# Statistics and R

InterTU Study Day 2018 4TU.AMI

June 29, 2018; Maikel Verouden


WAGENINGEN UNIVERSITY & RESEARCH

100years 1918 — 2018

4TU.AMI
MATHEMATICS FORINNOVATION

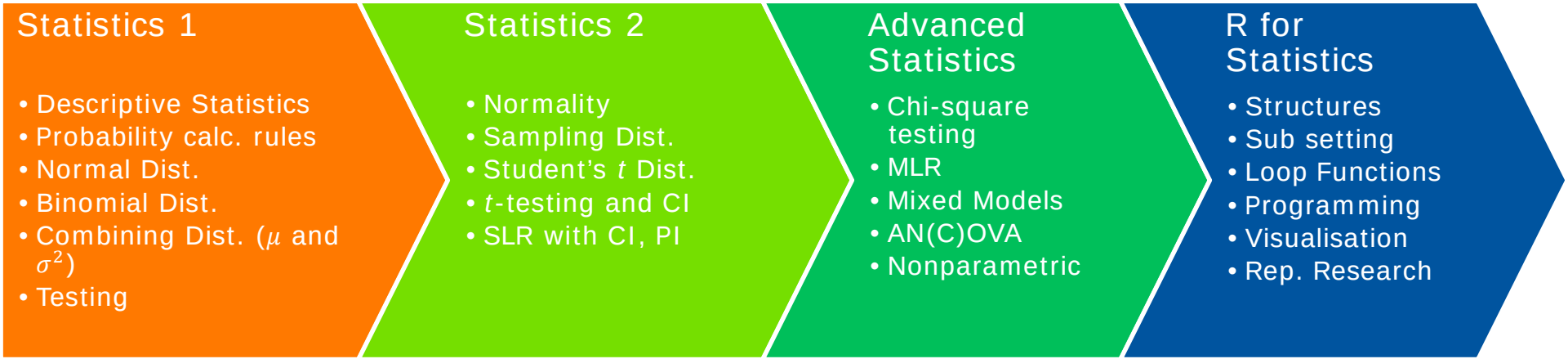
**Biometris**
Quantitative methods brought to life

# Applied Mathematics in Education

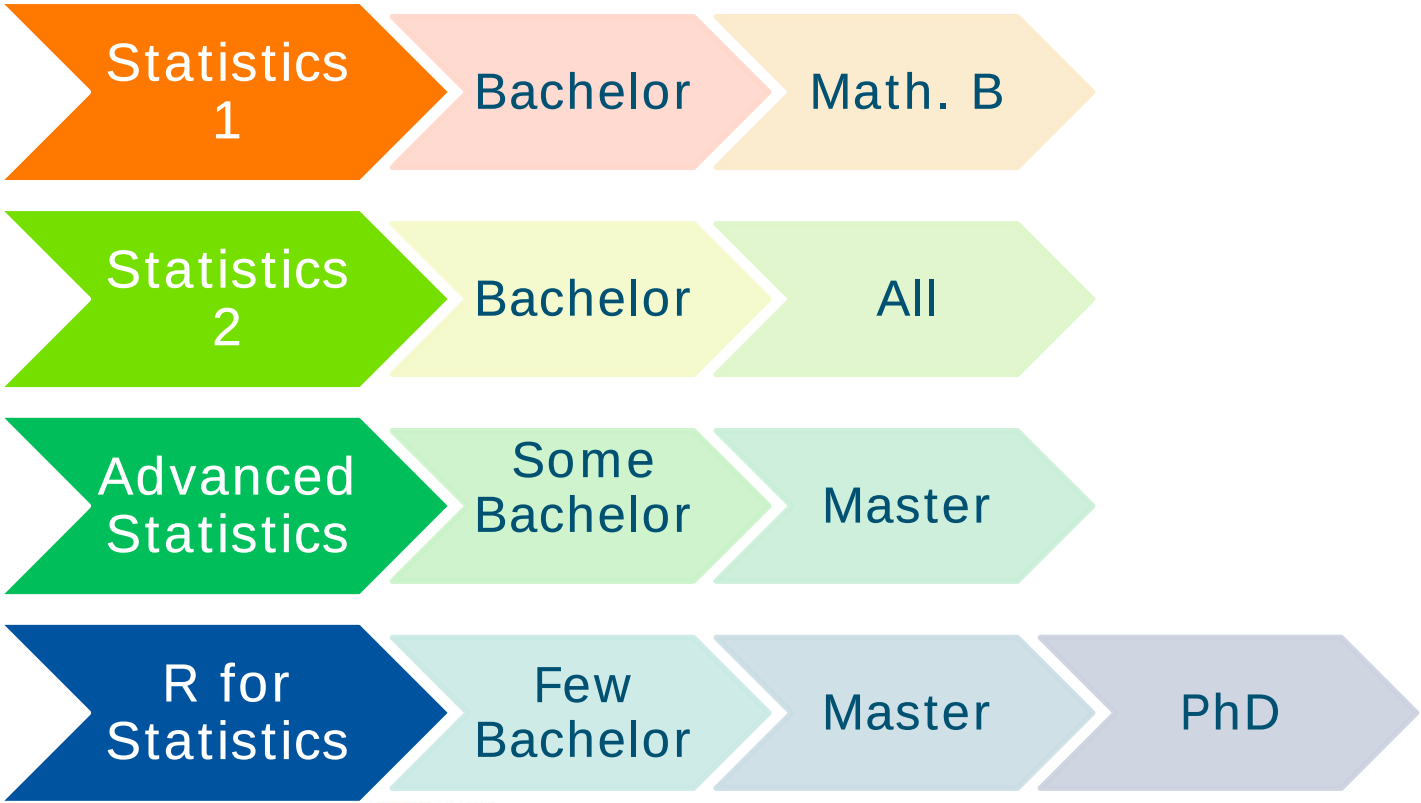
- Several continuation courses assume knowledge on Mathematics, e.g.:
  - Introductory Physics (i.a. BBW, BMW, BAT)
  - Cell Biology and Advanced Imaging Technologies (i.a. BBI)
  - Models for Ecological Systems (i.a. MFN)
  - Functional Zoology (i.a. MBI, MAS)

