Working with Azure Cognitive Services Anomaly Detector

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Overview

Provisioning Azure Cognitive Services

- Endpoint URL and API keys

Anomaly Detection API concepts

- Stream vs. batch detection mode
- API sensitivity
- Preparing time series data for the API

Detect outlier data using Anomaly Detector API

- Using the REST API and SDK (.NET)

Demo: Working with the Anomaly Detector API

Provisioning Anomaly Detector Resource

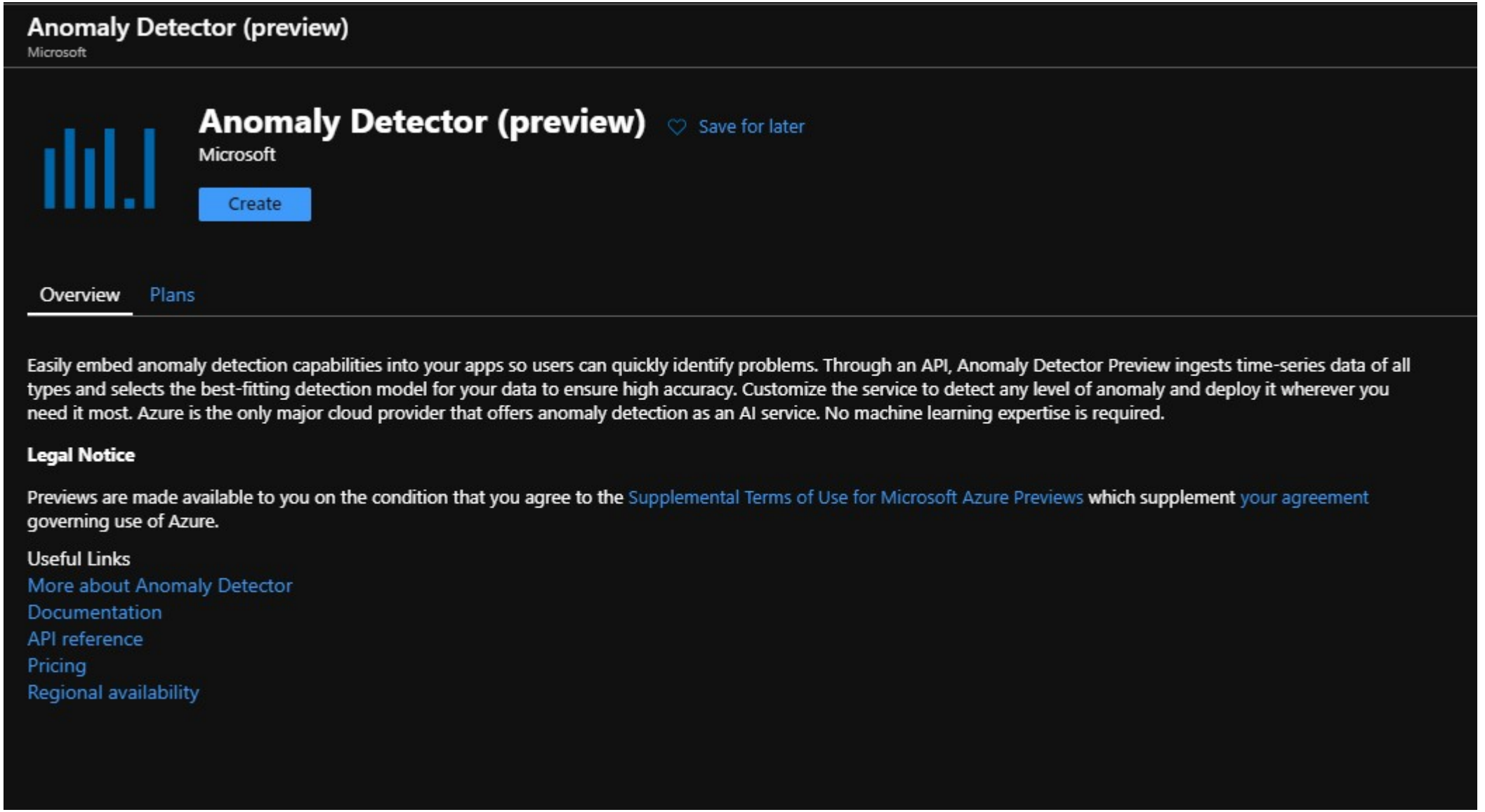
Using the Anomaly Detector API

