Josep Carreras LEUKAEMIA Research Institute

Data visualization in R

Angelika Merkel (Head of Bioinformatics Unit IJC)
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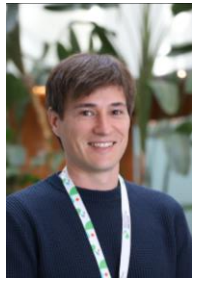
IJC Bioinformatics

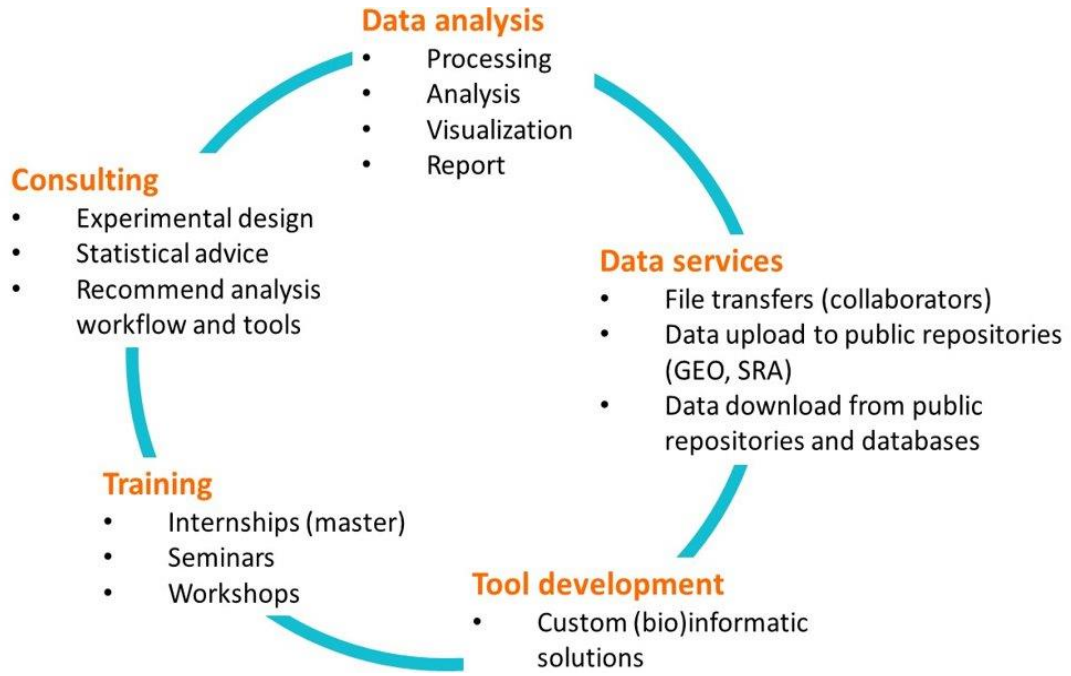
The IJC Bioinformatics Unit

Angelika Merkel
Unit Manager
Bioinformatician



Emilio Lario
Software Engineer

Marina Vilardell
Bioinformatician



Office: 1st floor; phone: 4300
https://ijcbit.eu
https://www.carrerasresearch.org/en/bioinformatics-unit

Materials

Course book:

R for Data Science, 2nd edition (Wickham, Cetinkaya-Rundel and Grolemund, 2023)

RStudio course server:

https://rstudio1.services.carrerasresearch.org/

BIT course webpage:

https://ijcbit.github.io/Workshops/

Data visualization in R

packages:

- {graphics} for basic graphic
- {lattice}, for high level data visualizations for multivariate data
- {ggplot2} coherent system for data visualizations based on 'the grammar of graphics'
- {ggpubr} publication-ready pots based on ggplot2
- {ComplexHeatmap}, {pheatmap} for specialized graphic such as heatmaps
- {gviz} vizualization of genomic data

The Tidyverse

Tidy verse = collection of approx. 25 packages for manipulation, visualization, transformation of "tidy data" (incl ggplot2)

Tidy data (and data frames aka 'tibbles'):
= each value is placed in its own “cell”,
each variable in its own column,
and each observation in its own row.


```
table1
#> # A tibble: 6 × 4
#>   country      year  cases population
#>   <chr>       <dbl>  <dbl>      <dbl>
#> 1 Afghanistan  1999    745   19987071
#> 2 Afghanistan  2000   2666   20595360
#> 3 Brazil       1999  37737  172006362
#> 4 Brazil       2000  80488  174504898
#> 5 China        1999 212258 1272915272
#> 6 China        2000 213766 1280428583
```

```
table2
#> # A tibble: 12 × 4
#>   country      year type           count
#>   <chr>       <dbl> <chr>          <dbl>
#> 1 Afghanistan  1999 cases            745
#> 2 Afghanistan  1999 population  19987071
#> 3 Afghanistan  2000 cases           2666
#> 4 Afghanistan  2000 population  20595360
#> 5 Brazil       1999 cases           37737
#> 6 Brazil       1999 population 172006362
#> # ℹ 6 more rows
```

```
table3
#> # A tibble: 6 × 3
#>   country      year rate
#>   <chr>       <dbl> <chr>
#> 1 Afghanistan  1999 745/19987071
#> 2 Afghanistan  2000 2666/20595360
#> 3 Brazil       1999 37737/172006362
#> 4 Brazil       2000 80488/174504898
#> 5 China        1999 212258/1272915272
#> 6 China        2000 213766/1280428583
```

Base R and the tidyverse

BaseR

- better for software development
- better for running quick simulations
- generally faster performance
- more appealing to users with previous programming experience

Use if:

- Most of your work involves software or package development, advanced statistical procedures, or computationally expensive operations
- You're used to other languages that have more in common with Base-R
- Most of your collaborators and online network use it too

Tidyverse

- ease of use, functions have the same structure and easier names, enables reading functions as instructions
- quick and easy data manipulation
- grouping datasets with many variable for summary statistics with dplyr
- over 25 packages in the tidyverse, each requiring its own updates to stay current
  -> adds overhead, difficult to reproduce, limits submission to code repros as R cran or bioconductor

Use if:

- Most of your work involves data cleaning, visualization, and common statistics
- You're newer to R and find it easier to read and understand than base-R
- Most of your collaborators and online network use it too

The Grammar of Graphics

- Variables are mapped to visual properties (aesthetics) : aes()
- Values of the aesthetic are assigned to each unique level (or values) of the variable = "scaling"
- Data is represented as = geom_*()
- Data might be transformed (rescaled) as part of the representation

Practical session

R for Data Science, 2nd edition (Wickham)

- Chapter 1
  - Building up a plot: ggplot(), mappings = aes(), representations = geoms_*()
  - Visualizing distributions of variables and relationships between variable for exploratory analysis

- Chapter 9
  - Adding layers
  - Mapping aesthetics to groups (general vs specific)
  - Aesthetics mapping vs geom_* attributes
  - Grouping by facets

- Chapter 11
  - Labels
  - Guides (legends)
  - Scales
  - Coordinate systems
  - Themes

Further resources

Tutorials:

- Datanovia

Inspirations with code examples:

- R gallery

GGplot2 extensions:

- https://exts.ggplot2.tidyverse.org/gallery/

Questions?

Thank you!