

Bayes Statistics: Past , Present and the Future

——In honor of the 250th
anniversary of Bayes'theorem

Contents

➤ Past

➤ Present

➤ Future

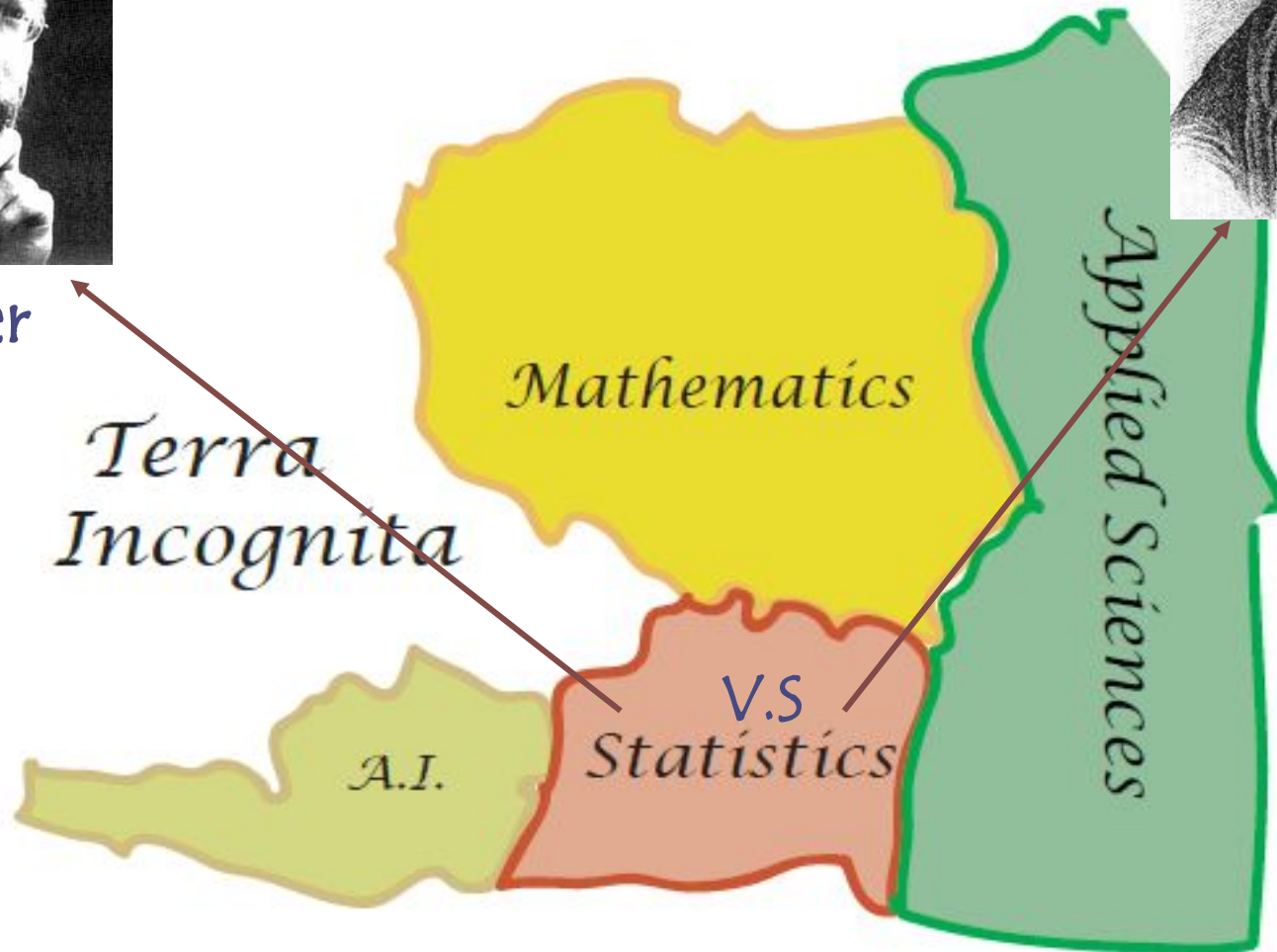
Greater mathematical world



Fisher



Bayes



Statistics

- ❖ Frequentist Neyman , Fisher and E. Pearson
 - ◆ Confidence inference
 - ◆ Probability
- ❖ Bayesian Bayes and Laplaces
 - ◆ Bayes' theorem
 - ◆ Prior information and posterior information

Bayes Rule(1763)

- ❖ 250th anniversary in 2013
- ❖ Always influential, usually controversial

$$P(A|B)=P(B|A)P(A)/P(B)$$

?



