

# Introduction to Power BI

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Modern Data Management



# Agenda

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- 1 Introduction to PBI**
- 2 Graph types, formatting and analytics**
- 3 Tool tips, interactions, focus mode and drill mode**
- 4 Bookmarks, buttons**
- 5 Custom visuals and R visuals**
- 6 Using Power BI Service to publish your dashboards**
- 7 Resources**

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# Pre-requisites

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You will need the following installed on your computer

- Power BI Desktop <https://www.microsoft.com/en-us/download/details.aspx?id=45331>
- Power BI Service Account to publish your dashboards online (use your CMU Qatar email) <https://powerbi.microsoft.com/en-us/landing/signin/>
- R and R Studio
  - <https://www.rstudio.com/products/rstudio/download/#download> (Makes using R easier)
  - <https://www.r-project.org/>
- The following R Packages: **tidyverse**, **corrgram**
- The slide footnotes contain links to pages for further information on the slide content
- Link to QSL sample data file: <https://tinyurl.com/y4b9tk62>
- Link to Power BI file: <https://tinyurl.com/y6m566kg>

# Some points on Power BI vs Excel

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There are certain trade-offs that come with using Power BI

- Less flexibility, especially with data wrangling as Power BI requires the use of DAX
- Power BI **is not** an Excel replacement:
  - Focus is on integration of multiple data sources: CRM, ERP, Relational DB etc
  - Focus is on streamed data vs static data
  - Focus is on visually rich dashboards instead of data wrangling
- Not as mature or widely adopted as Excel or certain competitors like Tableau, Spotfire or Qlikeview. A number of features are still experimental (preview mode) i.e: R/Python support or are only supported on the premium version.

For more information on features: <https://powerbi.microsoft.com/en-us/blog/category/announcements/>

# Loading data into Power BI

1. Click **Get Data**.

2. Select **Excel** from the **Most Common** list.

3. Select **Teams** from the **qsl data.xlsx [3]** file list.

4. Click **Load**.

Source: <https://docs.microsoft.com/en-us/power-bi/desktop-getting-started>

# Agenda

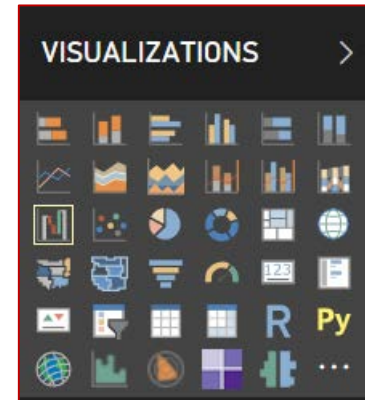
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# Graph types

## Visualization types

- Stacked Bar Chart, Column Bar Chart, Scatterplots, Line Charts etc
- R/Python Visuals
- Tables and Matrices
- Custom Visuals
- Marimekko, Funnel Charts, Waterfall Charts
- Slicers
- Maps etc.
- Clicking on the three dots will take you to the Power BI marketplace where you can find more custom visuals



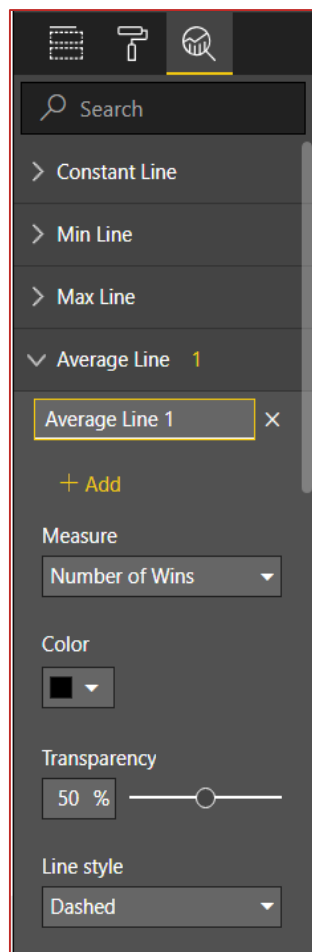
Visualizations pane includes a number of commonly used graphs

Source: <https://docs.microsoft.com/en-us/power-bi/visuals/power-bi-report-add-visualizations-i>  
<https://docs.microsoft.com/en-us/power-bi/visuals/power-bi-report-add-visualizations-ii>  
<https://docs.microsoft.com/en-us/power-bi/visuals/power-bi-visualization-customize-title-background-and-legend>

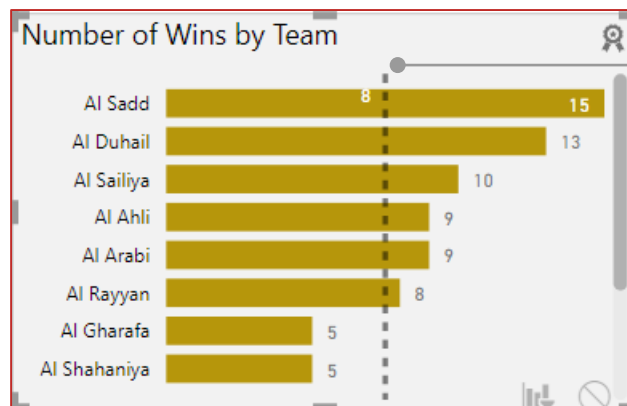


# Using Graph Analytics Features

1



2



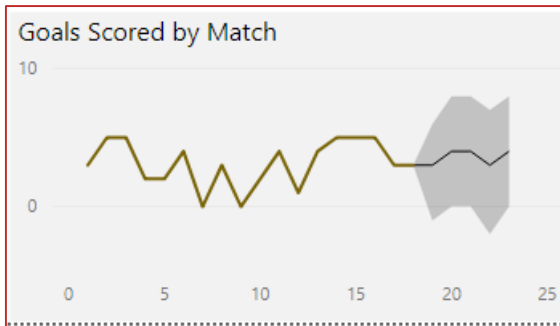
Average Line

## Graph Analytics Lines

- The graph analytics contains the following summary statistics lines. Certain time series graph support forecasting:
  - Average
  - Min & Max
  - Std. Deviation
  - Constant line
  - Median
  - Percentile based lines

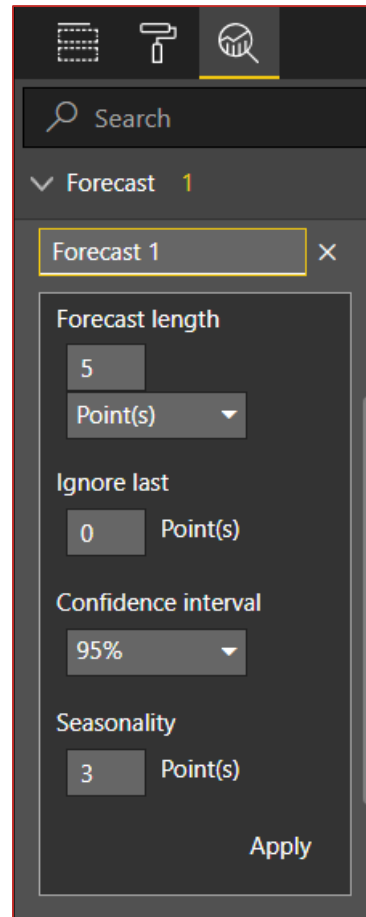
# Using Graph Analytics Features - Forecasting using Exponential Smoothing

1



The forecasting features use exponential smoothing to forecast next period(s). This function requires at least 6 data points and can only forecast a single time series at a time.