Provisioning an Azure Cognitive Services Instance

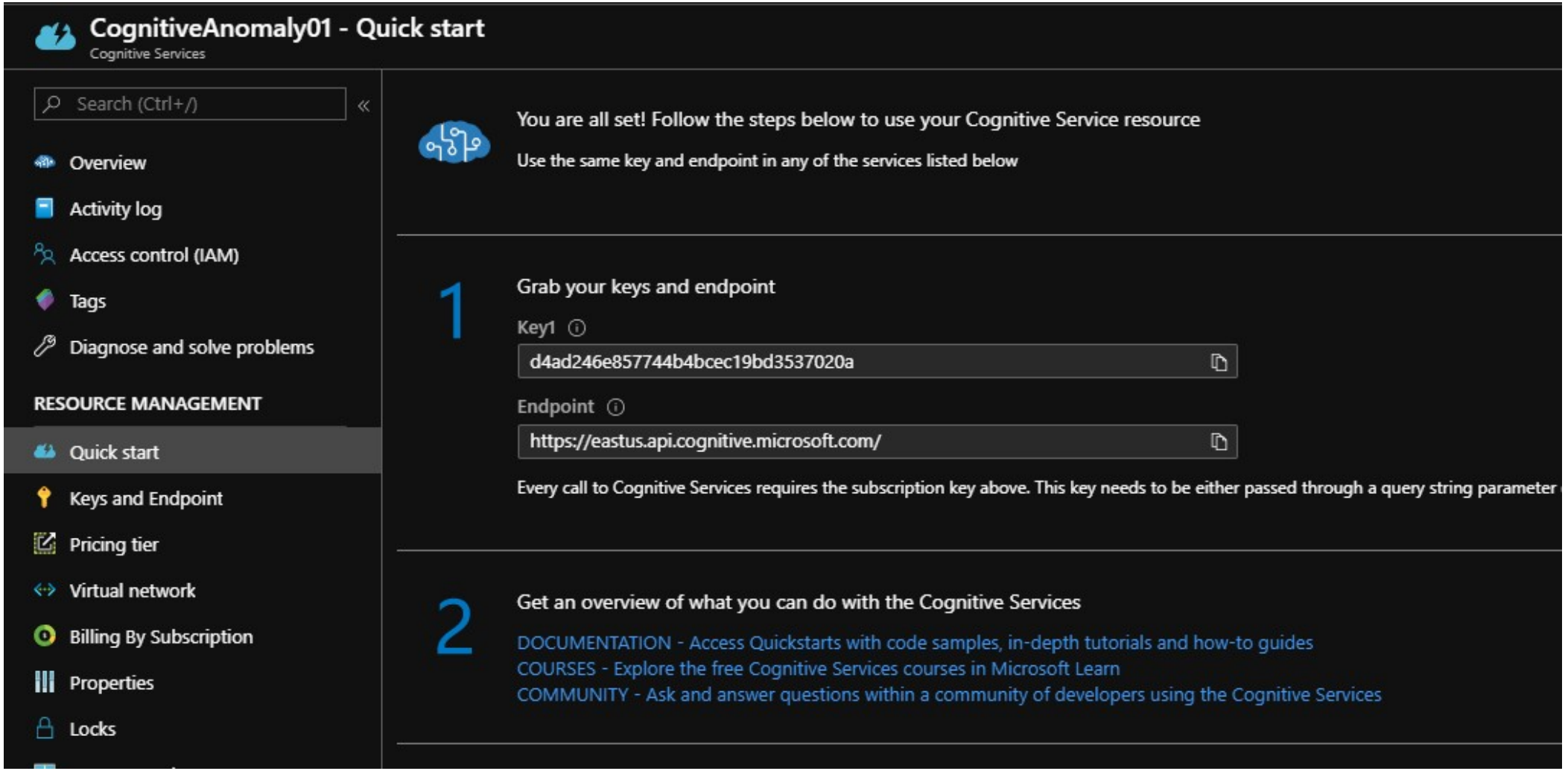
Get the API endpoint and URL

Call the API using the endpoint and key

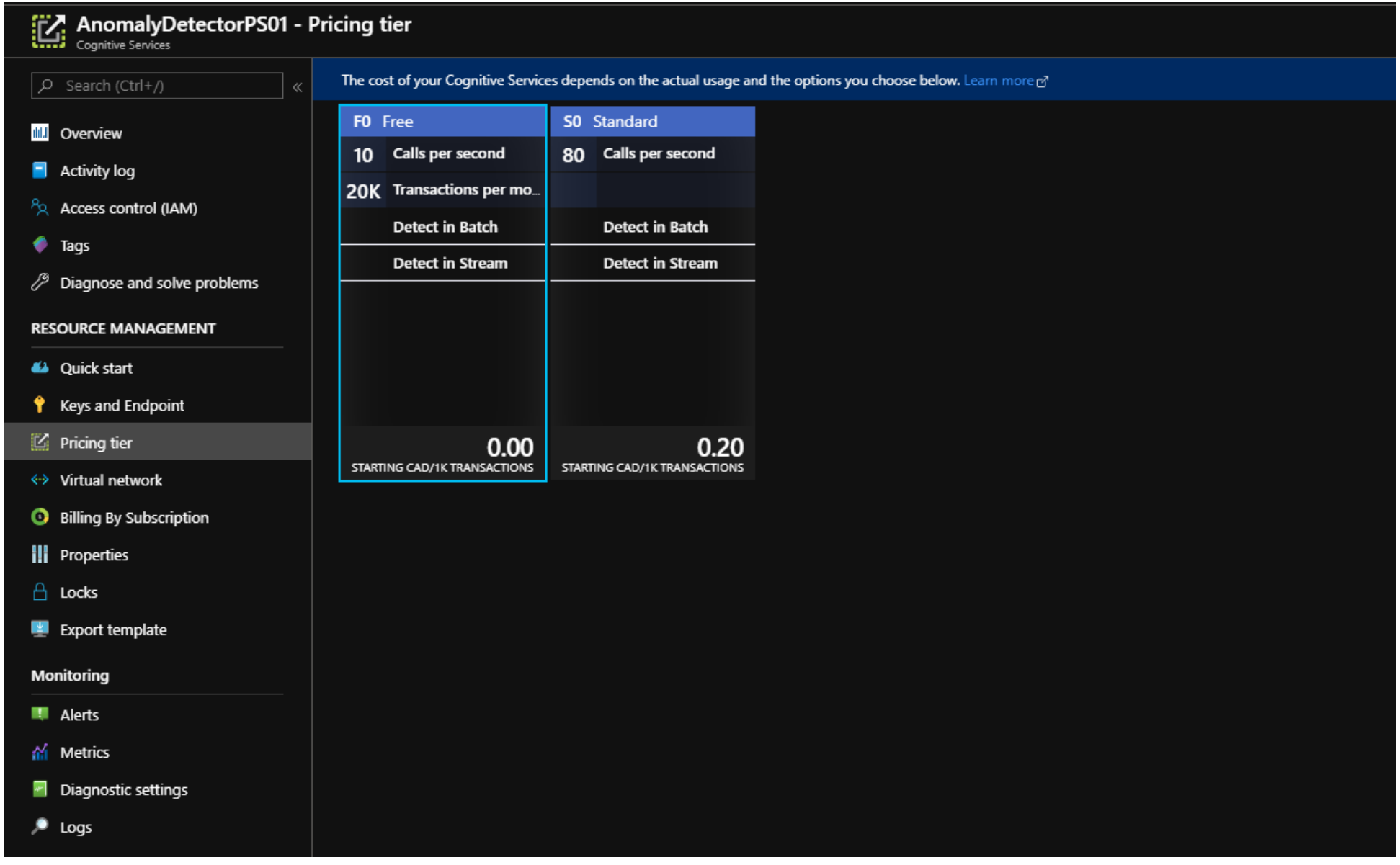
Create an Anomaly Detector Resource



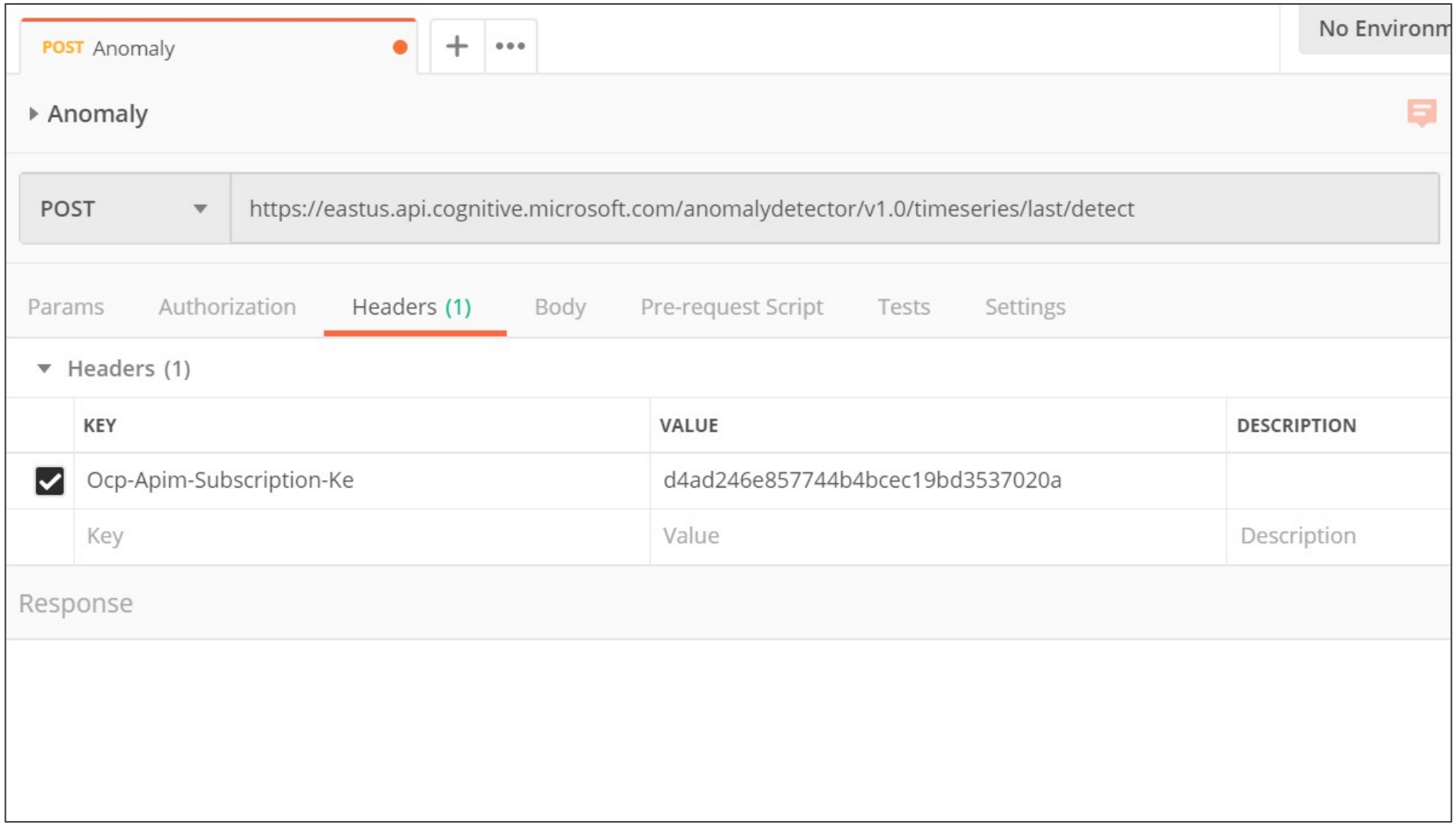
Anomaly Detector API Endpoint and Key



Anomaly Detector API Endpoint and Key



Anomaly Detector API Call



Anomaly Detector API Concepts

Anomaly Detector API Concepts

Anomaly detection mode (stream vs. batch)

API sensitivity (lower and upper boundaries)

