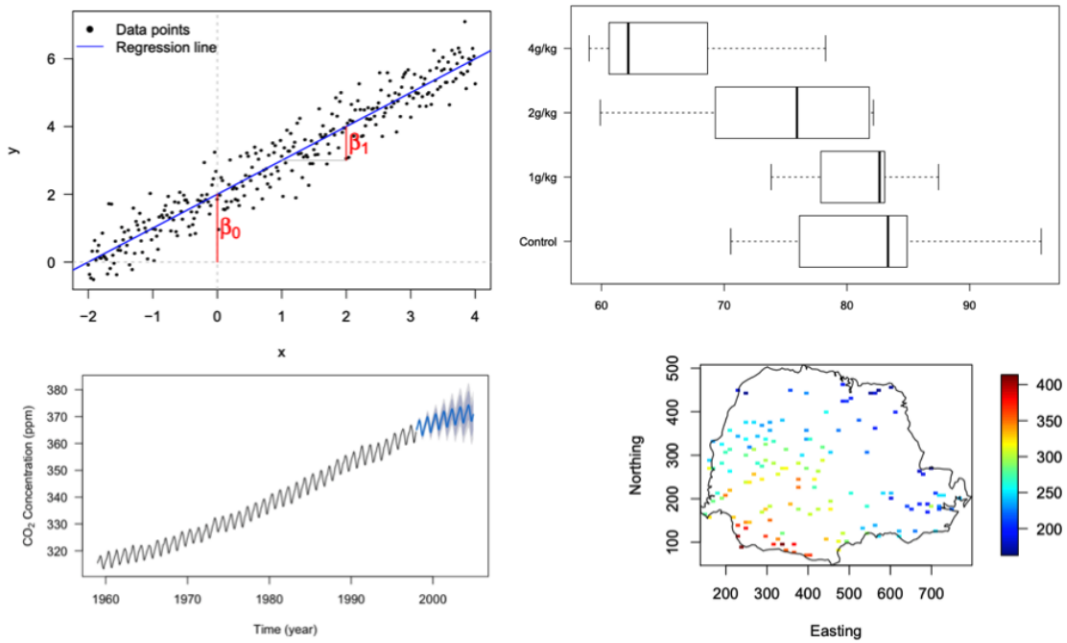
Lecture 0
Course Overview

STAT 8020 Statistical Methods II

Whitney Huang
Clemson University



About the Instructor

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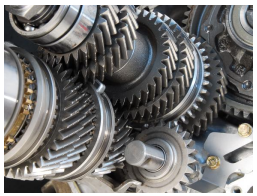
- Associate Professor of Applied Statistics and Data Science
- Born in Laramie, Wyoming, and raised in Taiwan

- Earned a B.S. in Mechanical Engineering before transitioning to Statistics in graduate school



- **Doctorate**: Ph.D. in Statistics, 2017, from PURDUE UNIVERSITY.

  Completed a samsi (NSF Duke NCSU UNC) University of Victoria CANSSI INCASS postdoc before joining CLEMSON UNIVERSITY

How to reach me?

- **Email:** wkhuang@clemson.edu

  Please include [STAT 8020] in your email subject line!!

- **Office**: O-221 Martin Hall

- **Office Hours**: Tues. 2:00 PM–3:00 PM; Thurs. 10:00 AM–11:00 AM; Fri. 9:00 AM–10:00 AM via Zoom, and by appointment. In-person office hours can be arranged upon request

Class Policies

Logistics

- **No exams:** The course emphasizes data analysis projects, which better reflect real-world statistical practice and are directly relevant to your research

- **Two projects** (due dates):
  - Project I: June 3 (Wednesday)
  - Project II: June 18 (Thursday)

- **10 R labs**:
  - Submit via Canvas by 11:59 PM ET on the due date
  - Best 5 out of 10 labs will count toward the final grade
  - Strongly encouraged to complete all labs (cumulative and essential for project preparation)

Course Materials at CANVAS

- Course syllabus / announcements
- Lecture slides/notes/videos
- R Sessions/Labs/Projects
- Data sets for lectures and labs