2

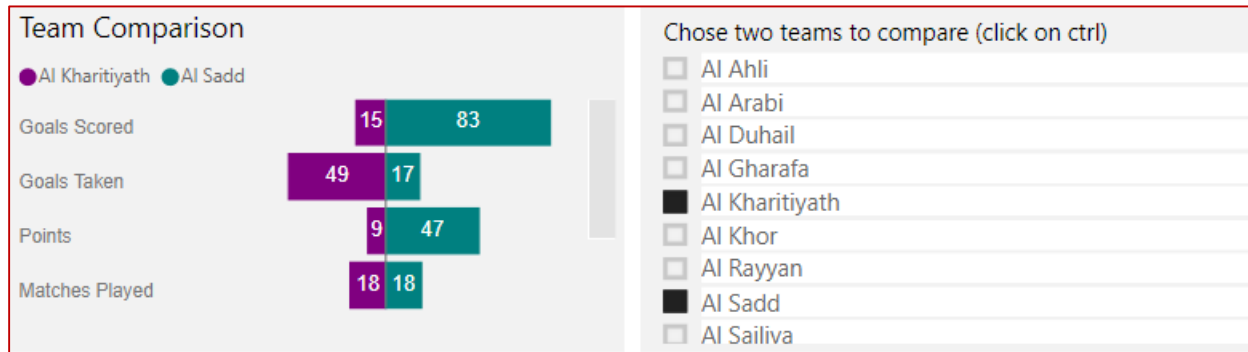


Set the number of periods you want to forecast in the forecast length. Choose the seasonality figure based on your assessment of the seasonality of the data

Source: <https://docs.microsoft.com/en-us/power-bi/desktop-analytics-pane>  
<https://www.youtube.com/watch?v=XIIPkyyztho>

# Special Case: Tornado Chart

- Certain types of graphs such as the Tornado Chart (accessible from the marketplace) require some data transformation to work, usually that involves un-pivoting the data columns



Source: <https://www.youtube.com/watch?v=e3tcV7SrRok>

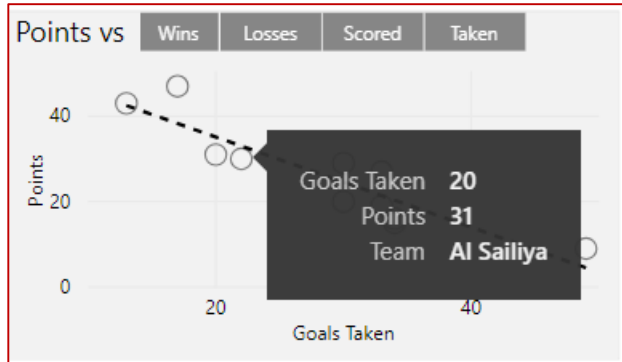
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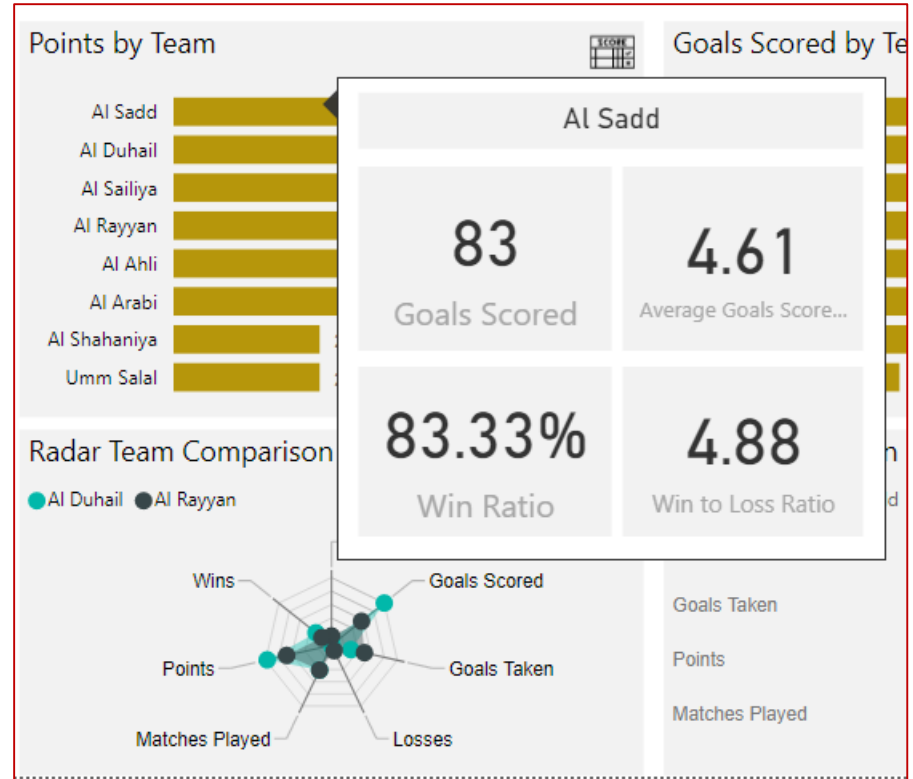
# Tool Tips

1



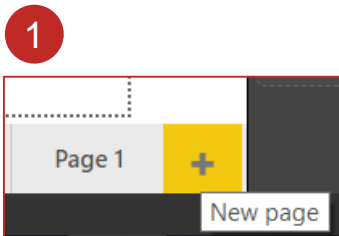
Default Power BI Tools Tips

2

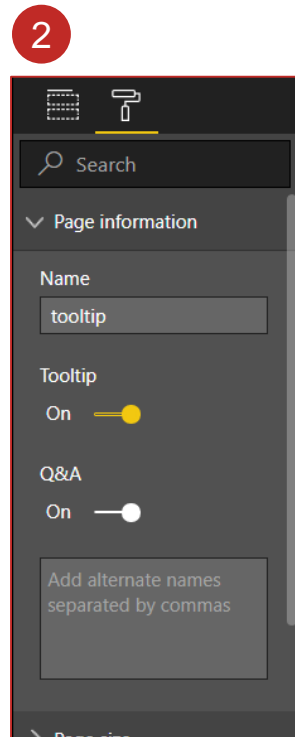


Power BI page based tool tip. Useful for visually richer content

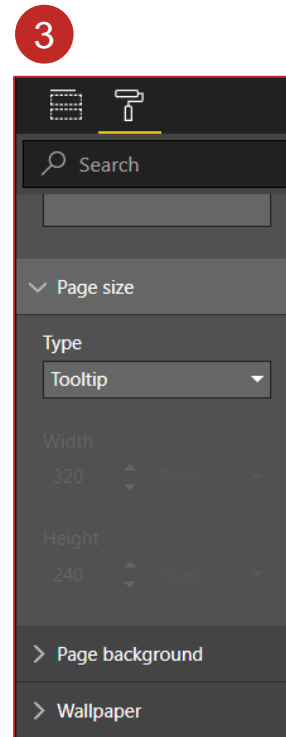
# Creating custom tooltips



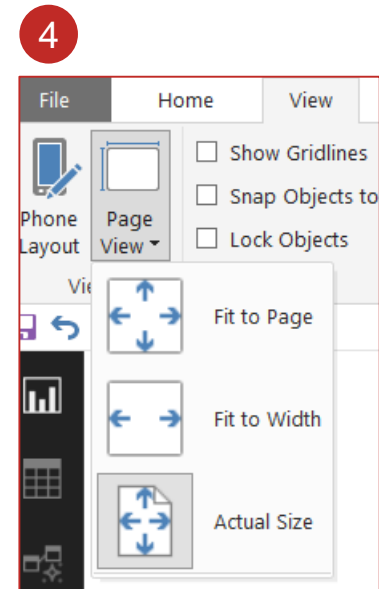
Create a new page to store your tool tip



