Excellent health statistics - smokers are less likely to die of age related illnesses.'

statistics (def.):

(1) a branch of mathematics dealing with the collection, analysis, interpretation, and presentation of masses of numerical data,

(2) the only science in which two recognized experts, using exactly the same set of data, may come to completely opposite conclusions.

Bayesian statistics

Course introduction

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2019

Why Bayesian?

- Computationally intensive but conceptually simple.

- Less prone to misinterpretation.

- Straightforward decision-making.

- Likely the future of how statistics is taught and applied. And definitely should be part of every statistician's toolbox.

Course objectives

Main: To apply Bayesian statistics in practice.

- Learn about the Bayesian view on probability and inference.

- Start using tools for Bayesian statistics.

- Understand the principles of Markov Chain Monte Carlo and their implications for Bayesian computation.

Illustrative examples

Course information

Prerequisites: Basic probability theory, basic statistics, R programming.

Organization: 6 lectures + 2 hands-on sessions.

Requirements:

- Take-home problem set (after first 4 lectures),
- Final project (deadline: before end of the school year).

Materials:

- https://github.com/bstatcomp/hse_bayesian
- All the slides, code and data will be added before each lecture.
- Further reading references will be included at end of each lecture.
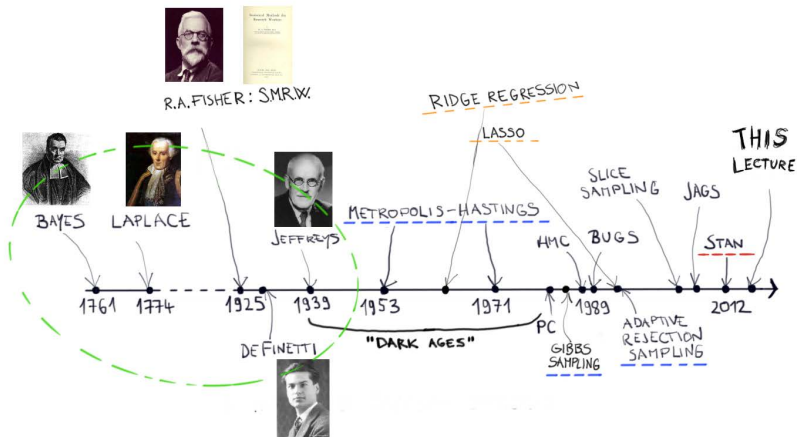
The tools that you will see me use

Software:

- **R + RStudio**,
- **ggplot2** package for visualization,
- **Stan** for Bayesian inference.

Reporting:

- **LaTeX + Texmaker**,
- **RStudio** + dynamic reports (**sweave**, **R markdown**, **R notebook**).

The Bayesian statistics timeline

Lectures outline

1 **Probabilistic thinking**

2 Principles of Bayesian inference

3 Probabilistic programming with Stan

4 Estimation, group comparison and linear regression

———————————— break ————————————

5 A gentle introduction to Markov Chain Monte Carlo

6 Hands-on session 1

7 Hierarchical modelling

8 Hands-on session 2 & Where to go from here