

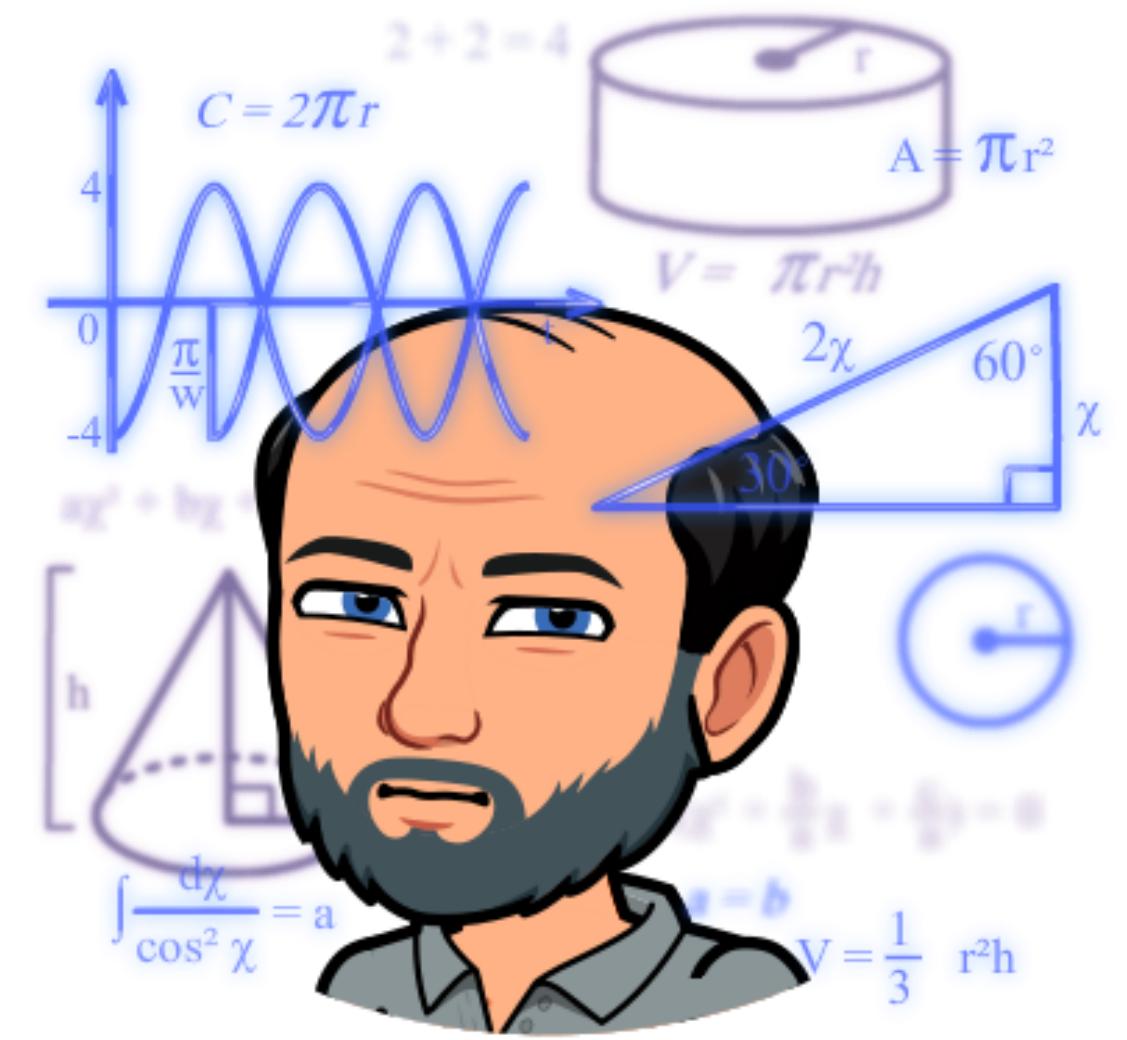
SQL days konferenz

Pimp your Power BI with R

Why not combine the best of both worlds? And you can!

