

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 (preview)
Microsoft

**Anomaly Detector (preview)** [Save for later](#)
Microsoft
[Create](#)

[Overview](#) [Plans](#)

Easily embed anomaly detection capabilities into your apps so users can quickly identify problems. Through an API, Anomaly Detector Preview ingests time-series data of all types and selects the best-fitting detection model for your data to ensure high accuracy. Customize the service to detect any level of anomaly and deploy it wherever you need it most. Azure is the only major cloud provider that offers anomaly detection as an AI service. No machine learning expertise is required.


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Useful Links

- [More about Anomaly Detector](#)
- [Documentation](#)
- [API reference](#)
- [Pricing](#)
- [Regional availability](#)

Anomaly Detector API Endpoint and Key

 **CognitiveAnomaly01 - Quick start**
Cognitive Services

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

RESOURCE MANAGEMENT

Quick start

Keys and Endpoint


Pricing tier

Virtual network

Billing By Subscription

Properties

Locks

 You are all set! Follow the steps below to use your Cognitive Service resource

Use the same key and endpoint in any of the services listed below

1

Grab your keys and endpoint

Key1 ⓘ
d4ad246e857744b4bcec19bd3537020a

Endpoint ⓘ
https://eastus.api.cognitive.microsoft.com/

Every call to Cognitive Services requires the subscription key above. This key needs to be either passed through a query string parameter

2

Get an overview of what you can do with the Cognitive Services


[DOCUMENTATION](#) - Access Quickstarts with code samples, in-depth tutorials and how-to guides

[COURSES](#) - Explore the free Cognitive Services courses in Microsoft Learn


[COMMUNITY](#) - Ask and answer questions within a community of developers using the Cognitive Services





Anomaly Detector API Endpoint and Key


 **AnomalyDetectorPS01 - Pricing tier**
Cognitive Services


Search (Ctrl+ /) <<

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 Properties


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 Export template

Monitoring

 Alerts

 Metrics

 Diagnostic settings

 Logs

The cost of your Cognitive Services depends on the actual usage and the options you choose below. [Learn more](#)

F0 Free		S0 Standard	
10	Calls per second	80	Calls per second
20K	Transactions per mo...		
Detect in Batch		Detect in Batch	
Detect in Stream		Detect in Stream	
0.00 STARTING CAD/1K TRANSACTIONS		0.20 STARTING CAD/1K TRANSACTIONS	



Anomaly Detector API Call

POST Anomaly

No Environment

▶ Anomaly

POST

https://eastus.api.cognitive.microsoft.com/anomalydetector/v1.0/timeseries/last/detect

Params

Authorization

Headers (1)

Body

Pre-request Script

Tests

Settings

▼ Headers (1)

	KEY	VALUE	DESCRIPTION
<input checked="" type="checkbox"/>	Ocp-Apim-Subscription-Key	d4ad246e857744b4bcec19bd3537020a	
	Key	Value	Description