Prior

A prior probability for a parameter is a description of what is known a priori about the parameter to be estimated.

- ❖ Informative
- ❖ Weakly informative
- ❖ Least informative
- ❖ Uninformative



From the view of Bayesian

Information

prior
information

sample
information

Method

loss
function

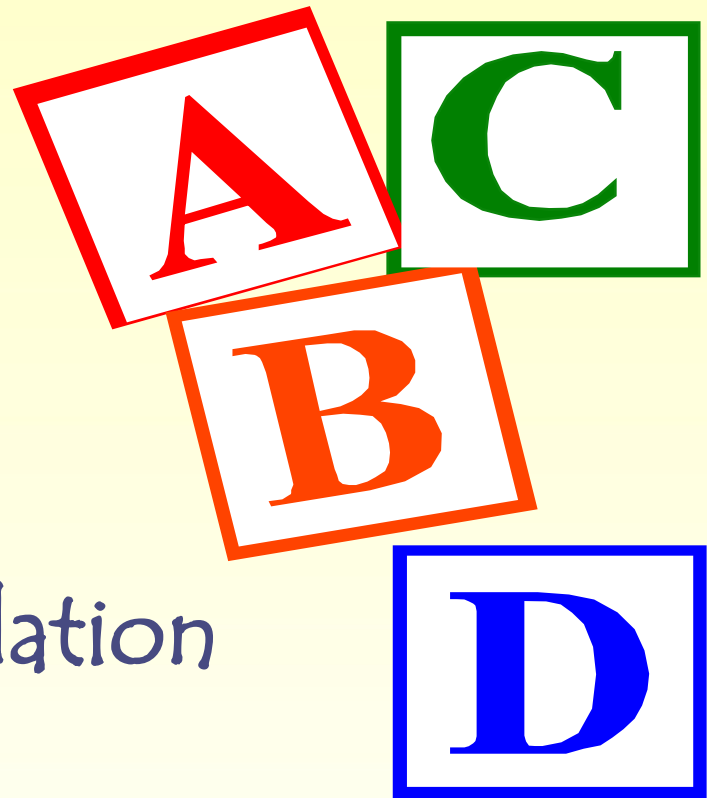
Result

more
believable

easier to
understand

From the view of Frequentist

- ❖ Uninformative priors
- ❖ “Subjective”
- ❖ High dimensions calculation



A.O'Hagan said

- ❖ Persuade sb without thinking carefully about using the Bayesian approach does not conform to the original intention of Bayesian statistics.
- ❖ There is no reason to go too extreme to knock Bayesian drum.

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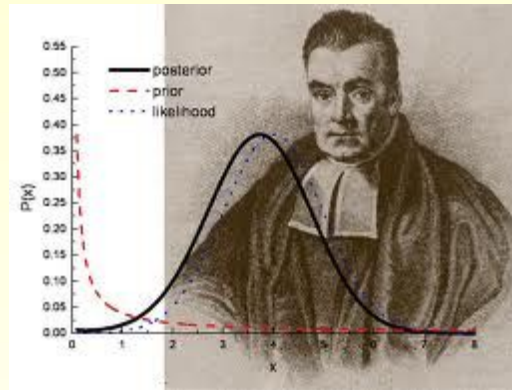
Bayes' Theorem in the 21st Century

