Power BI User Group

R in Power BI

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Agenda

- What is R
- R inside Power BI
- Why do you even need it?

~~What is love?~~ What is R?

More importantly, what can it do?

- data transform
- stat analysis
- machine learning / predictive modeling
- web apps
- reports, presentations
- websites & books

What can R do?

Data transformation

```
head(iris)
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1          5.1         3.5          1.4         0.2  setosa
## 2          4.9         3.0          1.4         0.2  setosa
## 3          4.7         3.2          1.3         0.2  setosa
## 4          4.6         3.1          1.5         0.2  setosa
## 5          5.0         3.6          1.4         0.2  setosa
## 6          5.4         3.9          1.7         0.4  setosa
```

What can R do?

Data transformation

```
iris_gather <- iris %>%
    gather("key", "size", -Species)

head(iris_gather)
```

```
##   Species          key size
## 1  setosa Sepal.Length  5.1
## 2  setosa Sepal.Length  4.9
## 3  setosa Sepal.Length  4.7
## 4  setosa Sepal.Length  4.6
## 5  setosa Sepal.Length  5.0
## 6  setosa Sepal.Length  5.4
```

What can R do?

Data transformation

```
iris_gather2 <- iris_gather %>%
    separate(col = key, into = c('part', 'dimension'))

head(iris_gather2)
```

```
##   Species  part dimension size
## 1  setosa Sepal    Length  5.1
## 2  setosa Sepal    Length  4.9
## 3  setosa Sepal    Length  4.7
## 4  setosa Sepal    Length  4.6
## 5  setosa Sepal    Length  5.0
## 6  setosa Sepal    Length  5.4
```

What can R do?

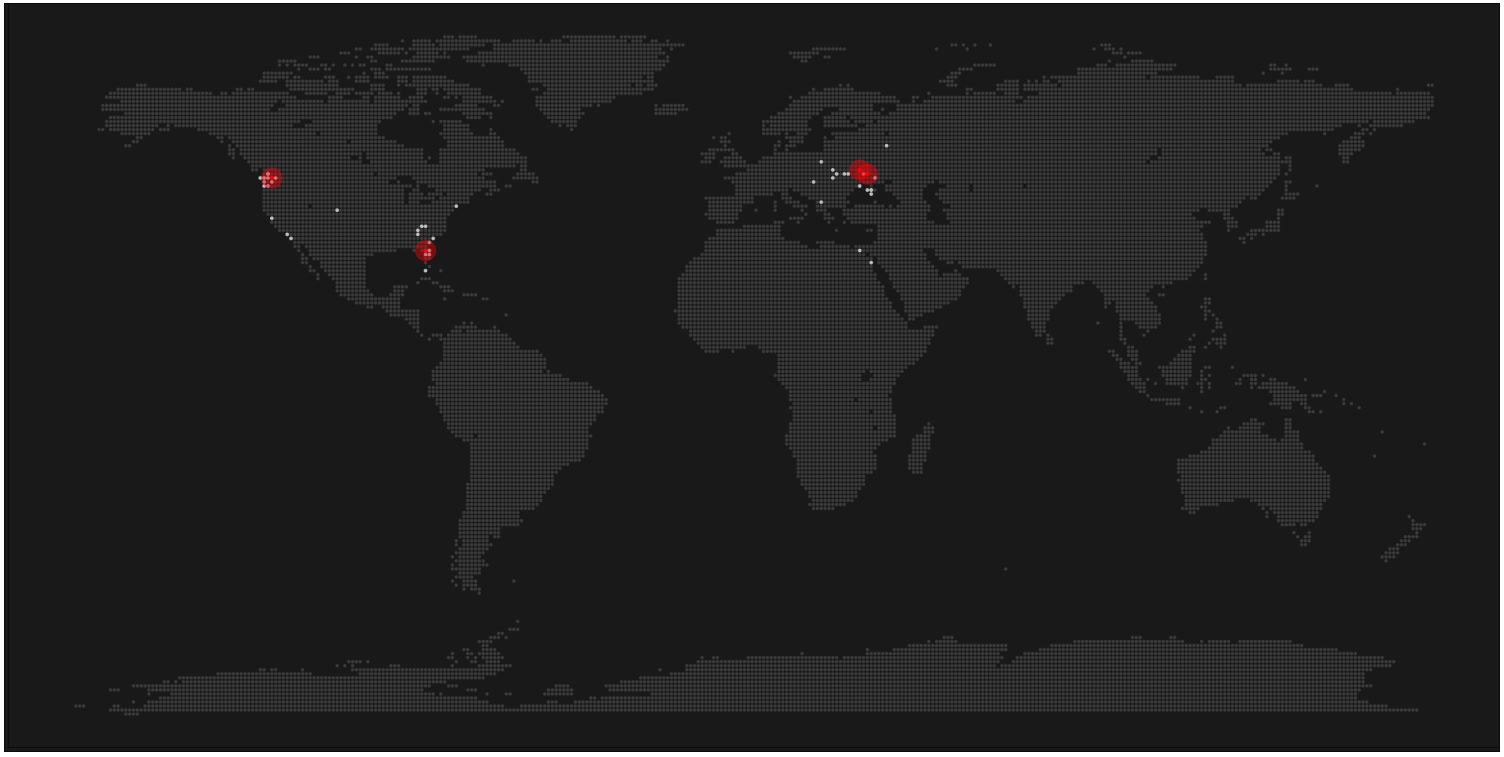
Data transformation

```
iris_summary <- iris_gather2 %>%
    group_by(Species) %>%
    summarise(size_avg = mean(size),
              size_sd = sd(size),
              size_med = median(size))

head(iris_summary)
```

```
## # A tibble: 3 x 4
##   Species    size_avg size_sd size_med
##   <fct>         <dbl>   <dbl>    <dbl>
## 1 setosa         2.54    1.85     2.10
## 2 versicolor     3.57    1.76     3.30
## 3 virginica      4.28    1.92     4.15
```