Preparing the time series data for the API

Anomaly Detection Mode

Stream

Detecting the anomaly status of latest data point only

Batch

Detecting anomalies through entire times series data

Batch Anomaly Detection Mode

To detect anomalies through entire time series dataset

Is not recommended for monitoring live data

Good for seasonal data with occasional anomalies

Good for flat trend data with occasional spikes or dips

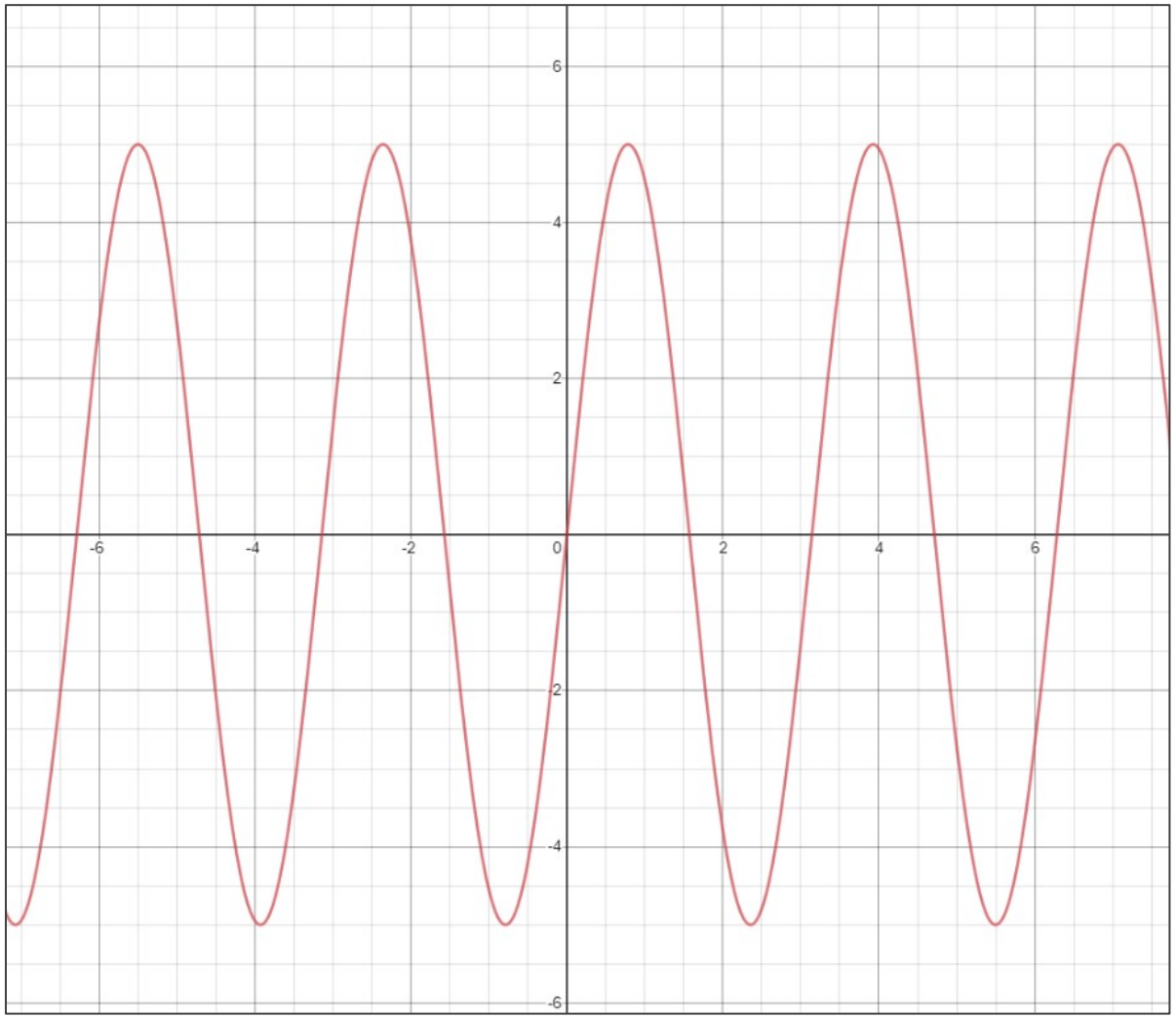
Seasonal Data

Weather data

Traffic on vacation days

Repeated over a fixed period

Daily, weekly, etc.