Big Data

Software

Life Sciences

MCMC

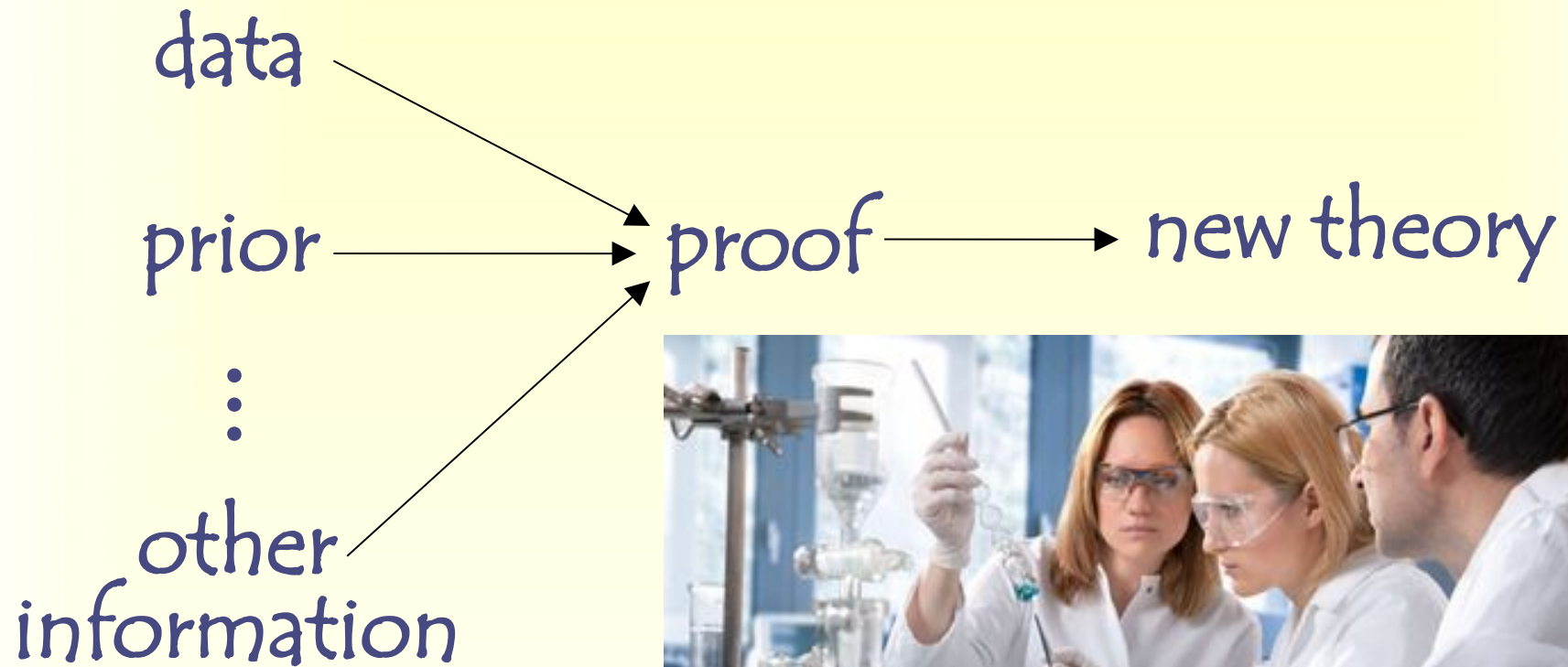


Actuarial
Science