Thomas Hütter
Senior developer

Pimp your Power BI with R



Thomas Hütter

SQL Days 2022, Erding

Pimp your Power BI with R

Thomas Hütter, Diplom-Betriebswirt

- Developer for ERP apps, SQL scripts and BI stuff
- Worked at consultancies, ISVs, end user companies
- 1995: SQL Server, 2001: Nav/BC, 2014: R, 2020: Power*
- Speaker at SQL/data/dev events around Europe



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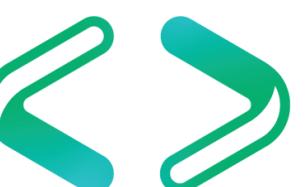


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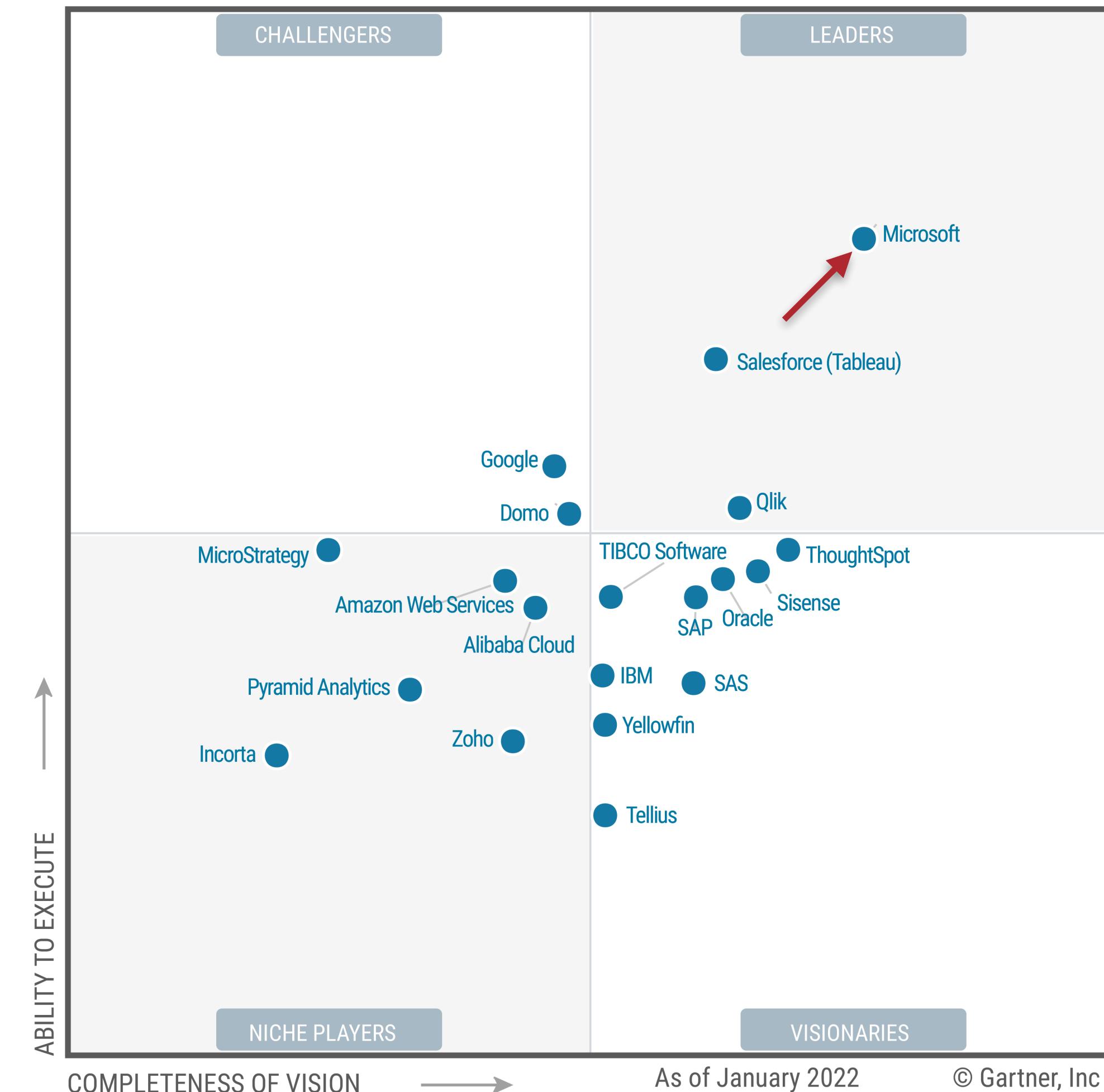
Agenda

- What is Power BI?
 - > Desktop, Service, Mobile, Report Server...
- What is R?
 - > Base R, RStudio, CRAN, packages...
- How to bring Power BI and R together
 - > Setting things up
- How to use Power BI and R together
 - > Combining the best of both worlds
- Round-up, resources & credits

What is Power BI?

- We all know that Power BI is the top enterprise analytics and BI platform according to Gartner, Forrester (and of course Microsoft 😊).
- And it's true, with Power BI you can share valuable insights through rich reports and dashboards.

