Thomas Hütter

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50 ways to show your data

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Thomas Hütter, Diplom-Betriebswirt

- Application developer, consultant, accidental DBA, author
- Worked at consultancies, ISVs, end user companies
- SQL Server > 6.5, former „Navision“ > 3.0, R > 3.1.2
- Speaker at SQL events around Europe

@DerFredo https://twitter.com/DerFredo

de.linkedin.com/in/derfredo

www.xing.com/profile/Thomas_Huetter

Agenda

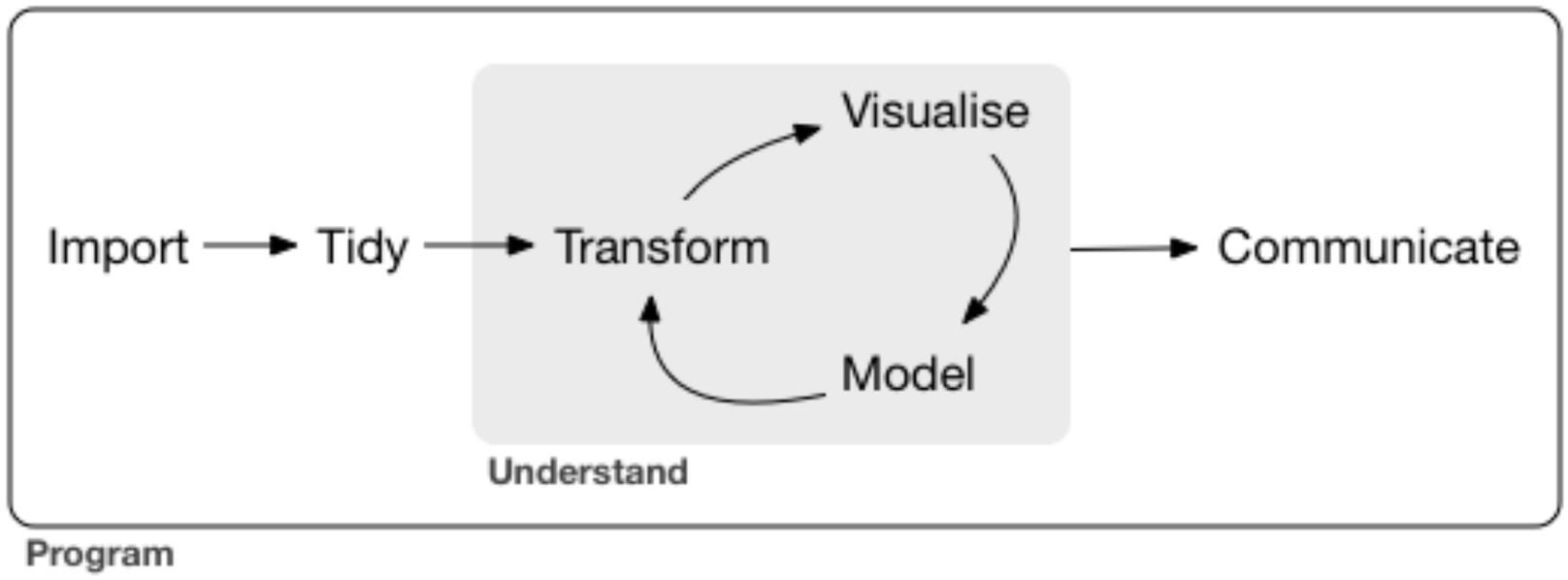
- What's the fuzz about this R language?
  - The flow of your data:
    - import, manipulate, visualize, communicate
- A grammar of graphics: ggplot2
- Fancy ggplot2 graphs and some fancy friends:
  - from facets
  - via ridgelines and waterfalls
  - to animated plots and yet some extras
- Round-up, resources, Q&A

What's the fuzz about this R language?