Bootstrap



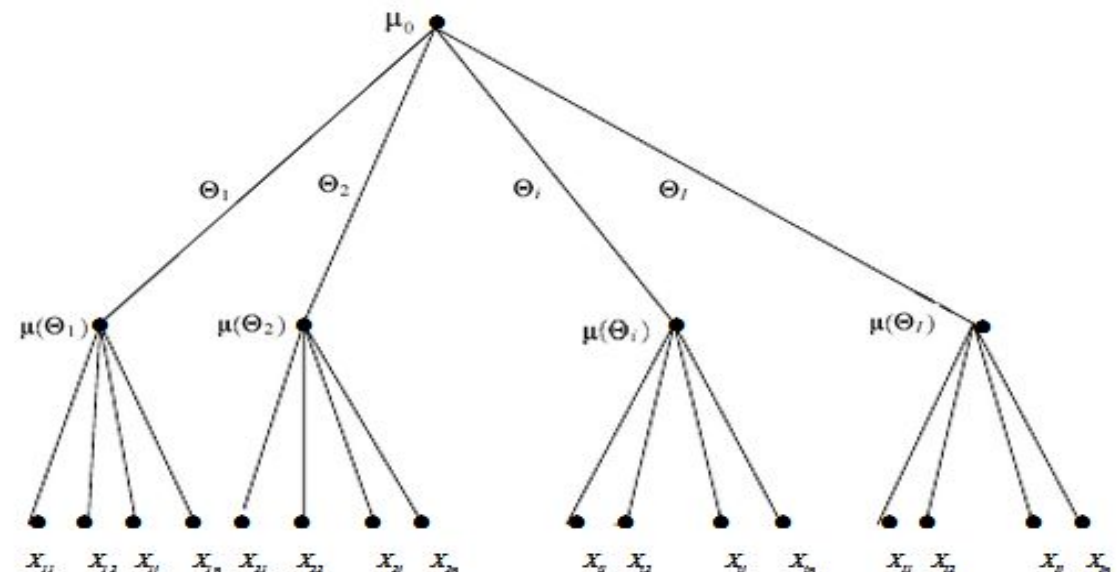
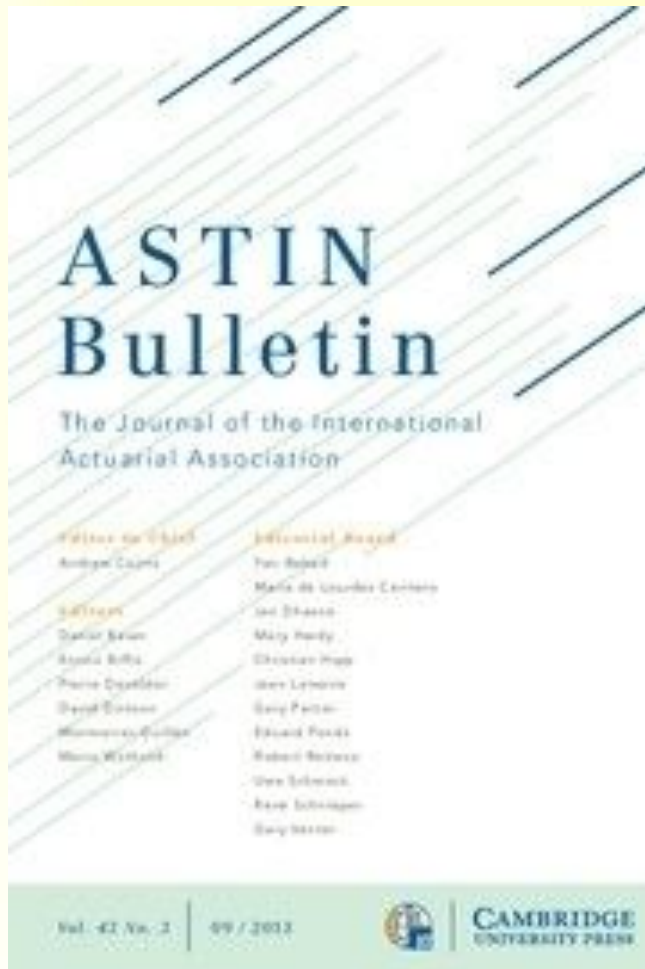
Life Sciences