Response



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



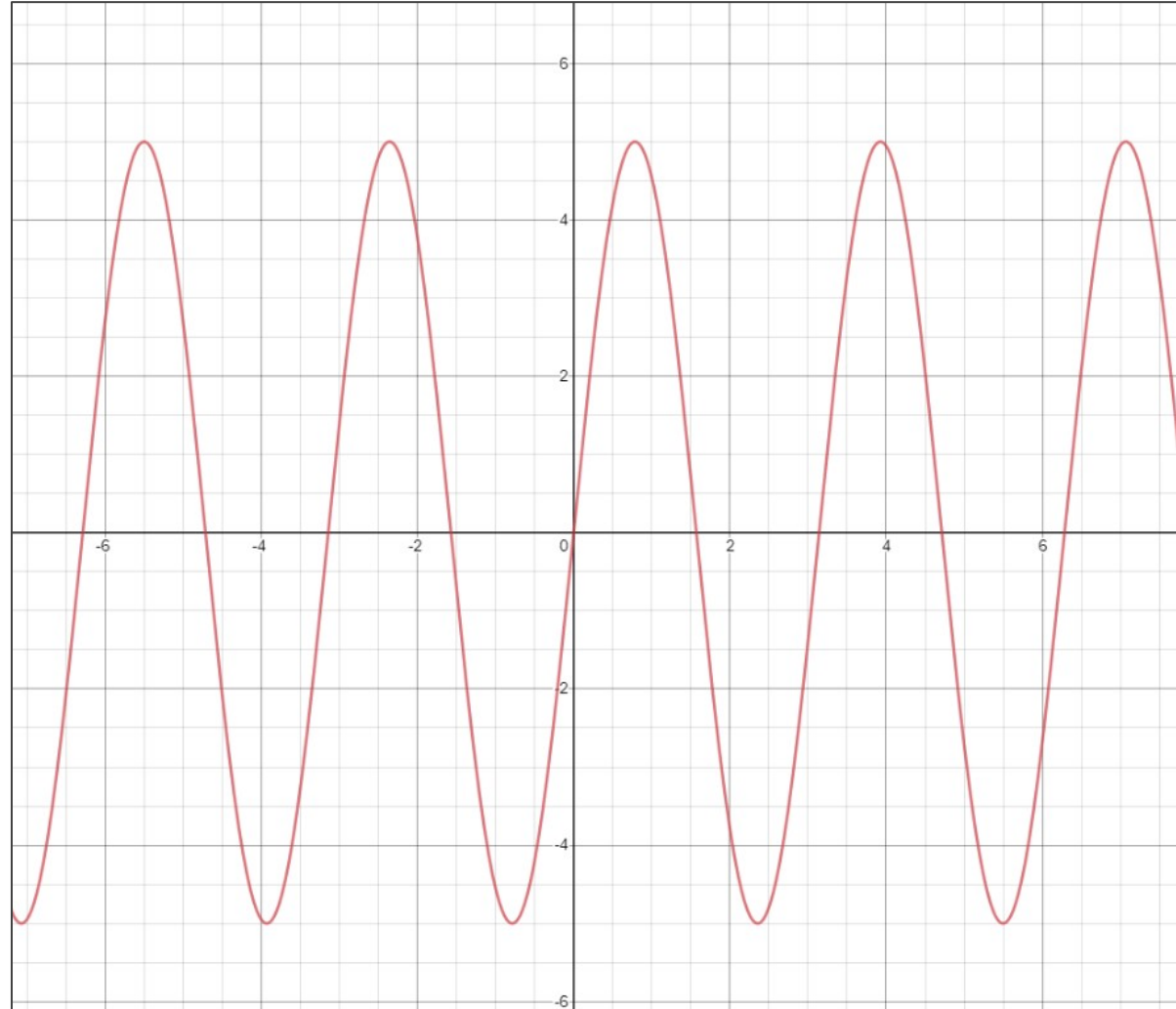
Seasonal Data