Stream Anomaly Detection Mode

Is recommended for live data monitoring

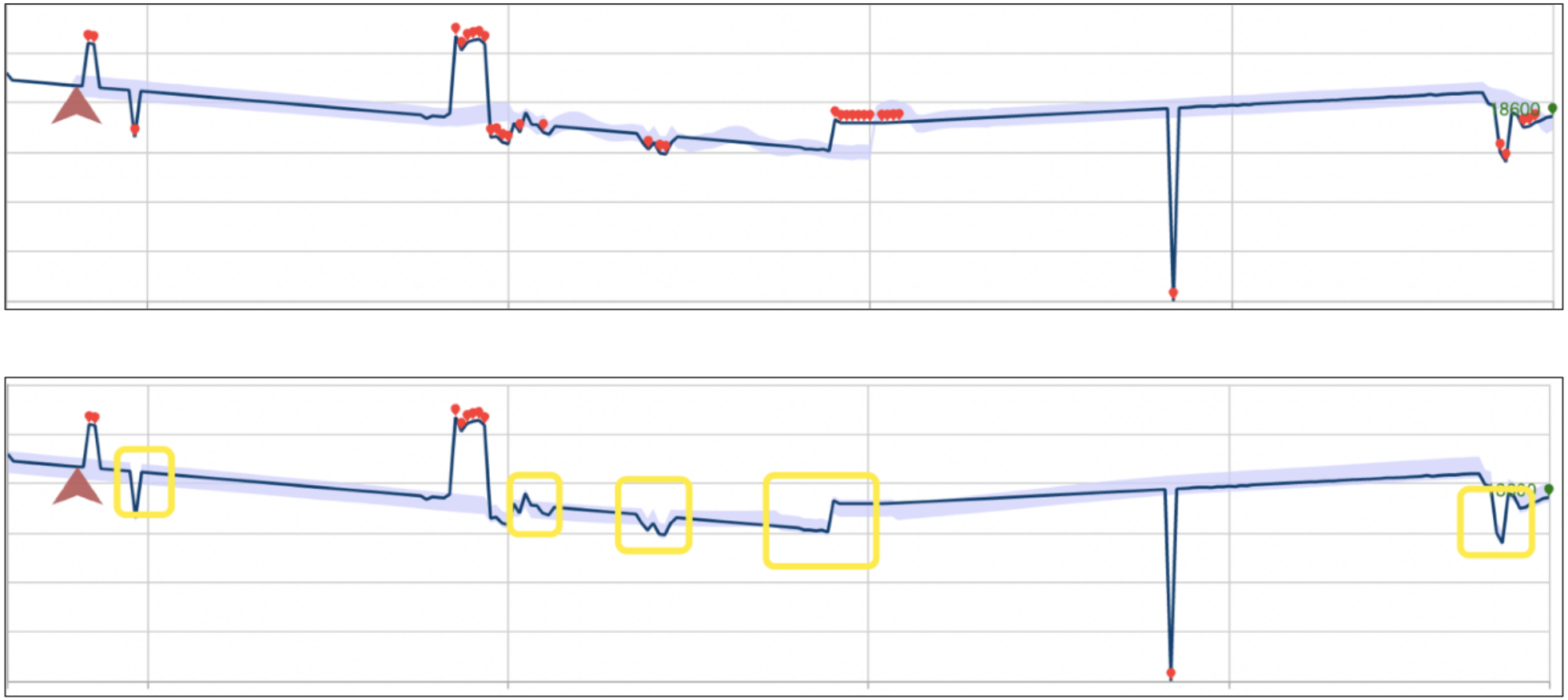
Faster than batch detection mode

Only detects anomaly for the last data point

Batch detection uses only one ML model for the whole batch.

The detection for each point is done in the context of whole series.