Figure 1: Magic Quadrant for Analytics and Business Intelligence Platforms



Source: Gartner (March 2022)

What is Power BI?

- Components of the



Microsoft Power Platform

The low code platform that spans Microsoft 365, Azure, Dynamics 365, and standalone apps.



Power BI
Business analytics



Power Apps
App development



Power Automate
Process automation



Power Virtual Agents
Intelligent virtual agents



Power Pages
External-facing
websites



**Data
connectors**



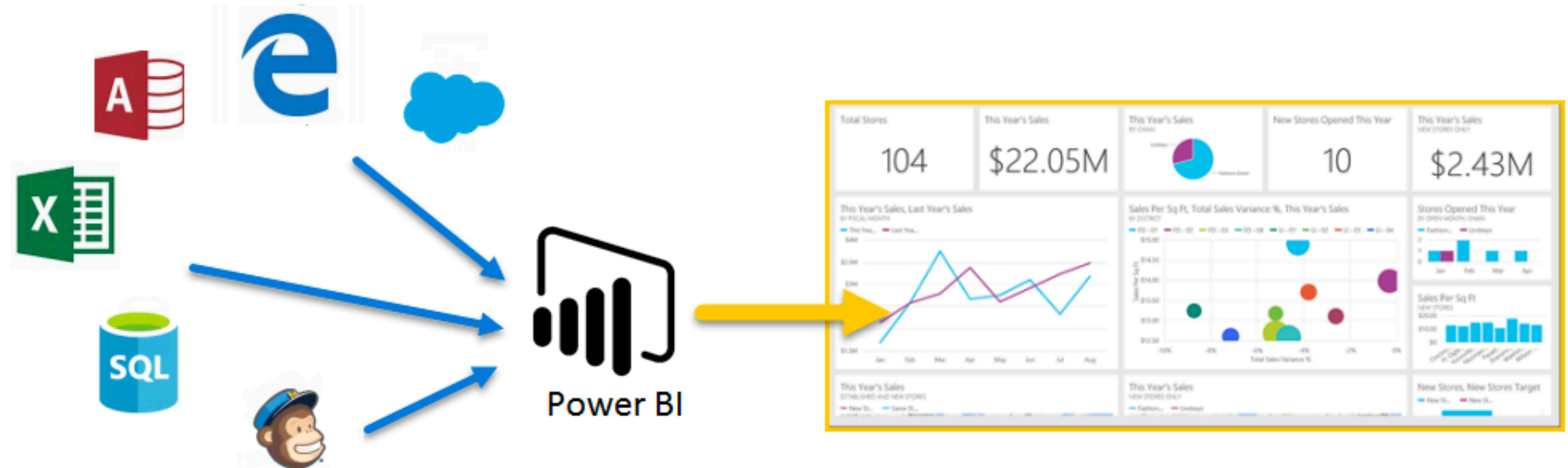
AI Builder



Dataverse

What is Power BI?

