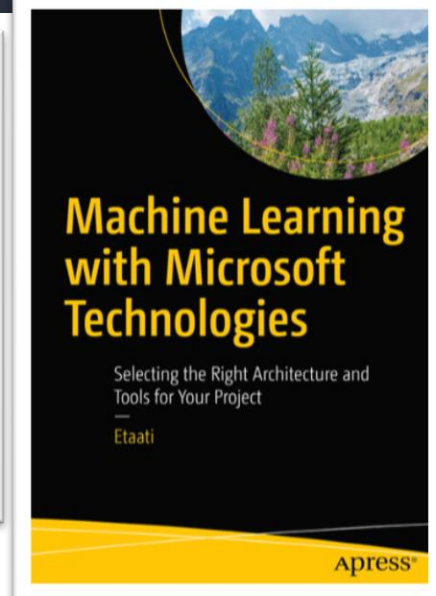
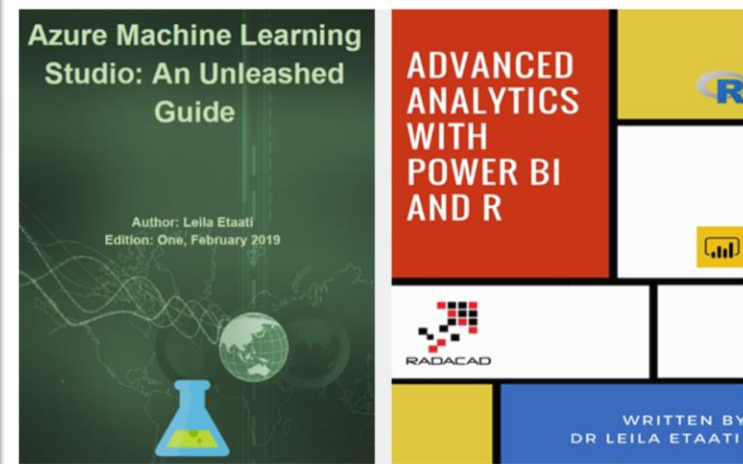
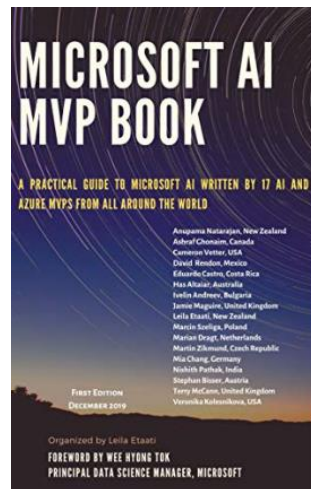


Anomaly Detection and Entity Extraction from Text in Power BI Desktop

Dr. Leila Etaati





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Ph.D. AI and Data Platform MVP,
Data Scientist, RADACAD



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<https://www.youtube.com/c/RADACAD>



AI and Data Platform Microsoft MVP

- Power BI All Start awarded
- Global AI Bootcamp Board Member
- Leila is the first AI MVP in NZ and Australia

Speaker, Data Scientist, Trainer and Mentor

- She is an international speaker for more than 100 conference in NZ, AUS, Europe, USA, and Asia.

PhD with over 15 years experiences

- Leila is a PH.D. in information system and has more than 10 years experiences in Data base, BI and AI



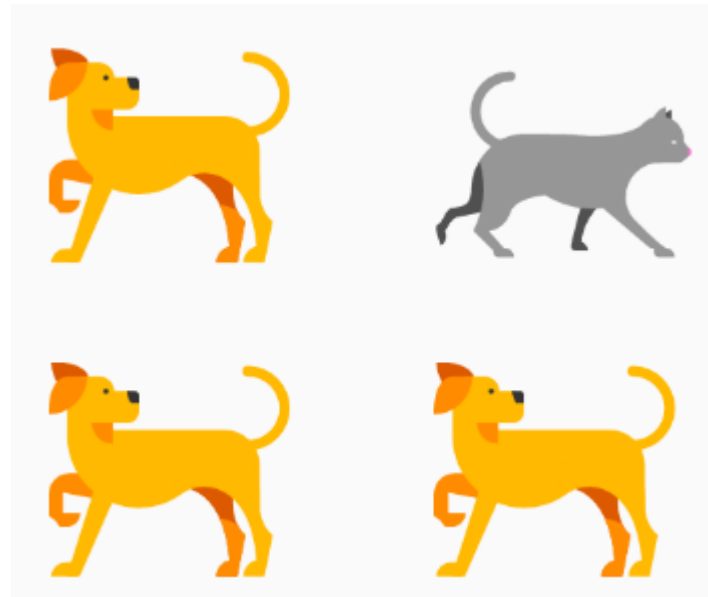
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Anomaly Detection

Anomaly detection is the process of detecting time-series data outliers; points on a given input time-series where the behaviour isn't what was expected, or "weird".



