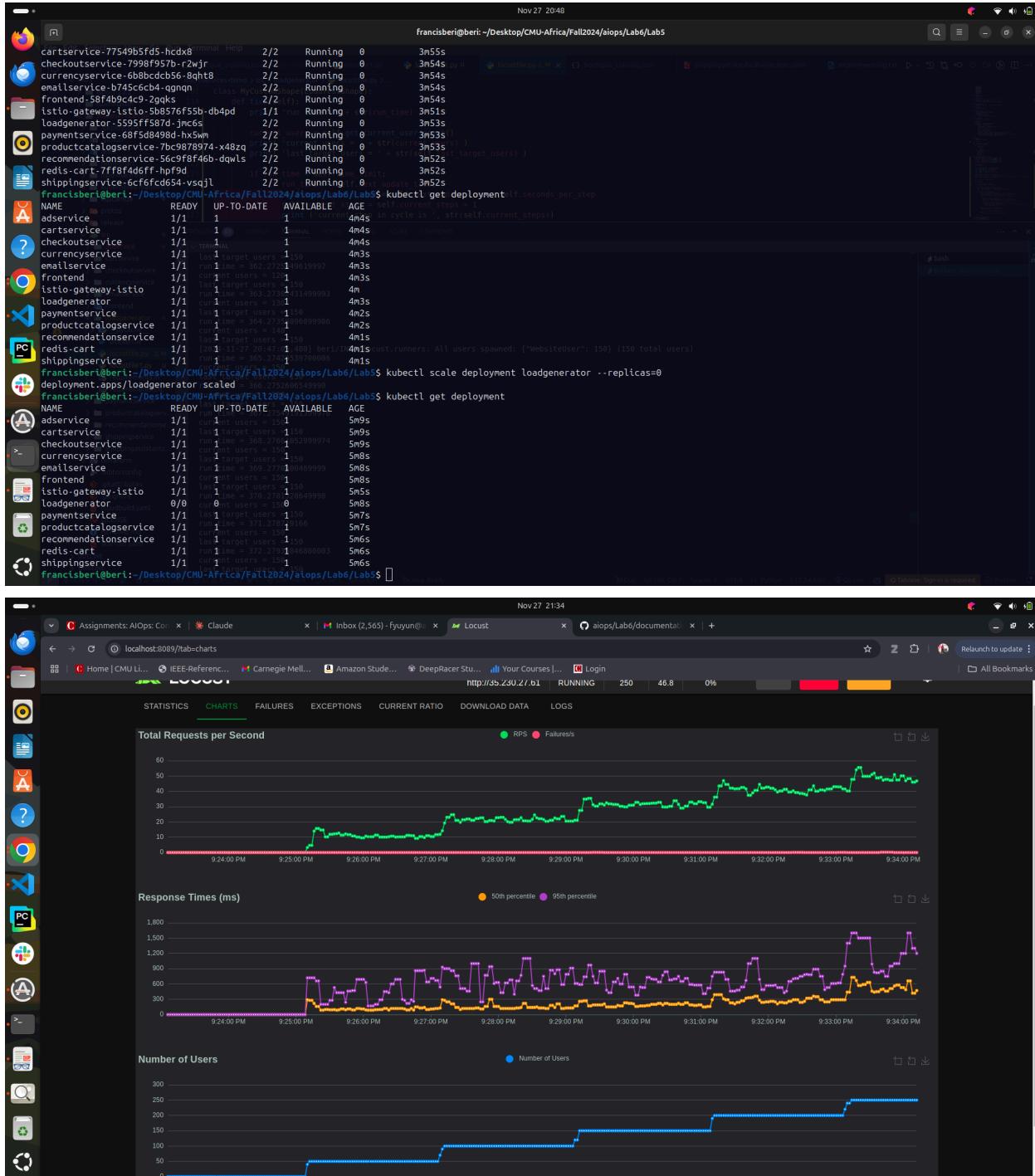


Yuyun Francis Berinyuy

Lab6

Task 2: Screenshot of Locust UI running with user and response time curves over training run



