

GLOBAL POWER PLATFORM BOOTCAMP

Organized Globally, Held Locally



POWER PLATFORM
BOOTCAMP



Advanced Analytics in Power BI

Andrea Martorana Tusa



#GlobalPowerPlatformBootcamp

Thanks to our sponsor!



#GlobalPowerPlatformBootcamp

- Microsoft MVP Data Platform
- Title: **BI Team Leader** (database, datawarehouse, cubes, reporting, , big data, ERP)
- Company: **Würth Phoenix**. IT company inside Würth Group
- Speaker for many community driven events: *SQL Saturday* (all Europe) and other conferences worldwide
- Author for *sqlservercentral.com*, *sqlshack.com*, *UGISS* (User Group Italiano SQL Server).



Session Agenda

- Quick Insights
- Analytic Line
- R Native scripts, R Custom visuals
- Key Influencer Visual
- Azure Machine Learning in Power Query
- *Azure Machine Learning built-in (Premium)*
- *Cognitive Services (Premium)*
- *AI Workload (Premium)*
- *AI functions in Power Query (Premium)*





			Analyst	Business Intelligence Developer	Data scientist
 Power BI Desktop	Visualization 	R/Python Visuals *			✓
		Key Influencer Visual	✓	✓	✓
		Q&A Visual	✓	✓	✓
		Custom Visual with R and JSON *			✓
		Decomposition tree	✓	✓	✓
	Power Query Run R script Run Python script Scripts	Cognitive Services with M and Power Query		✓	✓
		Call Azure ML free in Power Query		✓	✓
		R/ Python in Power Query *			✓
 Power BI service	Data flow	Call Azure ML inside Power Query		✓	✓
		Call Text analytics, Coming soon		✓	✓
		Automated ML		✓	✓
		Cognitive Service	✓	✓	✓
		Azure ML Integration		✓	✓

Licence

Pro Licence



Premium Licence



Free Account



Availability

General Available (GA)



Preview



Coming Soon.



*to publish to web, you need to have Pro account to support R/Python packages

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<https://radacad.com/overview-of-available-ai-and-ml-capabilities-in-power-bi>



Quick insights



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Quick insights

The Power BI service can automatically look for insights in your dashboards:

- Category outliers (Top/bottom)
- Change points in a time series
- Correlation
- Low variance
- Majority
- Overall trend in time series
- Seasonality in time series
- Steady share
- Time series outliers

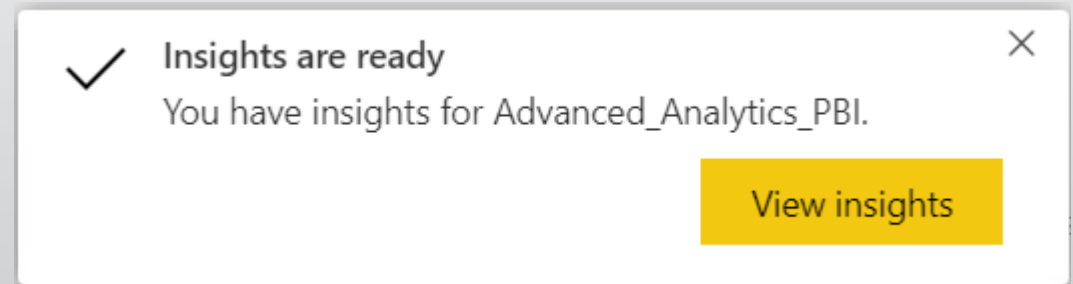
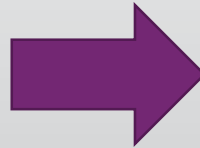
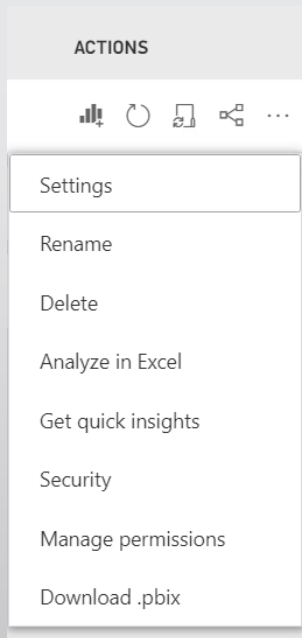
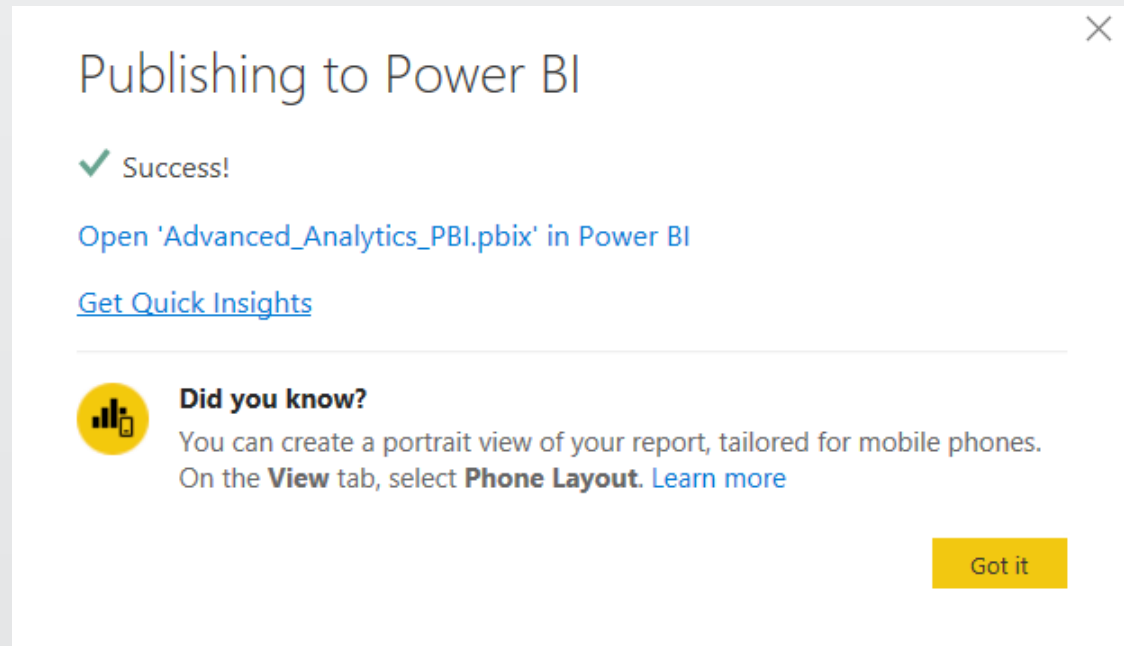
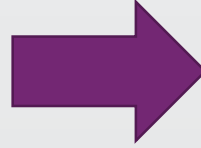
<https://docs.microsoft.com/en-us/power-bi/consumer/end-user-insight-types>