Anomaly detections

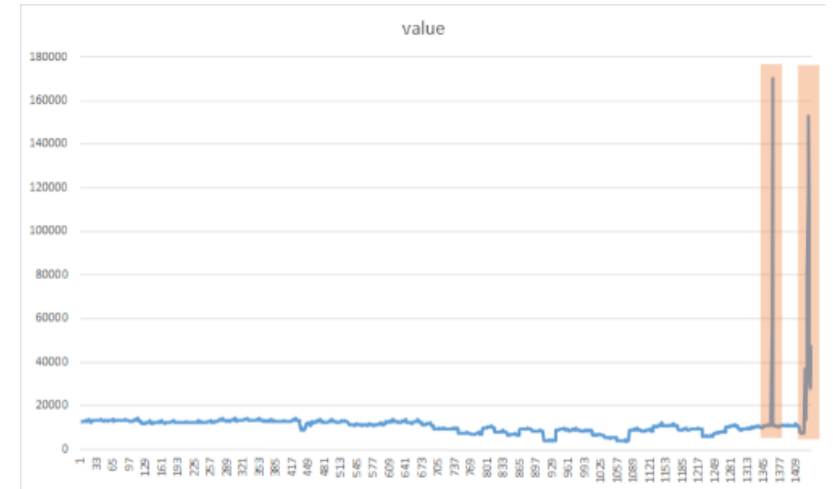


Car Accident :

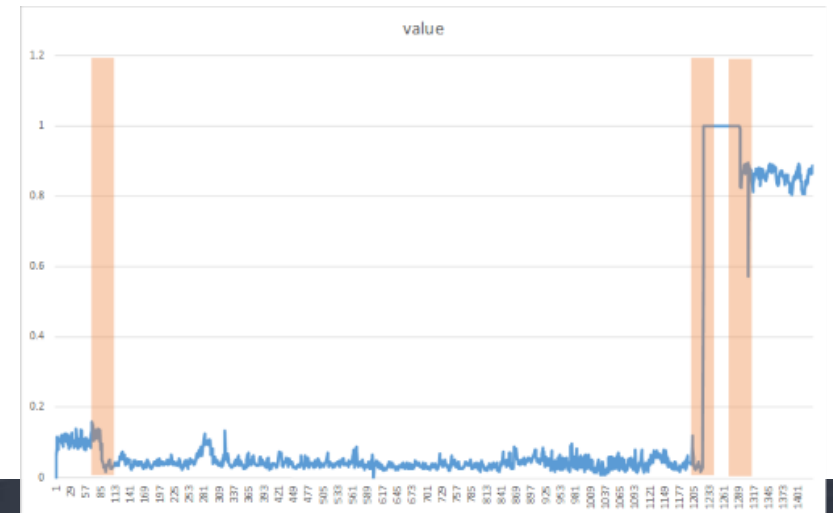
Is this oil gauge reading normal, or do I have a leak? If you're monitoring power consumption, you'd want to know: Is there an outage?

Two types of time series anomalies

Spikes indicate temporary bursts of anomalous behaviour in the system.



Change points indicate the beginning of persistent changes over time in the system.



Widley Used in lots of Industry



Environmental



Health



Manufacturing



Smart Home



Transportation
 @Leila_Etaati



Social Media



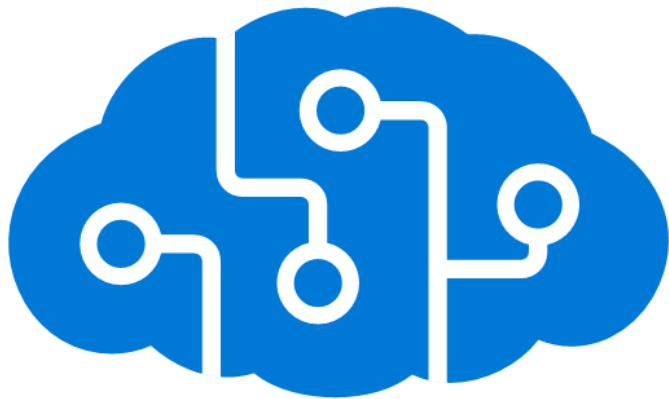
Finance and Insurance

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Microsoft Anomaly Detection Approaches

Pre Build AI



Custom AI



Anomaly Detection Time Series

Find abnormalities in your time series data with machine learning.