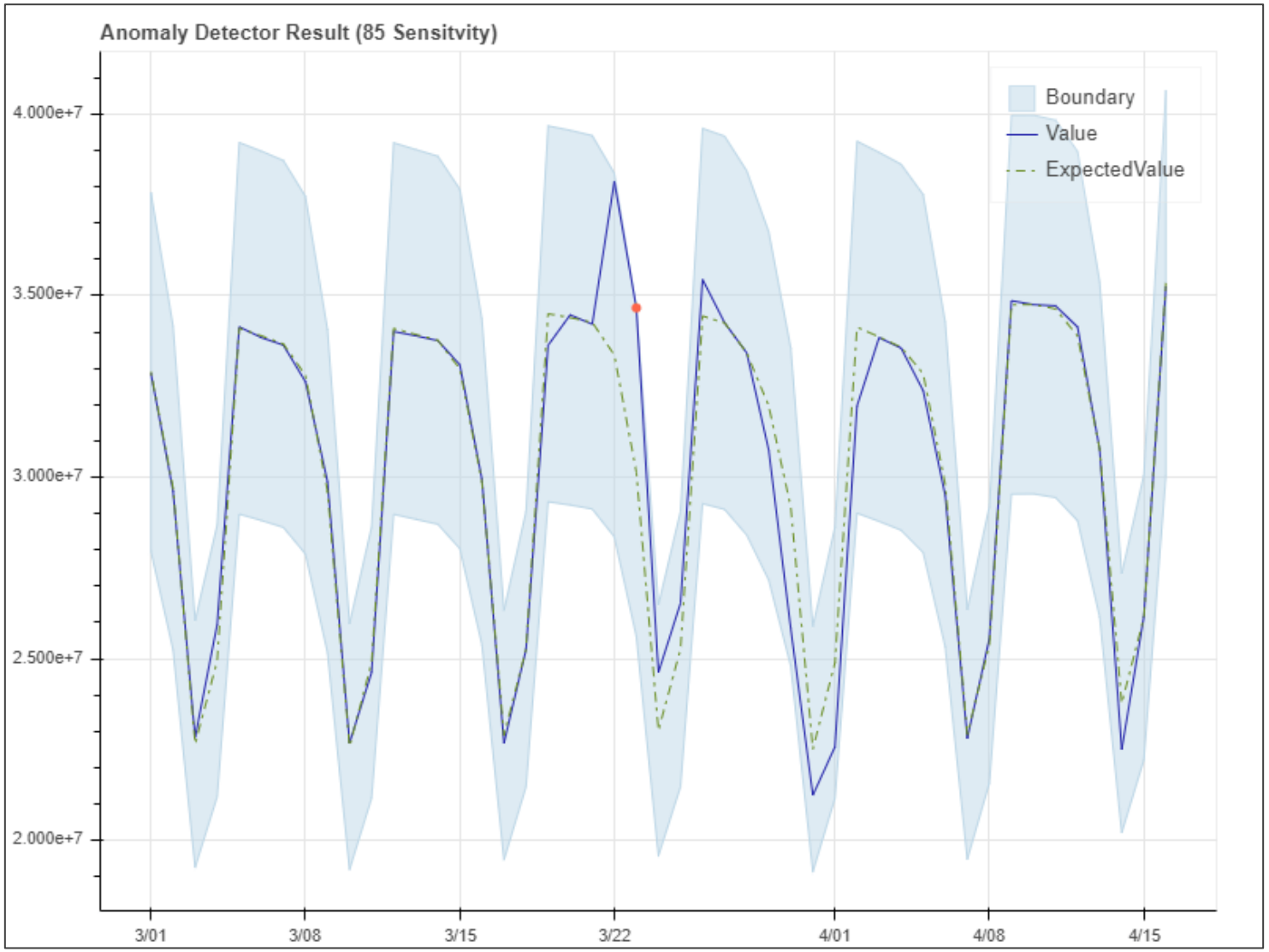
Batch vs. Stream Detection Performance



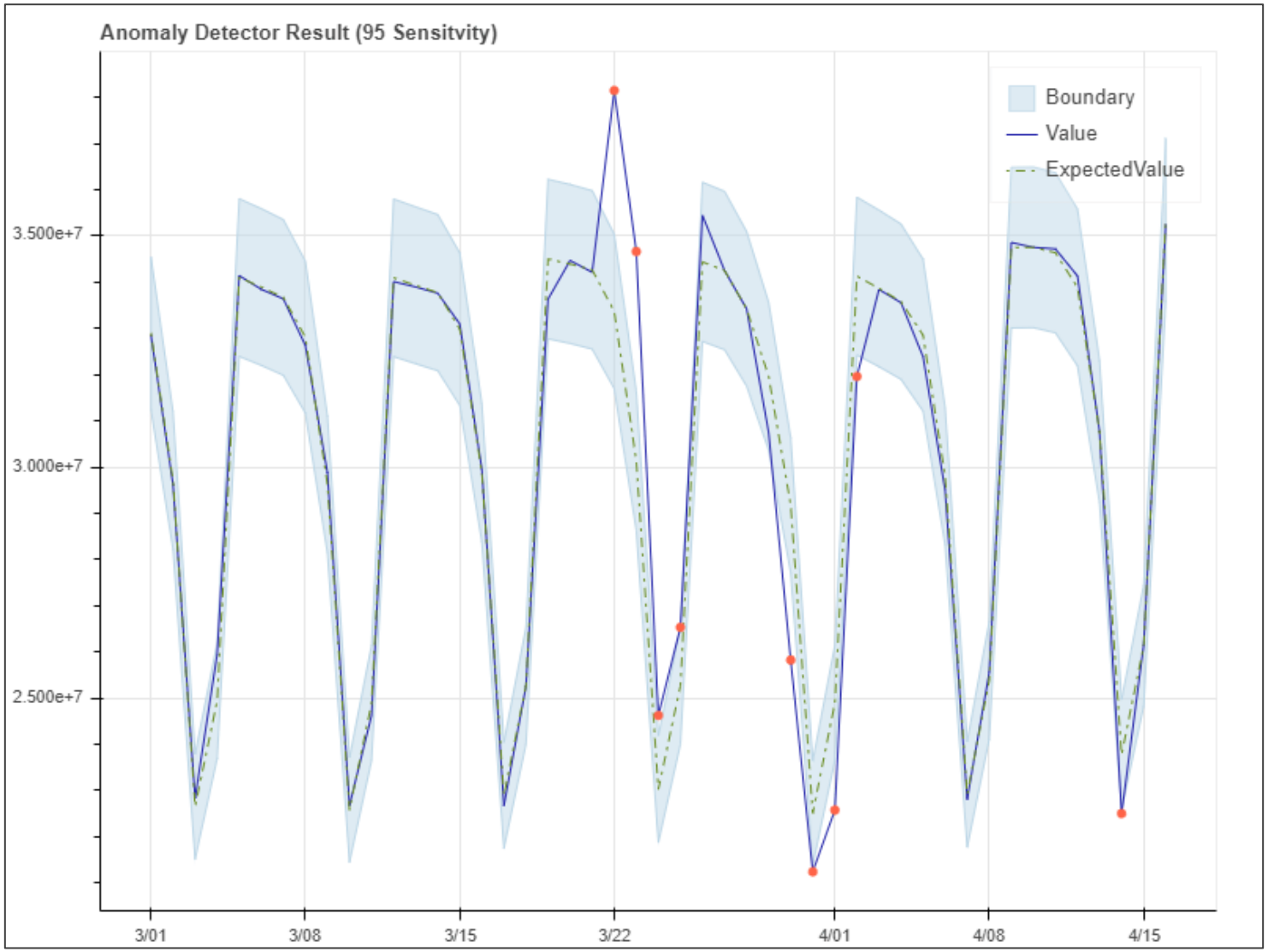
Images from Microsoft Documentation

The API sensitivity can be adjusted to meet your needs.