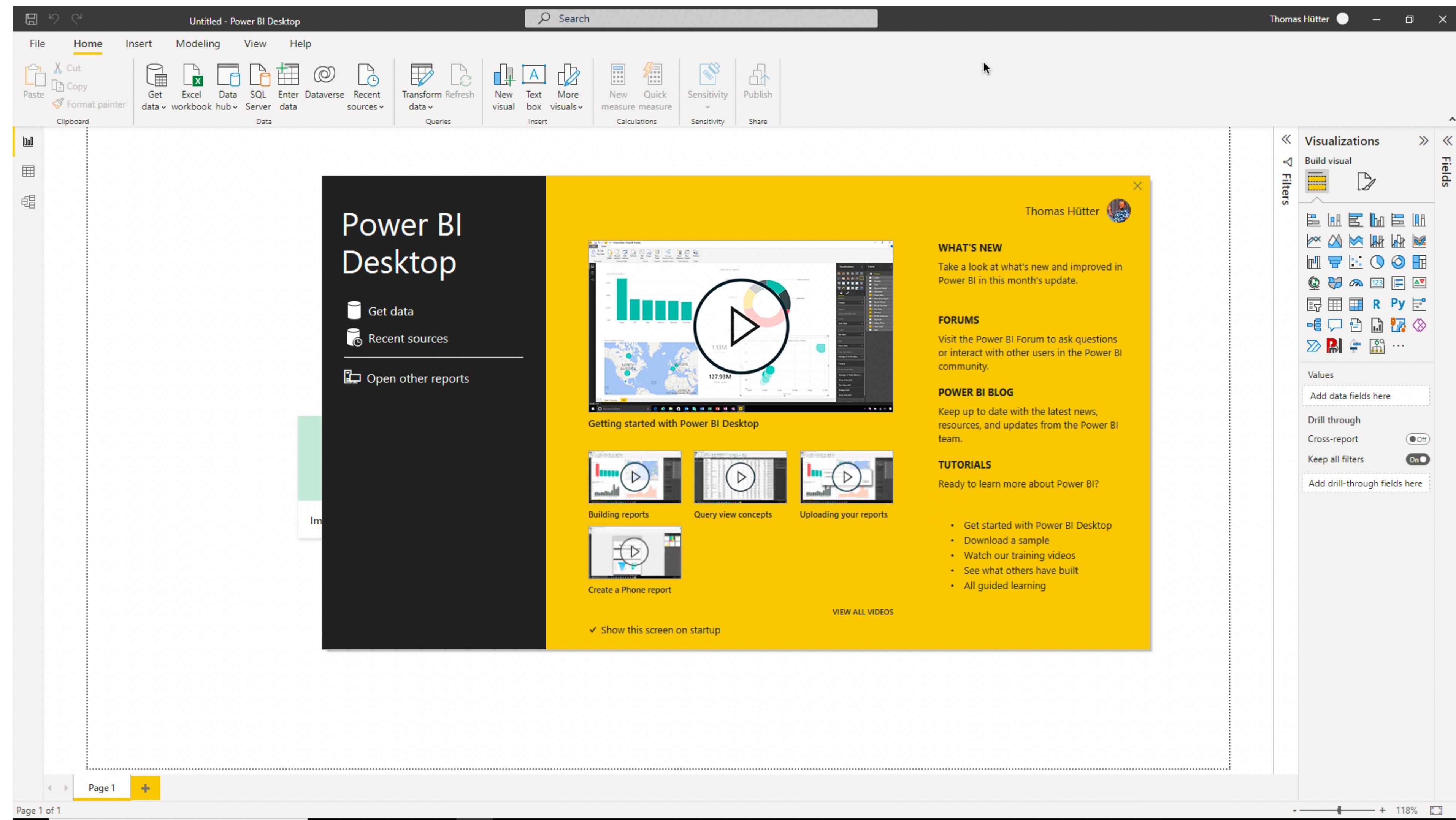
- „Microsoft Power BI is a collection of software services, apps, and connectors that work together to turn your unrelated sources of data into coherent, visually immersive, and interactive insights.“



What is Power BI...?

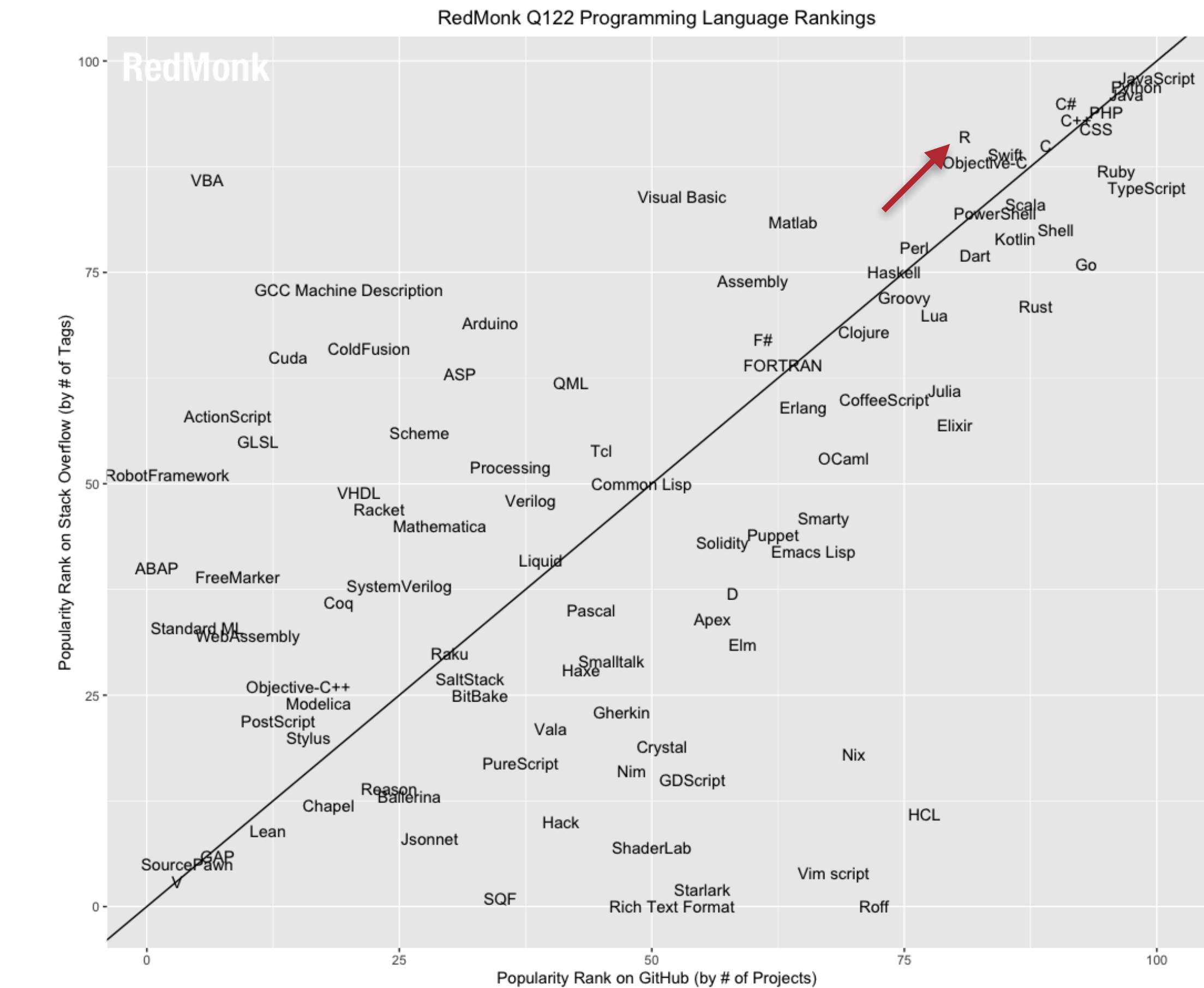
- Desktop
 - Windows desktop application to create reports and dashboards
- Service
 - Software as a Service to publish and share what you created
- Mobile App
 - App to view your results on iOS, Android and Windows mobile devices
- Report Builder
 - App for creating paginated reports to share in the PBI service
- Report Server
 - On-premises server where you can publish your PBI reports