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



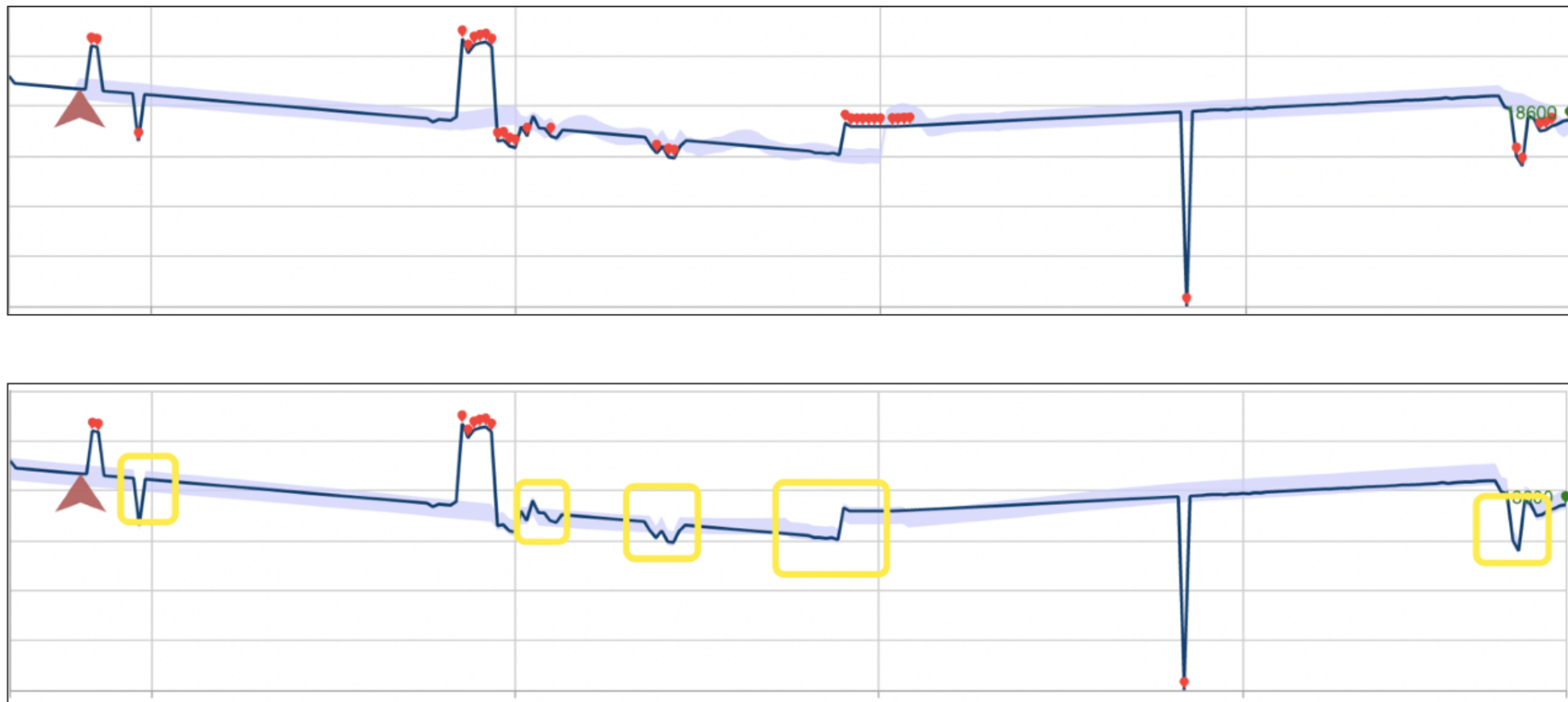
Batch detection uses only one ML model for the whole batch.