Reference Books

- *Linear Models with* R, 2_{nd} Edition, Julian Faraway, 2014 [Link]
- *An Introduction to Statistical Learning: with Applications in* R, 2_{nd} Edition, Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, 2021 [Link]
- *Extending the Linear Model with* R, 2_{nd} Edition, Julian Faraway, 2016 [Link]
- *A First Course in Design and Analysis of Experiments,* Gary Oehlert, 2010 [Link]
- *Design and Analysis of Experiments,* 2_{nd} Edition, Angela Dean, Daniel Voss, and Danel Draguljic, 2017 [Link]

Evaluation

Grades will be weighted as follows:

R Labs	20%
Project I	40%
Project II	40%

Final course grades will be assigned using the following grading scheme:

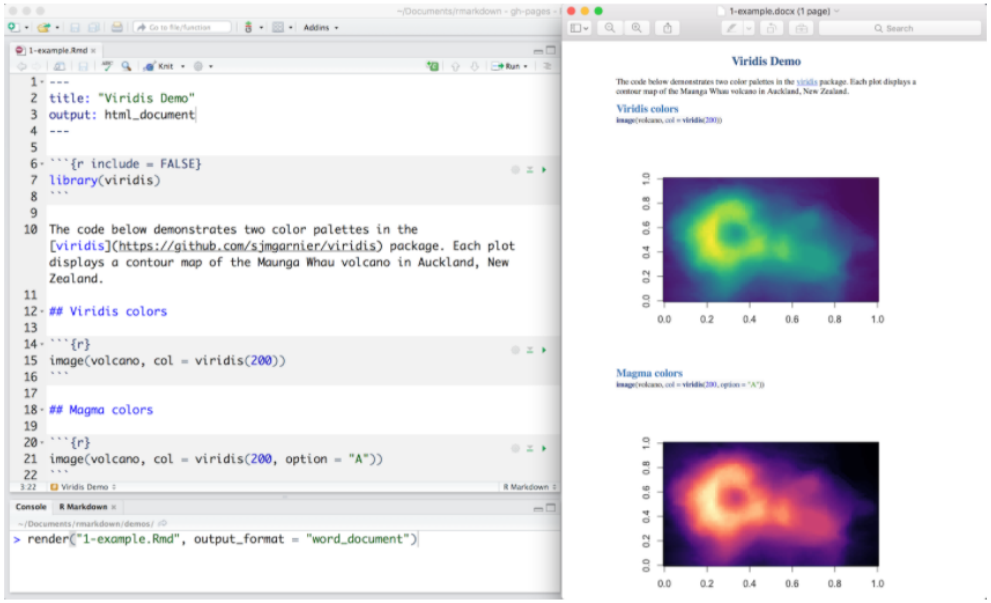
>= 90.00	A
88.00 ~ 89.99	A-
85.00 ~ 87.99	B+
80.00 ~ 84.99	B
78.00 ~ 79.99	B-
75.00 ~ 77.99	C+
70.00 ~ 74.99	C
68.00 ~ 69.99	C-
<= 67.99	F

Computing

We will use software to perform statistical analyses.

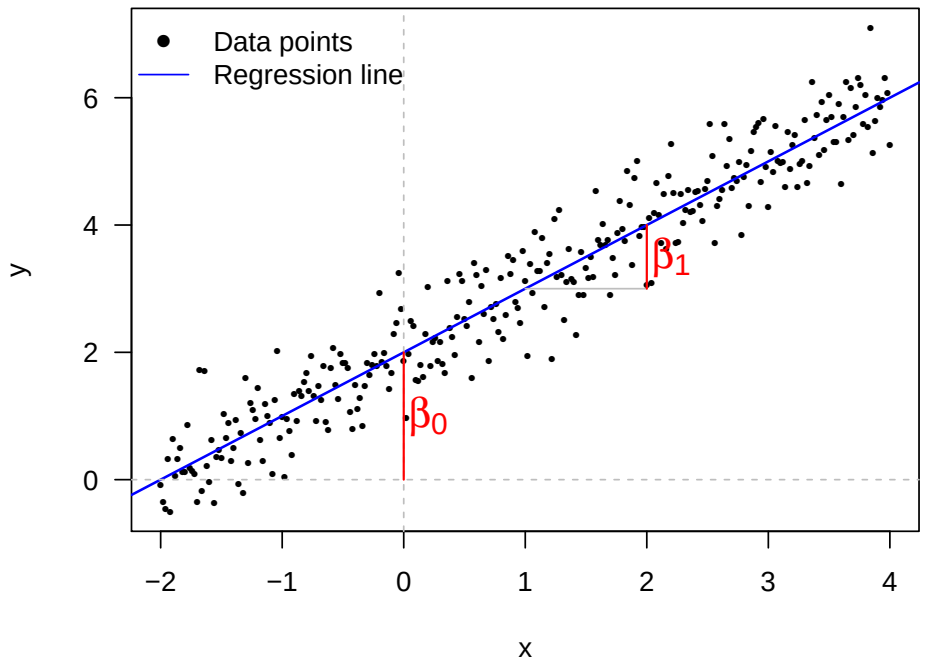
Specifically, we will be using `R/Rstudio` R / R Studio