Quick insights

Publish a report and get insights

Get insights from the dataset



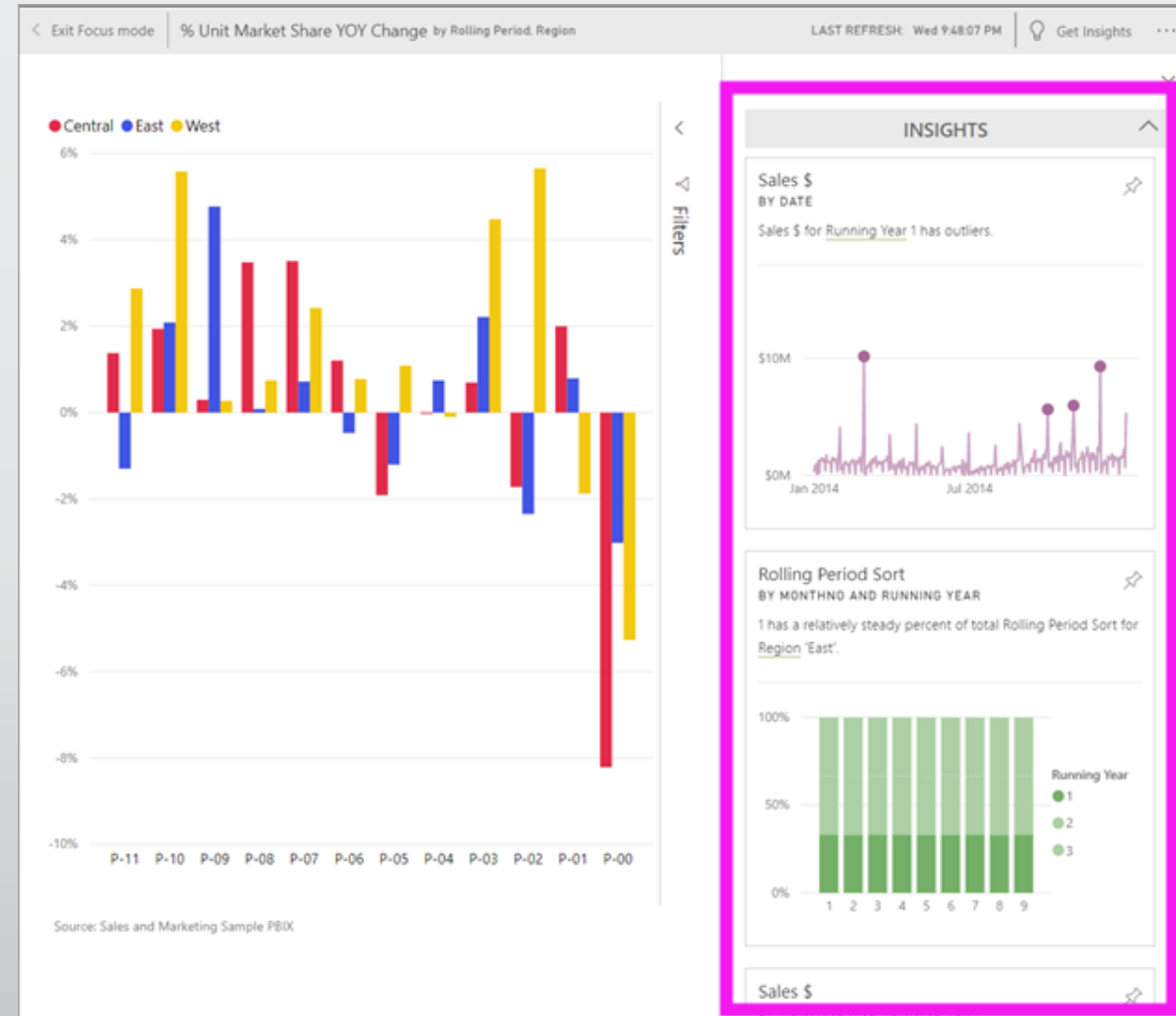
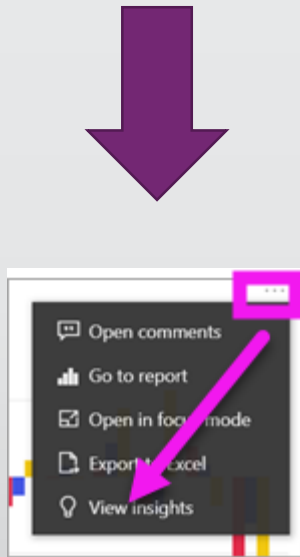
<https://docs.microsoft.com/en-us/power-bi/consumer/end-user-insights>



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Quick insights

Insights applies to dashboard tiles, too



Demo quick insights

Demo

User: andrea.martoranatusa@amtproweb.info

File: My Workspace > Advanced_Analytics_PBI.pbix

Dataset: Advanced_Analytics_PBI -> Settings -> Quick Insights

Dashboard: AA_Insights -> ellipsis on a tile -> view Insights



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Analytics lines



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Analytics Lines

With the **Analytics** pane in **Power BI Desktop**, you can add dynamic *reference lines* to visuals, and provide focus for important trends or insights.

Dynamic reference lines:

- Constant line
- Min line
- Max line
- Average line
- Median line
- Percentile line
- Forecasting

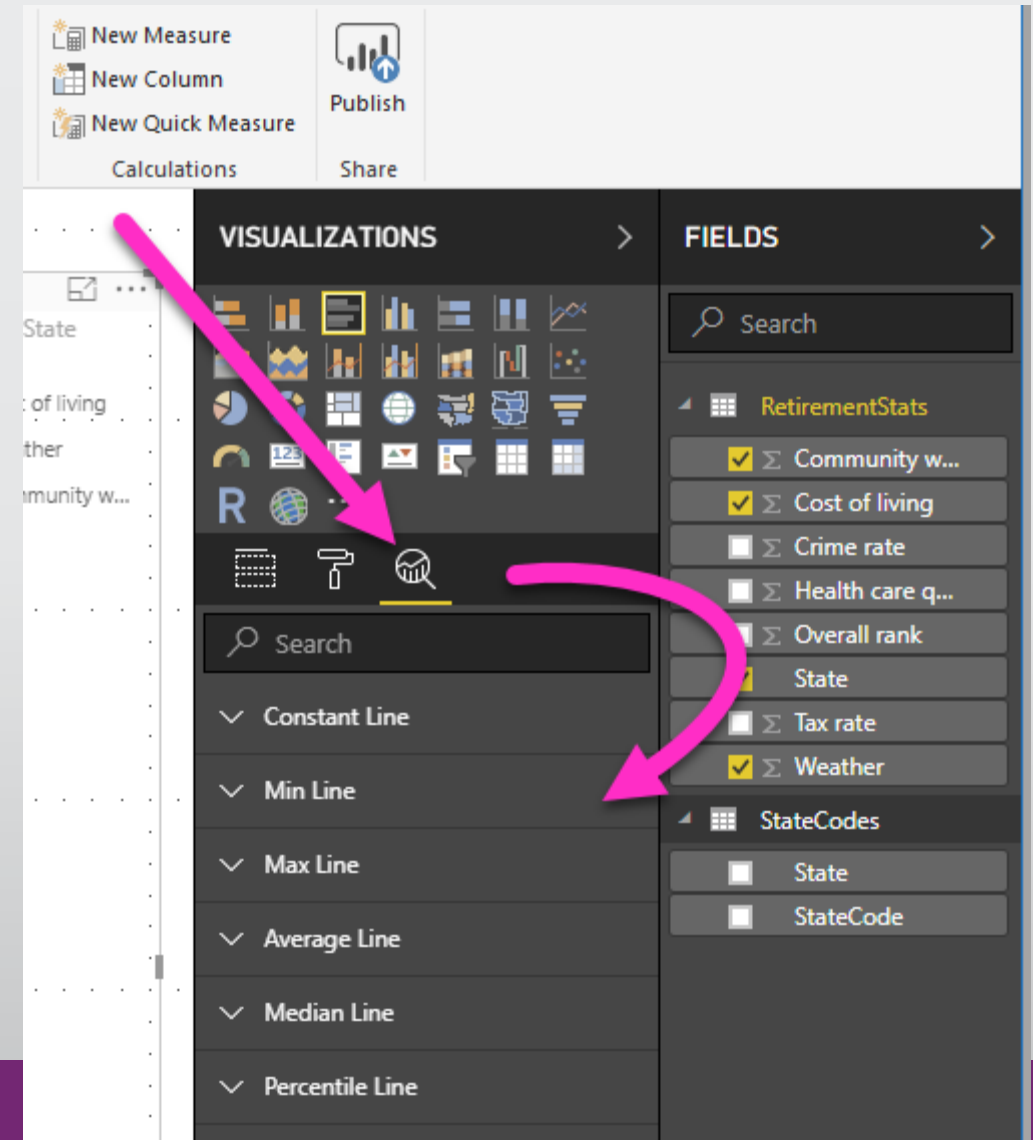
<https://docs.microsoft.com/en-us/power-bi/desktop-analytics-pane>