- Statistics is part of Applied Mathematics and at Wageningen University & Research every student gets (an) introductory Statistics course(s).

# Brief Overview Contents Statistics Courses

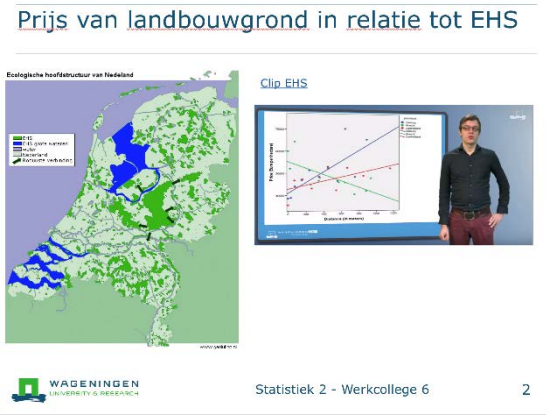


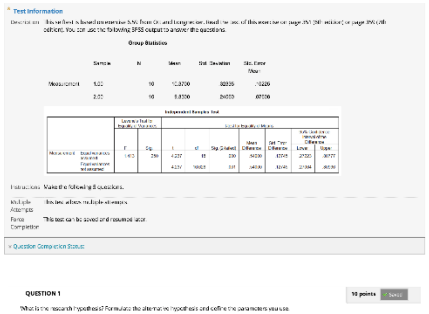
# Which Students in Statistics Courses

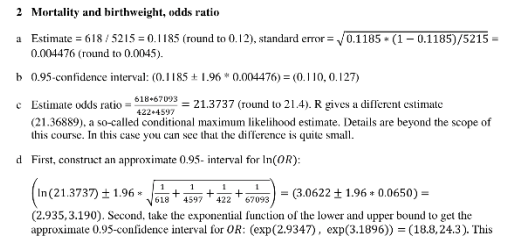


# Statistics Course Material

- Tailored with local Research Examples and Data
- Videos on YouTube
  - Refresh
  - Introduce
  - Motivate
  - Expand
- Self-tests on Blackboard
- Pen and Paper exercises (PPP)

# Latest Change: Introduction of R

- What is it?