What is Power BI...?



What is R?

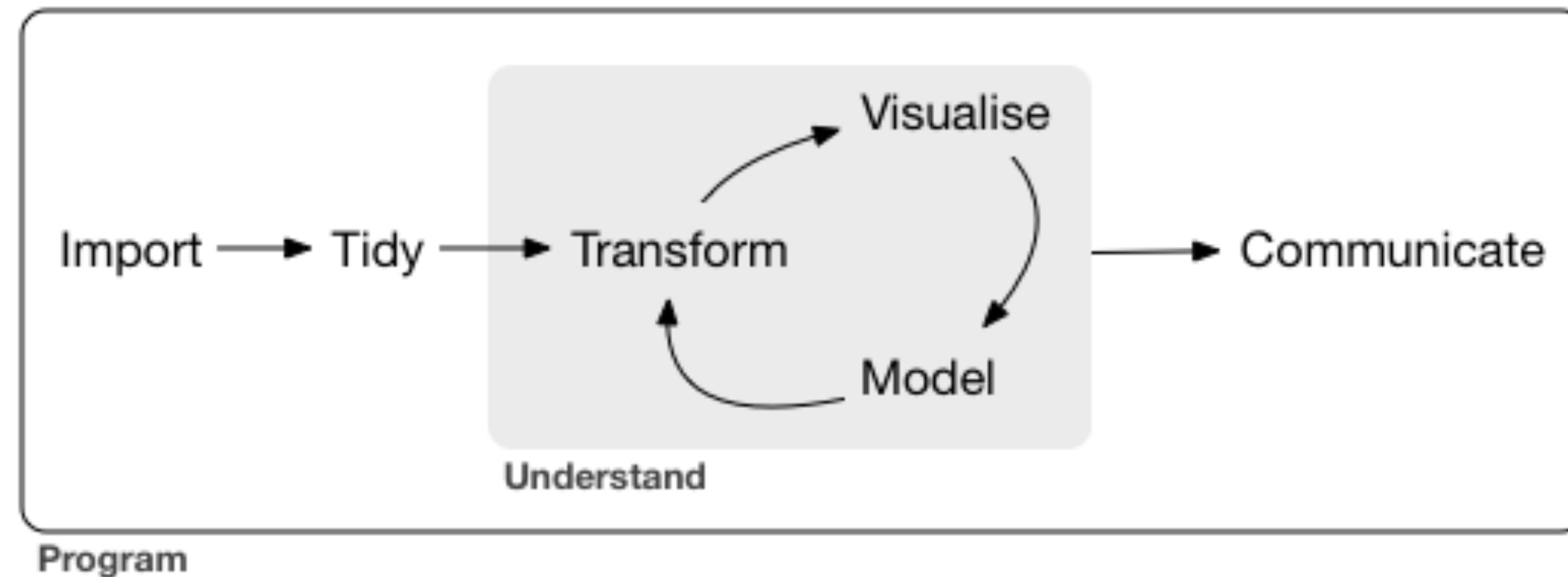
- Another ecosystem has earned high merits for data analysis, visualization and data science in the past decades - the R language.