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Analytics Lines

The **Analytics** pane is found in the **Visualizations** area of Power BI Desktop.



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Demo analytics lines

Power BI Desktop

File: Advanced_Analytics_PBI.pbix

Page : Analytic_line -> Visual Line chart -> Analytic line



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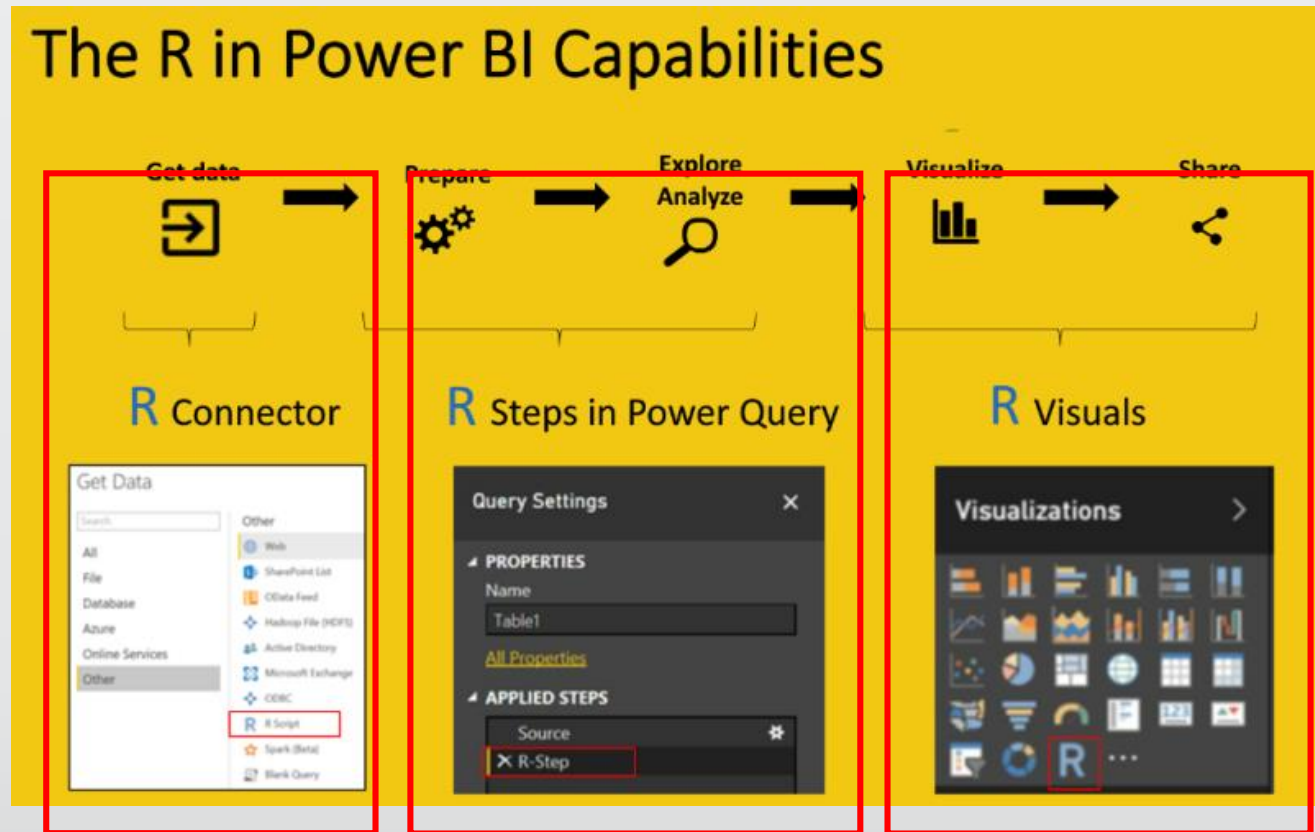
R, scripts and custom visuals



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R integration

With R in Power BI you can:



import data
using scripts

Cleanse and
transform data
sources, model,
shape, analyze
data

Create charts,
maps and any
sort of interactive
visualization

R integration

R as data source

<https://docs.microsoft.com/en-us/power-bi/desktop-r-scripts>

R for data transformation

<https://docs.microsoft.com/en-us/power-bi/desktop-r-scripts>

R for data visualization

<https://docs.microsoft.com/en-us/power-bi/desktop-r-visuals>



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R script

Paste or type your script code here:

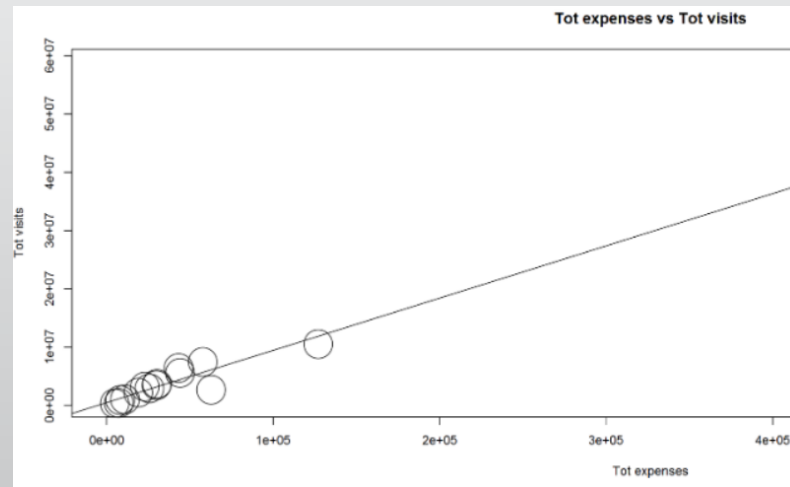
```
df_sql <- dataset
```

```
cor_coeff <- cor(df_sql$ExpenseAmountCountry, df_sql$TotVisitCountry)
```

