

# I See Metrics: Anomaly Detection on OpenShift

AI Ops in the AI Center of Excellence

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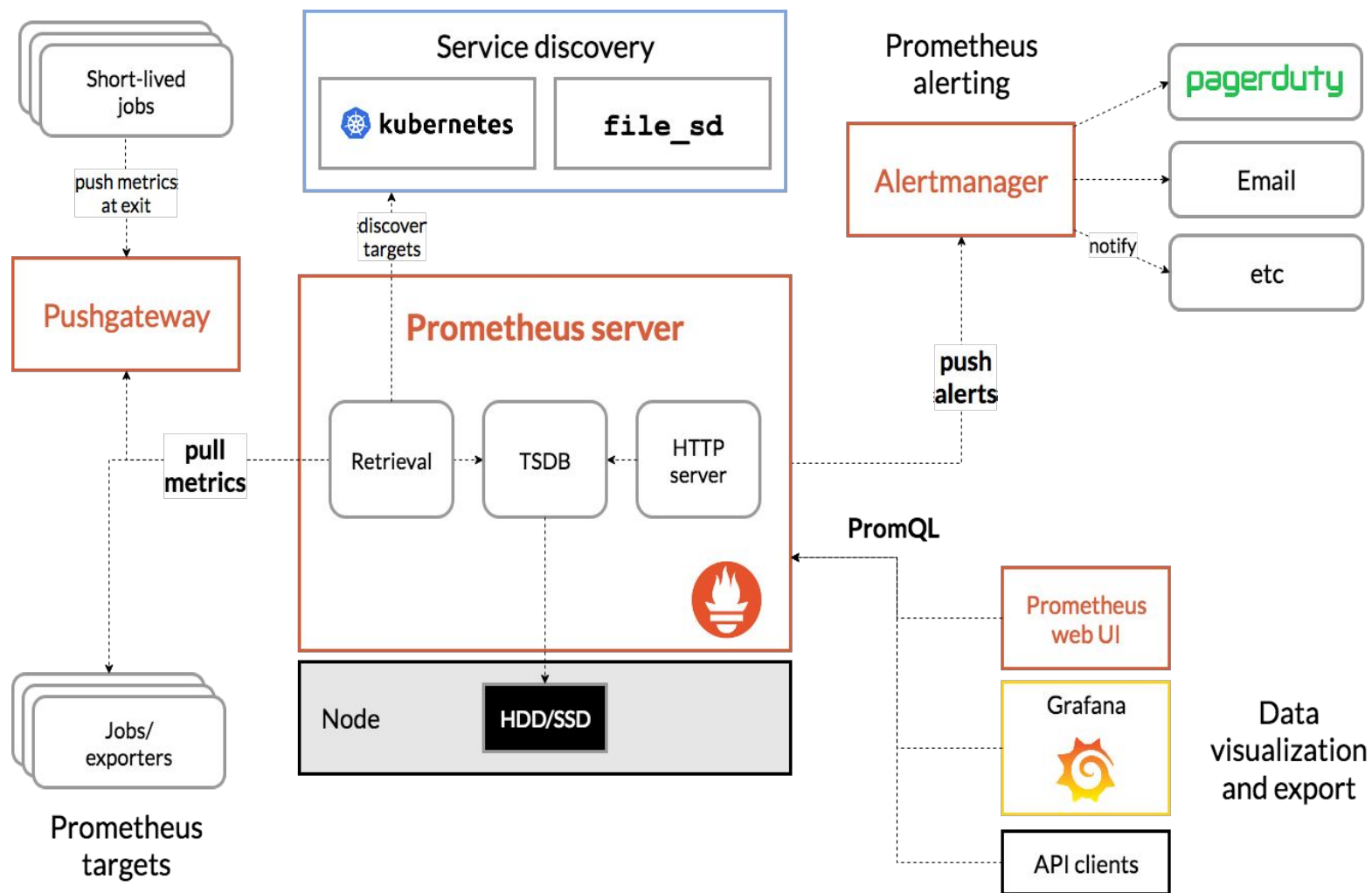
Monitoring → Applications → Prometheus

AI-backed anomaly  
detection for prometheus  
metrics.