Nov 27 21:47

| Type | Name | # Requests | # Fails | Median (ms) | 95%ile (ms) | Average (ms) | Min (ms) | Max (ms) | Average size (bytes) | Current RPS | Current Failures/s |
|------|----------------------|------------|---------|-------------|-------------|--------------|----------|----------|----------------------|-------------|--------------------|
| GET | / | 1764 | 0 | 320 | 1200 | 1800 | 420.83 | 73 | 2124 | 10878.62 | 0.9 |
| GET | /cart | 4336 | 0 | 260 | 890 | 1300 | 341.64 | 64 | 2193 | 13855.08 | 3.7 |
| POST | /cart | 4387 | 0 | 370 | 1200 | 1700 | 476.04 | 119 | 2316 | 18304.53 | 2.4 |
| POST | /cart/checkout | 1508 | 9 | 200 | 590 | 890 | 254.55 | 79 | 1925 | 6967.73 | 1.1 |
| GET | /product/0PUK6v6EVO | 2007 | 0 | 220 | 780 | 1100 | 286.96 | 66 | 1569 | 8182.4 | 1.5 |
| GET | /product/1YMWWN1N4O | 2034 | 0 | 210 | 750 | 1100 | 285.61 | 66 | 1672 | 8204.35 | 1.4 |
| GET | /product/2ZYFJ3GM2N | 2063 | 0 | 220 | 760 | 1200 | 292.25 | 67 | 1699 | 8202.67 | 1.1 |
| GET | /product/66VCHSJNUP | 2120 | 0 | 210 | 790 | 1100 | 288.7 | 67 | 1622 | 8167.8 | 1.2 |
| GET | /product/6E92ZMYYFZ | 2053 | 0 | 220 | 730 | 990 | 279.4 | 67 | 1633 | 8158.2 | 2 |
| GET | /product/9SIQ78TOJO | 2029 | 0 | 210 | 770 | 1000 | 285.28 | 67 | 1616 | 8208.89 | 1.2 |
| GET | /product/9ECAV7KIM | 2138 | 0 | 220 | 740 | 1100 | 278.21 | 68 | 1448 | 8174.88 | 1.6 |
| GET | /product/LS4PXSXUNUM | 2053 | 0 | 220 | 750 | 1100 | 288.63 | 66 | 1683 | 8174.79 | 0.9 |
| GET | /product/OLICESPC7Z | 2110 | 0 | 210 | 740 | 1000 | 280.79 | 66 | 1704 | 8206.29 | 1.3 |

```

❯ (myenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/aiops/Lab6/Lab5/microservices-demo/src/loadgenerator$ locust --host="http://35.230.27.61" -f locust.py
Locust version is 3.6.0
Spawn rate is 10
Cycle time is 1200
Users is 250
Number of steps is 10
Seconds per step is 120
Wait factor is 50
[2024-11-27 23:47:57,562] beri/INFO/locust.main: Starting Locust 3.32.2
[2024-11-27 23:47:57,562] beri/INFO/locust.main: Starting web interface at http://0.0.0.0:8089

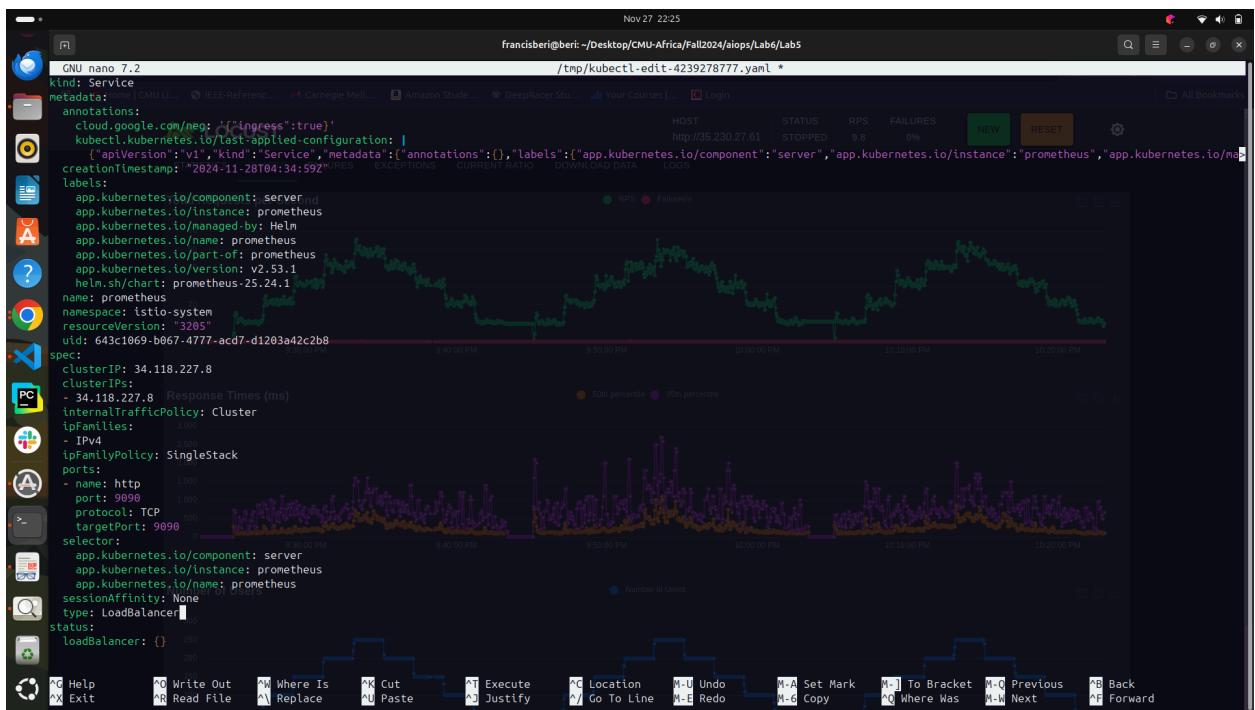
```

```

current users = 50
last_target_users = 50
run_time = 1197.84283082
current users = 50
last_target_users = 50
run_time = 1198.843207766
current users = 50
last_target_users = 50
run_time = 1199.8442962469999
current users = 50
last_target_users = 50
run_time = 1200.845390478
current users = 50
last_target_users = 50
current_step_in_cycle_is 10
target users = 0
[2024-11-27 21:43:04,899] beri/INFO/locust.runners: Shape test updating to 0 users at 10.00 spawn rate
[2024-11-27 21:43:04,900] beri/INFO/locust.runners: Ramping to 0 users at a rate of 10.00 per second
run_time = 1201.8463506299995
current users = 40
last_target_users = 0
run_time = 1202.847939145
current users = 30
last_target_users = 0
run_time = 1203.8483049679999
current users = 20
last_target_users = 0
run_time = 1204.849026555
current users = 10
last_target_users = 0
run_time = 1205.850269347
current users = 0
last_target_users = 0
run_time = 1206.850765434
current users = 0
last_target_users = 0
run_time = 1207.8512238019994
current users = 0
last_target_users = 0
run_time = 1208.8519472439993
current users = 0
last_target_users = 0
run_time = 1209.8523225539993
current users = 0

```

Task 2: Curl command to pull training data Screenshot of curl command to pull training data and save to file



```

service/prometheus edited
francisberl@berl:~/Desktop/CMU-Africa/Fall2024/aiops/Lab6/Lab6$ kubectl -n istio-system get svc prometheus
NAME      TYPE        CLUSTER-IP    EXTERNAL-IP   PORT(S)          AGE
prometheus   LoadBalancer  104.199.113.199  104.199.113.199  9090:32352/TCP  113m
francisberl@berl:~/Desktop/CMU-Africa/Fall2024/aiops/Lab6/Lab6$ curl -g -s "http://104.199.113.199:9090/api/v1/query" --data-urlencode "query=histogram_quantile( 0.5, rate(istio_t_duration_milliseconds_bucket[source_app='frontend', destination_app='shippingservice', reporter='source'][1m))[2h:30s]" | jq | more
{
  "status": "success",
  "data": {
    "resultType": "matrix"
  }
}

```

source_principal: "spiffe://cluster.local/ns/default/sa/frontend",
 source_workload: "frontend",
 source_workload_namespace: "default",
 interval: "30s",
 values: [{ ds: 1732768590, y: "3.0799232736572892" }, { ds: 1732768620, y: "3" }, { ds: 1732768650, y: "3" }, { ds: 1732768680, y: "3" }, { ds: 1732768710, y: "3" }, { ds: 1732768740, y: "3" }, { ds: 1732768770, y: "3" }, { ds: 1732768800, y: "3" }, { ds: 1732768830, y: "3" }]

Lab Task 2: Review in Jupyter notebook. Screenshot of prom.ipynb graphs showing (1) fit to training data and (2) detected anomalies from passing training data for model predictions (predict based on training data just as sanity test).