#plot model adding a linear regression line

```
plot(ExpenseAmountCountry~TotVisitCountry, data=df_sql, xlab="Tot expenses", ylab="Tot visits", main =  
"Tot expenses vs Tot visits", cex = 5)
```

```
abline(lm(ExpenseAmountCountry~TotVisitCountry, data = df_sql))
```



Forecasting with custom visuals



Time Series Forecasting Chart

Using exponential smoothing model to predict future values based on previously observed values

★★★★☆



Forecasting with ARIMA

Predict future values based on historical data using Autoregressive Integrated Moving Avg (ARIMA)

★★★★☆

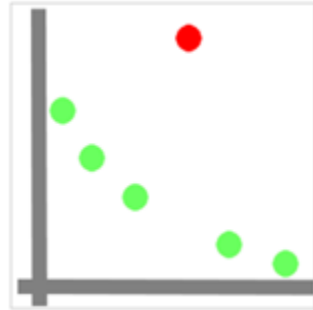


Forecast using Neural Network by MAQ So...

Use the Neural Network algorithm to forecast future values based on historical data.

★★★★☆

Other custom visuals



Outliers Detection
Microsoft Corporation



Correlation plot
Microsoft Corporation

Demo R

- R native script
 - Linear regression (Power BI Desktop. File: Advanced_AnalyticsPBI.pbix, page: R regr model)
 - Failure prediction: (Power BI Desktop. File: Failure_prediction.pbix, page: R regr model, R faceting, Time series forecast),
- Custom visuals
 - Forecasting (Power BI Desktop. File: Advanced_AnalyticsPBI.pbix, page: Forecasting custom visual, Corr coeff, Outliers)
 - Correlation plot
 - Outliers




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Key influencers visual



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Key influencers visual

- Built-in visual 
- Understand the factors that drive KPIs
- Uses machine learning algorithms to analyze data and provide insights
- Measure the same metrics from various perspectives

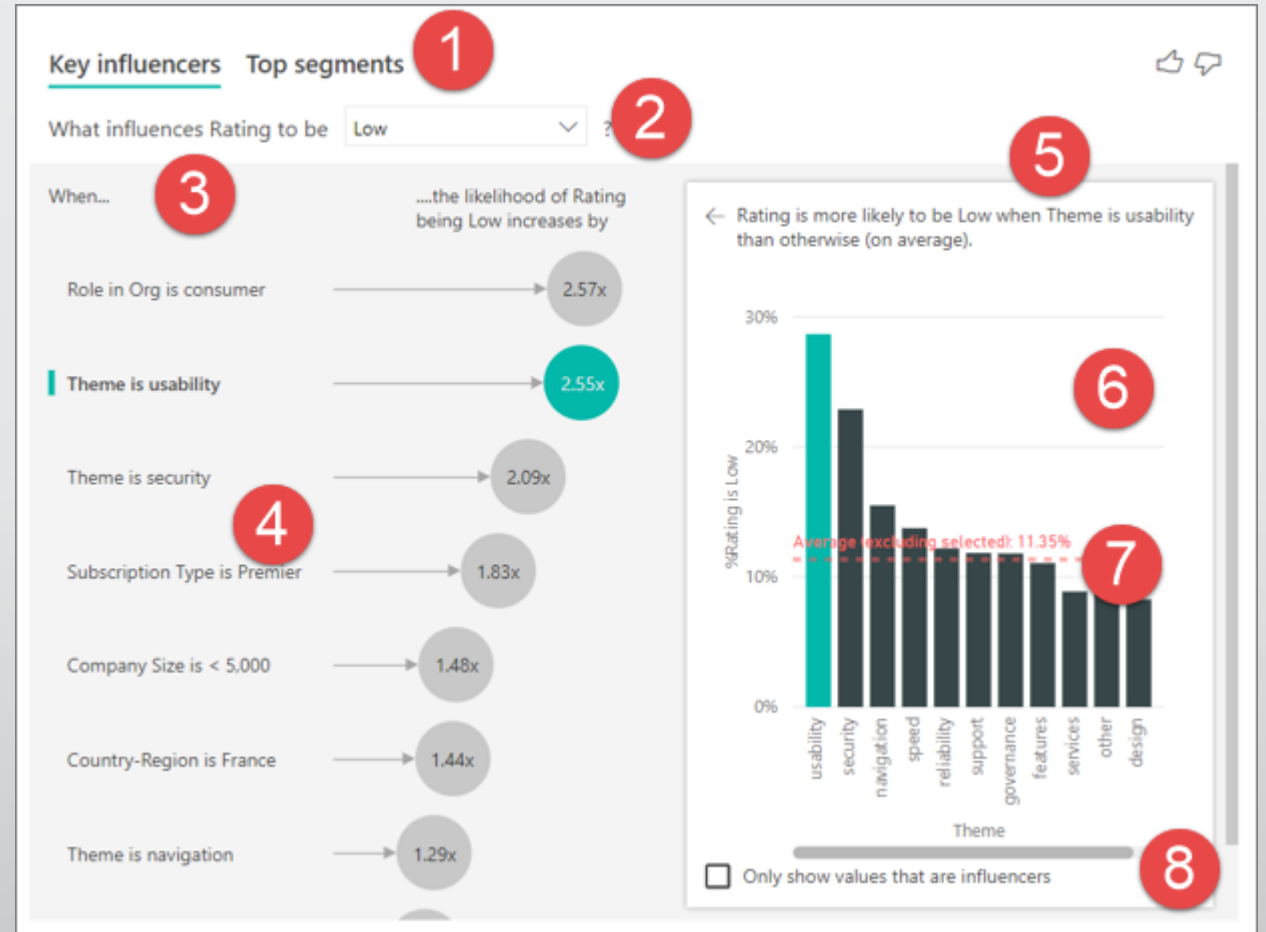
<https://docs.microsoft.com/en-us/power-bi/visuals/power-bi-visualization-influencers>



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Key influencers visual

- Analyze your data
- Ranks the factors that matter
- Displays them as key influencers
- Interact with other visuals
- Interpret continuous key influencers



Demo key influencers visual

Demo

Power BI Desktop

File: Customer feedback.pbix

Page: Key_i_vis

Move the metric you want to investigate into the **Analyze** field. To see what drives a customer rating of the service to be low, select **Customer Table > Rating**.

Move fields that you think might influence **Rating** into the **Explain by** field. You can move as many fields as you want. In this case, start with:

1. Country-Region
2. Role in Org
3. Subscription Type
4. Company Size
5. Theme

Leave the **Expand by** field empty. This field is only used when analyzing a measure or summarized field.

To focus on the negative ratings, select **Low** in the **What influences Rating to be** drop-down box.