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



Batch vs. Stream Detection Performance



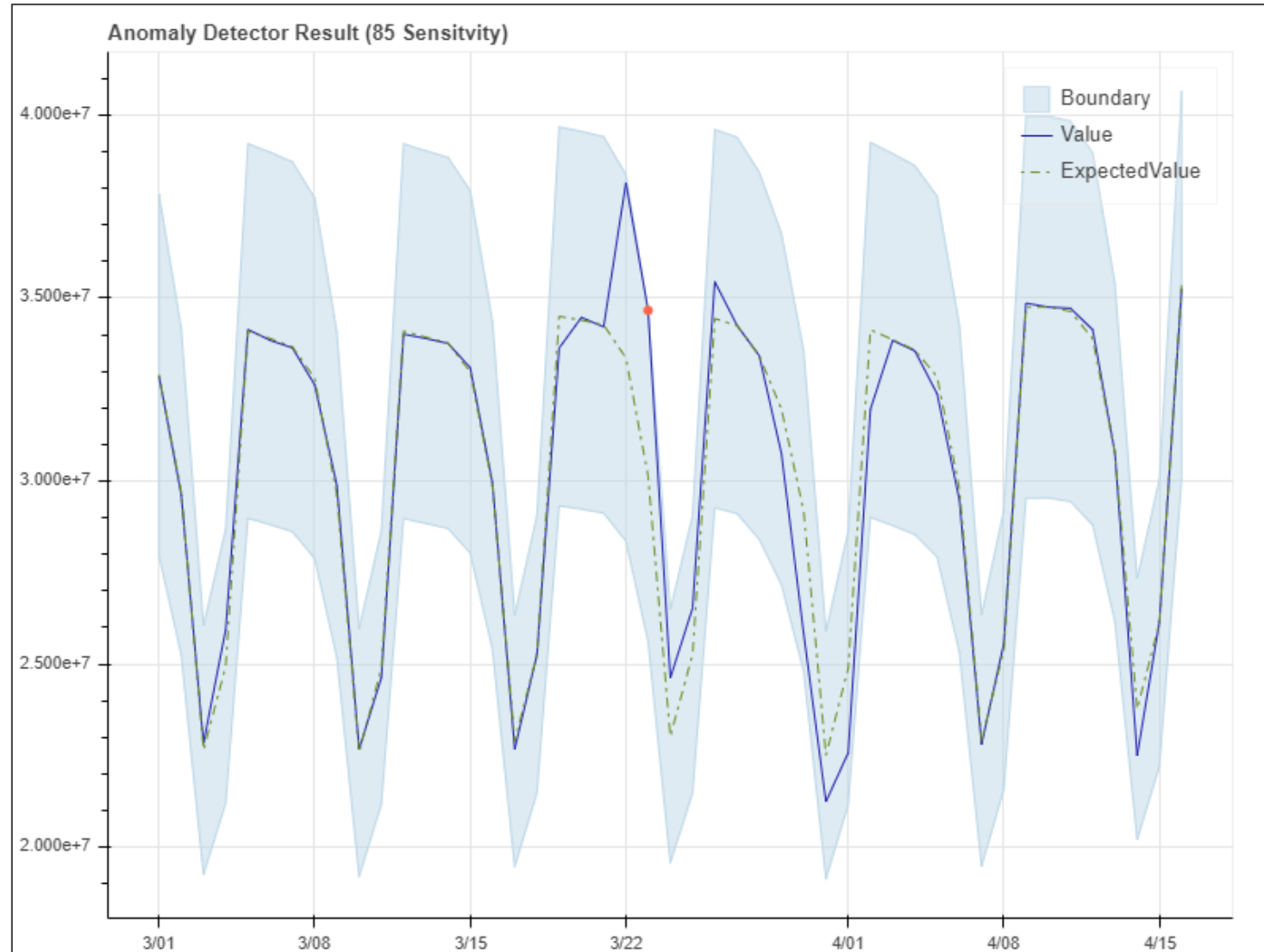