## Goals of Workshop

- Understanding Prometheus
- Monitoring applications and its challenges
- Leveraging AI for better monitoring
- Data Science toolkit
- Anatomy of an anomaly
- Integrating anomaly detection pipeline into monitoring setup

# Prometheus



## Prometheus Metrics

Metric name	Labels	Timestamp	Sample Value
...			
http_requests_total{status="200",method="GET"}		@1434317560938	94355
http_requests_total{status="200",method="GET"}		@1434317561287	94934
http_requests_total{status="200",method="GET"}		@1434317562344	96483
http_requests_total{status="404",method="GET"}		@1434317560938	38473
http_requests_total{status="404",method="GET"}		@1434317561249	38544
http_requests_total{status="404",method="GET"}		@1434317562588	38663
http_requests_total{status="200",method="POST"}		@1434317560885	4748
http_requests_total{status="200",method="POST"}		@1434317561483	4795
http_requests_total{status="200",method="POST"}		@1434317562589	4833
http_requests_total{status="404",method="POST"}		@1434317560939	122
...			

- **Gauge** - Arbitrary up and down value
- **Counter** - Monotonically Increasing
- **Histogram** - Cumulative samples of values
- **Summary** - Snapshot of values in a time window

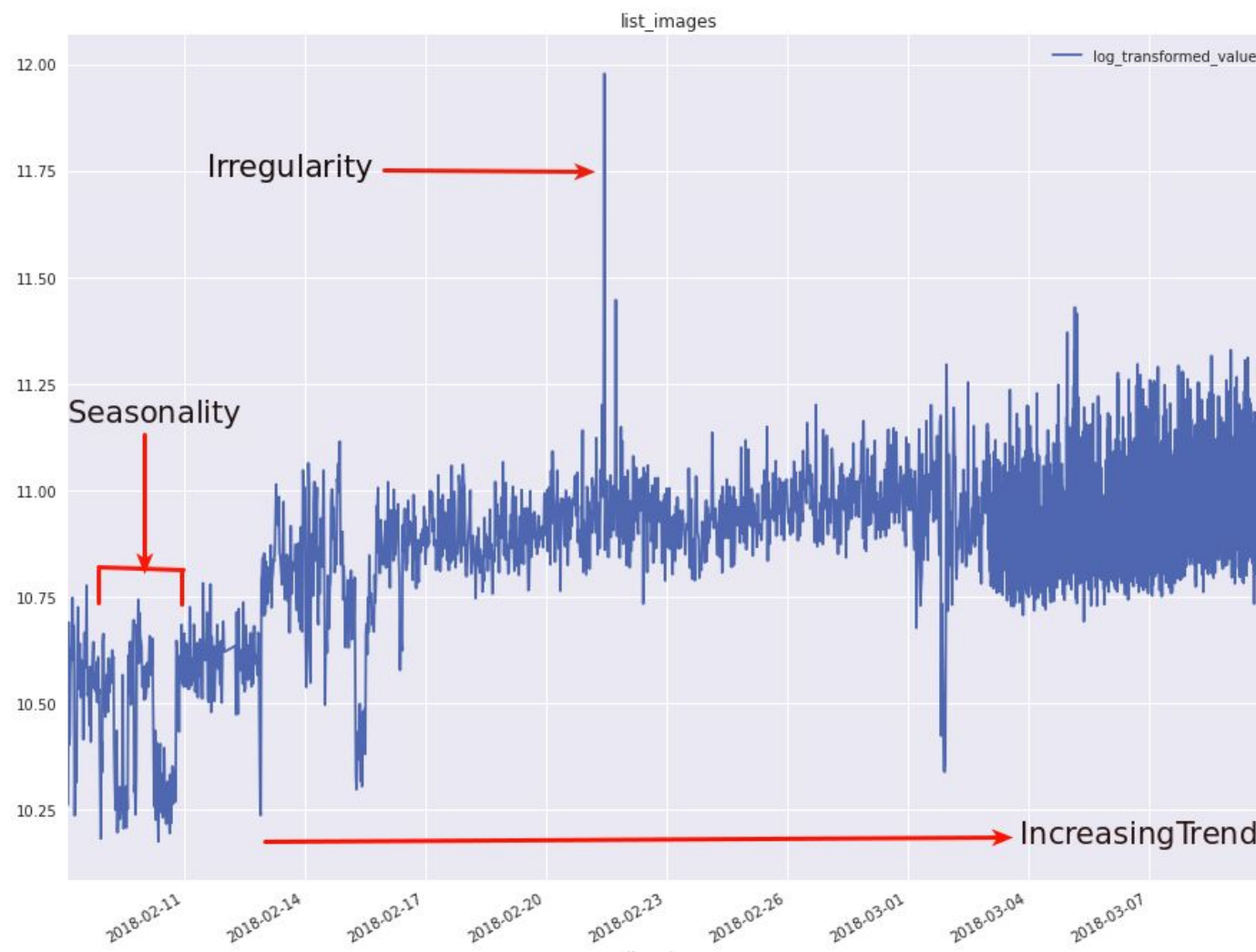
# Components of Time Series

## Trend

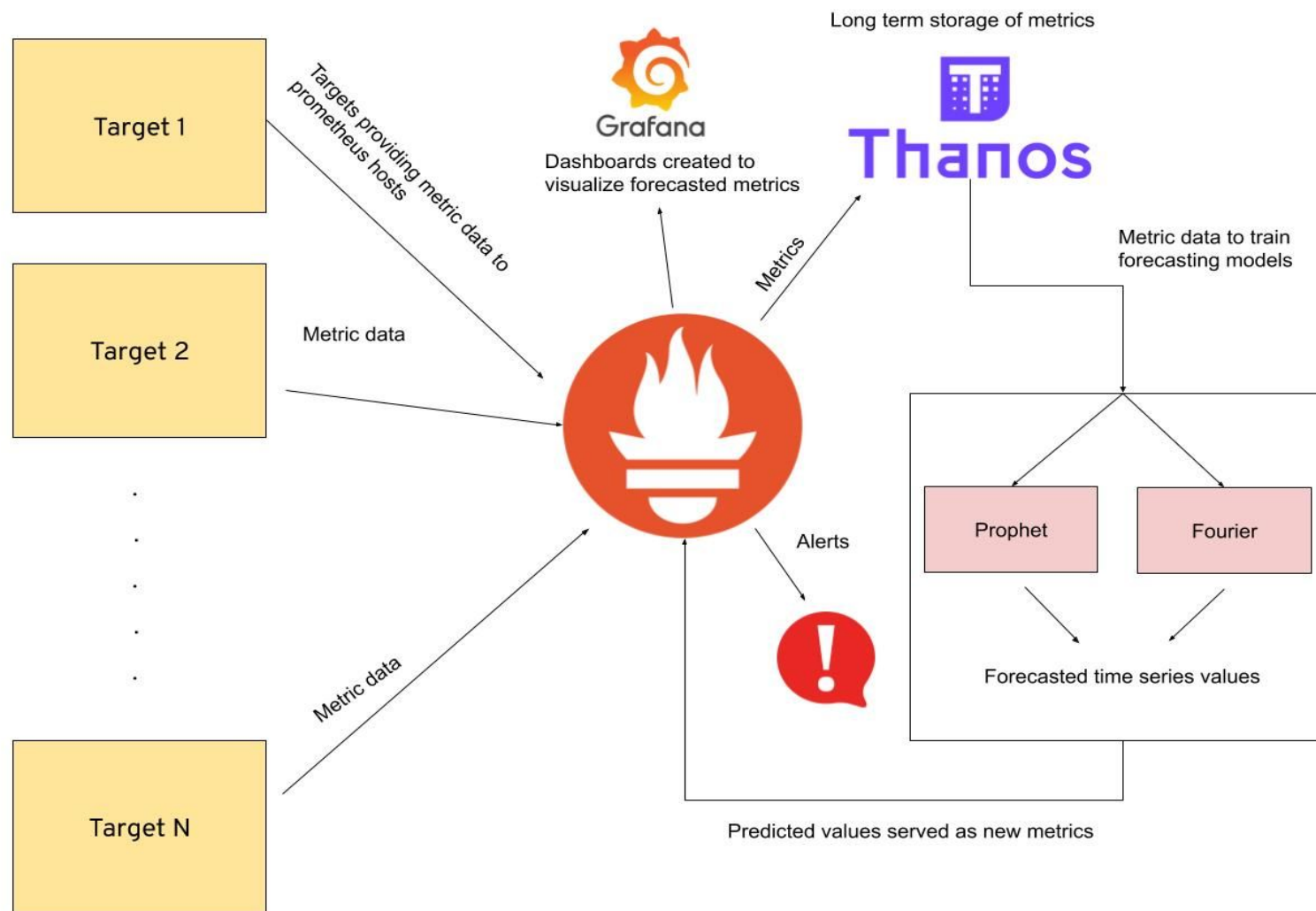
Increase or decrease in the series over a period of time.