What is R?

- Programming language for statistical computing and visualization, widely used by statisticians, data miners, analysts, data scientists
- Created by **Ross Ihaka** and **Robert Gentleman**, Uni Auckland, in 1993 as an open source implementation of the (1970s) S language
- GNU project, maintained by the R Foundation for Statistical Computing, compiled builds für Mac OS, Linux, Windows, supported by R Consortium
- Extensible through user-created packages, ≈ 19000 available on CRAN
- Commercial support, e.g. since 2007 by Revolution Analytics, acquired by Microsoft in 2015, now provide Microsoft R Open, R Server
- IDEs: R.App, RStudio, MS R Tools for VisualStudio (< Version 2019)
- Support for R now in SQL Server (R services), Azure ML and... Power BI 😊

What is R? ... The Tidyverse



- „The goal of these principles is to provide a uniform interface so that Tidyverse packages work together naturally“. *)
- The components of the Tidyverse cover these tasks and can help you to accomplish them in a concise manner.
- Tidy data is data stored it in a consistent, reusable structure, preferably in rectangular datasets, where ideally: 1 row = 1 observation and 1 column = 1 variable.

What is R? ... IDEs

The screenshot displays the RStudio interface, which is a popular integrated development environment (IDE) for R. The interface is divided into several panes:

- Script Editor (Top Left):** Shows a script named "sample_session.R" with the following code:

```
1 x <- rnorm(50)
2 y <- rnorm(x)
3 # Generate two pseudo-random normal vectors of x- and y-coordinates.
4
5 plot(x, y)
6 # Plot the points in the plane. A graphics window will appear automatically.
7
8 ls()
9 # See which R objects are now in the R workspace.
10
11 rm(x, y)
12 # Remove objects no longer needed. (clean up).
13
14 x <- 1:20
15 # Make x = (1, 2, ..., 20).
16
17 w <- 1 + sqrt(x)/2
18 # A 'weight' vector of standard deviations.
19
20 dummy <- data.frame(x=x, y= x + rnorm(x)*w)
21 dummy
22 # Make a data frame of two columns, x and y, and look at it.
23
24 fm <- lm(y ~ x, data=dummy)
25
```

- Global Environment (Top Right):** Shows the variables "x" and "y" defined in the workspace.

x	y
num [1:50] 0.3104 0.0651 0.9289 -1.0815 -0.5086 ...	num [1:50] -0.6484 0.8047 -0.7817 -0.9486 0.0895 ...