Detect anomalies as they occur in real-time.

Detect anomalies throughout your data set as a batch.

Get additional information about your data. Expected values, anomaly boundaries and positions.

Adjust anomaly detection boundaries.

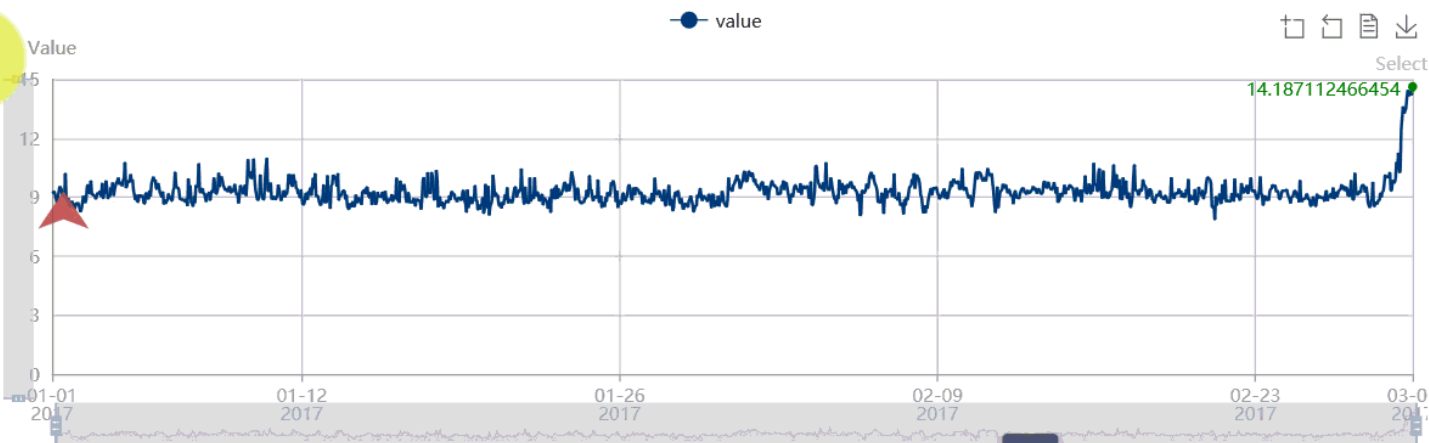


[Anomaly detector Last API](#)[Anomaly detector Entire API](#)[Azure Anomaly Detector](#)[Privacy](#)[Sample 1](#)[Sample 2](#)[Sample 3 with seasonality](#)[Choose local file](#)

"Last" mode will play a streaming detection from the 13th point. Every point will be detected based on a model trained by earlier data. It simulates the real streaming monitoring.

Please click any point on the chart, detection will start at the point.

Status: Stopped

[Start](#)

Sensitivity (Simulated in client)

"Sensitivity" is from 0 to 99, it defines how sensitive the backend API performs filtering on the result of anomaly detection algorithms. Adjust the sensitivity to see how it affects the anomalies filtering.

Max detecting window

"Max detecting window" defines how many history points are used to detect current anomalies. The range of the window varies according to different granularity.

[API key](#) [Get a key](#)

Endpoint:

<https://westus2.api.cognitive.microsoft.com></anomalydetector/v1.0/timeseries/last/detect>

Key:

[Current request](#)

```
{ "series": [ { "timestamp": "2018-08-13T00:00:00Z", "value": 2224746 }, { "timestamp": "2018-08-14T00:00:00Z", "value": 2238861 }, { "timestamp": "2018-08-15T00:00:00Z", "value": 2224746 }, { "timestamp": "2018-08-16T00:00:00Z", "value": 2238861 }, { "timestamp": "2018-08-17T00:00:00Z", "value": 2224746 }, { "timestamp": "2018-08-18T00:00:00Z", "value": 2083945 }, { "timestamp": "2018-08-19T00:00:00Z", "value": 2084364 } ] }
```

[Current response](#)

```
{ "expectedValue": 2393744.8925330527, "isAnomaly": true, "isNegativeAnomaly": false, "isPositiveAnomaly": true, "lowerMargin": 331144.8925330527, "period": 0, "suggestedWindow": 29, "upperMargin": 718123.4677599156 }
```

Sample 1

Sample 2

Sample 3 with seasonality

Choose local file

"Last" mode will play a streaming detection from the 13th point. Every point will be detected based on a model trained by earlier data. It simulates the real streaming monitoring.