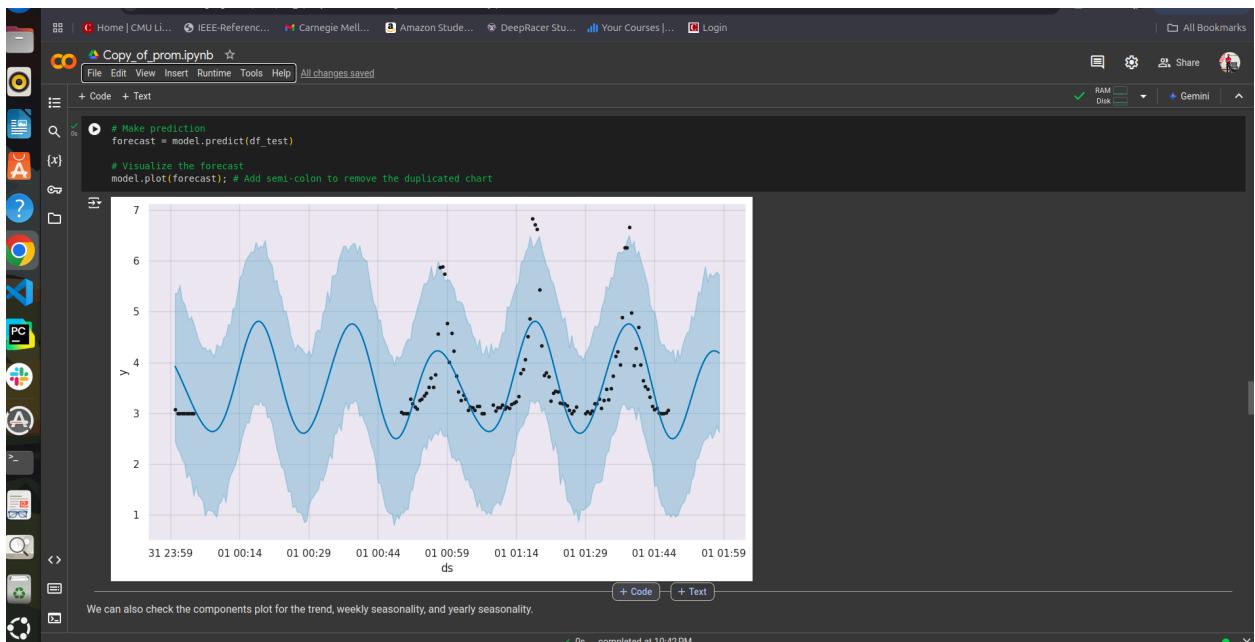
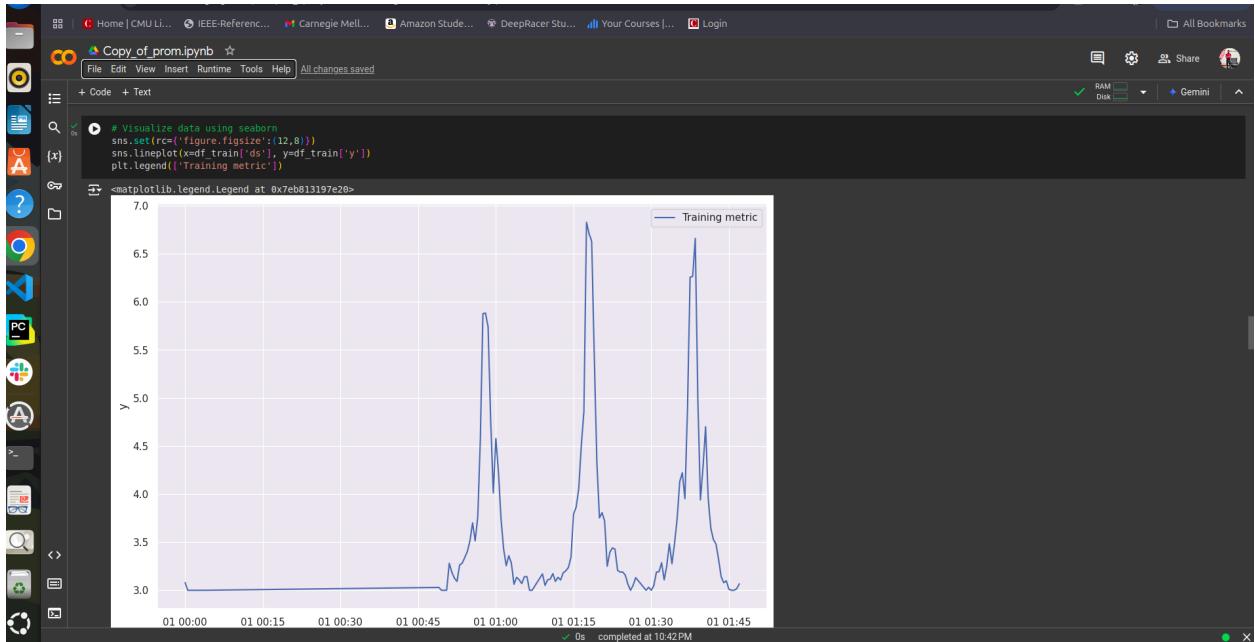
```

github_url = "https://raw.githubusercontent.com/yuyunfrancis/aiops-refs/heads/master/Lab6/Lab5/monitor_model/boutique_training.json"
try:
    response = requests.get(github_url)
    response.raise_for_status() # Raise an exception for bad status codes (4xx or 5xx)

    data = response.json()
    df_test = pd.DataFrame(data['data'][0]['result'][0]['values'])
    df_test.columns = ['ds', 'y']
    print(df_test.head())
except requests.exceptions.RequestException as e:
    print(f"Error fetching data from GitHub: {e}")
except ValueError as e:
    print(f"Error decoding JSON response: {e}")
except Exception as e:
    print(f"An unexpected error occurred: {e}")

```

| ds | y |
|----|--------------------|
| 0 | 1732768590 |
| 1 | 3.0799232736572892 |
| 2 | 1732768620 |
| 3 | 1732768650 |
| 4 | 1732768680 |
| 5 | 1732768710 |



You can paste the image from the clipboard.

[17] # Visualize the forecast components

```
model.plot_components(forecast);
```

trend

hourly

ds

Hours

Step 5: Check Time Series Model Performance

[18] forecast

0s completed at 10:42PM

You can paste the image from the clipboard.