- a **free/open-source** programming language for statistical analysis
- available at `https://www.r-project.org/` (`R`); `https://rstudio.com/` (`Rstudio`)
- We will use **`R` Markdown** for homework assignments and projects



Class Overview

Part I: Regression Analysis (Week 1 - Week 3)



- Multiple Linear Regression

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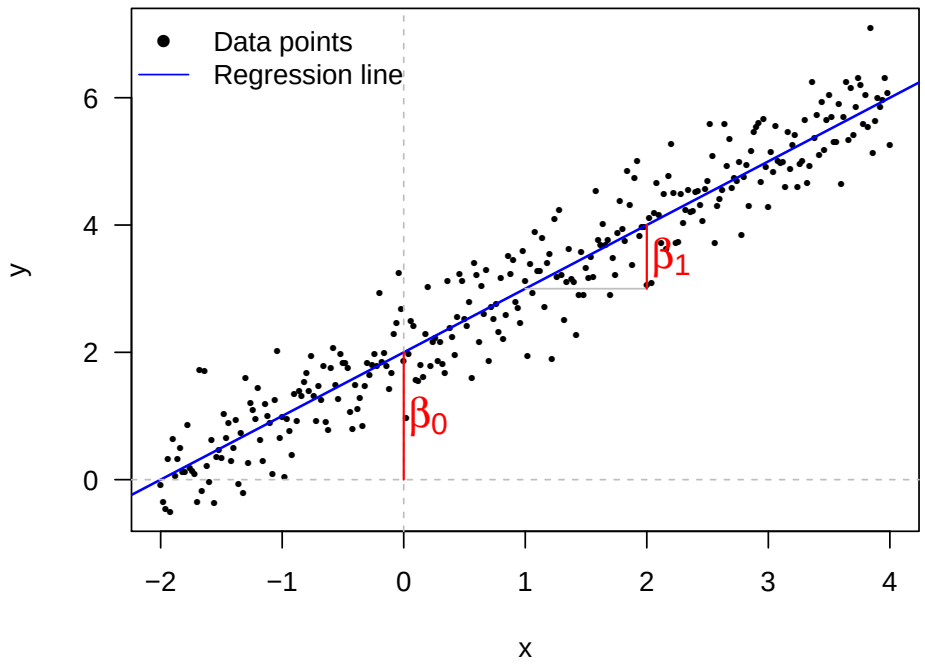

- Multiple Linear Regression
- Regression with Quantitative and Qualitative Predictors