*Images from Microsoft
Documentation*



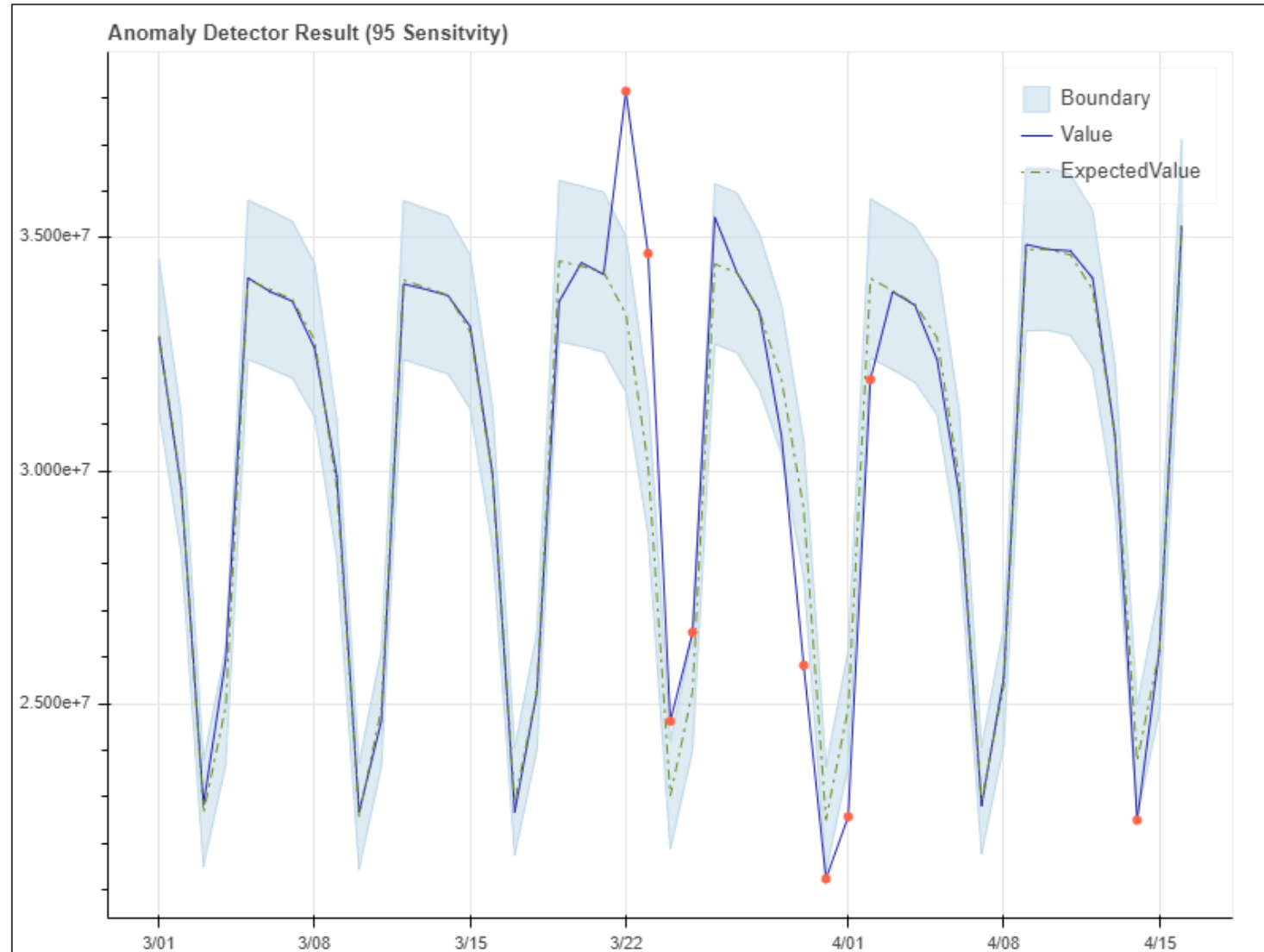
The API sensitivity can be
adjusted to meet your
needs.