forecast

| | ds | trend | yhat_lower | yhat_upper | trend_lower | trend_upper | additive_terms | additive_terms_lower | additive_terms_upper | hourly | hourly_lower | hourly_upper | multiplicative_terms | multiplicative_terms_lower | multiplicative_terms_upper |
|-----|---------------------|----------|------------|------------|-------------|-------------|----------------|----------------------|----------------------|-----------|--------------|--------------|----------------------|----------------------------|----------------------------|
| 0 | 1970-01-01 00:00:00 | 3.582767 | 2.446996 | 5.365867 | 3.582767 | 3.582767 | 0.340870 | 0.340870 | 0.340870 | 0.340870 | 0.340870 | 0.340870 | 0.0 | 0.0 | 0.0 |
| 1 | 1970-01-01 00:00:30 | 3.582767 | 2.305788 | 5.360972 | 3.582767 | 3.582767 | 0.249690 | 0.249690 | 0.249690 | 0.249690 | 0.249690 | 0.249690 | 0.0 | 0.0 | 0.0 |
| 2 | 1970-01-01 00:01:00 | 3.582767 | 2.235570 | 5.524642 | 3.582767 | 3.582767 | 0.152569 | 0.152569 | 0.152569 | 0.152569 | 0.152569 | 0.152569 | 0.0 | 0.0 | 0.0 |
| 3 | 1970-01-01 00:01:30 | 3.582767 | 2.092780 | 5.224215 | 3.582767 | 3.582767 | 0.051335 | 0.051335 | 0.051335 | 0.051335 | 0.051335 | 0.051335 | 0.0 | 0.0 | 0.0 |
| 4 | 1970-01-01 00:02:00 | 3.582767 | 2.018342 | 5.160950 | 3.582767 | 3.582767 | -0.052335 | -0.052335 | -0.052335 | -0.052335 | -0.052335 | -0.052335 | 0.0 | 0.0 | 0.0 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 232 | 1970-01-01 01:56:00 | 3.582767 | 2.642449 | 5.757053 | 3.582767 | 3.582767 | 0.611256 | 0.611256 | 0.611256 | 0.611256 | 0.611256 | 0.611256 | 0.0 | 0.0 | 0.0 |
| 233 | 1970-01-01 01:56:30 | 3.582767 | 2.510069 | 5.689165 | 3.582767 | 3.582767 | 0.639783 | 0.639783 | 0.639783 | 0.639783 | 0.639783 | 0.639783 | 0.0 | 0.0 | 0.0 |
| 234 | 1970-01-01 01:57:00 | 3.582767 | 2.616170 | 5.734364 | 3.582767 | 3.582767 | 0.647490 | 0.647490 | 0.647490 | 0.647490 | 0.647490 | 0.647490 | 0.0 | 0.0 | 0.0 |
| 235 | 1970-01-01 01:57:30 | 3.582767 | 2.753003 | 5.786846 | 3.582767 | 3.582767 | 0.635437 | 0.635437 | 0.635437 | 0.635437 | 0.635437 | 0.635437 | 0.0 | 0.0 | 0.0 |
| 236 | 1970-01-01 01:58:00 | 3.582767 | 2.630950 | 5.723016 | 3.582767 | 3.582767 | 0.605135 | 0.605135 | 0.605135 | 0.605135 | 0.605135 | 0.605135 | 0.0 | 0.0 | 0.0 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |

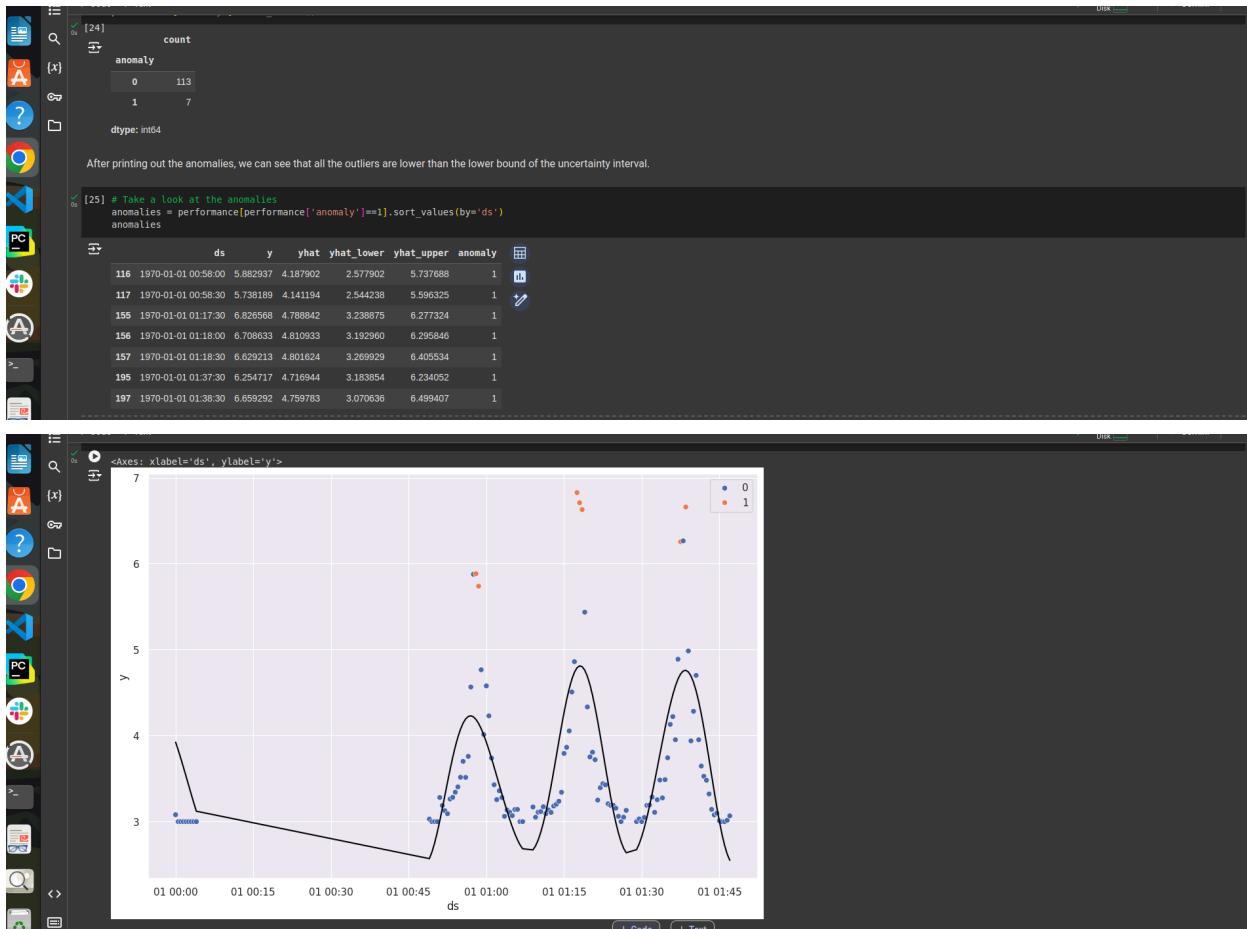
0s completed at 10:42PM

[21] performance.dropna(subset=['y', 'yhat'], inplace=True)

```
# Check MAE value
performance_MAE = mean_absolute_error(performance['y'], performance['yhat'])
print('The MAE for the model is', performance_MAE)

# Check MAPE value
performance_MAPE = mean_absolute_percentage_error(performance['y'], performance['yhat'])
print('The MAPE for the model is', performance_MAPE)
```

The MAE for the model is 0.46087557142844016
The MAPE for the model is 0.11729716979623786



Lab Task 3: Console output of a run covering at least one full cycle of test data without faults generated to verify minimal anomaly detection and correct model following of seasonality.