Please click any point on the chart, detection will start at the point.

Status: Stopped

Continue



Sensitivity (Simulated in client)

25

"Sensitivity" is from 0 to 99, it defines how sensitive the backend API performs filtering on the result of anomaly detection algorithms. Adjust the sensitivity to see how it affects the anomalies filtering.

Max detecting window

28

"Max detecting window" defines how many history points are used to detect current anomalies. The window varies according to different granularity.

0.25

API key [Get a key](#)

Endpoint:

<https://westus2.api.cognitive.microsoft.com></anomalydetector/v1.0/timeseries/last/detect>

Key:

7

Current request

```
{
  "series": [
    {
      "timestamp": "2018-08-18T00:00:00Z",
      "value": 2083945
    },
    {
      "timestamp": "2018-08-19T00:00:00Z",
      "value": 2084364
    },
    {
      "timestamp": "2018-08-20T00:00:00Z",
      "value": 2345557
    },
    {
      "timestamp": "2018-08-21T00:00:00Z",
      "value": 2259315
    },
    {
      "timestamp": "2018-08-22T00:00:00Z",
      "value": 2126929
    },
    {
      "timestamp": "2018-08-23T00:00:00Z",
      "value": 2085586
    },
    {
      "timestamp": "2018-08-24T00:00:00Z",
      "value": 2109472
    }
  ]
}
```

Current response

```
{
  "expectedValue": 2892269.5047701252,
  "isAnomaly": false,
  "isNegativeAnomaly": false,
  "isPositiveAnomaly": false,
  "lowerMargin": 829669.5047701253,
  "period": 0,
  "suggestedWindow": 29,
  "upperMargin": 2169202.1285775937
}
```

Visualize anomalies using batch detection and Power BI



Queries [14]

- Other [12]
 - Query1
 - WeatherData (1)
 - WeatherData (2)
 - data1
 - anomaly
 - Invoked Function (4)
 - Query1 (2)
 - Invoked Function (5)
 - Query2
 - anomalyVersion1
 - milk
 - dataAnomalyV2
- Other Queries [2]
 - anomalyVersion (2)
 - Invoked Function (6)

fx = "#anomalyVersion (2)"(dataAnomalyV2)

timestamp	1.2 value	isAnomaly	1.2 expectedValues	isPositiveAnomaly	isNegativeAnomaly	1.2 upperMargins	1.2 lowerMargins
1/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
2/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
3/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
4/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
5/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
6/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
7/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
8/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
9/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
10/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
11/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
12/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
13/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
14/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
15/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
16/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
17/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
18/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
19/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
20/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
21/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%
22/03/2017 1:00:00 PM	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%	Valid 100%
23/03/2017 1:00:00 PM	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%	Error 0%
24/03/2017 1:00:00 PM	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%	Empty 0%

Query Settings

Properties

Applied Steps

Source



Fields

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

A	B	C
timestamp	value	
2017-03-01	25	
2017-03-01	26	
2017-03-01	28	
2017-03-01	30	
2017-03-01	87	
2017-03-01	32	
2017-03-01	26	
2017-03-01	28	
2017-03-10	25	
2017-03-11	24	
2017-03-11	22	
2017-03-11	23	
2017-03-14	27	
2017-03-15	29	
2017-03-16	77	
2017-03-17	25	
2017-03-18	26	
2017-03-19	32	
2017-03-20	34	
2017-03-21	31	
2017-03-22	26	
2017-03-23	28	
2017-03-24	36	