- Programming language for statistical computing, analysis and visualization, widely used by statisticians, data miners, analysts, data scientists
- Created by **R**oss Ihaka and **R**obert 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, > 15300 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 Visual Studio (< version 2019)
- Support for R now in SQL Server, Power BI, Azure ML, Data science VM

The flow of your data

What a typical data analysis/data science project may look like



The components of the Tidyverse (ggplot2 being one part) cover these tasks and can help you to accomplish them in a concise manner.

figure © 2017 Wickham/Grolemund: „R for Data Science“

A grammar of graphics: ggplot2

- „The grammar of graphics“, a 2005 book by Leland Wilkinson et al. served as a foundation for implementing the R package ggplot2
- My simple approach to „what is needed to describe a graph“:
  - data: *what do you want to show*
  - aesthetic mappings: *which relations are there to show*
  - geometries: *how do you want to show it*
  - extras:
    - guides: axes, scales and legends
    - labels, annotations
    - facetting, coordinate systems
    - colours, themes
    - …

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- facets
  show small multiples,
  apply the big picture to subsets of your data
- violins
  show more detail of the data distribution than a box plot
- lollipop charts [ggalt]
  alternative to bar charts with lots of nearly-similar-sized bars,
  on screen: reduce moiré, on paper: reduce waste of ink
- encircling areas [ggalt]
  draw attention to certain regions or groups of points,
  visualize clustering

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- jitter plots / counts charts
  show information otherwise hidden by overlapping points
- avoiding overlap of text labels [ggrepel]
  avoid overlap of text labels
- ridgeline plots [ggridges] (ex joyplots*)
  compare distribution or timeline for a number of subgroups
  * name deprecated, see http://serialmentor.com/blog/2017/9/15/goodbye-joyplots
- tree maps [treemap]
  display hierarchical data as nested rectangles

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- waterfall diagrams [waterfall(s)]
  show up- and down development of a single measure
- correlograms [(gg)corrplot]
  show correlation between several variables at once
- marginal histograms and boxplots [ggExtra]
  show distribution details for the dimensions of
  a scatter plot
- radar charts [ggradar]
  compare multiple measures for few items

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- maps [ggmap]
  include geospatial information
- animated plots [gganimate]
  automatically show development over time
- Chernoff faces [ggChernoff]
  everyone likes smilies, don’t they?
- More extras:
  facet zooming [ggforce],
  diverse themes [ggthemes, ggTech],
  interactive: tooltips [ggiraph]

Round-up / conclusions

- With R, a lot is possible in terms of analysis and especially visualizations
- With ggplot2 and it’s extensions, graphs can be constructed in a very concise manner, according to the grammar of graphics
- Don’t overdo/overload your visualizations
- Careful with the number and choice of colours/shapes
- Consider the occasion of your presentation (Chernoff faces are not suitable for every audience)

Credits & resources / inspired by:

- Selva Prabhakaran's Top 50 ggplot2 Visualizations Master List
  (use under Creative commens license, referred to as „Top 50 list")
- A list of ggplot2 extensions http://www.ggplot2-exts.org/
- The ggplot2 reference online http://ggplot2.tidyverse.org/reference/

- R Graphics Cookbook, by Winston Chang, O'Reilly,
  ISBN 978-1449316952
- R for Data Science, Hadley Wickham & Garrett Grolemund, O'Reilly,
  ISBN 978-1491910399, also online at http://r4ds.had.co.nz

- Formula 1 data set: www.formel1.de
- Cellphone subscriptions data: data.worldbank.org
- Live parking data: www.kleve.de

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Time for some Q & A:

That is: questions that might be of common interest, and their answers might fit into the remaining time :-)

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Thank you for your interest & keep in touch:

- @DerFredo https://twitter.com/DerFredo
- de.linkedin.com/in/derfredo
- www.xing.com/profile/Thomas_Huetter

This file and all demo scripts can be found at:
https://j.mp/DerFredoHull2020