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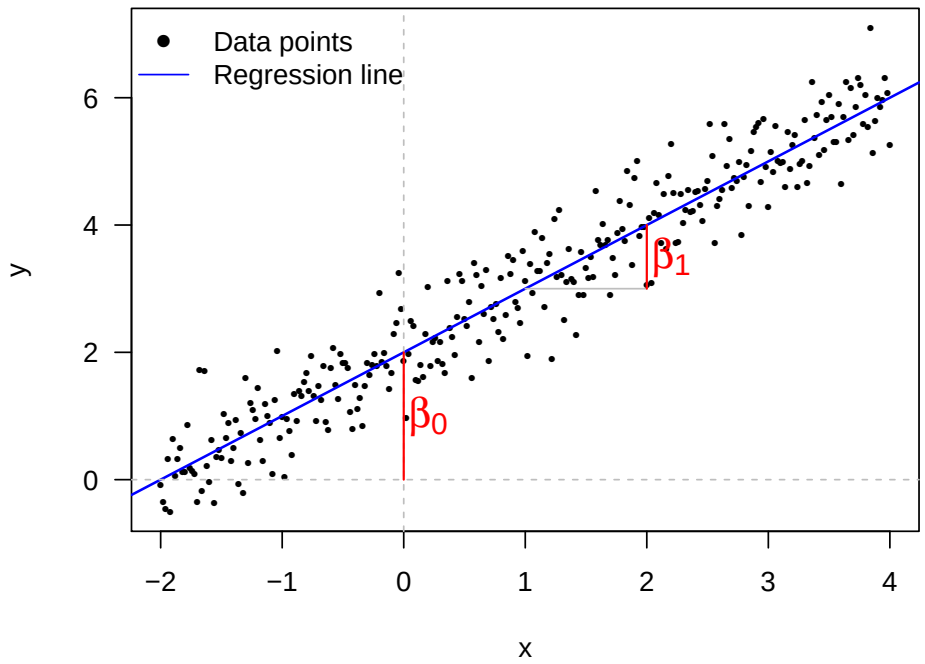

- Multiple Linear Regression
- Regression with Quantitative and Qualitative Predictors
- Nonlinear and Non-parametric Regression

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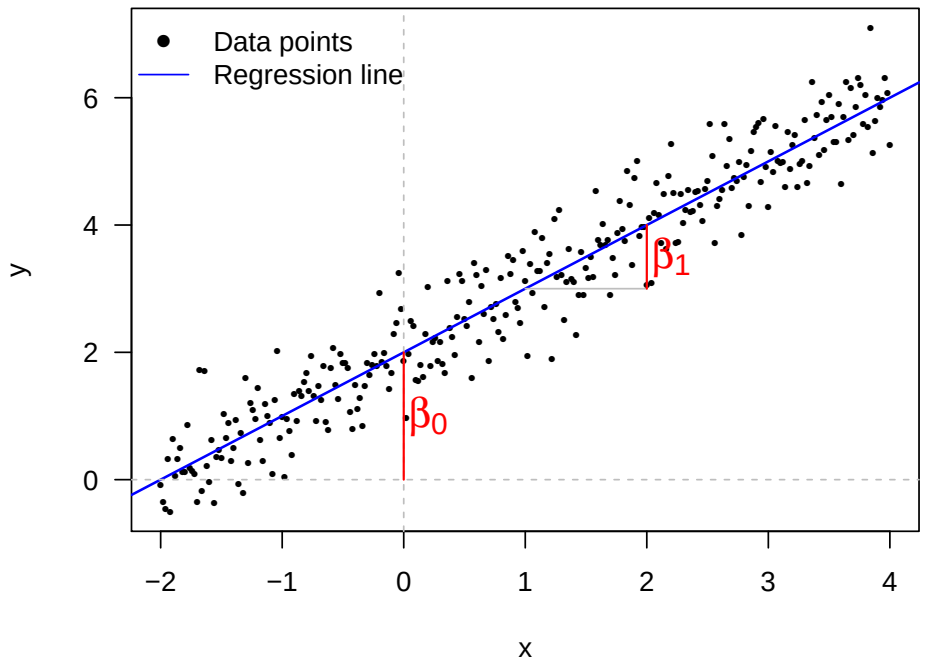

- Multiple Linear Regression
- Regression with Quantitative and Qualitative Predictors
- Nonlinear and Non-parametric Regression
- Ridge Regression and Lasso