What can R do? Data visualization



https://taraskaduk.com/2017/11/26/pixel-maps/

What can R do? Web apps (A.k.a Shiny)

https://taraskaduk.shinyapps.io/rate/

What can R do?

So much more!

- reports
- presentations
- websites
- books

What can R do? Bread and butter

> *"The best thing about R is that it was written by statisticians. The worst thing about R is that it was written by statisticians."* ~ **Bob Cowgill** (probably) [1]

1 - Why has R, despite quirks, been so successful? - Revolution Analytics

What can R do?

Statistical analysis and Machine Learning

- perform statistical analysis
- create, train and test models on your laptop (`caret`, `modelr` packages)
- reach to Keras and TensorFlow from within R
- et cetera et cetera

R in Power BI

R in Microsoft

What can you do with R inside of MS products?

- Run R on SQL Server.
- Run R code in Azure ML
- Use Microsoft R Server for paralel processing

https://microsoft.github.io/sql-ml-tutorials/R/rentalprediction/step/3.html

```
-- Stored procedure that trains and generates an R model using the re
DROP PROCEDURE IF EXISTS generate_rental_rx_model;
go
CREATE PROCEDURE generate_rental_rx_model (@trained_model varbinary(m
AS
BEGIN
    EXECUTE sp_execute_external_script
      @language = N'R'
    , @script = N'
        require("RevoScaleR");


            rental_train_data$Holiday = factor(rental_train_data$Holi
            rental_train_data$Snow = factor(rental_train_data$Snow);
            rental_train_data$WeekDay = factor(rental_train_data$Week

        #Create a dtree model and train it using the training data se
        model_dtree <- rxDTree(RentalCount ~ Month + Day + WeekDay +
        #Before saving the model to the DB table, we need to serializ
        trained_model <- as.raw(serialize(model_dtree, connection=NUL

    , @input_data_1 = N'select "RentalCount", "Year", "Month", "Day",
    , @input_data_1_name = N'rental_train_data'
    , @params = N'@trained_model varbinary(max) OUTPUT'
    , @trained_model = @trained_model OUTPUT;
END;
```

R in Power BI

That's cool, but what can I do with R in Power BI?

- scripts
- visuals

Demo 1 - financial foreacst in R -> visualize in Power BI

- financial_forecast_demo.R
- financial_forecast_demo_working.pbix
- PowerBI-visuals-forcasting-exp.1.0.3.0.pbix

Power BI in R

Custom R Visuals

https://github.com/Microsoft/PowerBI-visuals-forcasting-exp

```
ets_params = list(Automatic="Z",Multiplicative="M",Additive="A",Nor
if(frequency(timeSeries) == 1)
  seasonType = "None"
deModel = paste(ets_params[[errorType]],ets_params[[trendType]],ets

if(sum(deModel==c("ANM","ZMA","MMA","AZM","AMZ","AMM","AMA","AMN","
  deModel = "ZZZ"

fit = ets(timeSeries, model=deModel,damped=damped)
```

Power BI in R

Custom R Visuals

https://github.com/Microsoft/PowerBI-visuals-forcasting-exp

```
    p1a <- p1a + labs (title = pbiInfo, caption = NULL) + theme_bw()
    p1a <- p1a + xlab(labTime) + ylab(labValue)
    p1a <- p1a + scale_x_continuous(breaks = seq(1,length(predictions
    p1a <- p1a +  theme(axis.text.x  = element_text(angle = getAngle)
                                                    hjust=1, size = s
                        axis.text.y  = element_text(vjust = 0.5, size
                        plot.title  = element_text(hjust = 0.5, size
                        axis.title=element_text(size =  sizeLabel),
                        axis.text=element_text(size =  sizeTicks),
                        panel.border = element_blank())
```

Demo 2

Use R script within Query Editor

- car_data.csv

Demo 3

Use a model to create a *What If* scenario

- what_if.R
- what_if.pbix

Demo 4

R Visuals

- what_if.pbix
- financial_forecast_demo_working.pbix

When to use and when not to use R in Power BI

Do

- performance
- machine learning, statistical analysis
- custom visualizations

Don't

- when no one else knows R on your team
- when you can get by with Power BI
- when you can get by with SQL

- Pre-built visuals
  - https://docs.microsoft.com/en-us/power-bi/service-custom-visuals-getting-started-with-developer-tools
  - https://github.com/Microsoft/PowerBI-visuals
  - http://community.powerbi.com/t5/Developer/Tweaking-an-existing-Custom-Visual-the-change-is-successful-but/m-p/107019
  - https://github.com/Microsoft/PowerBI-visuals-forcasting-exp/blob/master/script.r