A language and environment for statistical computing

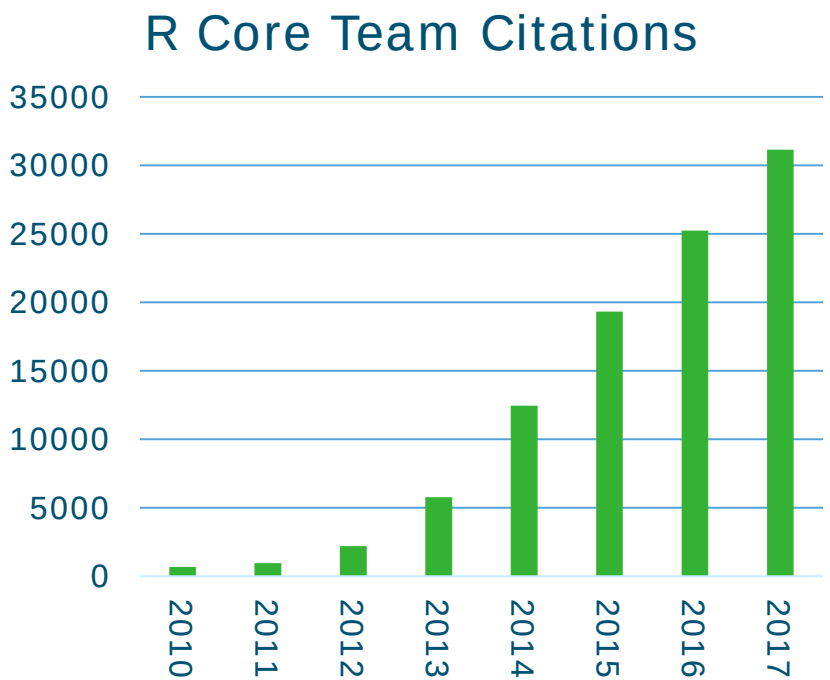
- Why?

From a didactic point of view

- R has a steep learning curve
- One software for all courses

By popular demand

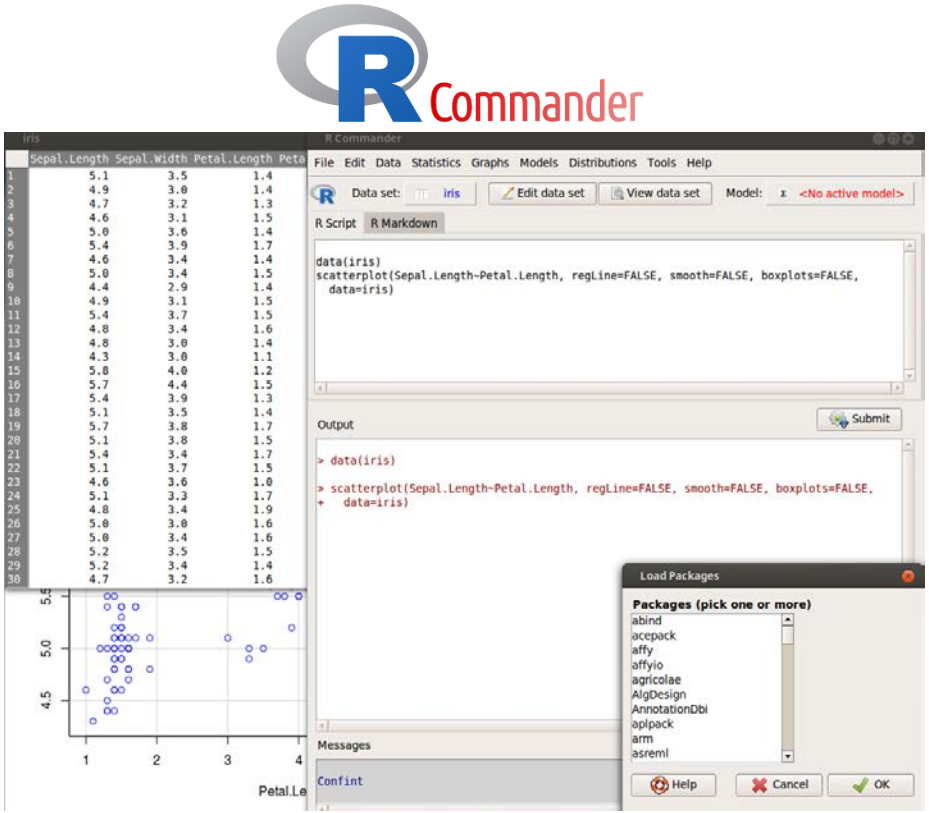
- Programme Directors
- Students




Source: Google Scholar search 'R Core Team'