The figure shows a terminal window with the following output:

```
francisberi@beri:~/Desktop/CMU-Africa/Fall2024/siops/Lab6/Lab5/monitor_model$ conda activate myenv
francisberi@beri:~/Desktop/CMU-Africa/Fall2024/siops/Lab6/Lab5/monitor_model$ python3 monitor1.py
=====
PHASE: STARTUP - Loading Model
> Timestamp: 2024-11-27 22:52:01.356245
=====
22:52:01 - cmdstampy - INFO - Chain [1] start processing
22:52:01 - cmdstampy - INFO - Chain [1] done processing
=====
PHASE: NORMAL OPERATION - No Delay Injection
> Timestamp: 2024-11-27 22:52:01.446921
=====
Monitor started - waiting for initial data points...
Monitoring Results:
+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+
| 2024-11-27 22:52:01.071364 | 3.028 | 3.024 | 2.353 | 5.436 | 0 | 0.895 | 0.296 |
+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.895
Average MAPE: 0.296

Monitoring Results:
+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+
| 2024-11-27 22:52:01.071364 | 3.028 | 3.024 | 2.353 | 5.436 | 0 | 0.895 | 0.296 |
+-----+-----+-----+-----+-----+
| 2024-11-27 22:53:02.263352 | 3.052 | 3.735 | 2.160 | 5.386 | 0 | 0.683 | 0.224 |
+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.789
Average MAPE: 0.269
```

```

monitoring Results:
+-----+-----+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:52:01.971364 | 3.028 | 3.924 | 2.353 | 5.436 | 0 | 0.895 | 0.296 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:53:02.263352 | 3.052 | 3.735 | 2.160 | 5.386 | 0 | 0.683 | 0.224 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:54:02.383619 | 3.000 | 3.530 | 2.015 | 5.265 | 0 | 0.530 | 0.177 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:55:02.507789 | 3.001 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.703
Average MAPE: 0.232

monitoring Results:
+-----+-----+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:52:01.971364 | 3.028 | 3.924 | 2.353 | 5.436 | 0 | 0.895 | 0.296 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:53:02.263352 | 3.052 | 3.735 | 2.160 | 5.386 | 0 | 0.683 | 0.224 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:54:02.383619 | 3.000 | 3.530 | 2.015 | 5.265 | 0 | 0.530 | 0.177 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:55:02.507789 | 3.001 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.592
Average MAPE: 0.195

monitoring Results:
+-----+-----+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:52:01.971364 | 3.028 | 3.924 | 2.353 | 5.436 | 0 | 0.895 | 0.296 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:53:02.263352 | 3.052 | 3.735 | 2.160 | 5.386 | 0 | 0.683 | 0.224 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:54:02.383619 | 3.000 | 3.530 | 2.015 | 5.265 | 0 | 0.530 | 0.177 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:55:02.507789 | 3.001 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.494
Average MAPE: 0.163

```

Lab Task 4: Run with injected delays. Console output of your run beginning with no delay injection, followed by a period of time where anomalies are detected, and then another time period when the Istio delay is re-moved. (Clearly mark in the output where delays are introduced and removed).

```

monitoring Results:
+-----+-----+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:54:02.383619 | 3.000 | 3.530 | 2.015 | 5.265 | 0 | 0.530 | 0.177 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:55:02.507789 | 3.001 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:56:02.676208 | 3.016 | 3.118 | 1.643 | 4.491 | 0 | 0.102 | 0.034 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:57:02.797544 | 4.275 | 2.936 | 1.265 | 4.631 | 0 | 1.339 | 0.313 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:58:02.915788 | 1750.000 | 2.787 | 1.287 | 4.312 | 1 | 1747.213 | 0.998 |
+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 1
Average MAE: 349.888
Average MAPE: 0.321

monitoring Results:
+-----+-----+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:55:02.507789 | 3.001 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:56:02.676208 | 3.016 | 3.118 | 1.643 | 4.491 | 0 | 0.102 | 0.034 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:57:02.797544 | 4.275 | 2.936 | 1.265 | 4.631 | 0 | 1.339 | 0.313 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:58:02.915788 | 1750.000 | 2.787 | 1.287 | 4.312 | 1 | 1747.213 | 0.998 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:59:03.862166 | 1750.000 | 2.683 | 1.242 | 4.256 | 1 | 1747.317 | 0.998 |
+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 2
Average MAE: 699.246
Average MAPE: 0.486

```

```

monitoring Results:
+-----+-----+-----+-----+-----+-----+-----+
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:55:02.507789 | 3.001 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:56:02.676208 | 3.016 | 3.118 | 1.643 | 4.491 | 0 | 0.102 | 0.034 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:57:02.797544 | 4.275 | 2.936 | 1.265 | 4.631 | 0 | 1.339 | 0.313 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:58:02.915788 | 1750.000 | 2.787 | 1.287 | 4.312 | 1 | 1747.213 | 0.998 |
+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-27 22:59:03.862166 | 1750.000 | 2.683 | 1.242 | 4.256 | 1 | 1747.317 | 0.998 |
+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 2
Average MAE: 699.246
Average MAPE: 0.486

```

monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-27 22:55:02.507789 | 3.061 | 3.318 | 1.543 | 4.930 | 0 | 0.257 | 0.084 |
| 2024-11-27 22:56:02.676208 | 3.016 | 3.118 | 1.643 | 4.491 | 0 | 0.102 | 0.034 |
| 2024-11-27 22:57:02.797544 | 4.275 | 2.936 | 1.265 | 4.631 | 0 | 1.339 | 0.313 |
| 2024-11-27 22:58:02.915788 | 1750.000 | 2.707 | 1.207 | 4.312 | 1 | 1747.213 | 0.998 |
| 2024-11-27 22:59:03.062166 | 1750.000 | 2.683 | 1.242 | 4.256 | 1 | 1747.317 | 0.998 |

Window Summary:
 Total Anomalies: 2
 Average MAE: 699.246
 Average MAPE: 0.486

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-27 22:56:02.676208 | 3.016 | 3.118 | 1.643 | 4.491 | 0 | 0.102 | 0.034 |
| 2024-11-27 22:57:02.797544 | 4.275 | 2.936 | 1.265 | 4.631 | 0 | 1.339 | 0.313 |
| 2024-11-27 22:58:02.915788 | 1750.000 | 2.707 | 1.207 | 4.312 | 1 | 1747.213 | 0.998 |
| 2024-11-27 22:59:03.062166 | 1750.000 | 2.683 | 1.242 | 4.256 | 1 | 1747.317 | 0.998 |
| 2024-11-27 23:00:03.197744 | 1750.000 | 2.648 | 1.250 | 4.145 | 1 | 1747.360 | 0.998 |

Window Summary:
 Total Anomalies: 3
 Average MAE: 1648.666
 Average MAPE: 0.668

monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-27 22:58:02.915788 | 1750.000 | 2.787 | 1.207 | 4.312 | 1 | 1747.213 | 0.998 |
| 2024-11-27 22:59:03.062166 | 1750.000 | 2.683 | 1.242 | 4.256 | 1 | 1747.317 | 0.998 |
| 2024-11-27 23:00:03.197744 | 1750.000 | 2.648 | 1.250 | 4.145 | 1 | 1747.360 | 0.998 |