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Azure machine learning



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Azure Machine Learning

- Visualize the output of an Azure Machine Learning model inside Power BI
- Invoke insights from ML models in reports, dashboards and other analytics
- Operationalize Azure ML models through the Power BI service

<https://docs.microsoft.com/en-us/power-bi/service-machine-learning-integration>



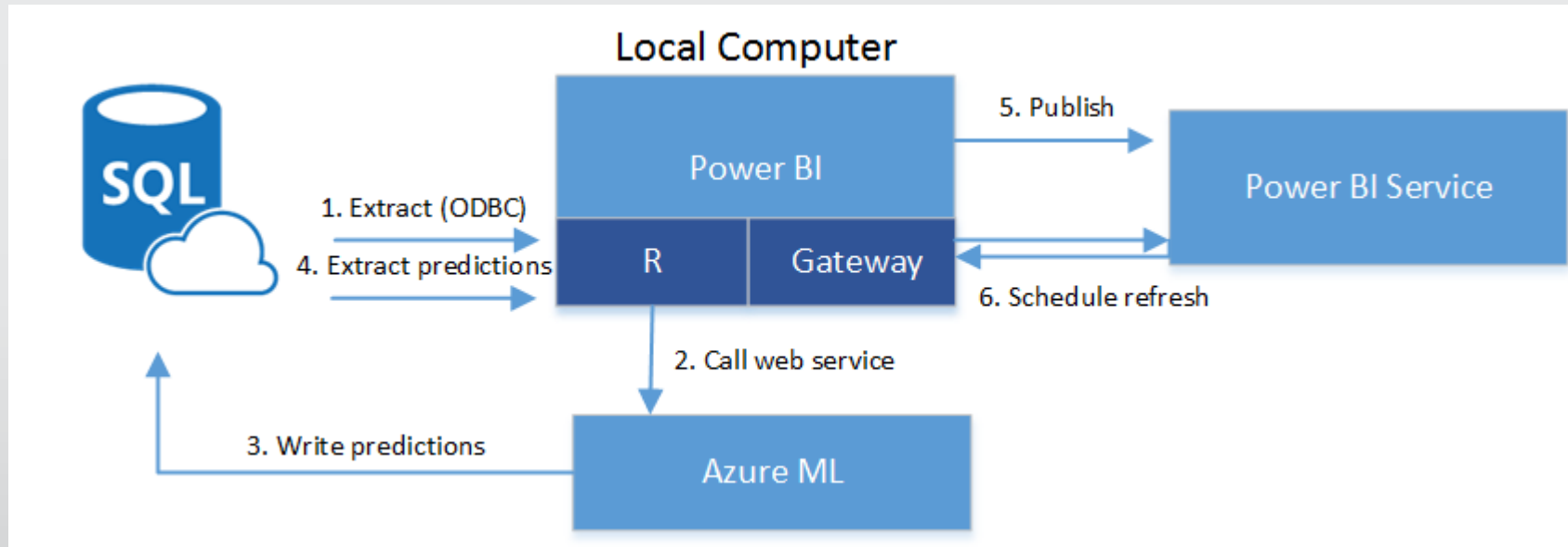
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Azure Machine Learning

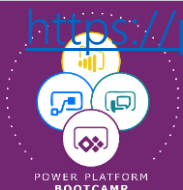
Part of the Cortana analytics suite



Azure Machine Learning



<https://powerbi.microsoft.com/en-us/blog/power-bi-azure-ml/>



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Azure Machine Learning

Create a predictive model

1. Use R to extract data out of a SQL data source that has not yet been scored by the ML model
2. Use R to call the Azure ML web service and send it the unscored data
3. Write the output of the Azure ML model back into SQL
4. Use R to read scored data into Power BI
5. Publish the Power BI file to the Power BI service
6. Schedule a refresh of the data using the Personal Gateway (which triggers a scheduled re-run of the R script and brings in new predictions)

<https://powerbi.microsoft.com/en-us/blog/power-bi-azure-ml/>



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Azure Machine Learning

Microsoft Azure Machine Learning Studio (classic)

credit risk prediction web service

DASHBOARD CONFIGURATION

General [New Web Services Experience](#) preview

Published experiment

[View snapshot](#) [View latest](#)

Description

No description provided for this web service.

API key

[REDACTED]

Default Endpoint

[API HELP PAGE](#)

[TEST](#)

[APPS](#)



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Demo Azure machine learning

- Create an experiment in ML Studio: credit experiment
- <https://studio.azureml.net/>
- <https://docs.microsoft.com/en-us/azure/machine-learning/studio/tutorial-part1-credit-risk>
- Create a web service
- Consume the web service within Power BI
 - File: credit risk prediction.pbix. Account: andrea.martoranatusa@gmail.com, R > 3.4.4, R script inside data transform. Azure ML experiment: credit risk prediction

Categories for credit risk calculation:

Status of checking account, Duration in months, Credit history, Purpose, Credit amount, Savings account/bond, Present employment since, Installment rate in percentage of disposable income, Personal status and sex, Other debtors, Present residence since, Property, Age in years, Other installment plans, Housing, Number of existing credits, Job, Number of people providing maintenance for, Telephone, Foreign worker, Credit risk



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Cognitive services



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Cognitive Services

Integrate Power BI with the Text Analytics Cognitive Service

The **Text Analytics API** is a cloud-based service that provides advanced natural language processing over raw text, and includes four main functions: sentiment analysis, key phrase extraction, language detection, and entity recognition.

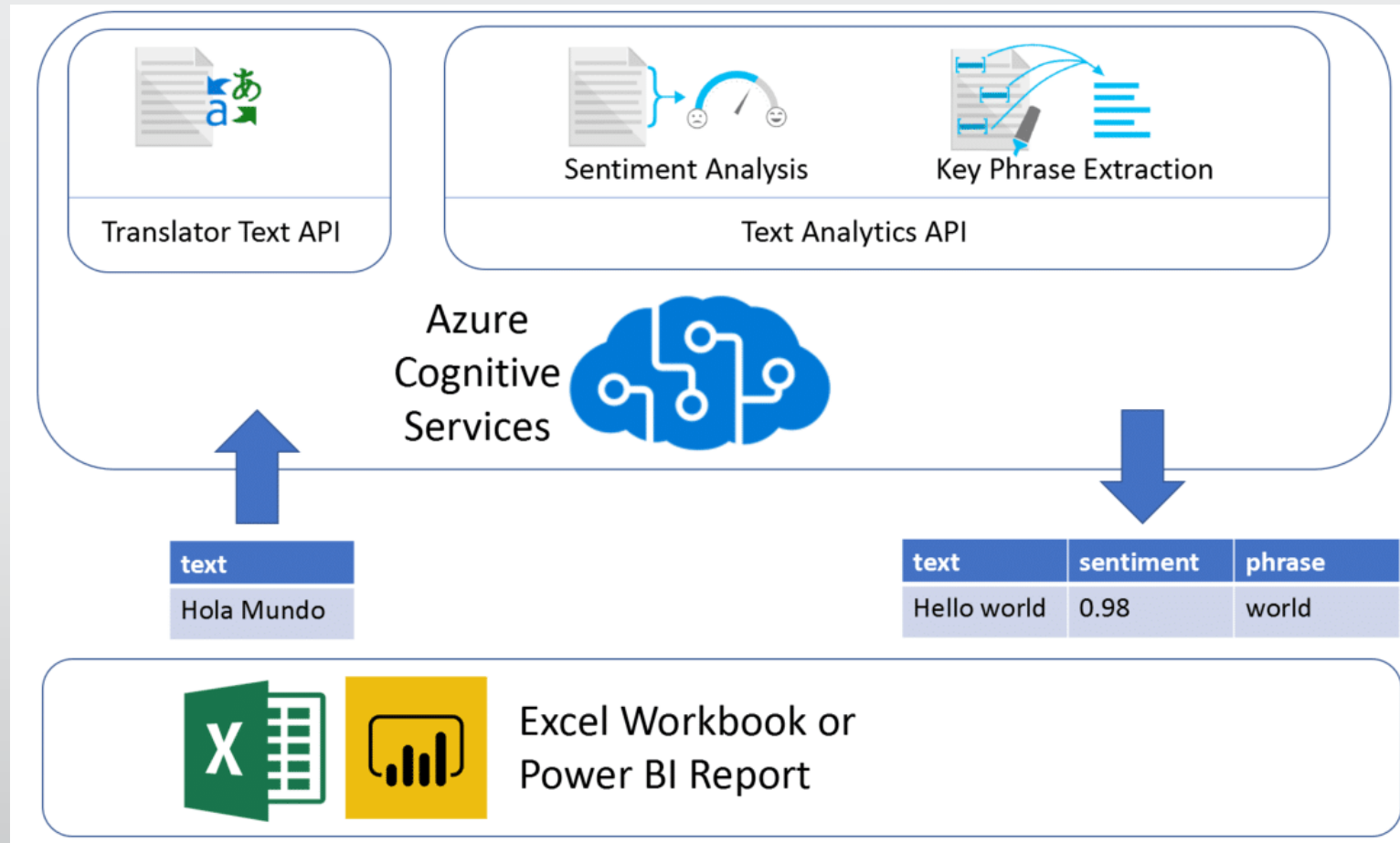
The API is a part of **Azure Cognitive Services**, a collection of machine learning and AI algorithms in the cloud for your development projects.