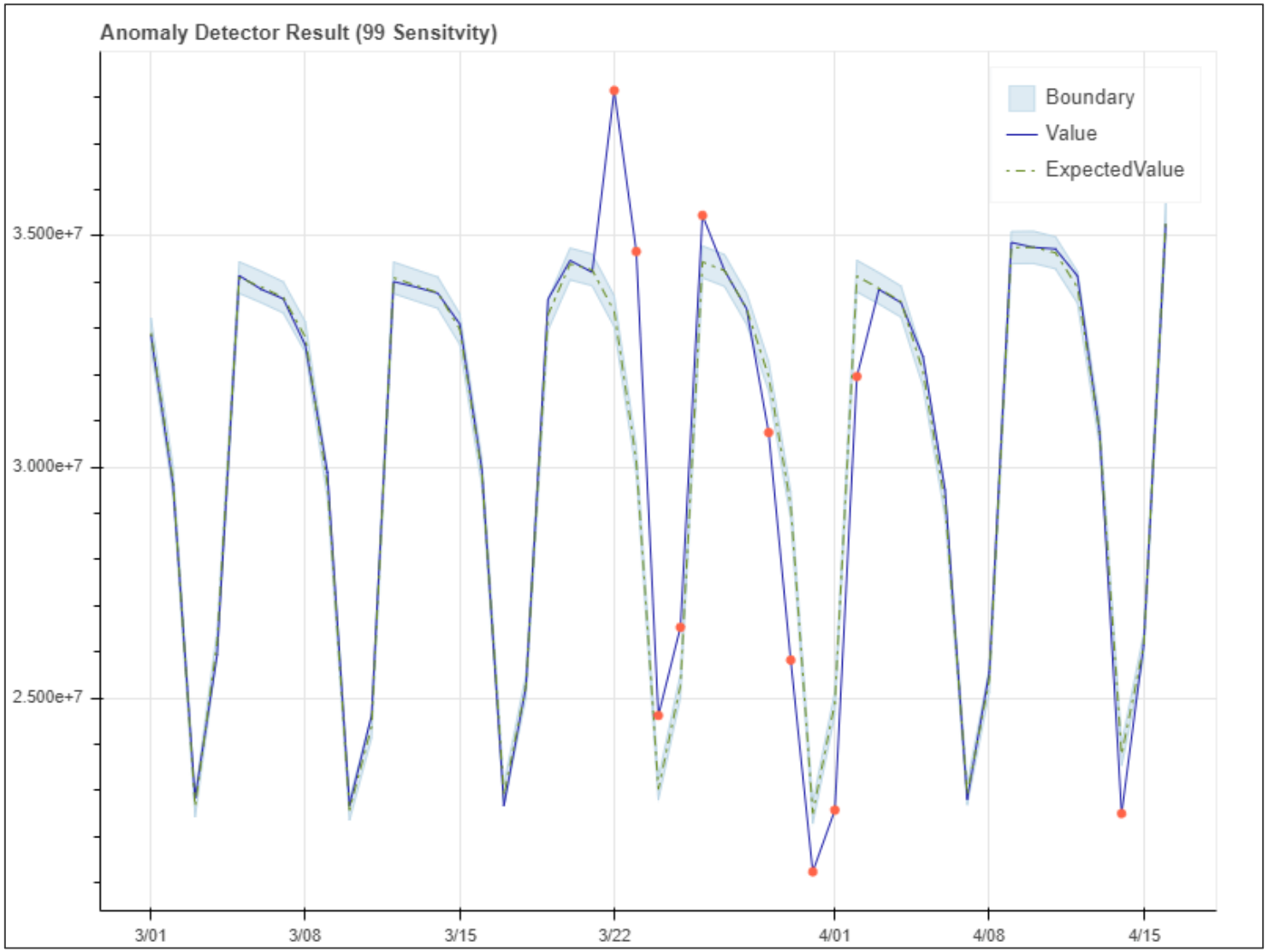
API Sensitivity



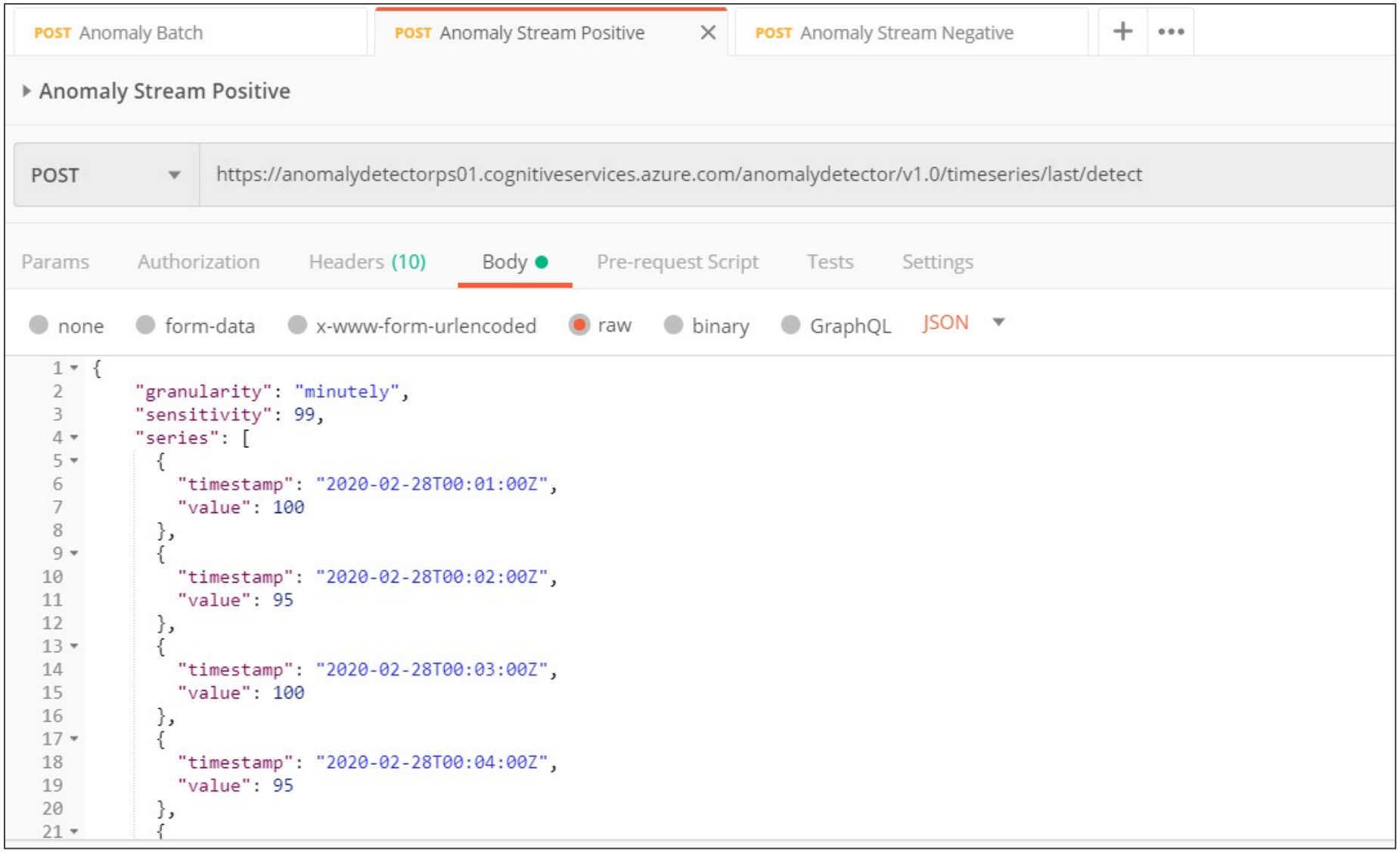
API Sensitivity



API Sensitivity



API Sensitivity



Preparing the Time Series Data

- Data point granularity
- Recommended number of data points for seasonal data
- Data point number limits
- Missing data points

Granularity is the rate your data is sampled at.

Granularity Enum

Namespace: Microsoft.Azure.CognitiveServices.AnomalyDetector.Models

Assembly: Microsoft.Azure.CognitiveServices.AnomalyDetector.dll

Defines values for Granularity.