Window Summary:
 Total Anomalies: 5
 Average MAE: 1747.286
 Average MAPE: 0.998

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-27 22:59:03.062166 | 1750.000 | 2.683 | 1.242 | 4.256 | 1 | 1747.317 | 0.998 |
| 2024-11-27 23:00:03.197744 | 1750.000 | 2.648 | 1.250 | 4.145 | 1 | 1747.360 | 0.998 |
| 2024-11-27 23:01:03.349434 | 1750.000 | 2.673 | 0.983 | 4.258 | 1 | 1747.327 | 0.998 |
| 2024-11-27 23:02:03.482757 | 1750.000 | 2.788 | 1.317 | 4.362 | 1 | 1747.212 | 0.998 |
| 2024-11-27 23:03:03.617357 | 1750.000 | 2.992 | 1.342 | 4.613 | 1 | 1747.008 | 0.998 |

Window Summary:
 Total Anomalies: 5
 Average MAE: 1747.245
 Average MAPE: 0.998

monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-27 23:01:03.349434 | 1750.000 | 2.673 | 0.983 | 4.258 | 1 | 1747.327 | 0.998 |
| 2024-11-27 23:02:03.482757 | 1750.000 | 2.788 | 1.317 | 4.362 | 1 | 1747.212 | 0.998 |
| 2024-11-27 23:03:03.617357 | 1750.000 | 2.992 | 1.342 | 4.613 | 1 | 1747.008 | 0.998 |
| 2024-11-27 23:04:03.759981 | 1750.000 | 3.268 | 1.583 | 4.857 | 1 | 1746.732 | 0.998 |
| 2024-11-27 23:05:03.902405 | 1430.000 | 3.596 | 2.139 | 5.158 | 1 | 1426.404 | 0.997 |

Window Summary:
 Total Anomalies: 5
 Average MAE: 1682.936
 Average MAPE: 0.998

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-27 23:02:03.482757 | 1750.000 | 2.788 | 1.317 | 4.362 | 1 | 1747.212 | 0.998 |
| 2024-11-27 23:03:03.617357 | 1750.000 | 2.992 | 1.342 | 4.613 | 1 | 1747.008 | 0.998 |
| 2024-11-27 23:04:03.759981 | 1750.000 | 3.268 | 1.583 | 4.857 | 1 | 1746.732 | 0.998 |
| 2024-11-27 23:05:03.902405 | 1430.000 | 3.596 | 2.139 | 5.158 | 1 | 1426.404 | 0.997 |
| 2024-11-27 23:06:04.049980 | 3.000 | 3.946 | 2.373 | 5.579 | 0 | 0.946 | 0.313 |

Window Summary:
 Total Anomalies: 4
 Average MAE: 1332.660
 Average MAPE: 0.862

Code suggestions are disabled because there is no user account.

Lab Task 5: console output showing running monitor in K8S. Sample console output from your Kubernetes pod showing running monitor

```

[auth] library/python:pull token for registry-1.docker.io
=> [internal] load .dockerrigignore
=> [internal] transfer manifest: 2B
=> [1/8] FROM docker.io/library/python:3sha256:bc78d3c007f86dbb87d711bb8b82d9d5648b8025487e780d24ccb851d83ef8b0
=> [2/8] RUN apk add dumb-init https://github.com/Yelp/dumb-init/releases/download/v1.2.5/dumb-init_1.2.5_x86_64
=> [3/8] RUN chmod +x /usr/local/bin/dumb-init
=> [4/8] COPY requirements.txt .
=> [5/8] COPY requirements.txt .
=> [6/8] RUN pip install -r requirements.txt
=> [7/8] COPY boutique_training.json .
=> [8/8] COPY boutique_training.json .
=> exporting manifest sha256:3d26ce0e6412bfff83a8480d656ff9b9c105ae5c4b750e7ec5e8ff12a93f8bda24
=> exporting config sha256:538241e4febe1ad80beb6da674846cc01cd7d5b8966714cbac72e9ebffee3d1ec
=> exporting attestation manifest sha256:b7f0ff1bcc251812116382592807fc8eb51346e2f650d58f4d1d9ffca016182
=> exporting service manifest sha256:95f63c920b3328a7f9f1320f953800bd993651
=> pushing to docker.io/francisberi/boutique-monitor:latest
=> unpacking to docker.io/francisberi/boutique-monitor:latest
latest: digest: sha256:ae7b9b0d73f9323d1b1bd695f63c920b3328a7f9f1320f953800bd993651 size: 856
(myenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ 
  
```

What's next:

```

francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ docker push francisberi/boutique-monitor:latest
57b44683e2c1: Layer already exists
a247a0c0764: Layer already exists
4b2d28a00bbb: Pushed
c3cc766f0473: Layer already exists
3ed3f00b002c: Layer already exists
1d380fadcc: Layer already exists
1d380fadcc: Layer already exists
4fa596aa0abf: Pushed
55d82d544a59: Layer already exists
0e3fc61f6b03: Pushed
4d87a670c3ff: Layer already exists
4d87a670c3ff: Layer already exists
9721635962a: Layer already exists
ef45f15f570b: Layer already exists
latest: digest: sha256:ae7b9b0d73f9323d1b1bd695f63c920b3328a7f9f1320f953800bd993651 size: 856
(myenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ 
  
```

```

francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ kubectl get deployment
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
adservice     1/1     1           1           16m
boutique-monitor   0/0     0           0           11s
cartservice    1/1     1           1           16m
checkoutservice 1/1     1           1           16m
currencyservice 1/1     1           1           16m
emailservice   1/1     1           1           16m
frontend      1/1     1           1           16m
istio-gateway-istio 1/1     1           1           16m
loadgenerator  0/0     0           0           16m
paymentservice 1/1     1           1           16m
productcatalogservice 1/1     1           1           16m
recommendationservice 1/1     1           1           16m
redis-cart    1/1     1           1           16m
shippingservice 1/1     1           1           16m
  
```

```

francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ kubectl scale deployment boutique-monitor --replicas=1
francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ kubectl get deployment
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
adservice     1/1     1           1           16m
boutique-monitor   0/1     1           0           11s
cartservice    1/1     1           1           16m
checkoutservice 1/1     1           1           16m
currencyservice 1/1     1           1           16m
emailservice   1/1     1           1           16m
frontend      1/1     1           1           16m
istio-gateway-istio 1/1     1           1           16m
loadgenerator  0/0     0           0           16m
paymentservice 1/1     1           1           16m
productcatalogservice 1/1     1           1           16m
recommendationservice 1/1     1           1           16m
redis-cart    1/1     1           1           16m
shippingservice 1/1     1           1           16m
  