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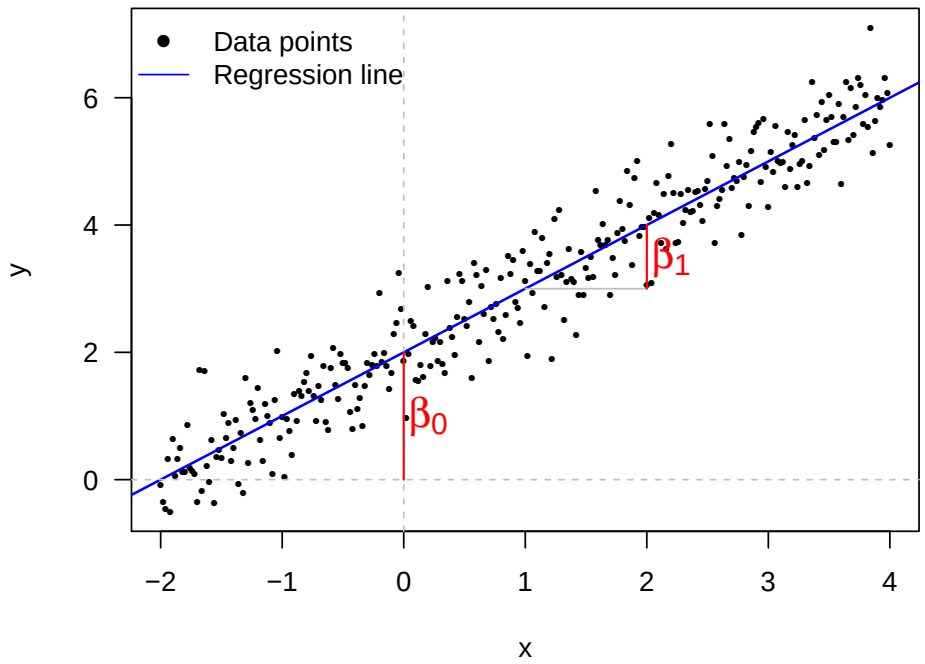
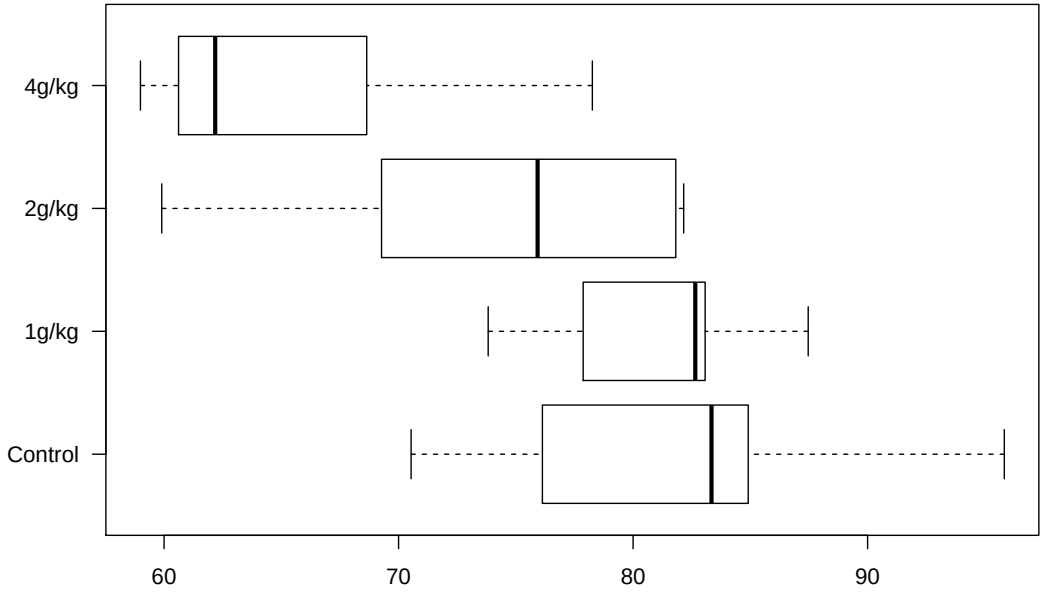