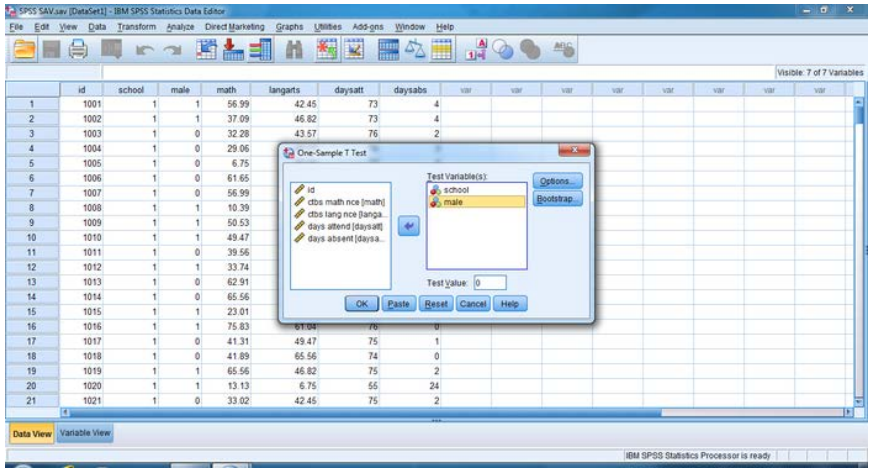
# Statistics 1

- Microsoft Excel used in computer practical
- Academic Year 2018-2019 a switch to R Commander will be made
  - A Point-and-Click Interface for R
  - Focus on understanding output, not learning R



# Statistics 2

- IBM SPSS Statistics
  - Output:
    - Lectures, exercises
    - Exam questions
  - Computers practicals




- When introduction of R Commander in Statistics 1 successful
- Possible switch to R (Commander) in Academic Year 2019-2020

# Advanced Statistics

- IBM SPPS Statistics
  - Output:
    - Lectures, exercises
    - Exam questions
  - Practicals
- R (Rgui/Rstudio)
  - Some DIY exercises during computer practicals
  - Output in Pen and Paper Practicals and exam questions
  - In two years full switch to R

# R for Statistics


- Working with R in previous courses
  - With a focus on Statistics
- R is required/useful in many graduation/PhD projects
  - Need to focus on R
- ‘R for Statistics’ as optional course
  - With a focus on R with Rstudio (IDE around R)
  - Application by repetition of previous acquired Statistics knowledge

# Teaching ‘R for Statistics’

- R can not be learned from lectures
- An intensive practical approach is used:
    - Small introduction R internals
        - Exercises
    - Introduction application previously learned statistical analyses in R
        - Exercises
- Assessment: end-of-the-week $(2 * \frac{1}{6})$ and final assignment $(\frac{4}{6})$ reports

{swirl}

Learn R, in R.

https://swirlstats.com

# Student Survey Results (after 2 runs)

| Opinions | Weighted Average | Pooled Stand. Dev. |
|---|---|---|
| Course Materials | 4.35 | 0.56 |
| Motivation | 4.26 | 0.85 |
| Workload | 3.15 | 1.25 |
| Challenge | 4.55 | 0.60 |
| Satisfaction | 4.35 | 0.65 |

# Student Evaluation Remarks


“The workload is too high for a 3 ECTS course. Additional time is required in the afternoon to finish all assignments and prepare for the next day.”

“The course is intensive, but very useful to get a basic understanding of of R in a relative short time. I would recommend it to everyone wanting to learn R.”

# Biometris collaborated statistical courses using R

- Modern Statistics for the Life Sciences (Animal Breeding and Genetics, ABG-30806)
- Data Science MSc, Leiden Universiteit
- Graduate Schools:
    - Production Ecology and Resource Conservation (PE&RC)
    - Voeding, Levensmiddelentechnologie, AgroBiotechnologie en Gezondheid (VLAG)
    - Wageningen Institute of Animal Sciences (WIAS; not yet fully in R, but will be completely in the near future)

# Q&A