```

```

francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ kubectl get svc
NAME        TYPE        CLUSTER-IP       EXTERNAL-IP      PORT(S)        AGE
adservice   ClusterIP   34.118.228.190 <none>        9555/TCP      16m
cartservice  ClusterIP   34.118.237.108 <none>        7870/TCP      16m
checkoutservice ClusterIP  34.118.234.206 <none>        5080/TCP      16m
currencyservice ClusterIP  34.118.238.188 <none>        7080/TCP      16m
emailservice  ClusterIP   34.118.232.155 <none>        5080/TCP      16m
frontend     ClusterIP   34.118.229.216 <none>        80/TCP       16m
istio-gateway-istio LoadBalancer  34.118.231.85  15021:32537/TCP,80:31859/TCP  16m
kubernetes   ClusterIP   34.118.224.209 <none>        443/TCP      16m
  
```

```

francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alops/Lab6/Lab5$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
adservice-766c974448-ddmv 2/2     Running   0          168m
boutique-monitor-8dd45dc459-rh9rt 2/2     Running   0          107s
cartservice-77549b5f45-hcd8x 2/2     Running   0          168m
checkoutservice-7998f957b-rzwjr 2/2     Running   0          168m
currencyservice-b68bcdc56-8qht8 2/2     Running   0          168m
emailservice-b745c6cb4-qnnqi 2/2     Running   0          168m
frontend-58f4b9c49-2gks 2/2     Running   0          168m
istio-gateway-istio-588576f55b-db4pd 1/1     Running   0          168m
paymentservice-68fsd8498d-hxswm 2/2     Running   0          168m
productcatalogservice-7bc9878974-x4zqz 2/2     Running   0          168m
recommendationservice-56c9ff8f46b-dqwlw 2/2     Running   0          168m
redis-cart-7ff8f4d6ff-hpf9d 2/2     Running   0          168m
shippingservice-6cf6cd654-vsqjl 2/2     Running   0          168m
  
```

```

francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6$ kubectl logs -f boutique-monitor-84d45dc459-rh9rt
Importing plotly failed. Interactive plots will not work.(tox)
=====
PHASE: STARTUP - Loading Model
Timestamp: 2024-11-28 07:21:45.992689
=====
A 07:21:46 : cmdstanpy - INFO - Chain [1] start processing
A 07:21:46 : cmdstanpy - INFO - Chain [1] done processing
PHASE: NORMAL OPERATION - No Delay Injection
Timestamp: 2024-11-28 07:21:46.154580
=====
Monitoring Results:
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-28 07:21:46.207529 | 3.033 | 3.924 | 2.465 | 5.407 | 0 | 0.890 | 0.294 |
+-----+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.890
Average MAPE: 0.294
Monitoring Results:
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-28 07:21:46.207529 | 3.033 | 3.924 | 2.465 | 5.407 | 0 | 0.890 | 0.294 |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-28 07:22:46.273757 | 3.000 | 3.735 | 1.933 | 5.230 | 0 | 0.735 | 0.245 |
+-----+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.813
Average MAPE: 0.245
=====
Copy of command:
Window Summary: what's next:
View a summary of image vulnerabilities and recommendations - docker scan quickview
(mvenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6/Lab5/monitor_models$ docker push francisberi/boutique-monitor:latest
57b44683ec1c: Layer already exists
af247aae9764: Layer already exists
212de5e7c3ff: Layer already exists
d0903a0a002c: Layer already exists
3ed3f000002c: Layer already exists
=====
latest: digest: sha256:ae709bb0d57319323d1b17bd095f63c9c20b3328a779f1320f9538000bd993651 size: 856
(mvenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6/Lab5/monitor_models$ kubectl apply -f monitor-deployment.yaml
deployment.apps/boutique-monitor created
(mvenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6/Lab5/monitor_models$ 

```

```

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-28 07:21:46.207529 | 3.033 | 3.924 | 2.465 | 5.407 | 0 | 0.890 | 0.294 |
+-----+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.890
Average MAPE: 0.294
Monitoring Results:
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-28 07:21:46.207529 | 3.033 | 3.924 | 2.465 | 5.407 | 0 | 0.890 | 0.294 |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 2024-11-28 07:22:46.273757 | 3.000 | 3.735 | 1.933 | 5.230 | 0 | 0.735 | 0.245 |
+-----+-----+-----+-----+-----+-----+-----+-----+
Window Summary:
Total Anomalies: 0
Average MAE: 0.813
Average MAPE: 0.245
=====
Copy of command:
Window Summary: what's next:
View a summary of image vulnerabilities and recommendations - docker scan quickview
(mvenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6/Lab5/monitor_models$ docker push francisberi/boutique-monitor:latest
57b44683ec1c: Layer already exists
sh256:3d05e90412bf03a8409d55ff099c105a54b7597cc5edff1293f10ba24
sh256:538241e4fe1nd08be0d5c7400c1c1705b896714bc729e9bbffed31cd
sh256:ae709bb0d57319323d1b17bd095f63c9c20b3328a779f1320f9538000bd993651
sh256:776771bc2c51b15211630259280ffce0e513462f65900587401d9ffca16182
sh256:aef709bb0d57319323d1b17bd095f63c9c20b3328a779f1320f9538000bd993651
sh256:40d7067dc1ff: Layer already exists
sh256:16268e3c: Layer already exists
sh256:776771bc2c51b15211630259280ffce0e513462f65900587401d9ffca16182
sh256:af45715f570b: Layer already exists
=====
latest: digest: sha256:ae709bb0d57319323d1b17bd095f63c9c20b3328a779f1320f9538000bd993651 size: 856
(mvenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6/Lab5/monitor_models$ kubectl apply -f monitor-deployment.yaml
deployment.apps/boutique-monitor created
(mvenv) francisberi@beri:~/Desktop/CMU-Africa/Fall2024/alios/Lab6/Lab5/monitor_models$ 

```

| Monitoring Results: | | | | | | | |
|----------------------------|--------|-----------|-------------|-------------|---------|-------|-------|
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
| 2024-11-28 07:23:46.328521 | 3.016 | 3.538 | 1.838 | 5.000 | 0 | 0.514 | 0.171 |
| 2024-11-28 07:24:46.383511 | 3.000 | 3.322 | 1.698 | 5.089 | 0 | 0.322 | 0.107 |
| 2024-11-28 07:25:46.448694 | 3.015 | 3.121 | 1.459 | 4.750 | 0 | 0.106 | 0.035 |
| 2024-11-28 07:26:46.504148 | 3.000 | 2.939 | 1.450 | 4.523 | 0 | 0.061 | 0.020 |
| 2024-11-28 07:27:46.565006 | 3.000 | 2.789 | 1.303 | 4.303 | 0 | 0.211 | 0.070 |

Window Summary:
 Total Anomalies: 0
 Average MAE: 0.243
 Average MAPE: 0.081

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|--------|-----------|-------------|-------------|---------|-------|-------|
| 2024-11-28 07:24:46.383511 | 3.000 | 3.322 | 1.698 | 5.089 | 0 | 0.322 | 0.107 |
| 2024-11-28 07:25:46.448694 | 3.015 | 3.121 | 1.459 | 4.750 | 0 | 0.106 | 0.035 |
| 2024-11-28 07:26:46.504148 | 3.000 | 2.939 | 1.450 | 4.523 | 0 | 0.061 | 0.020 |
| 2024-11-28 07:27:46.565006 | 3.000 | 2.789 | 1.303 | 4.303 | 0 | 0.211 | 0.070 |