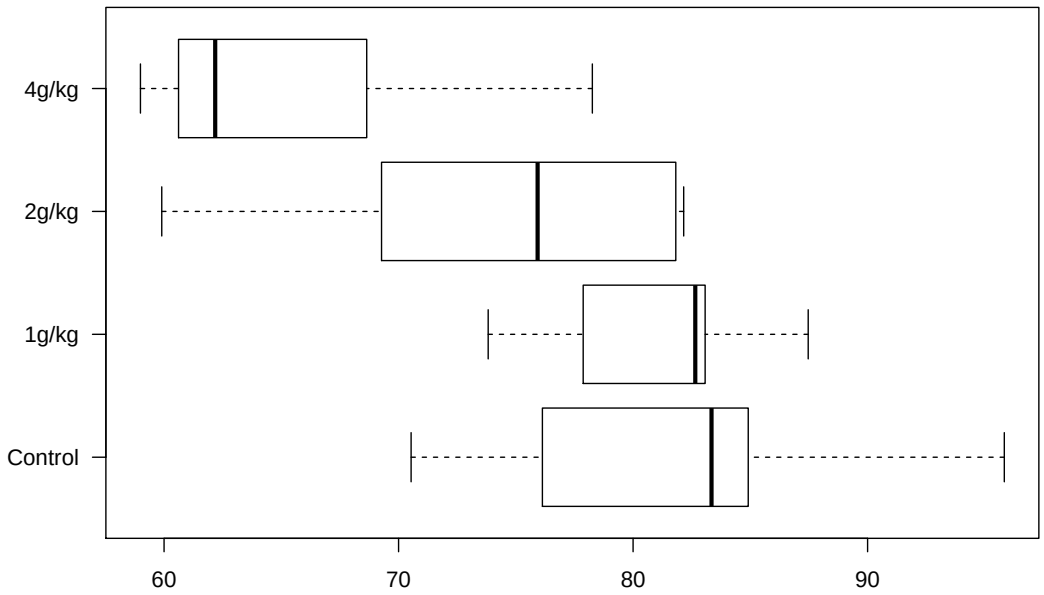
- Multiple Linear Regression
- Regression with Quantitative and Qualitative Predictors
- Nonlinear and Non-parametric Regression
- Ridge Regression and Lasso
- Logistic Regression and Poisson Regression

Part II: Experimental Design (Week 4)



- Introduction to Experimental Design

Part II: Experimental Design (Week 4)



- Introduction to Experimental Design
- Completely Randomized Designs, Block Designs, Nested and Split-Plot Designs

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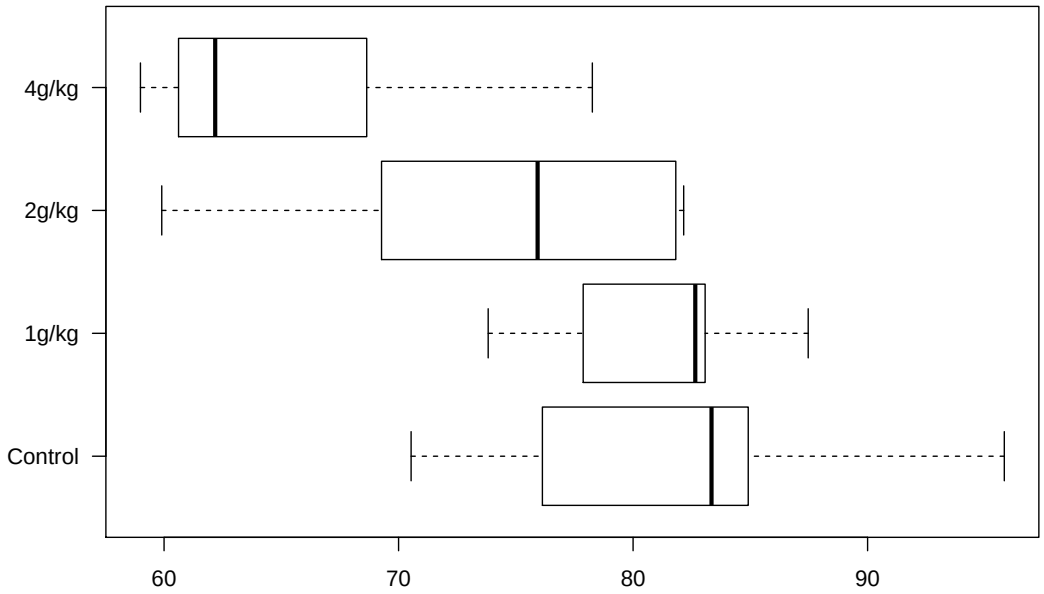

- Introduction to Experimental Design
- Completely Randomized Designs, Block Designs, Nested and Split-Plot Designs
- Random and Mixed Effects Models