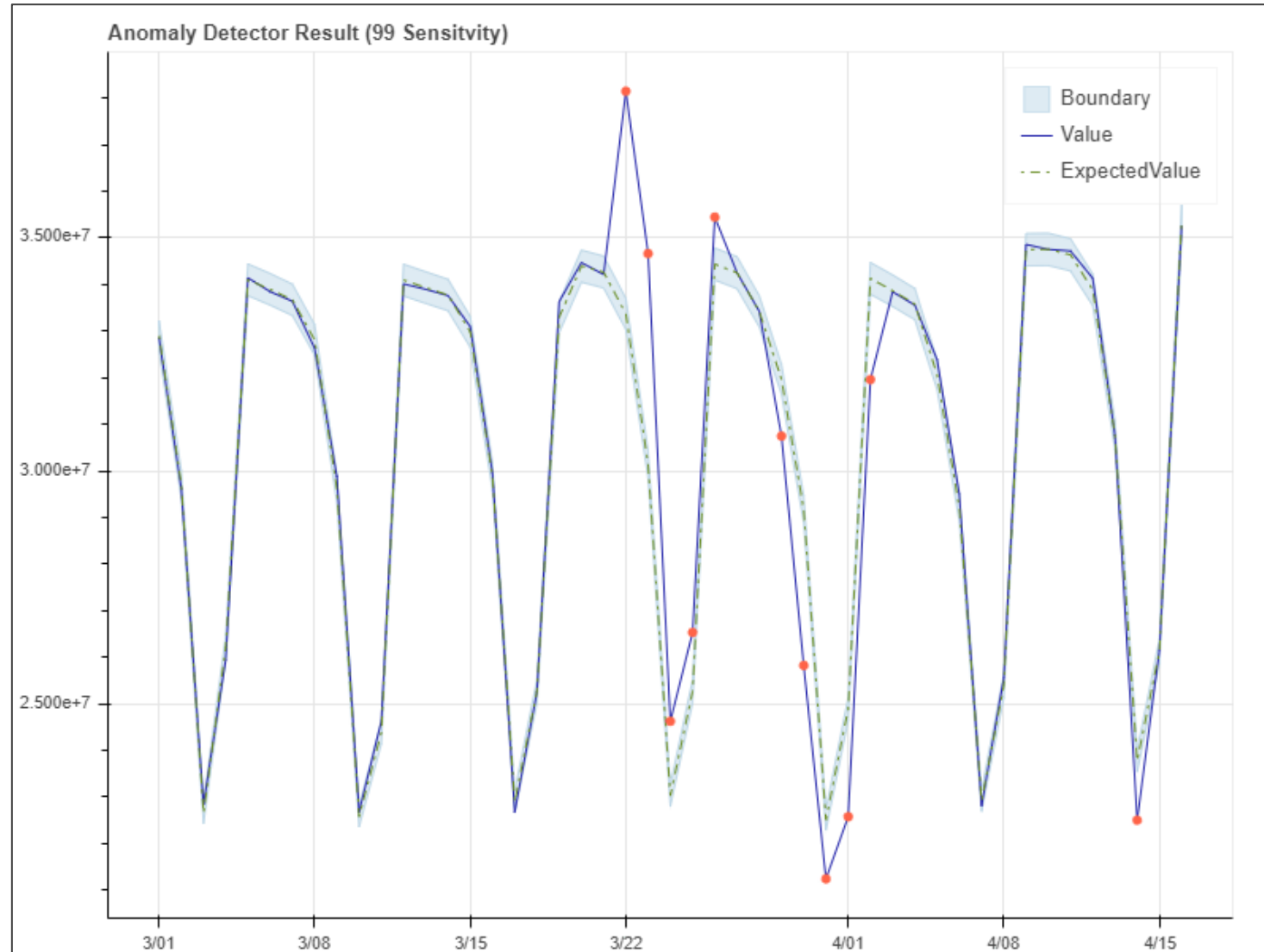
API Sensitivity



API Sensitivity



API Sensitivity



API Sensitivity

POST Anomaly Batch

POST Anomaly Stream Positive X

POST Anomaly Stream Negative + ...

▶ Anomaly Stream Positive

POST ▼

https://anomalydetectorps01.cognitiveservices.azure.com/anomalydetector/v1.0/timeseries/last/detect

Params

Authorization

Headers (10)

Body ●

Pre-request Script

Tests

Settings

☐ none

☐ form-data

☐ x-www-form-urlencoded

☒ raw

☐ binary

☐ GraphQL

JSON ▼

```
1 {
2   "granularity": "minutely",
3   "sensitivity": 99,
4   "series": [
5     {
6       "timestamp": "2020-02-28T00:01:00Z",
7       "value": 100
8     },
9     {
10      "timestamp": "2020-02-28T00:02:00Z",
11      "value": 95
12    },
13    {
14      "timestamp": "2020-02-28T00:03:00Z",
15      "value": 100
16    },
17    {
18      "timestamp": "2020-02-28T00:04:00Z",
19      "value": 95
20    },
21  ]
22 }
```



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: $(7 \times 24 \times 4) + 1 = 673$



Data Point Limitation

Minimum allowed

12 data points

Maximum allowed

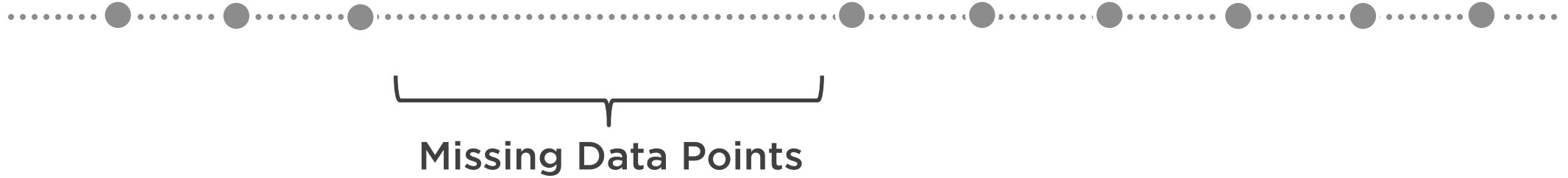
8640 data points

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

POST Anomaly

No Environment

▶ Anomaly

POST

https://eastus.api.cognitive.microsoft.com/anomalydetector/v1.0/timeseries/last/detect