In the formatting tab, set the page as a tooltip page by turning on the tool tip option



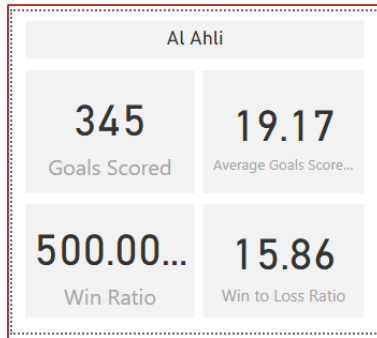
Set the page size as a tooltip



Fit the page to the actual size in order to have a better idea of the final overall look as you design your tool tip

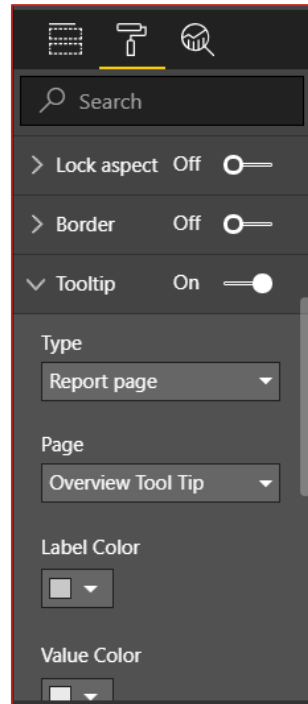
# Creating custom tooltips

5



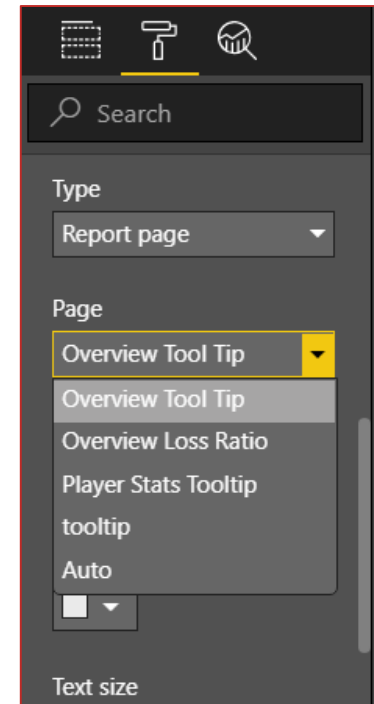
Design your tooltip like any other page

6



Select the graph that you want to link to the new tool tip, click on the formatting tab, turn on tooltip and chose Report page as type

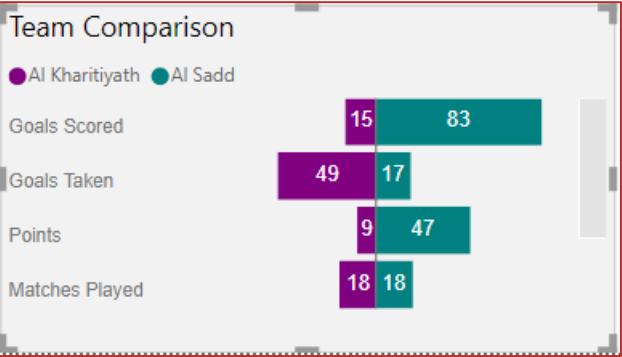
7



Chose the tooltip you want to link to your graph from the list of tooltips you designed

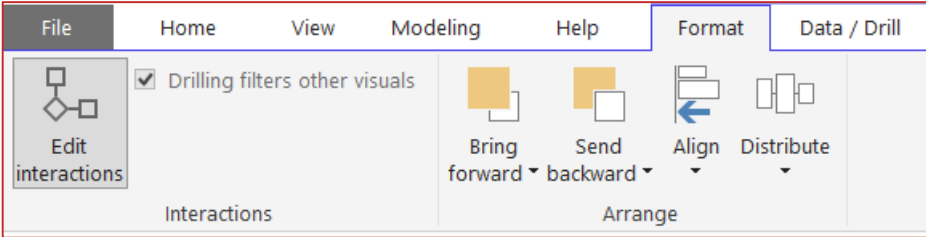
# Interactions

1



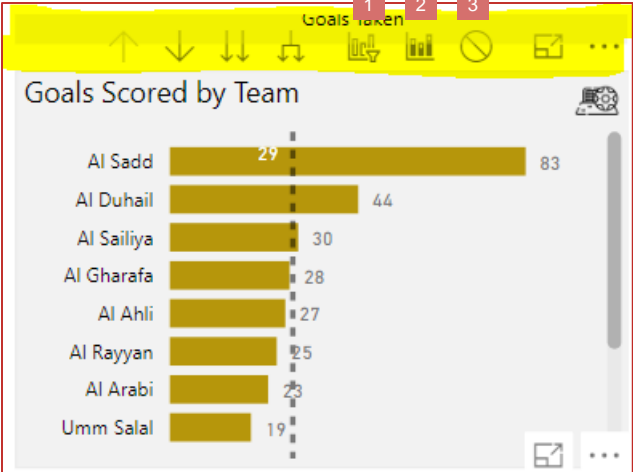
Select the object who's interactions you want to edit

2



From the Format tab, click on Edit Interactions button

3



With your original object still selected, a new set of buttons will appear on the other objects when you hover over them. Each icon sets a different interaction type

1  
Filter second object based on the first object

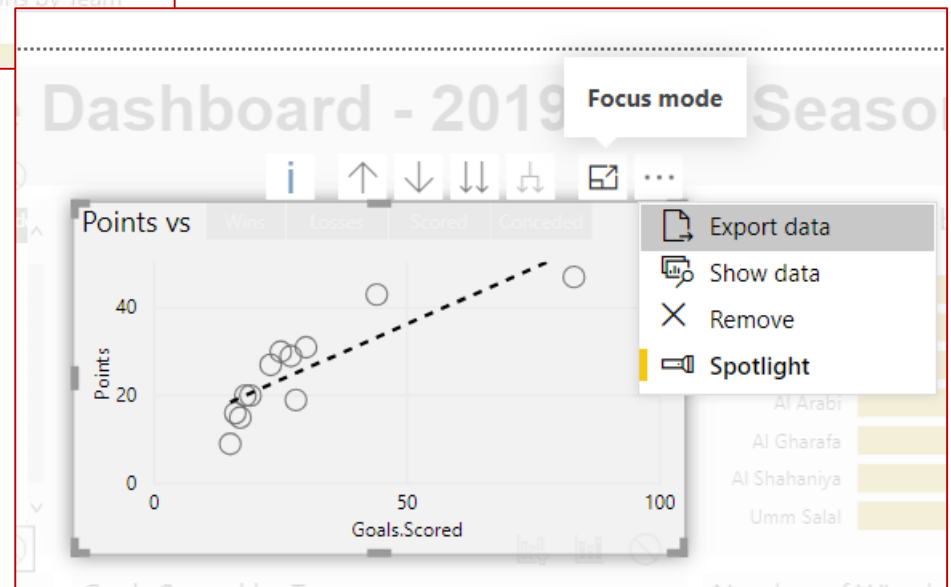
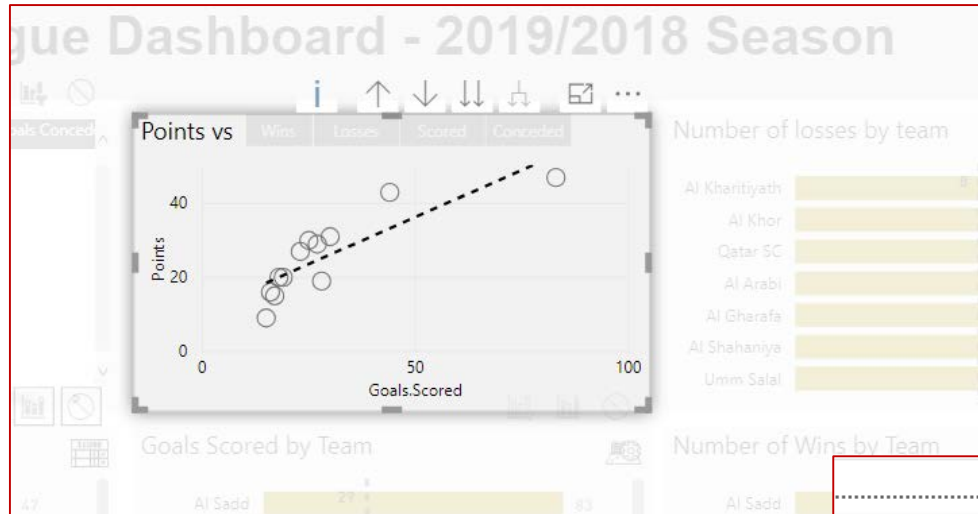
2  
Highlight Second object based on first