C# Copy

```
[Newtonsoft.Json.JsonConverter(typeof(Newtonsoft.Json.Converters.StringEnumConverter))]
public enum Granularity
```

Inheritance Enum → Granularity

Attributes JsonConverterAttribute

Fields

Daily	3
Hourly	4
Minutely	5
Monthly	1
Weekly	2
Yearly	0

Data Point Granularity

JSON

```
{
    "granularity": "Hourly",
    "series": [
      {
        "timestamp": "2020-02-01T00:00:00Z",
        "value": 12810
      },
      {
        "timestamp": "2020-02-01T01:00:00Z",
        "value": 11200
      },
    ]
}
```

```
{
    "granularity" : "minutely",
    "customInterval" : 3
}
```

```
{
    "granularity" : "daily",
    "customInterval" : 15
}
```

Improve Accuracy and Response Time For Seasonal Data

Improve the API latency by 50% by specifying the “period” parameter

Improve the API accuracy by passing 4 periods worth of data plus 1

Weekly traffic data sampled hourly:
period=7*24 , data worth: (7 x 24 x 4) + 1 = 673

Data Point Limitation

Minimum allowed

12 data points

Maximum allowed

8640 data points

Short intervals

Make sure the maximum limit is not exceeded

Missing Data Points

Missing Data Points

Missing data points can happen especially for fine data granularities

Missing less than 10% of the expected data points should not have negative impact on results

If more than 10% missing, fill the gap by methods such as moving averages, etc.

Calling the Anomaly Detector API

Calling the Anomaly Detector API

Client SDK

Available for
C#, Python, Node.js

REST API

Any language supporting
HTTP calls

```
dotnet add package
Microsoft.Azure.CognitiveServices.AnomalyDetector
```

Anomaly Detector SDK (.NET)

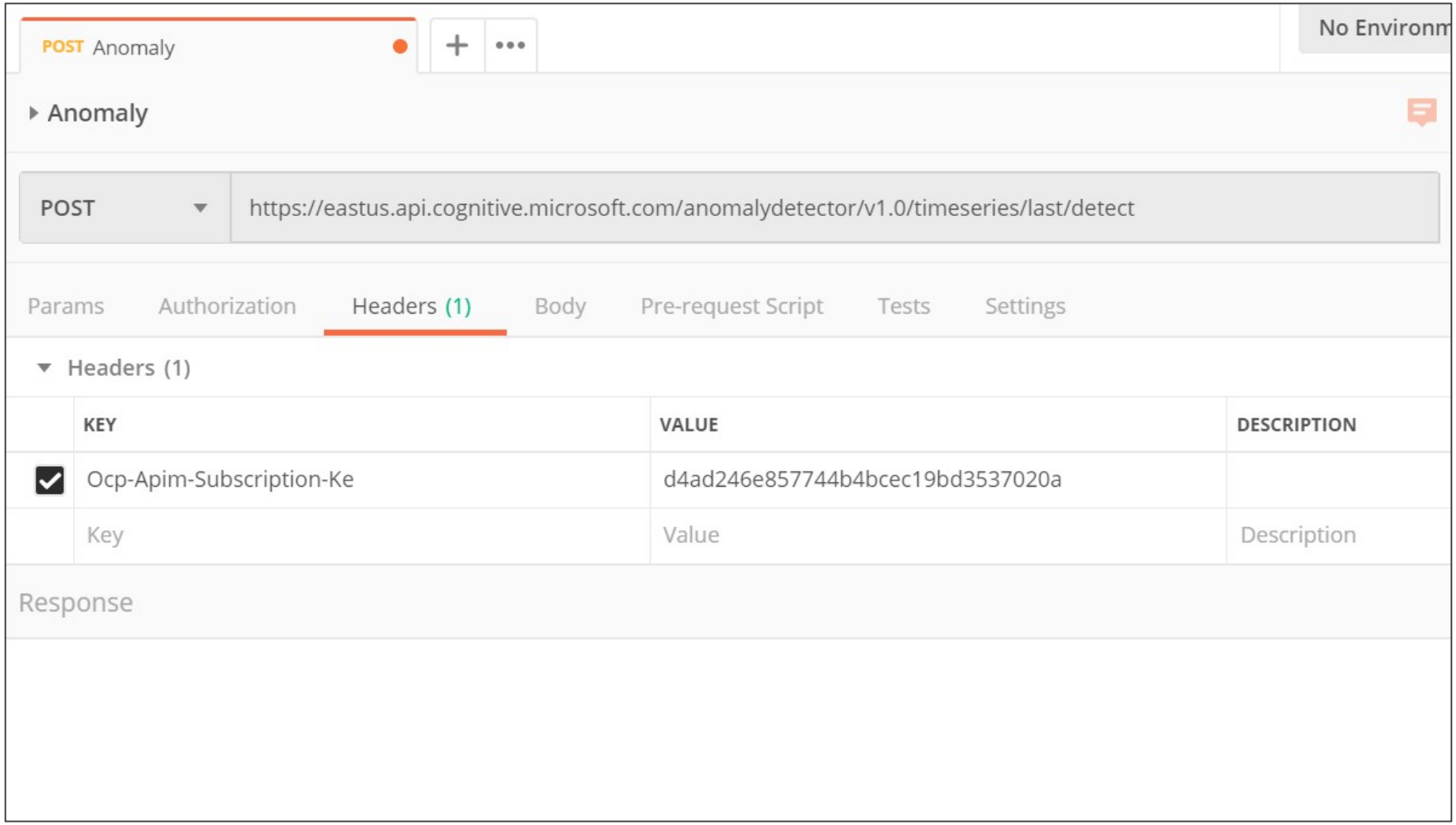
```
dotnet add package
Microsoft.Azure.CognitiveServices.AnomalyDetector
```

```
using Microsoft.Azure.CognitiveServices.AnomalyDetector;

using Microsoft.Azure.CognitiveServices.AnomalyDetector.Models;
```

Anomaly Detector SDK (.NET)