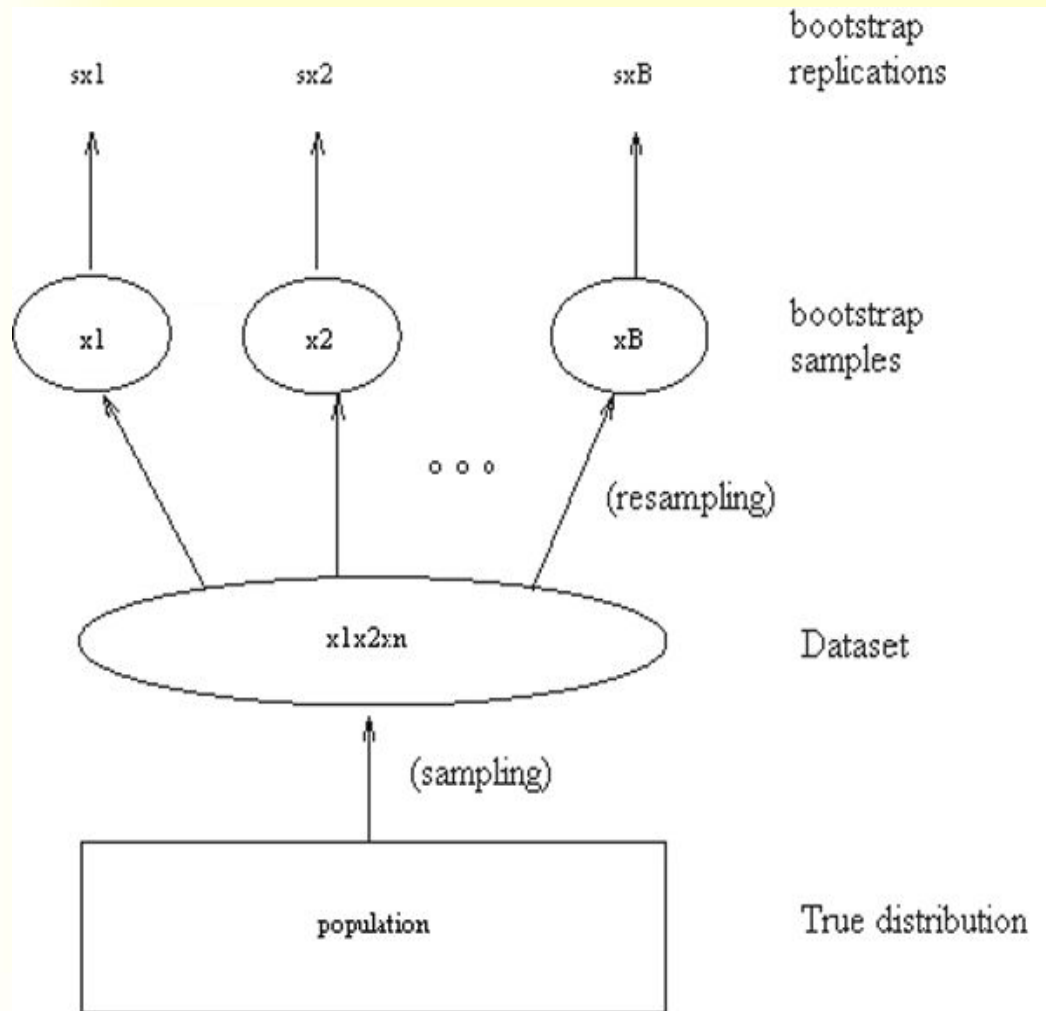
Actuarial Science

The Bühlmann–Straub Model





Bootstrap



Being or relating to a process that is self-initiating or self-sustaining



MCMC

Markov Chain

Monte Carlo

MCMC methods are a class of algorithms for sampling from probability distributions based on constructing a Markov chain that has the desired distribution as its equilibrium distribution.

?





WinBUGS

Win---Windows

B---Bayesian Inference

U---Using

G---Gibbs

S---Sampling





Why Bayesian and Big Data ?



Bayes' Rule can help
mining the signal from
big data sets.

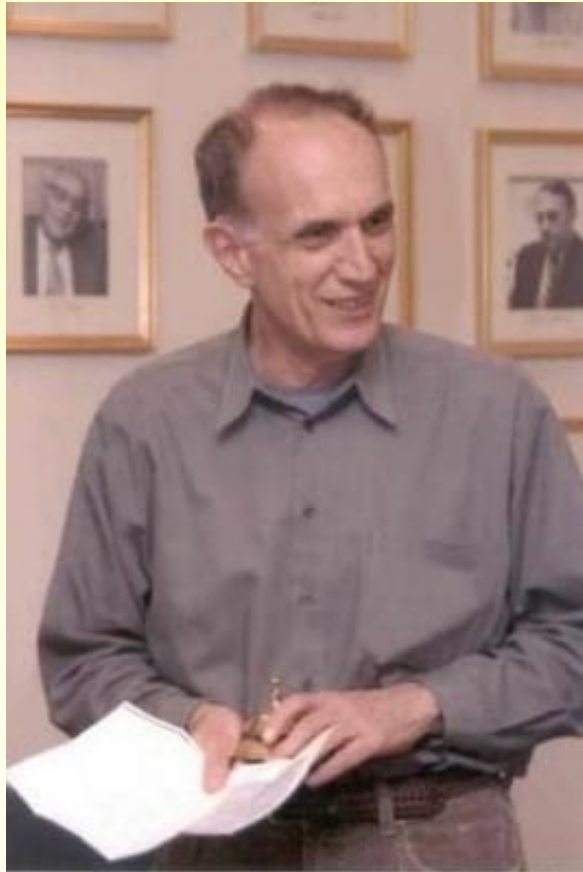


LaplacesDemon

LaplacesDemon is an
R package for
Bayesian inference, and
is freely available
for download.



Bradley Efron



Bradley Efron (born May 24, 1938) is an American statistician best known for proposing the bootstrap resampling technique.



Xiao-Li Meng



Dean of the Graduate School of
Arts and Sciences Whipple
V.N.Jones Professor of Statistics

Research Interests

- ❖ Statistical principles and foundational issues.
- ❖ Effective deterministic and stochastic algorithms for Bayesian ;MCMC.
- ❖ Bayesian inference, ranking and mapping.


Contents

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The future...

- ❖ Learn from each other
 - ❖ Fuse
 - ❖ Empirical Bayes
- 
- parametric Bayes
 - non-parametric Bayes

There are two potent arrows in the statistician's quiver, and there is no need to go hunting armed with only one.

Relevant information

Web

❖ www.bayesian-inference.com

❖ bayes-stat.github.io

Article

❖ A 250-YEAR ARGUMENT: Belief, Behavior, and the Bootstrap——Bradley Efron

❖ A Statistically Significant Future for Bayes' Rule——R. van Hulst

Thanks!