3  
No Interaction between the two objects

Source: <https://docs.microsoft.com/en-us/power-bi/service-reports-visual-interactions>

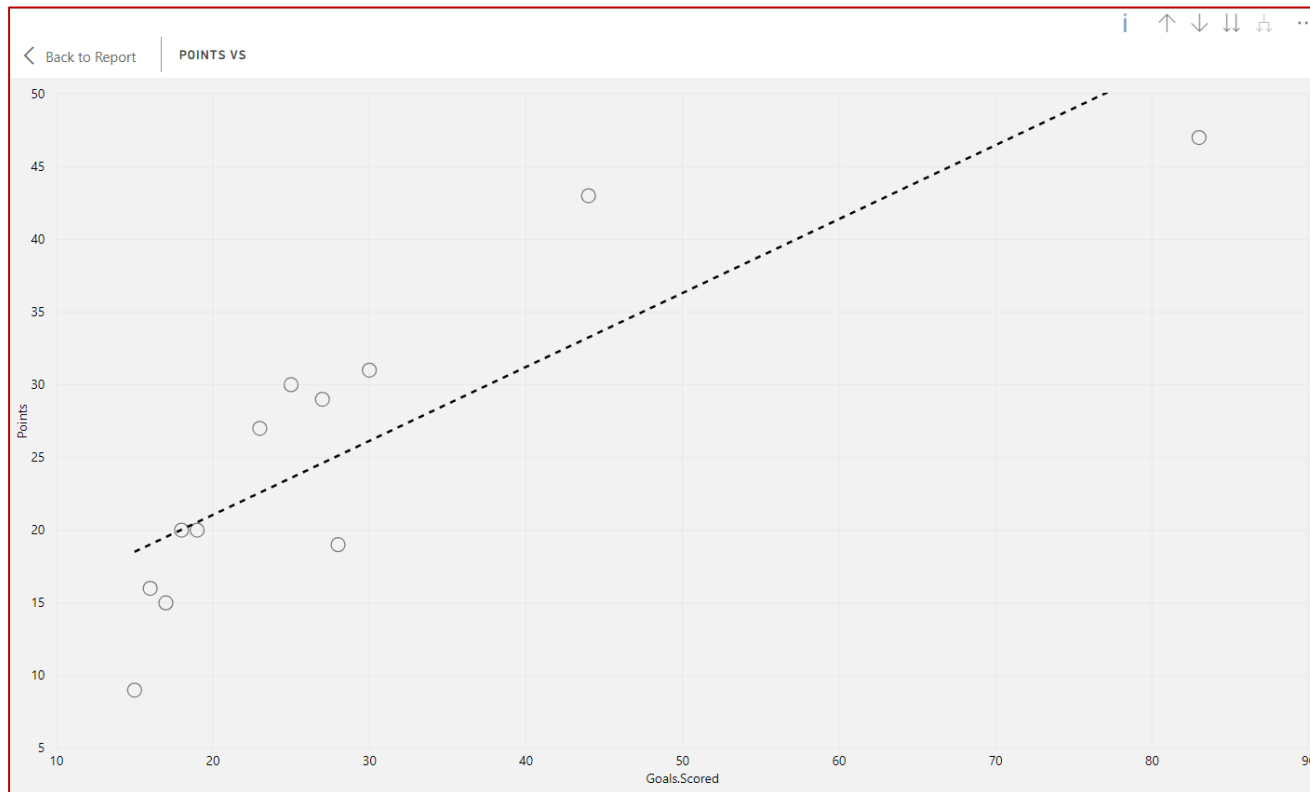


# Spotlight and Focus mode



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

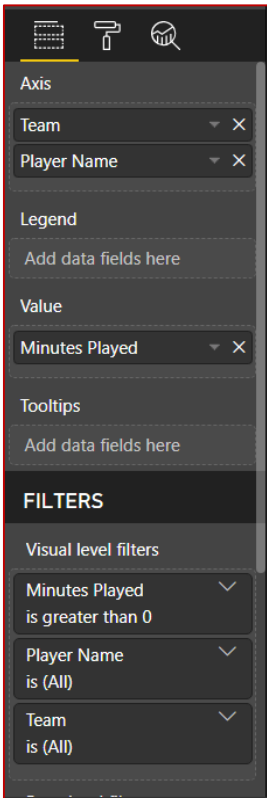
# Spotlight and Focus mode



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

# Drill mode

1



Axis

Team

Player Name

Legend

Add data fields here

Value

Minutes Played

Tooltips

Add data fields here

**FILTERS**

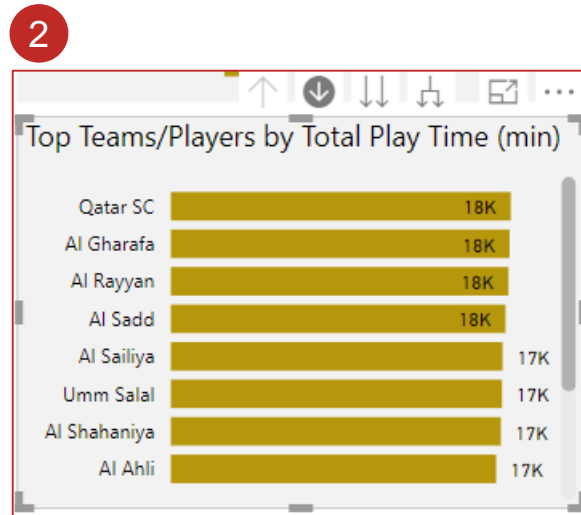
Visual level filters

Minutes Played  
is greater than 0

Player Name  
is (All)

Team  
is (All)

Put your y-axis variables of interest one under the other. In this case Team is our first level in the hierarchy followed by Player Name



Click on the **arrow down** to activate drill mode



Upon clicking on one of the bars you will go down the hierarchy level. You can go up the hierarchy by clicking on the **arrow up** button