Anomaly Detector REST API

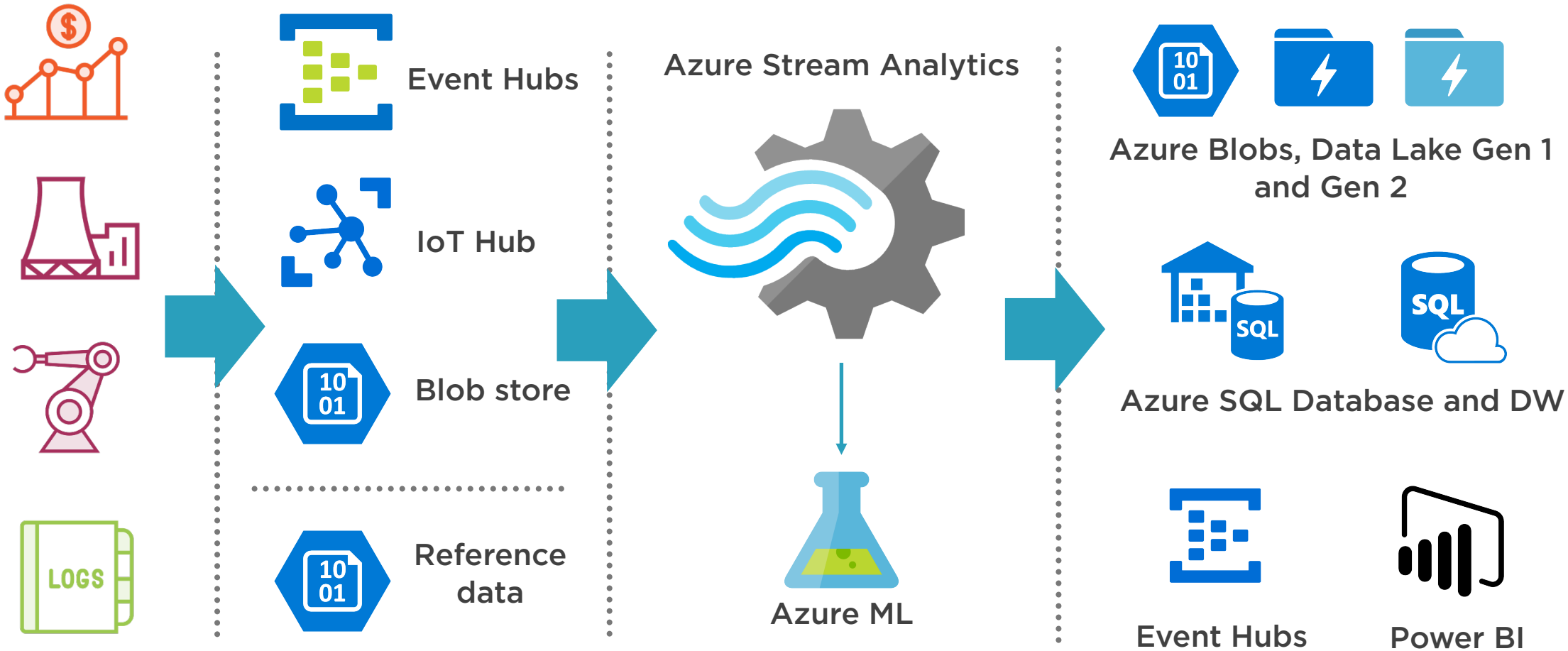


Anomaly Detection in Azure Stream Analytics

Azure Stream Analytics

A fully managed, real-time analytics service designed to process fast moving streams of data.

Azure Stream Analytics

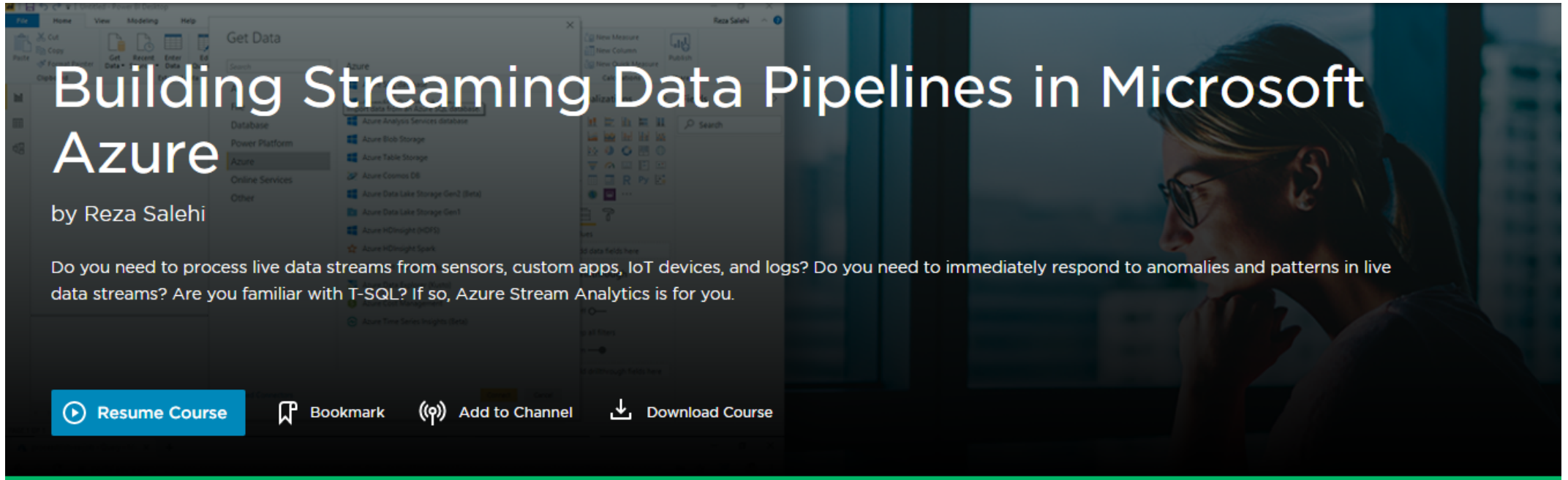


Anomaly Detection in Azure Stream Analytics

Azure Stream Analytics offers built-in anomaly detection powered by machine learning

Perform anomaly detection directly in your Stream Analytics job

AnomalyDetection_SpikeAndDip and AnomalyDetection_ChangePoint functions



Building Streaming Data Pipelines in Microsoft Azure

by Reza Salehi

Do you need to process live data streams from sensors, custom apps, IoT devices, and logs? Do you need to immediately respond to anomalies and patterns in live data streams? Are you familiar with T-SQL? If so, Azure Stream Analytics is for you.

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This course is part of: Microsoft Azure Data Engineer (DP-200) Path | Building Data Pipelines in Microsoft Azure Path

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Azure Stream Analytics Overview	✓	37m 54s
Configure Azure Stream Analytics with Event Hub and Blob Storage Inputs	✓	23m 8s
Query Data Using Azure Stream Analytics	✓	35m 0s
Implement Azure Stream Analytics Data Visualization with PowerBI	✓	20m 49s

Activity

Think of a sample time series data to use with Anomaly Detector.

Activity

Try the module demos with your own data.

Demo

Provisioning an Azure Cognitive Services instance

Get the API endpoint and key

Demo

Detecting anomalies in time series data with the SDK for .NET Core

Demo

Detecting anomalies in time series data with the REST API

- Stream
- Batch

Demo

Detecting anomalies using a live demo from Microsoft

- https://aka.ms/addemo

Summary

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Thank you!