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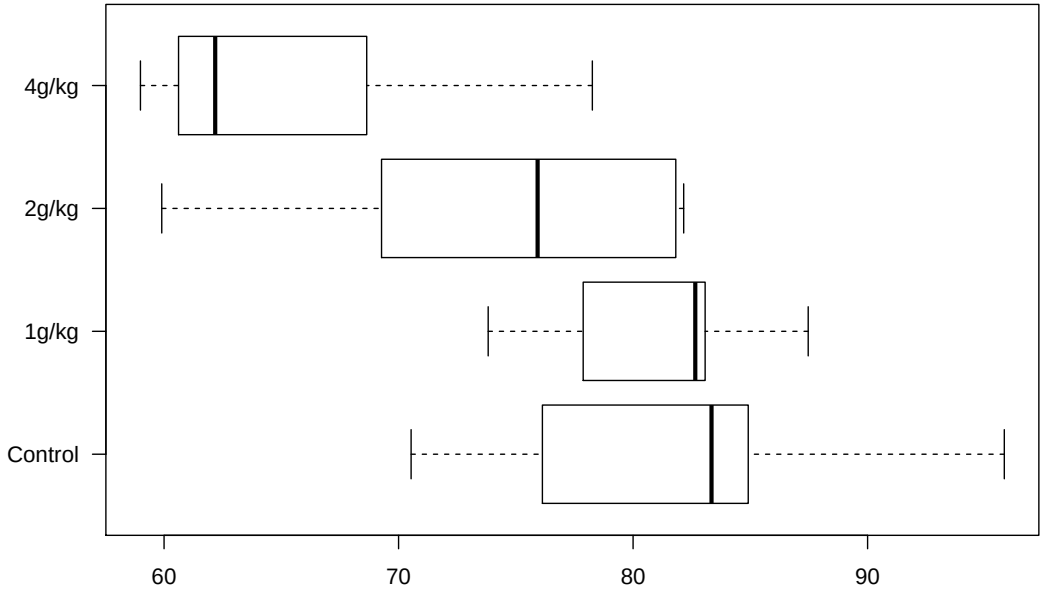
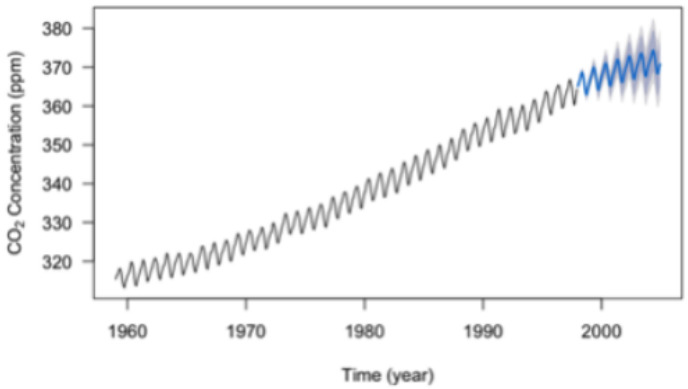
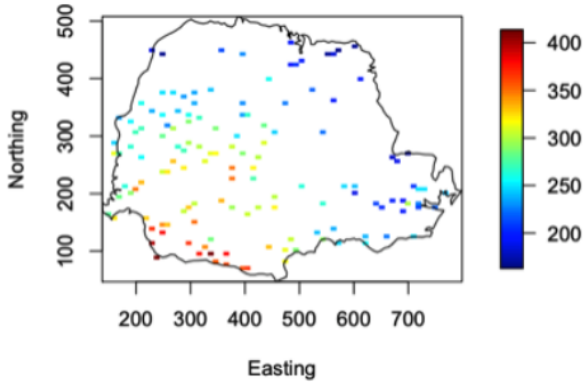


- Introduction to Experimental Design
- Completely Randomized Designs, Block Designs, Nested and Split-Plot Designs
- Random and Mixed Effects Models
- Computer Experiments

Part III: Spatial and Time Series Analysis (Week 5 - Week 6)





- Stationary Processes, Autocovariance Function
- Autoregressive Integrated Moving Average (ARIMA) Models and Seasonal Models
- Stationarity and Isotropy, Covariance Function
- Gaussian Process Spatial Interpolation (aka Kriging)