Window Summary:
 Total Anomalies: 1
 Average MAE: 349.603
 Average MAPE: 0.246

| Monitoring Results: | | | | | | | |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
| 2024-11-28 07:34:46.963945 | 1750.000 | 3.585 | 2.047 | 5.154 | 1 | 1746.415 | 0.998 |
| 2024-11-28 07:35:47.013504 | 1750.000 | 3.934 | 2.393 | 5.675 | 1 | 1746.066 | 0.998 |
| 2024-11-28 07:36:47.063657 | 1750.000 | 4.268 | 2.888 | 5.771 | 1 | 1745.732 | 0.998 |
| 2024-11-28 07:37:47.112634 | 1750.000 | 4.547 | 2.964 | 6.096 | 1 | 1745.453 | 0.997 |
| 2024-11-28 07:38:47.173846 | 1750.000 | 4.736 | 3.134 | 6.194 | 1 | 1745.264 | 0.997 |

Window Summary:
 Total Anomalies: 5
 Average MAE: 1745.786
 Average MAPE: 0.998

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-28 07:35:47.013504 | 1750.000 | 3.934 | 2.393 | 5.675 | 1 | 1746.066 | 0.998 |
| 2024-11-28 07:36:47.063657 | 1750.000 | 4.268 | 2.888 | 5.771 | 1 | 1745.732 | 0.998 |
| 2024-11-28 07:37:47.112634 | 1750.000 | 4.547 | 2.964 | 6.096 | 1 | 1745.453 | 0.997 |
| 2024-11-28 07:38:47.173846 | 1750.000 | 4.736 | 3.134 | 6.194 | 1 | 1745.264 | 0.997 |
| 2024-11-28 07:39:47.224549 | 1750.000 | 4.811 | 3.167 | 6.412 | 1 | 1745.189 | 0.997 |

Window Summary:
 Total Anomalies: 5
 Average MAE: 1745.541
 Average MAPE: 0.997

```

+-----+
| 2024-11-28 07:37:47.112634 | 1750.000 | 4.547 | 2.964 | 6.096 | 1 | 1745.453 | 0.997 |
+-----+
| 2024-11-28 07:38:47.173846 | 1750.000 | 4.736 | 3.134 | 6.194 | 1 | 1745.264 | 0.997 |
+-----+
| 2024-11-28 07:39:47.224549 | 1750.000 | 4.811 | 3.167 | 6.412 | 1 | 1745.189 | 0.997 |
+-----+
| 2024-11-28 07:40:47.277717 | 1750.000 | 4.759 | 3.179 | 6.424 | 1 | 1745.241 | 0.997 |
+-----+

```

Window Summary:
Total Anomalies: 5
Average MAE: 1745.376
Average MAPE: 0.997

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|---------|----------|-------|
| 2024-11-28 07:37:47.112634 | 1750.000 | 4.547 | 2.964 | 6.096 | 1 | 1745.453 | 0.997 |
| 2024-11-28 07:38:47.173846 | 1750.000 | 4.736 | 3.134 | 6.194 | 1 | 1745.264 | 0.997 |
| 2024-11-28 07:39:47.224549 | 1750.000 | 4.811 | 3.167 | 6.412 | 1 | 1745.189 | 0.997 |
| 2024-11-28 07:40:47.277717 | 1750.000 | 4.759 | 3.179 | 6.424 | 1 | 1745.241 | 0.997 |
| 2024-11-28 07:41:47.390851 | 3.466 | 4.589 | 2.999 | 6.199 | 0 | 1.123 | 0.324 |

Window Summary:
Total Anomalies: 4
Average MAE: 1396.454
Average MAPE: 0.863

```

+-----+
| 2024-11-28 07:40:47.277717 | 1750.000 | 4.759 | 3.179 | 6.424 | duration_m1 | 1745.241 | 0.997 |
+-----+
| 2024-11-28 07:41:47.390851 | 3.466 | 4.589 | 2.999 | 6.199 | 0 | 1.123 | 0.324 |
+-----+
| 2024-11-28 07:42:47.466148 | 3.016 | 4.328 | 2.742 | 5.960 | 0 | 1.305 | 0.433 |
+-----+
| 2024-11-28 07:43:47.543297 | 3.000 | 3.987 | 2.423 | 5.575 | 0 | 0.987 | 0.329 |
+-----+
| 2024-11-28 07:44:47.603127 | 3.000 | 3.627 | 1.997 | 5.338 | 0 | 0.627 | 0.289 |
+-----+

```

Window Summary:
Total Anomalies: 2
Average MAE: 698.769
Average MAPE: 0.616

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|----------|-----------|-------------|-------------|-------------|----------|-------|
| 2024-11-28 07:40:47.277717 | 1750.000 | 4.759 | 3.179 | 6.424 | duration_m1 | 1745.241 | 0.997 |
| 2024-11-28 07:41:47.390851 | 3.466 | 4.589 | 2.999 | 6.199 | 0 | 1.123 | 0.324 |
| 2024-11-28 07:42:47.466148 | 3.016 | 4.328 | 2.742 | 5.960 | 0 | 1.305 | 0.433 |
| 2024-11-28 07:43:47.543297 | 3.000 | 3.987 | 2.423 | 5.575 | 0 | 0.987 | 0.329 |
| 2024-11-28 07:44:47.603127 | 3.000 | 3.627 | 1.997 | 5.338 | 0 | 0.627 | 0.289 |

Window Summary:
Total Anomalies: 1
Average MAE: 349.856
Average MAPE: 0.458

Monitoring Results:

| Timestamp | Actual | Predicted | Lower Bound | Upper Bound | Anomaly | MAE | MAPE |
|----------------------------|--------|-----------|-------------|-------------|---------|-------|-------|
| 2024-11-28 07:41:47.390851 | 3.466 | 4.589 | 2.999 | 6.199 | 0 | 1.123 | 0.324 |
| 2024-11-28 07:42:47.466148 | 3.016 | 4.328 | 2.742 | 5.960 | 0 | 1.305 | 0.433 |
| 2024-11-28 07:43:47.543297 | 3.000 | 3.987 | 2.423 | 5.575 | 0 | 0.987 | 0.329 |
| 2024-11-28 07:44:47.603127 | 3.000 | 3.627 | 1.997 | 5.338 | 0 | 0.627 | 0.289 |
| 2024-11-28 07:45:47.669864 | 3.034 | 3.281 | 1.766 | 5.045 | 0 | 0.247 | 0.082 |

Window Summary:
Total Anomalies: 0
Average MAE: 0.000
Average MAPE: 0.000

Lab Task 5: Grafana dashboard: Screenshot of Grafana dashboard showing visualizations listed in Task 5