## Seasonality

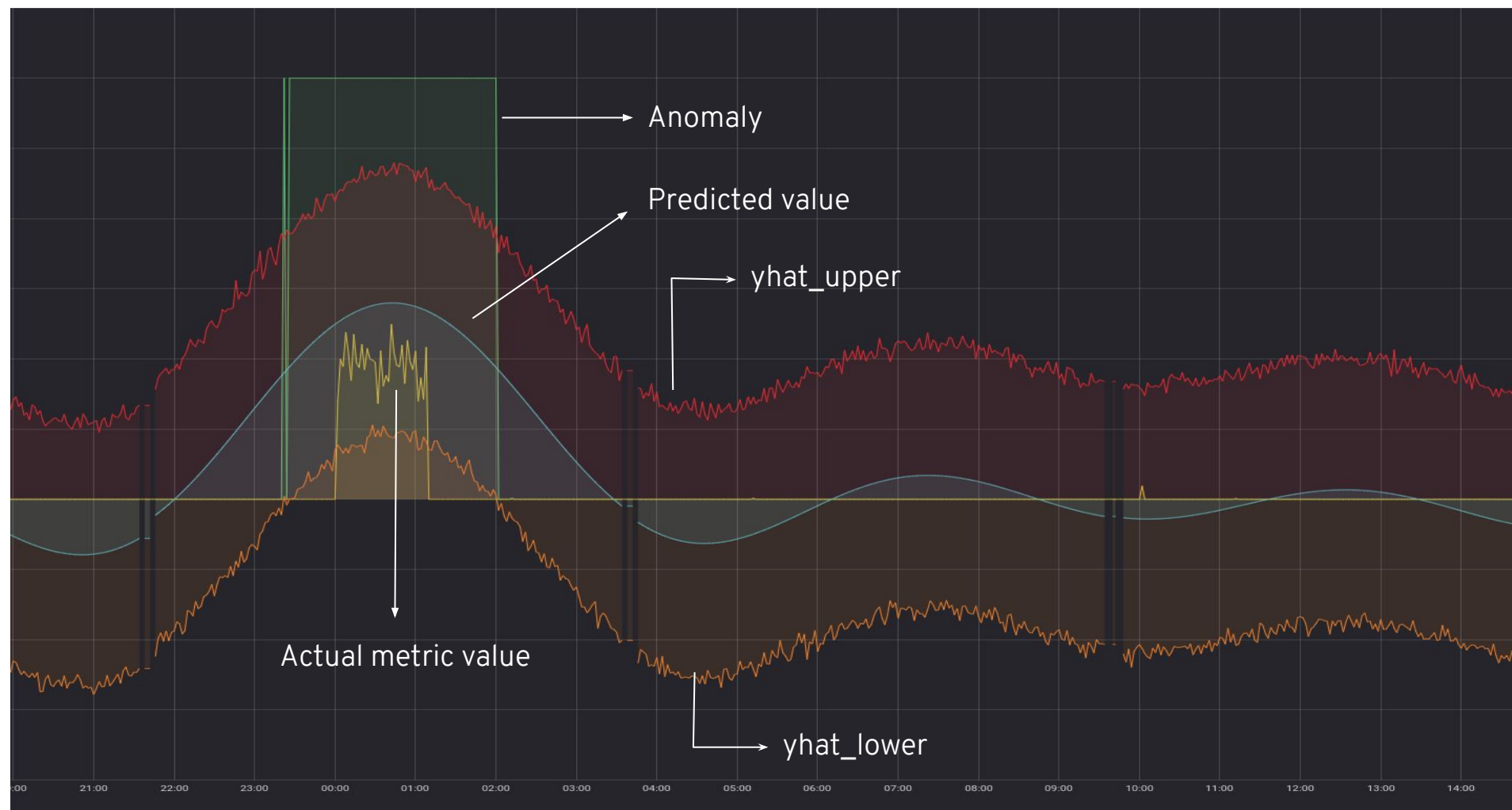
Regular pattern of up and down fluctuations. It is a short-term variation occurring due to seasonal factors.



