

Advanced Methods: Bayesian statistics

Constituting Session

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Introduction to Bayesian Statistics with R

- Dr. Oliver Lindemann
 - Email: lindemann@essb.eur.nl
- Workshop
 - 19. Feb.–23. Feb. 2018 (9:00–15:00)
 - Room: 2.14.0.18
 - Website: <http://bit.ly/bayes2018>

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What is Bayesian Statistics?

Procedure

Theory → **Hypothesis** → Experiment → **Data** → Statistics

What does now the p -value tell us?

$$p(\text{Data}|\neg\text{Hypothesis})$$

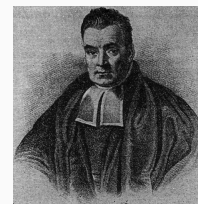
But what do we actually want to know from the data?

$$p(\text{Hypothesis}|\text{Data})$$

But... $p(\text{Hypothesis}|\text{Data}) \neq p(\text{Data}|\neg\text{Hypothesis})$

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Thomas Bayes (1701 – 1761)



Bayes Theorem

$$p(H|D) = \frac{p(D|H) p(H)}{p(D)}$$

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Aims of this Course

- Recent developments in behavioral statistics
 - critical view on frequentist inference (i.e., *classical* statistics)
- Basic principles of Bayes statistics
 - understanding the some mathematical principles
 - Markov-chain-Monte-Carlo (MCMC) sampling
- **Hands on experiences in conducting Bayesian analyses**
 - Using R and the sampling software JAGS (later more)

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Outline

1. Bayesian analysis of beliefs and probabilities
 - mathematical and procedural basics
 - MCMC sampling
 - coin flips, coin flips, coin flips ...
2. Bayesian Data analysis for psychologist
 - Bayesian t -test
 - Bayesian ANOVAs
 - Bayesian regressions
 - Bayesian confidence intervals
 - Bayesian model comparison
3. Maybe
 - Bayesian Cognitive Processes Models
 - Hierarchical Linear Model/Linear Mixed Models

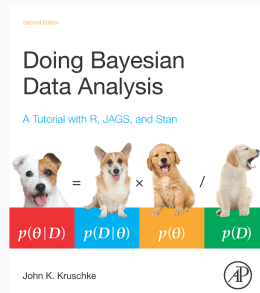
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Key readings

Kruschke, John K. (2015) *Doing Bayesian Data Analysis* (2nd Edition), Academic Press, Amsterdam.

~ 45 Euro via
<http://bit.ly/2D6vGPR>

Further literature will be provided during the course



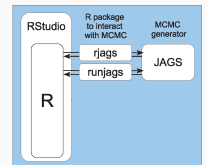
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Technical Requirements

- preferable: own laptop
- Only free software
- Bayesian Modelling
 - **R 3.1**
 - **RStudio OpenSource Edition**
 - **JAGS 3.4**
- “SPSS”-like statistical software package
 - Jasp

Links

R <http://mirrors.softlist.de/cran/>
RStudio <http://www.rstudio.com/products/rstudio/download/>
JAGS <http://sourceforge.net/projects/mcmc-jags/files/JAGS/3.x>
Jasp <https://jasp-stats.org/>



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