QueryManage ColumnsReduce RowsSortTransformCombineAI Insights

Advanced Editor

anomalyVersion (2)Display Options?

```
((table as table)) => let
    apikey      = "5b96b93899424770b2697ad62e55a475",
    endpoint    = "https://EastUS.api.cognitive.microsoft.com/anomalydetector/v1.0/timeseries/entire/detect",
    inputTable  = Table.TransformColumnTypes(table,{{"timestamp", type text},{ "value", type number}}),
    jsonText    = Text.FromBinary(Json.FromValue(inputTable)),
    jsonbody    = "{ \"series\": \"& jsonText &\", \"maxAnomalyRatio\":0.25, \"sensitivity\":95, \"granularity\":\"daily\", \"customInterval\":\"1\"}",
    bytesbody   = Text.ToBinary(jsonbody),
    headers     = [{"Content-Type" = "application/json", #"Ocp-Apim-Subscription-Key" = apikey}],
    bytesresp   = Web.Contents(endpoint, [Headers=headers, Content=bytesbody]),
    jsonresp    = Json.Document(bytesresp),

    respTable = Table.FromColumns({
        Table.Column(inputTable, "timestamp")
        , Table.Column(inputTable, "value")
        , Record.Field(jsonresp, "isAnomaly") as list
        , Record.Field(jsonresp, "expectedValues") as list
        , Record.Field(jsonresp, "upperMargins") as list
        , Record.Field(jsonresp, "lowerMargins") as list
        , Record.Field(jsonresp, "isPositiveAnomaly") as list
        , Record.Field(jsonresp, "isNegativeAnomaly") as list
    }, {"timestamp", "value", "isAnomaly", "expectedValues", "upperMargin", "lowerMargin", "isPositiveAnomaly", "isNegativeAnomaly"}),

    respTable1 = Table.AddColumn(respTable, "upperMargins", (row) => row[expectedValues] + row[upperMargin]),
    respTable2 = Table.AddColumn(respTable1, "lowerMargins", (row) => row[expectedValues] - row[lowerMargin]),
    respTable3 = Table.RemoveColumns(respTable2, "upperMargin"),
    respTable4 = Table.RemoveColumns(respTable3, "lowerMargin"),

    results = Table.TransformColumnTypes(
        respTable4,
        {{ "timestamp", type datetime}, {"value", type number}, {"isAnomaly", type logical}, {"isPositiveAnomaly", type logical}, {"isNegativeAnomaly", type logical}}
    )

```

✓ No syntax errors have been detected.

DoneCancel

```
(table as table) => let
apikey = "Your API Code",
endpoint = "https://westus2.api.cognitive.microsoft.com/anomalydetector/v1.0/timeseries/entire/detect",
inputTable = Table.TransformColumnTypes(table,{{"timestamp", type text},{ "value1", type number}}),
jsonText = Text.FromBinary(Json.FromValue(inputTable)),
jsonbody = anomaly,
bytesbody = Text.ToBinary(jsonbody),
headers = [{"Content-Type" = "application/json", #"Ocp-Apim-Subscription-Key" = apikey}],
bytesresp = Web.Contents(endpoint, [Headers=headers, Content=bytesbody]),
jsonresp = Json.Document(bytesresp),
respTable = Table.FromColumns({
Table.Column(inputTable, "timestamp")
,Table.Column(inputTable, "value1")
, Record.Field(jsonresp, "isAnomaly") as list
, Record.Field(jsonresp, "expectedValues") as list
, Record.Field(jsonresp, "upperMargins") as list
, Record.Field(jsonresp, "lowerMargins") as list
, Record.Field(jsonresp, "isPositiveAnomaly") as list
, Record.Field(jsonresp, "isNegativeAnomaly") as list
}, {"timestamp", "value1", "isAnomaly", "expectedValues", "upperMargin", "lowerMargin", "isPositiveAnomaly", "isNegativeAnomaly"}
),
respTable1 = Table.AddColumn(respTable, "upperMargins", (row) => row[expectedValues] + row[upperMargin]),
respTable2 = Table.AddColumn(respTable1, "lowerMargins", (row) => row[expectedValues] - row[lowerMargin]),
respTable3 = Table.RemoveColumns(respTable2, "upperMargin"),
respTable4 = Table.RemoveColumns(respTable3, "lowerMargin"),
results = Table.TransformColumnTypes(
respTable4,
{{"timestamp", type datetime}, {"value1", type number}, {"isAnomaly", type logical}, {"isPositiveAnomaly", type logical}, {"isNegativeAnomaly", type logical},
{"expectedValues", type number}, {"upperMargins", type number}, {"lowerMargins", type number}}
)
```

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<https://learn.radacad.com>

- \$30 Discount for the first month of RADACAD Academy Membership:
- (limited to 5 people, be fast 😊)
- **TorontoPUG**
- <https://learn.radacad.com/product/academy-membership/>

<https://radacad.com/time-series-anomaly-detection-in-power-bi-using-cognitive-service-and-power-query>



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<https://youtu.be/7ZOtZDbn6gM>



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