<https://docs.microsoft.com/en-us/azure/cognitive-services/text-analytics/overview>



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Cognitive Services

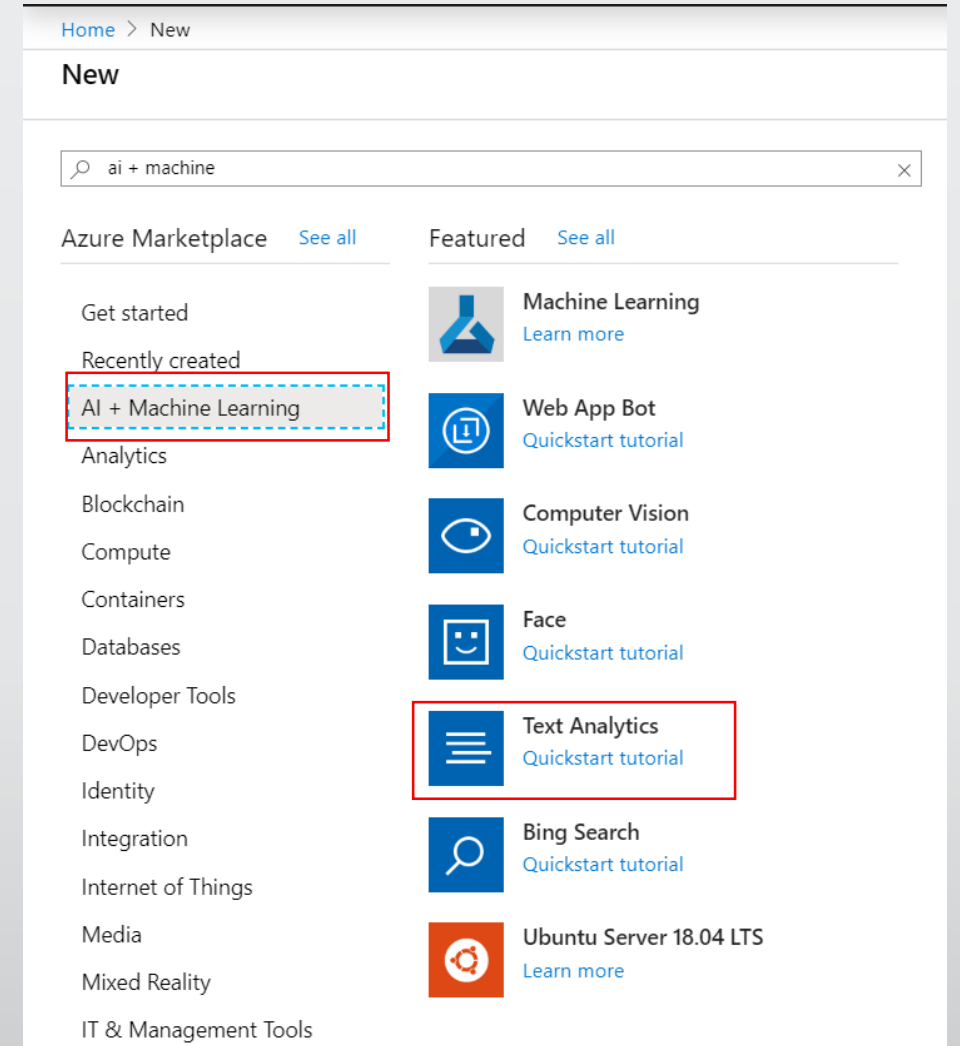


<https://datachant.com/2018/11/28/text-analytics-power-bi-template-all-in-one/>

Cognitive Services

Create a resource in Azure

New > AI + Machine Learning > Text Analytics



Cognitive Services

Register the resource.

Be aware of the pricing tier!

Create

Text Analytics

Name *

AMTTextAnalytics

Subscription *

Visual Studio Enterprise

Location *

(Europe) West Europe

Pricing tier ([View full pricing details](#)) *

F0 (5K Transactions per 30 days)


Resource group *

rg_azureamt

[Create new](#)

Cognitive Services


Get API key and endpoint

 **AMTTextAnalytics - Quick start**
Cognitive Services

- Overview
- Activity log
- Access control (IAM)
- Tags
- Diagnose and solve problems

RESOURCE MANAGEMENT

- Quick start
- Keys




Explore the Quickstart guidance to get up and running with Text Analytics.


1

Get the API Key to authenticate your applications and start sending calls to the service.


Key1 ⓘ

953 

Endpoint ⓘ

https://amtte 

All Text Analytics calls and docker container activations require a key. Specify the key either in the request header (Web API), the Text Analytics client (SDK), or through the command-line (Docker container).