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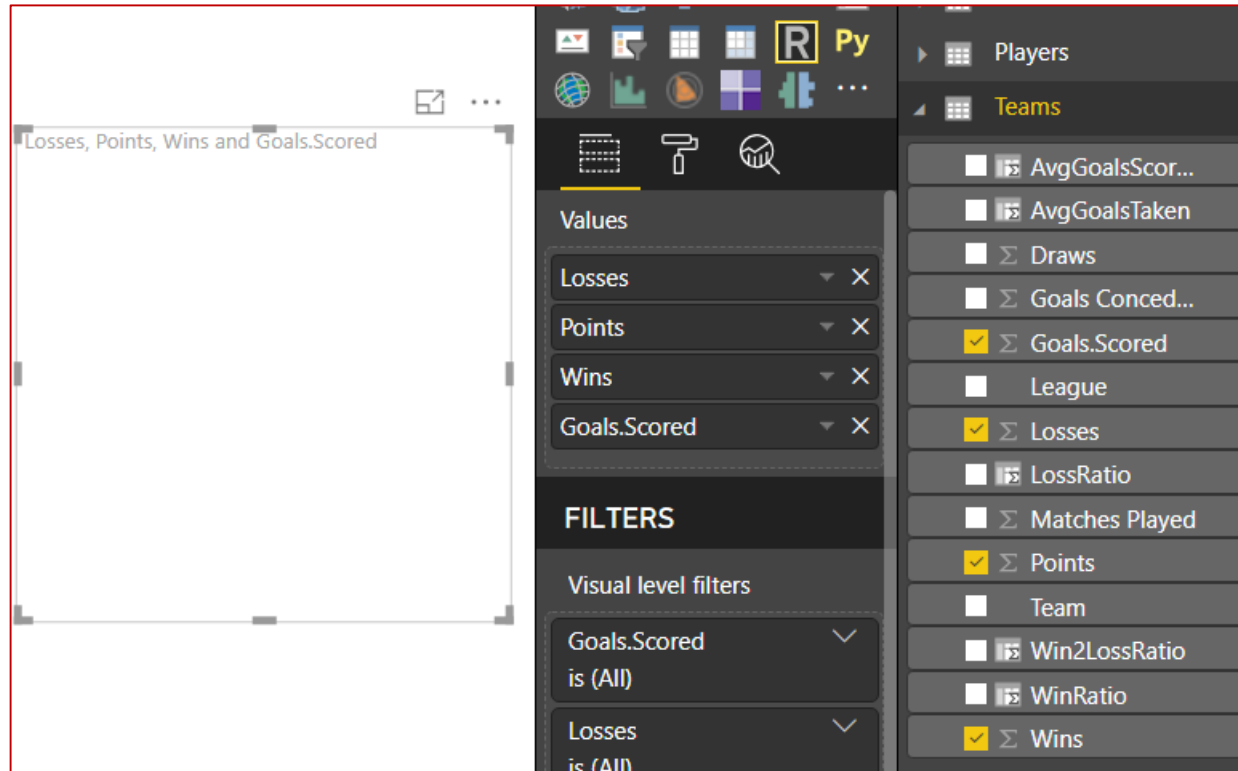
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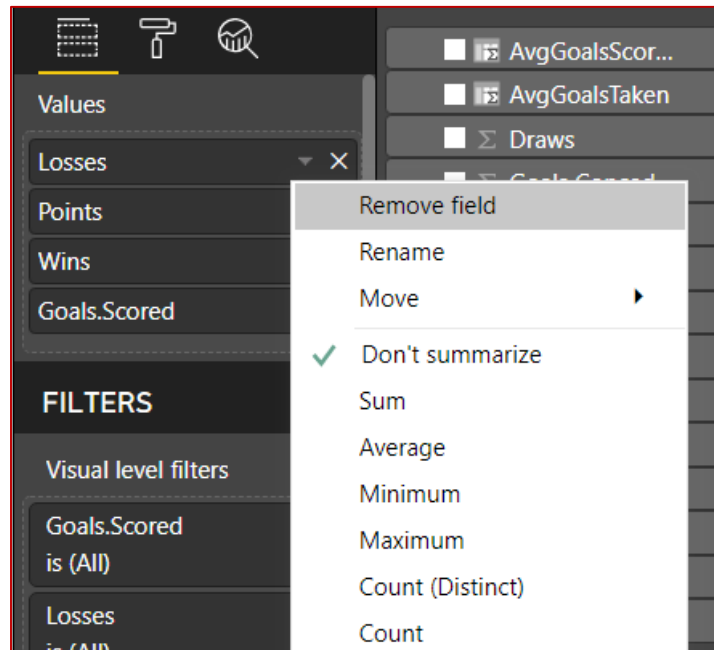
# Custom R Visuals



List of supported R Packages: <https://docs.microsoft.com/en-us/power-bi/service-r-packages-support>

# Custom R Visuals

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R visuals require that your variables are not summarized. If your visuals don't render it's very likely you forgot to select **Don't summarize**

# Custom R Visuals

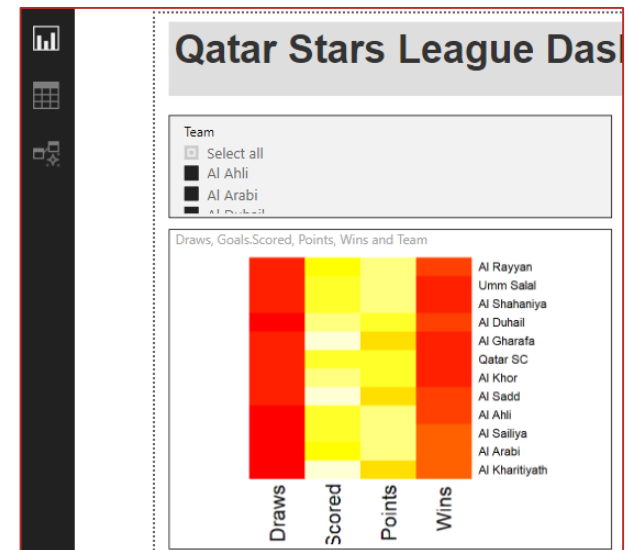
```
R script editor
1 # The following code to create a dataframe and remove duplicated rows is always executed and acts as a preamble for your script:
2
3 # dataset <- data.frame(Losses, Points, Wins, Goals.Scored)
4 # dataset <- unique(dataset)
5
6 # Paste or type your script code here:
```

Power BI will automatically create a data frame from the loaded variables. Those green lines are not R comments but code that Power BI runs before your script so don't delete them.

```
R script editor
⚠ Duplicate rows will be removed from the data.
4 # dataset <- unique(dataset)
5
6 # Paste or type your script code here:
7 library(dplyr)
8 dataset <- data.frame(dataset, row.names = dataset$Team)
9 dataset <- dataset %>% select(1:4)
10 data <- as.matrix(dataset)
11 heatmap(data, Colv=NA, Rowv=NA, scale="row")
```

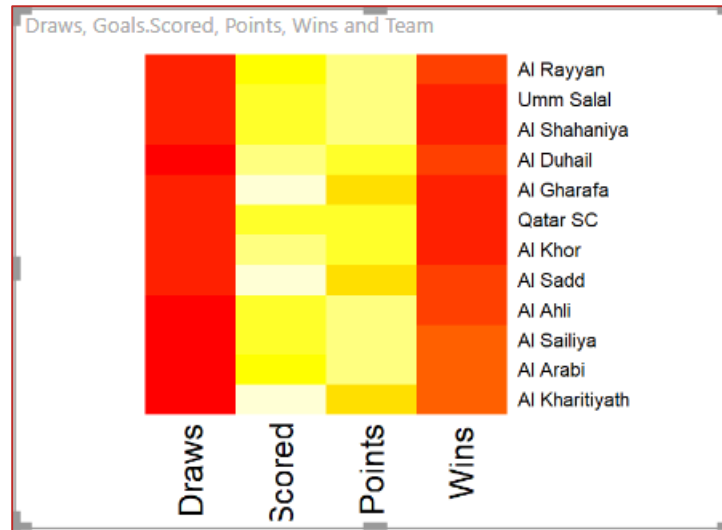
Overview   Disciplinary Actions   Player Stats   Position Stats   R Visuals