# Implementation




# Grafana Dashboard Visualization





# Alerting on Anomalies



Sesheta Bot 16 mins

**Prometheus Alert** 🚨:

**Anomaly detected by Prophet** in instance  
**anomaly-detection-demo-aiops-prod-prometheus-**  
**predict.cloud.paas.psi.redhat.com:80.**  
Job: **anomaly-detector-demo-app**  
Severity: **HIGH**  
Status: **firing**

[OPEN THE ALERT](#)

Prometheus Alerts Graph Status Help

## Alerts

☐ Show annotations

**Anomaly detected by Prophet (1 active)**

```
alert: Anomaly
  detected by Prophet
expr: flask_http_request_total_prophet{instance="anomaly-detection-demo-aiops-prod-prometheus-predict.cloud.paas.psi.redhat.com:80",job="anomaly-detector-demo-app",method="GET",status="200",value_type="anomaly"}
== 1
for: 5m
annotations:
  severity: HIGH
  summary: Anomaly detected by Prophet
```

Labels	State	Active Since	Value
<code>alertname="Anomaly detected by Prophet"</code> <code>instance="anomaly-detection-demo-aiops-prod-prometheus-predict.cloud.paas.psi.redhat.com:80"</code> <code>job="anomaly-detector-demo-app"</code> <code>method="GET"</code> <code>status="200"</code> <code>value_type="anomaly"</code>	<b>FIRING</b>	2019-10-14 20:49:17.978105206 +0000 UTC	1

1 alert for alertname=Anomaly detected by Prophet

[View In AlertManager](#)

[1] Firing

**Labels**

alertname = Anomaly detected by Prophet  
instance = [anomaly-detection-demo-aiops-prod-prometheus-predict.cloud.paas.psi.redhat.com:80](#)  
job = anomaly-detector-demo-app  
method = GET  
monitor = prometheus  
replica = \$(HOSTNAME)  
status = 200  
value\_type = anomaly

**Annotations**

severity = HIGH  
summary = Anomaly detected by Prophet

[Source](#)

[Sent by AlertManager](#)

# Model Testing

- For a given timeframe of a metric, with known anomalies, the PAD can also be run in **test-mode** to check whether the models reported back these anomalies. The accuracy and performance of the models can then be logged as metrics to MLFlow for comparing the results.

## MLflow Tracking

Record and query experiments: code, data, config, and results.

[Read more](#)

## MLflow Projects

Packaging format for reproducible runs on any platform.

[Read more](#)

## MLflow Models

General format for sending models to diverse deployment tools.

[Read more](#)

MLFlow: <https://mlflow.org/>

mlflow

GitHub Docs

Experiments

Default

go\_gc\_duration\_seconds:rat...

go\_gc\_duration\_seconds:rat...

go\_gc\_duration\_seconds\_sum

badger\_disk\_writes:rate1m

badger\_disk\_reads:rate1m

badger\_disk\_writes:rate1m

Experiment ID: 4Artifact Location: ./mlruns/4

Search

Expression: metrics.rmse < 1 and params.model = "tree"

State: Active

Search

Params: alpha, lr

Metrics: rmse, r2

Clear

4 matching runs

Compare

Delete

Download CSV

	Date	User	Run Name	Source	Version	Parameters	Metrics
	2019-08-19 16:43:14	asanmukh	test_...			retraining_inter... 360 rolling_training... 9 days, 23:59:5... true_anomaly_t... 0.001	Accuracy: 74.166666666... Forecasted ano... 0 Ground truth a... 93 Number of test ... 360 RMSE: 8.36456790295... Total ground tru... 628 Total true positi... 258 Total true positi... 0.41082802547... true_anomaly_... 0.15652173913...
	2019-08-12 09:47:32	hemaveer...	test_...		dc5dc7	retraining_inter... 15 rolling_data_wi... 24h true_anomaly_t... 0.001	Accuracy: 80 Forecasted ano... 0 Ground truth a... 3 Number of test ... 15

## References

- Project Repository: <https://github.com/AICoE/prometheus-anomaly-detector>
- Prometheus API Client: <https://github.com/AICoE/prometheus-api-client-python>
- Mojo blog post:  
<https://mojo.redhat.com/groups/red-hat-artificial-intelligence-center-of-excellence-ai-coe/blog/2019/09/10/prometheus-anomaly-detection-for-thoth-dgraph-metrics>
- Team Mail list: [aicoe-aiops@redhat.com](mailto:aicoe-aiops@redhat.com)
- GChat: AICoE - AIOps

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