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Cognitive Services

- Integrate Power BI with the Text Analytics Cognitive Service
- Get a *Key Phrases API*
- Create a custom function to integrate Power BI and Text Analytics
- Invoke the function for every row in the dataset
- Use the custom visual *Word Cloud* for showing outcomes

<https://docs.microsoft.com/en-us/azure/cognitive-services/text-analytics/tutorials/tutorial-power-bi-key-phrases>

<https://docs.microsoft.com/en-us/power-bi/service-tutorial-use-cognitive-services>



Demo cognitive services

Demo: integrate Power BI to analyze customer feedback

Azure resource name: AMTTextAnalytics, account:
andrea.martoranatusa@gmail.com

File to import: FabrikamComments.csv

Power BI Desktop

File: Advanced_Analytics_PBI.pbix

Transform data: 3 new functions: KeyPhrases, SentimentAnalysis, LanguageDetection. Apply functions to text column for dataset FabrikamComments

Page: Cognitive services

Custom visual: Word Cloud



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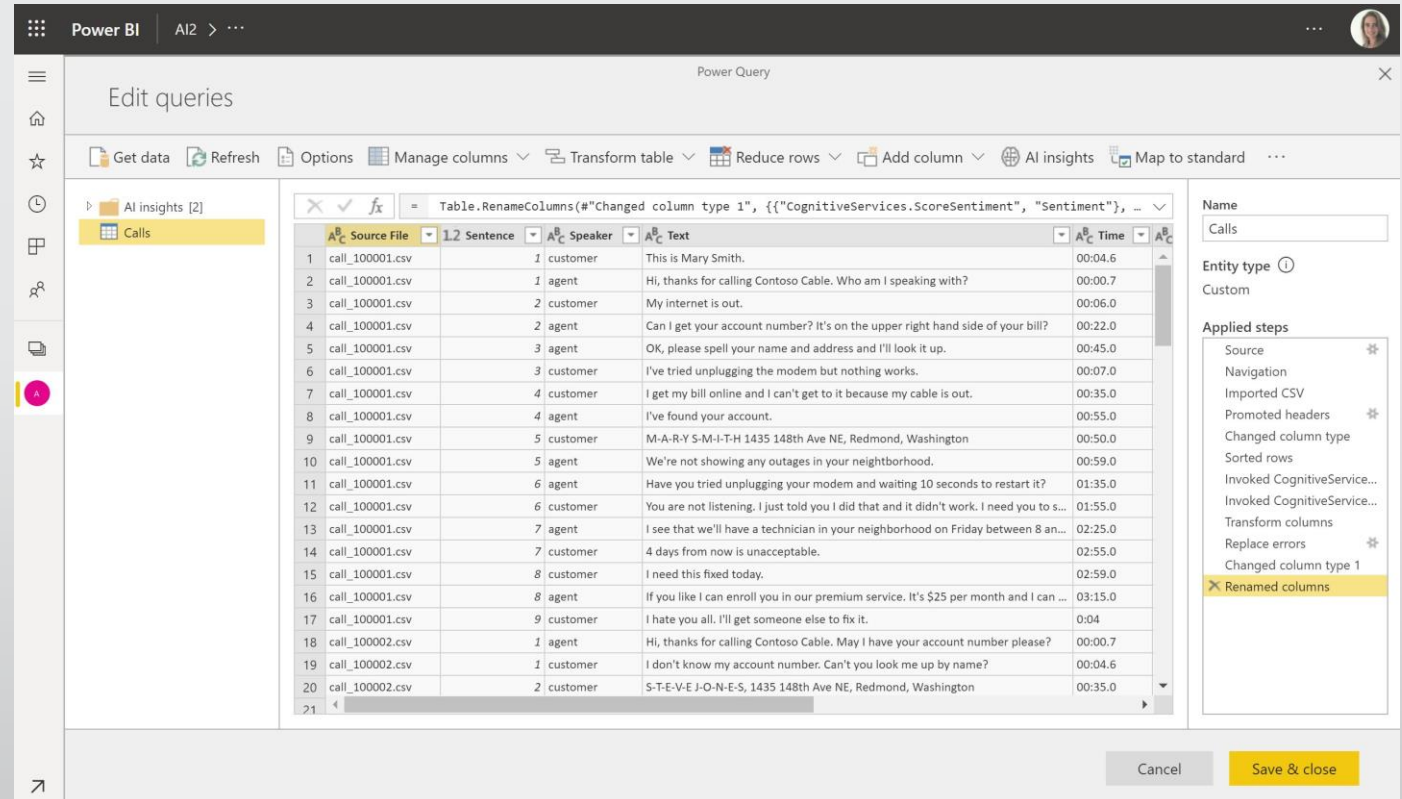
Artificial intelligence



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New AI features in Power BI Services

- AI Premium Workload
- Cognitive Services
- Azure ML
- Only in Premium ... ☹️



The screenshot displays the Power BI 'Edit queries' interface. The main area shows a Power Query table with the following columns: Source File, Sentence, Speaker, Text, and Time. The table contains 20 rows of call data. The 'Applied steps' pane on the right shows a list of steps, with 'Renamed columns' selected. The table data is as follows:

	Source File	Sentence	Speaker	Text	Time
1	call_100001.csv	1	customer	This is Mary Smith.	00:04.6
2	call_100001.csv	1	agent	Hi, thanks for calling Contoso Cable. Who am I speaking with?	00:00.7
3	call_100001.csv	2	customer	My internet is out.	00:06.0
4	call_100001.csv	2	agent	Can I get your account number? It's on the upper right hand side of your bill?	00:22.0
5	call_100001.csv	3	agent	OK, please spell your name and address and I'll look it up.	00:45.0
6	call_100001.csv	3	customer	I've tried unplugging the modem but nothing works.	00:07.0
7	call_100001.csv	4	customer	I get my bill online and I can't get to it because my cable is out.	00:35.0
8	call_100001.csv	4	agent	I've found your account.	00:55.0
9	call_100001.csv	5	customer	M-A-R-Y S-M-I-T-H 1435 148th Ave NE, Redmond, Washington	00:50.0
10	call_100001.csv	5	agent	We're not showing any outages in your neighborhood.	00:59.0
11	call_100001.csv	6	agent	Have you tried unplugging your modem and waiting 10 seconds to restart it?	01:35.0
12	call_100001.csv	6	customer	You are not listening. I just told you I did that and it didn't work. I need you to s...	01:55.0
13	call_100001.csv	7	agent	I see that we'll have a technician in your neighborhood on Friday between 8 an...	02:25.0
14	call_100001.csv	7	customer	4 days from now is unacceptable.	02:55.0
15	call_100001.csv	8	customer	I need this fixed today.	02:59.0
16	call_100001.csv	8	agent	If you like I can enroll you in our premium service. It's \$25 per month and I can ...	03:15.0
17	call_100001.csv	9	customer	I hate you all. I'll get someone else to fix it.	0:04
18	call_100002.csv	1	agent	Hi, thanks for calling Contoso Cable. May I have your account number please?	00:00.7
19	call_100002.csv	1	customer	I don't know my account number. Can't you look me up by name?	00:04.6
20	call_100002.csv	2	customer	S-T-E-V-E J-O-N-E-S, 1435 148th Ave NE, Redmond, Washington	00:35.0