You can now run your run code and see its output



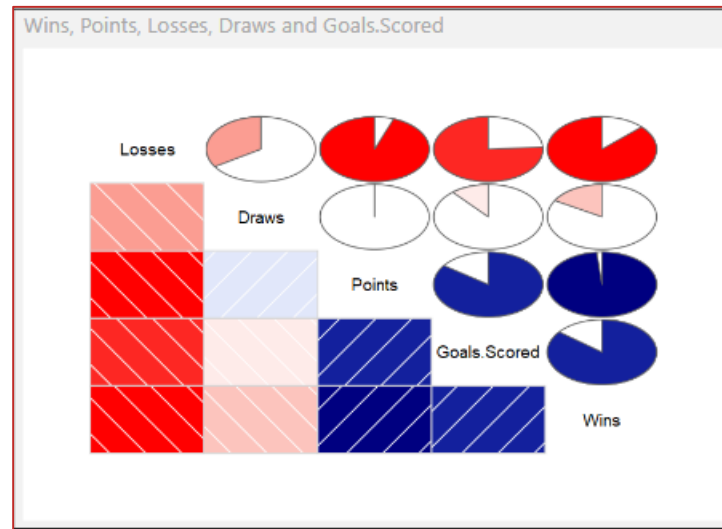


# Creating a heatmap with R Script visuals



```
library(dplyr) #we use dplyr to filter our dataset columns
dataset <- data.frame(dataset, row.names = dataset$Team) #set the row names for our data frame
dataset <- dataset %>% select(1:4) #filter our dataframe
data <- as.matrix(dataset) #transform our dataframe into a numeric matrix
heatmap(data, Colv=NA, Rowv=NA, scale="row") #Render our heatmap
```

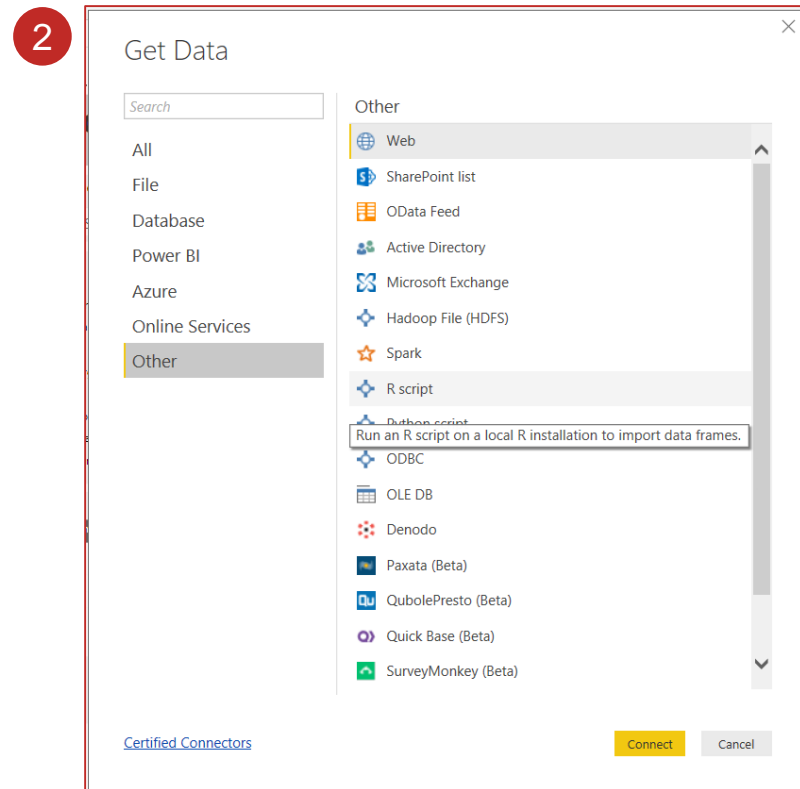
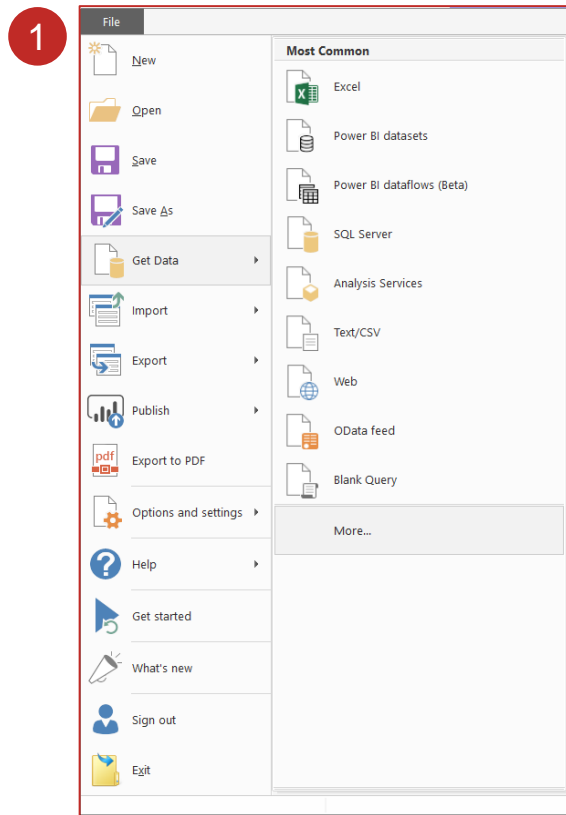
# Creating a correlogram with R Script Visual



```
library(corrgram) #load our corrgram library  
corrgram(dataset, order=TRUE, upper.panel=panel.pie) #Render the correlogram
```