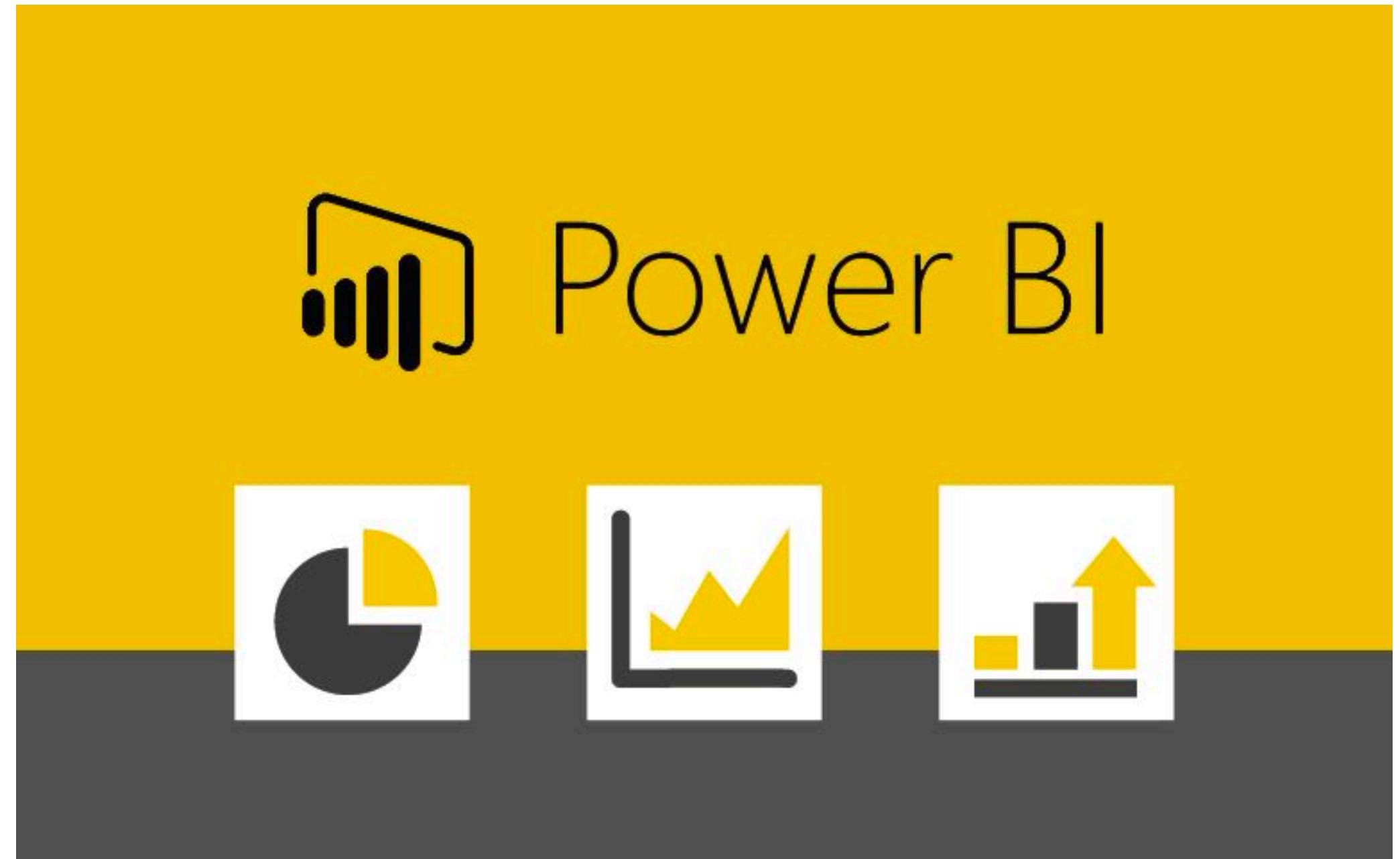
- Console (Bottom Left):** Shows the R command history:

```
> x <- rnorm(50)
> y <- rnorm(x)
> plot(x, y)
>
```

- Plots (Bottom Right):** Displays a scatter plot of the generated data points.

How to bring Power BI and R together

- Why not combine the best of both worlds? And you can!
- Let's see what it takes to connect your Power BI Desktop to R and how R functionality can be extended by installing packages.



How to bring Power BI and R together

- Install the base R system
- Install RStudio
(or another IDE of your choice)
- In Power BI Desktop, make sure the options for R scripting are adjusted
(which should happen automagically, but can be changed)

Options

GLOBAL

Data Load
Power Query Editor

DirectQuery

R scripting

Python scripting

Security

Privacy

Regional Settings

Updates

Usage Data

Diagnostics

Preview features

Auto recovery

Report settings

CURRENT FILE

Data Load

R script options

To choose a home directory for R, select a detected R installation from the drop-down list, or select Other and browse to the location you want.

Detected R home directories:

C:\Program Files\R\R-4.2.1

[How to install R](#)

To choose which R integrated development environment (IDE) you want Power BI Desktop to launch, select a detected IDE from the drop-down list, or select Other to browse to another IDE on your machine.

Detected R IDEs:

R Studio

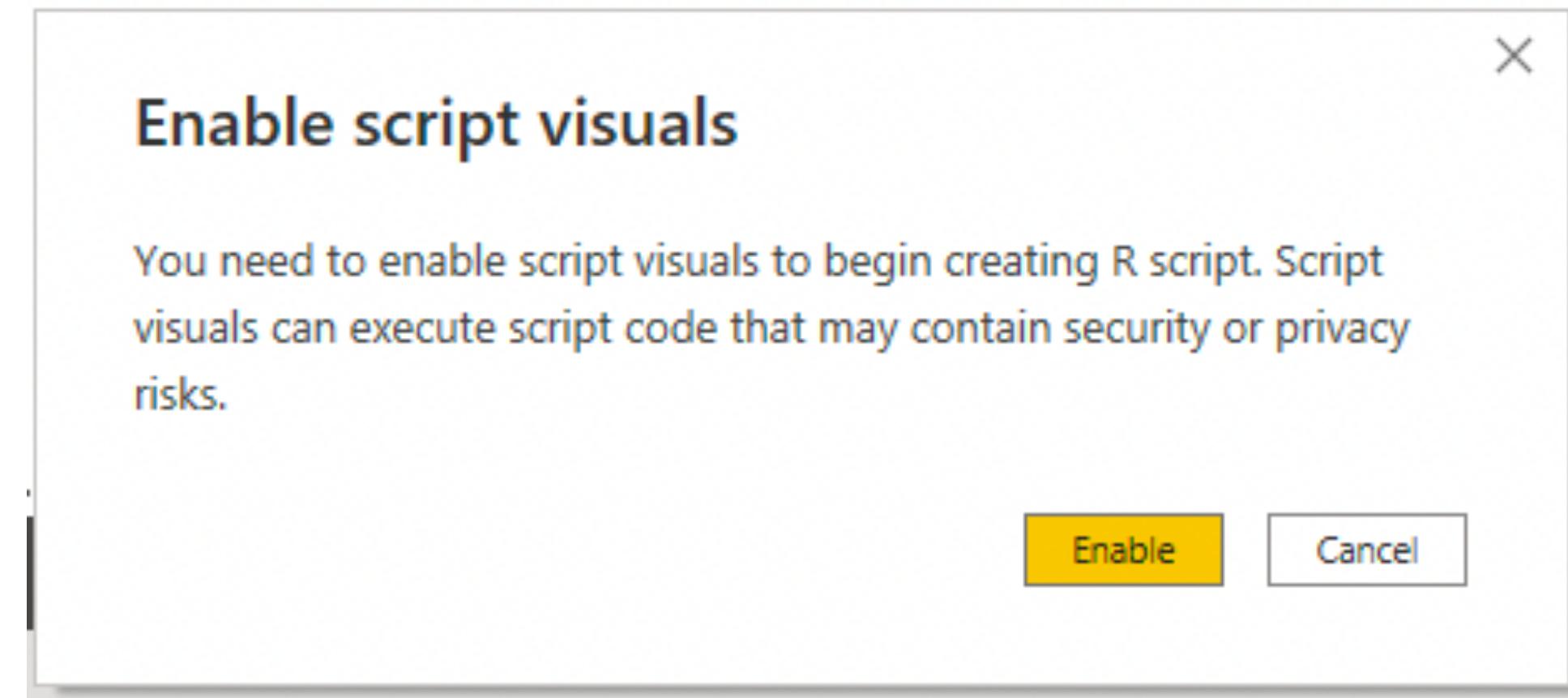
[Learn more about R IDEs](#)

[Change temporary storage location](#)

Note: Sometimes, R custom visuals automatically install additional packages. For those to work, the temporary storage folder name must be written in Latin characters (letters in the English alphabet).

How to use Power BI and R together

- Using an R script as a data source
Get Data -> Other -> R script
- Using the visualization powers of R on PBI data
-> R script visual



- All in R: data ingestion, manipulation and visualization

How to use Power BI and R together

Limitations:

- Current R runtime: 3.4.4 (may only be true for Microsoft runtime)
- Power BI service supports R packages with free and open-source licenses
- Only CRAN based packages, no private or custom packages are supported
- No direct client-server queries over www (such as RgoogleMaps)
- List of supported packages available from

<https://learn.microsoft.com/en-us/power-bi/connect-data/service-r-packages-support>

Resources

- Power BI:

Power BI documentation: <https://docs.microsoft.com/en-us/power-bi/>

PBI desktop download: <https://www.microsoft.com/en-us/download/details.aspx?id=58494>

Dashboard in a day: <https://powerbi.microsoft.com/en-us/diad/>

Create R visuals in PBI (also on R limitations in PBI desktop):

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

On R limitations for PBI service, see: <https://learn.microsoft.com/en-us/power-bi/visuals/service-r-visuals>

- R:

CRAN: <https://cran.r-project.org/index.html>, introduction: <https://cran.r-project.org/doc/manuals/r-release/R-intro.html>

The Tidyverse web site: <http://www.tidyverse.org/>

R for Data Science, Wickham & Grolemund, O'Reilly, ISBN 978-1491910399: <http://r4ds.had.co.nz>

The tidy tools manifesto <https://mran.microsoft.com/web/packages/tidyverse/vignettes/manifesto.html>

RStudio Desktop IDE: <https://www.rstudio.com/products/rstudio/download/#download>

Pimp your Power BI with R

Thank you for your time and interest & keep in touch:

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-  de.linkedin.com/in/derfredo
-  www.xing.com/profile/Thomas_Huetter



This file and the demo scripts can be found at:

<https://bit.ly/DerFredoErding22>

Vielen Dank!

Ich freue mich auf Feedback!