AI features in Power BI Services

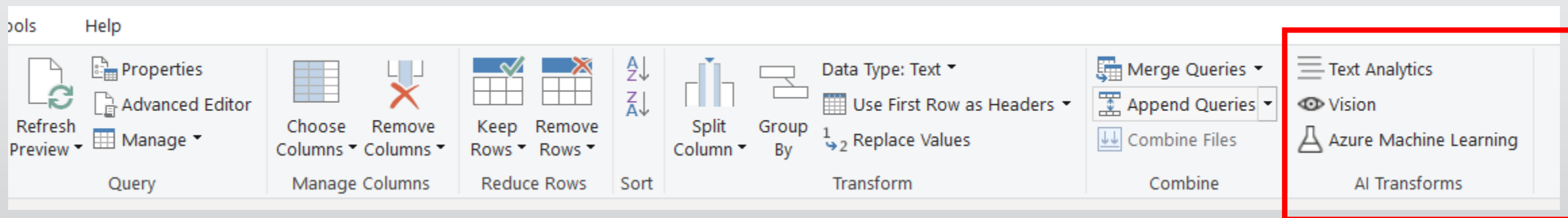
AI summary metrics. Last 7 days metrics

AI Summary			
AI Function Execution TOTAL	AI Function Execution RELIABILITY	CPU MAX (%)	Memory MAX (GB)
685	100.00%	84.38	1.87
AI Function Execution MAX WAIT TIME (MS)	AI Function Execution AVERAGE WAIT TIME (MS)	AI Function Execution MAX DURATION (MS)	AI Function Execution AVERAGE DURATION (MS)
0.00	0.00	688.24K	607.05K

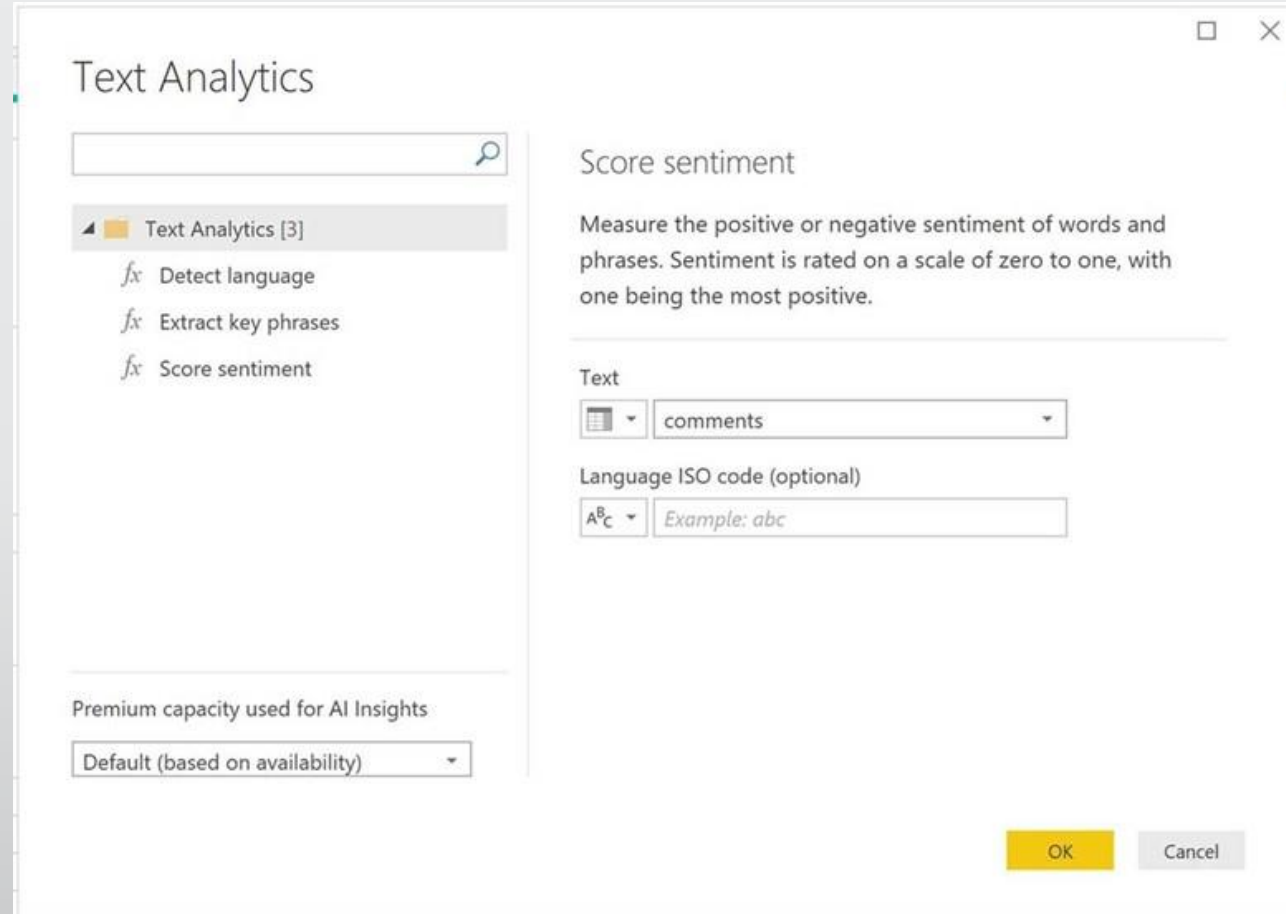


AI Functions in Power Query

- November 2019 release (preview)
- Only Premium ☹ ...



AI Functions in Power Query



The screenshot shows the 'Text Analytics' task pane in Power Query. On the left, there is a search bar and a list of functions under the 'Text Analytics [3]' category: 'Detect language', 'Extract key phrases', and 'Score sentiment'. The 'Score sentiment' function is selected. On the right, the 'Score sentiment' configuration area is shown. It includes a description: 'Measure the positive or negative sentiment of words and phrases. Sentiment is rated on a scale of zero to one, with one being the most positive.' Below this, there is a 'Text' dropdown menu set to 'comments' and a 'Language ISO code (optional)' dropdown menu set to 'Example: abc'. At the bottom, there is a 'Premium capacity used for AI Insights' dropdown menu set to 'Default (based on availability)'. The 'OK' button is highlighted in yellow.

Text Analytics

Search

Text Analytics [3]

- fx Detect language
- fx Extract key phrases
- fx Score sentiment

Score sentiment

Measure the positive or negative sentiment of words and phrases. Sentiment is rated on a scale of zero to one, with one being the most positive.

Text

comments

Language ISO code (optional)

Example: abc

Premium capacity used for AI Insights

Default (based on availability)

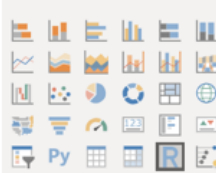
OK Cancel



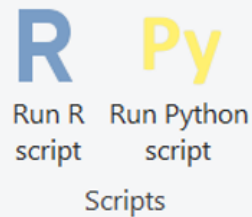
Power BI Desktop

Visualization

Visualizations >



Power Query



Power BI service

Data flow

R/Python Visuals *



Key Influencer Visual



Q&A Visual



Custom Visual with R and JSON *



Decomposition tree



Cognitive Services with M and Power Query



Call Azure ML free in Power Query



R/ Python in Power Query *



Call Azure ML inside Power Query



Call Text analytics, Coming soon



Automated ML



Cognitive Service



Azure ML Integration



Business Intelligence Developer



Any Questions?



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Help us make better!



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**Please fill
out the
survey!
& Win
Swags!!**



<https://www.powerplatformbootcamp.com/survey>



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Thank You For Attending

andrea.martoranatusa@wuerth-phoenix.com

@bruco441



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