# Loading R Datasets Directly into Power BI

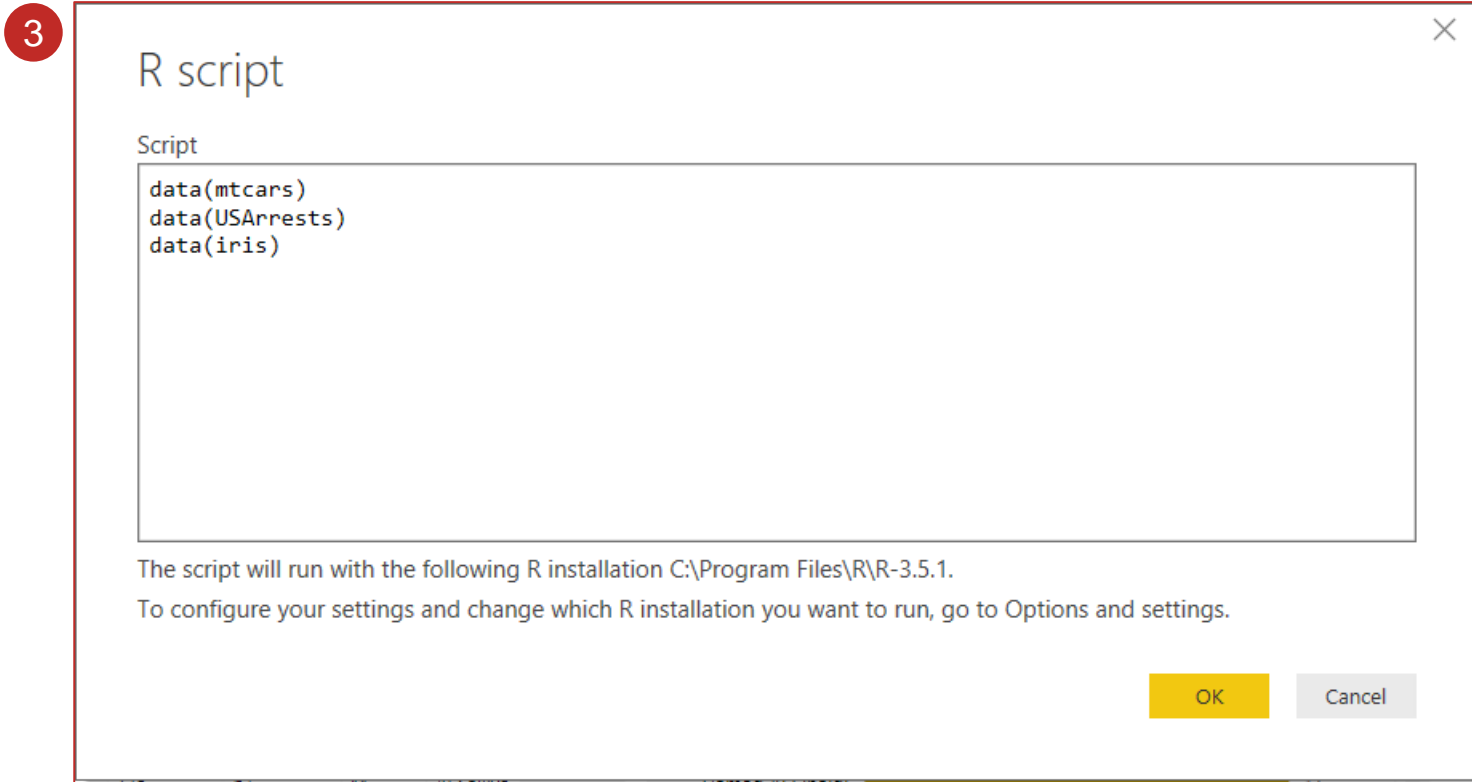
A number of R examples you will see online will make use of standard R datasets, you can replicate these tutorials by loading these datasets directly into Power BI using the R Script data import option.



A list of the standard R datasets is available on this page: <https://stat.ethz.ch/R-manual/R-patched/library/datasets/html/00Index.html>

# Loading R Datasets Directly into Power BI

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# Loading R Datasets Directly into Power BI

4

The screenshot shows the Power BI Navigator window. On the left, under 'R [3]', the 'iris' dataset is selected. The main area displays a preview of the 'iris' dataset, downloaded on Saturday, March 30, 2019. The data is presented in a table with the following columns: Sepal.Length, Sepal.Width, Petal.Length, Petal.Width, and Species. The table contains 150 rows of data, all of which are 'setosa' species. At the bottom of the window, there are three buttons: 'Load', 'Edit', and 'Cancel'.

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa
5.4	3.7	1.5	0.2	setosa
4.8	3.4	1.6	0.2	setosa
4.8	3	1.4	0.1	setosa
4.3	3	1.1	0.1	setosa
5.8	4	1.2	0.2	setosa
5.7	4.4	1.5	0.4	setosa
5.4	3.9	1.3	0.4	setosa
5.1	3.5	1.4	0.3	setosa
5.7	3.8	1.7	0.3	setosa
5.1	3.8	1.5	0.3	setosa
5.4	3.4	1.7	0.2	setosa
5.1	3.7	1.5	0.4	setosa

Source: <https://docs.microsoft.com/en-us/power-bi/desktop-r-in-query-editor>

## A note regarding radar charts in R

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- You might come across a package called **ggradar** that uses **ggplot2** to make radar plots. That package is compatible with **ggplot2 version 2.0.0 (2015)**, **ggplot2** is currently on **version 3.1.1** and therefore it's unlikely that **ggradar** will work unless you're running a really old version of R with old packages that are not updated.
- In case you want to tinker with **ggradar** (good luck) this a link to the package documentation <https://github.com/ricardo-bion/ggradar> (note: you will have to download a lot of old, deprecated packages. Time saver tip: it's still unlikely that you will manage to make it work)

# A note on R Script Visuals/ R Custom Visuals

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- Currently online publication of R visuals is only supported on **Power BI Service Pro**:  
<https://docs.microsoft.com/en-us/power-bi/visuals/service-r-visuals>
- R visuals in Power BI come in 2 shapes: **R script visuals** are those we can run directly from inside Power BI, while they are easier to implement you face limitations with their use relatively fast. The other class of R visuals is known as **custom R visuals** (i.e.: the ones available on the marketplace) and those require more thorough design and development and knowledge of R but provide greater flexibility. More information regarding the design and development of custom R visuals can be found in the following link:  
<https://github.com/Microsoft/PowerBI-visuals>
- **A number of packages that you see in the supported packages page can only work with R custom visuals and not with R script visuals!**
- For tinkering purposes here is a list of custom R visual tutorials:
  - <https://stackoverflow.com/questions/39368729/is-it-possible-to-use-r-plotly-library-in-r-script-visual-of-power-bi/55022829#55022829>
  - <https://www.blue-granite.com/tutorials/power-bi-interactive-r-visual>
  - <http://radacad.com/interactive-map-using-r-and-power-bi-create-custom-visual-part-1>
  - <http://radacad.com/interactive-charts-using-r-and-power-bi-create-custom-visual-part-2>

