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).
Statistics 1
- Descriptive Statistics
- Probability calc. rules
- Normal Dist.
- Binomial Dist.
- Combining Dist. \((\mu \text{ and } \sigma^2)\)
- Testing

Statistics 2
- Normality
- Sampling Dist.
- Student’s \(t\) Dist.
- \(t\)-testing and CI
- SLR with CI, PI

Advanced Statistics
- Chi-square testing
- MLR
- Mixed Models
- AN(C)OVA
- Nonparametric

R for Statistics
- Structures
- Sub setting
- Loop Functions
- Programming
- Visualisation
- Rep. Research

Statistics and R
Which Students in Statistics Courses

- Statistics 1: Bachelor (All levels)
- Statistics 2: Bachelor (All levels)
- Advanced Statistics: Some Bachelor (Master)
- R for Statistics: Few Bachelor (Master, PhD)
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)
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
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 ($2 \times \frac{1}{6}$) and final assignment ($\frac{4}{6}$) reports
# Student Survey Results (after 2 runs)

<table>
<thead>
<tr>
<th>Opinions</th>
<th>Weighted Average</th>
<th>Pooled Stand. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Materials</td>
<td>4.35</td>
<td>0.56</td>
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<tr>
<td>Motivation</td>
<td>4.26</td>
<td>0.85</td>
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<tr>
<td>Workload</td>
<td>3.15</td>
<td>1.25</td>
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<tr>
<td>Challenge</td>
<td>4.55</td>
<td>0.60</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>4.35</td>
<td>0.65</td>
</tr>
</tbody>
</table>
“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 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