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<input checked="" type="checkbox"/>	Ocp-Apim-Subscription-Key	d4ad246e857744b4bcec19bd3537020a	
	Key	Value	Description

Response



Anomaly Detection in Azure Stream Analytics

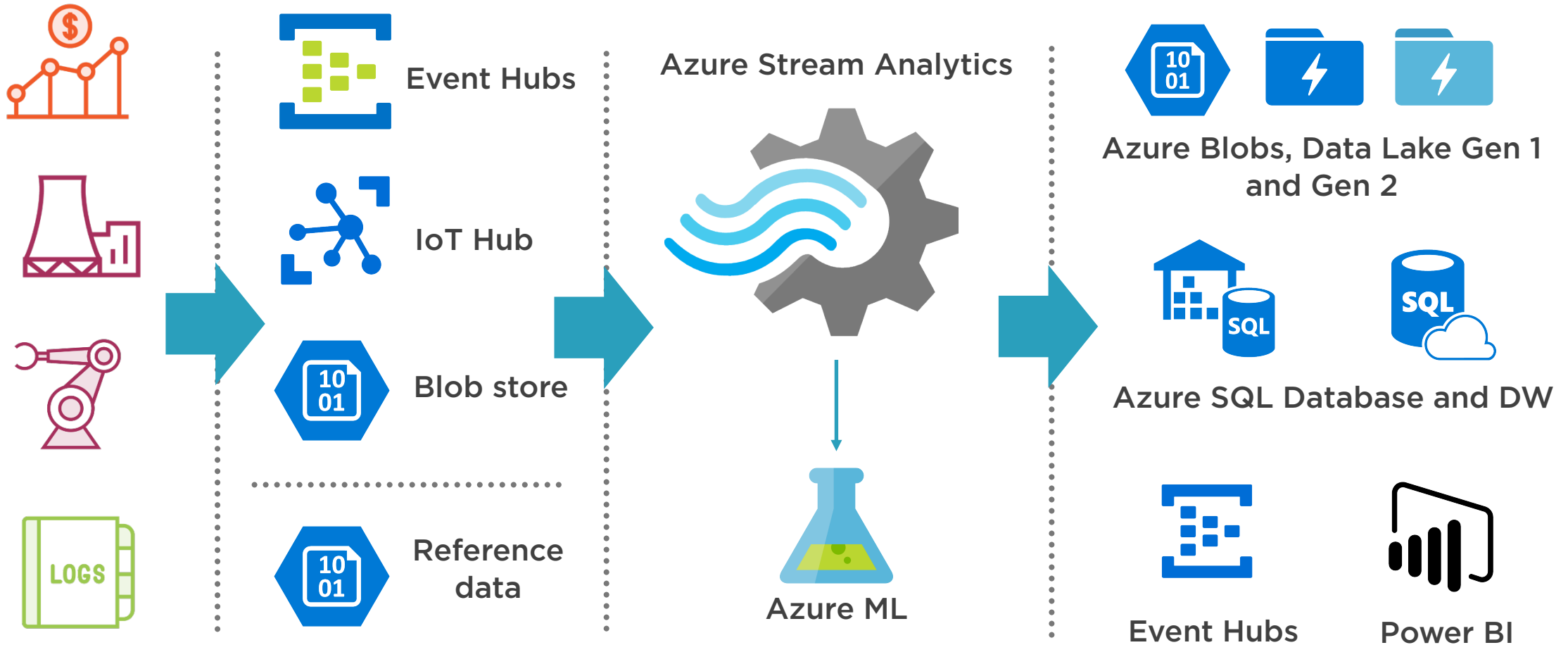


Azure Stream Analytics

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

Expand All



Course Overview



1m 12s



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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Anomaly Detection API concepts

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

Detect outlier data using Anomaly Detector API

- Using the REST API and SDK (.NET)

Demo: Working with the Anomaly Detector API



Thank you!