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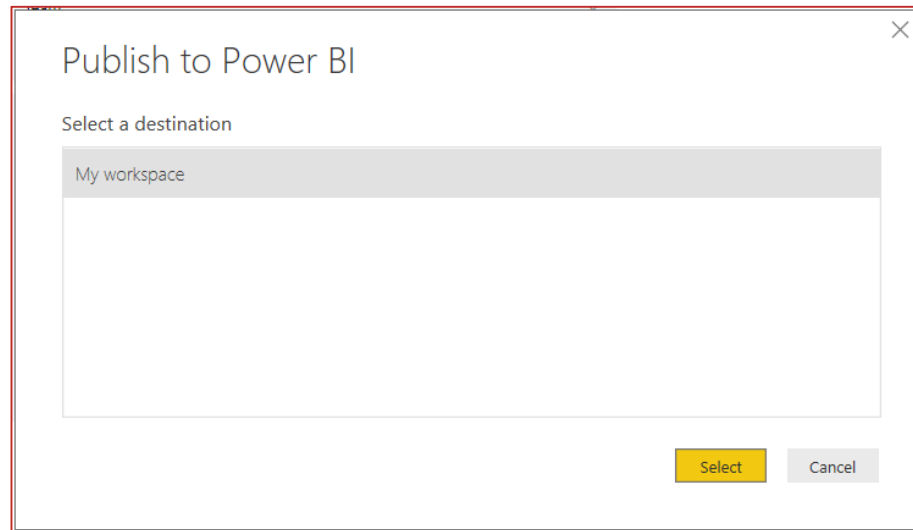
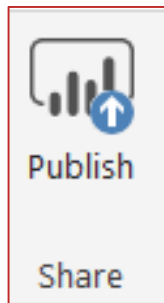
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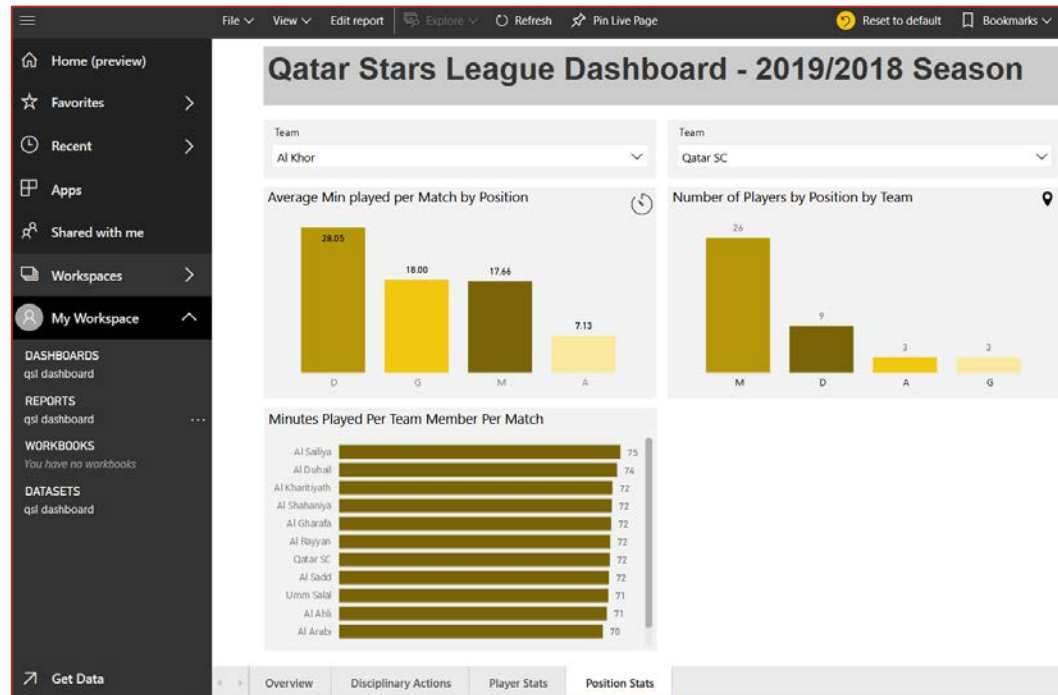
# Publishing your dashboard to Power BI Service

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Source: <https://docs.microsoft.com/en-us/power-bi/desktop-upload-desktop-files>  
<https://docs.microsoft.com/en-us/power-bi/guided-learning/publishingandsharing?tutorial-step=11>

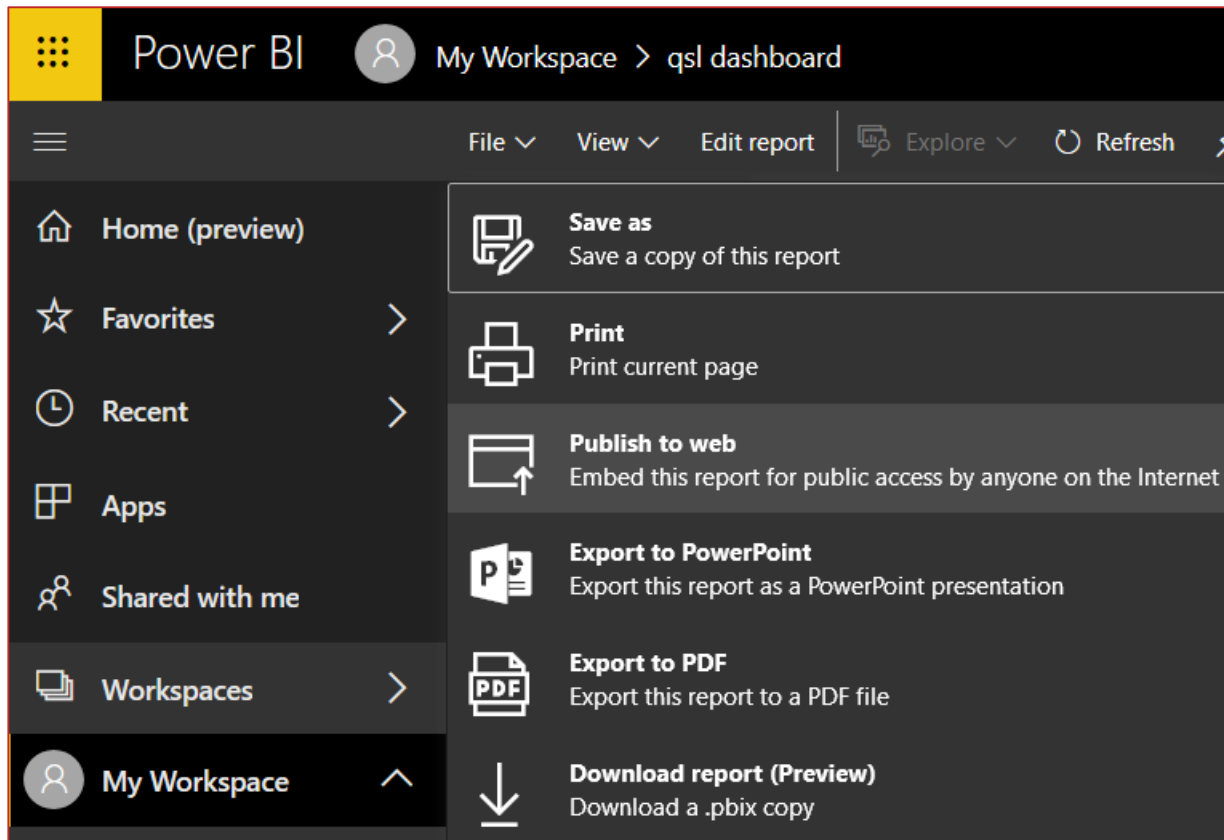
# Publishing your dashboard to Power BI Service



Source: <https://docs.microsoft.com/en-us/power-bi/desktop-upload-desktop-files>  
<https://docs.microsoft.com/en-us/power-bi/guided-learning/publishingandsharing?tutorial-step=11>

# Publishing your dashboard to Power BI Service

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Source: <https://docs.microsoft.com/en-us/power-bi/desktop-upload-desktop-files>  
<https://docs.microsoft.com/en-us/power-bi/guided-learning/publishingandsharing?tutorial-step=11>

# Publishing your dashboard to Power BI Service

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Embed code

Link you can send in email

```
dCI6IjVIZWY2MGJILTdkNWQtNDUzOC1hZWRkLTg5YWM1YTZhMTcyMyIsImMiOjZ9
```

Html you can paste into your blog or website

```
<iframe width="800" height="600" src="https://app.powerbi.com/view?r=eyJrljoi
```

Size

Close

Source: <https://docs.microsoft.com/en-us/power-bi/desktop-upload-desktop-files>  
<https://docs.microsoft.com/en-us/power-bi/guided-learning/publishingandsharing?tutorial-step=11>

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For those of your interested in learning more about Power BI

- Power BI official Microsoft course: <https://tinyurl.com/jtdzn96>
- Product/Feature announcement and tutorials (Power BI official blog) to know the latest updates: <https://powerbi.microsoft.com/en-us/blog/>
- Power BI Official documentation: <https://docs.microsoft.com/en-us/power-bi/>
- Where to find help/answers for your questions:
  - Community forum: <https://community.powerbi.com/>
  - StackOverflow search for **powerbi** tag