# Statistical Computing

Lecture 0: Course Introduction

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## General information

- **Credits:** 2 credits
- **Lecturer:** Yanfei Kang
- **Language:** Taught in Chinese. Materials are in English.
- **Computer language: R**
- **Reception hours:** Questions concerned with this course can be asked during or after each lecture or via email.
- **Lecture notes:** available on on https://yanfei.site/teaching/sc.

## References

1. R programming for data science. Roger Peng. Leanpub. 2018.
2. Advanced statistical computing. Roger Peng. 2018.
3. Introduction to scientific programming and simulation using R. Owen Jones, Robert Maillardet, Andrew Robinson. 2nd Edition. CRC press. 2014. ISBN: 9781466569997.

## Unit objectives

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1. Learn R programming for data science;
2. Learn optimization and simulation tools;
3. Develop computational linear algebra techniques, such as eigenanalysis and singular value decomposition and their applications.

## Examinations

- Assignments (labs): 40%
- Final exam: 60%

## About assignments

1. Subject of your email: "SC2019Lab-N-Name-StudentID".
2. Email attachments: R script named as "SC2019Lab-N-Name-StudentID.R".
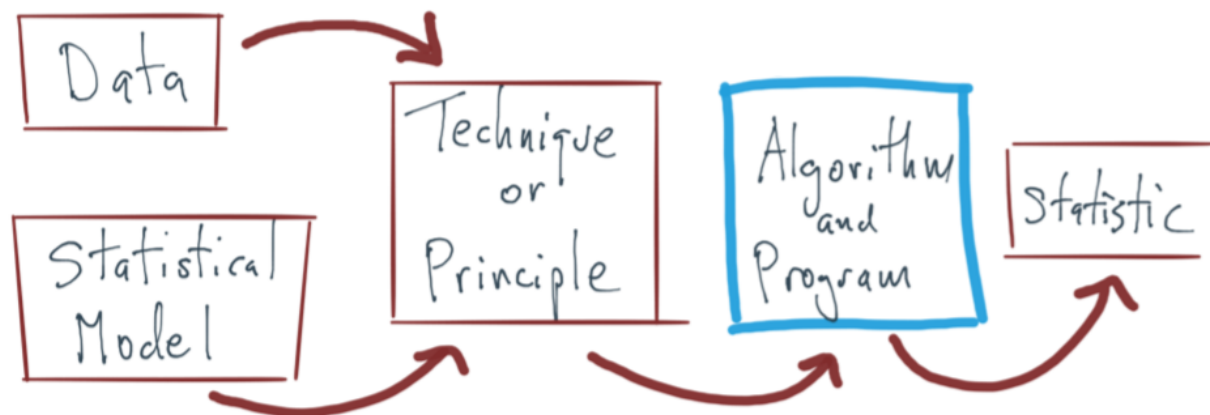3. **Pls let me know who you are.**
4. **Pls write a decent email.**

Figure 1: The process of statistical modeling.

## Course contents

- R for data science
  - R basics
  - Managing data frames with the `dplyr` package
  - Control structures and functions
  - Dealing with text data
  - Debugging and Profiling R code
- Optimization
  - Newton's method
  - Quasi-Newton methods
  - Derivative free methods
- Simulation
  - Independent Monte Carlo
  - Markov Chain Monte Carlo
- Computational Linear Algebra
  - Eigendecomposition
  - Singular value decomposition
  - Numerical algorithms for eigenanalysis
  - Applications: Classification of handwritten digits and face images