BAYESIAN DATA ANALYSIS

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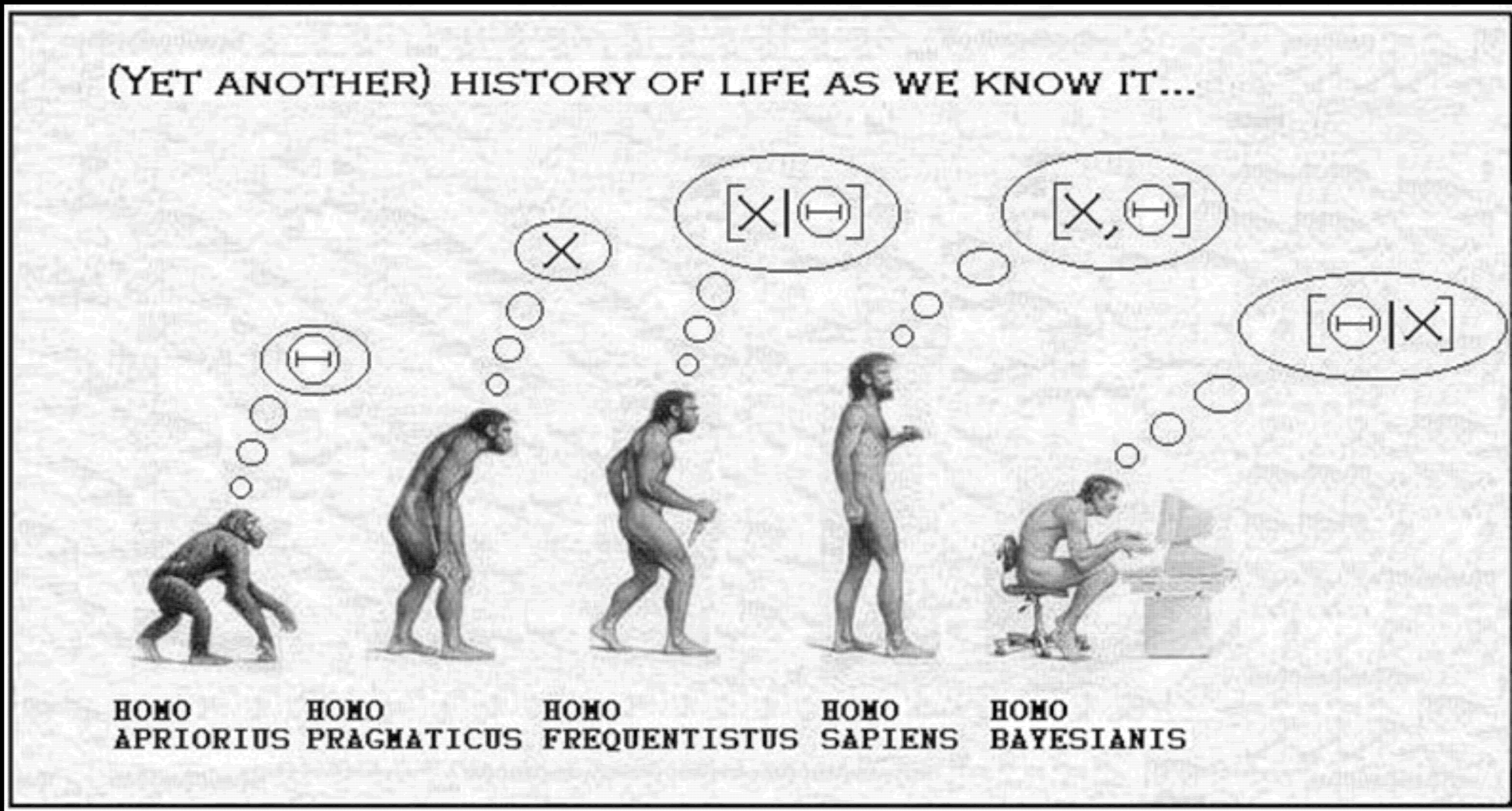
Thomas Bayes

Bayes Theorem

posterior prior likelihood

$$p(\boldsymbol{\theta}|\mathbf{y}) \propto p(\boldsymbol{\theta})\, p(\mathbf{y}|\boldsymbol{\theta})$$


(YET ANOTHER) HISTORY OF LIFE AS WE KNOW IT...
Θ
X
[X|Θ]
[X,Θ]
[Θ|X]
HOMO APRIORIUS
HOMO PRAGMATICUS
HOMO FREQUENTISTUS
HOMO SAPIENS
HOMO BAYESIANIS

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THE MONTE CARLO METHOD

NICHOLAS METROPOLIS AND S. ULAM
Los Alamos Laboratory

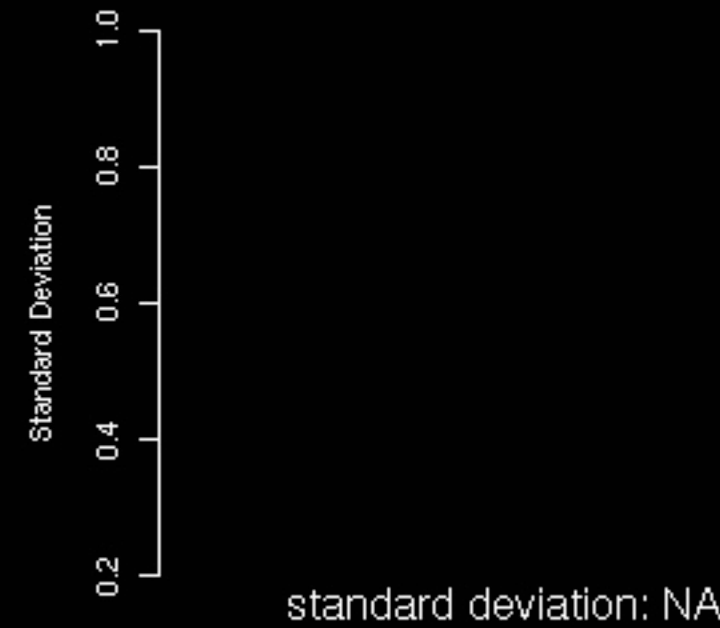
We shall present here the motivation and a general description of a method dealing with a class of problems in mathematical physics. The method is, essentially, a statistical approach to the study of differential equations, or more generally, of integro-differential equations that occur in various branches of the natural sciences.

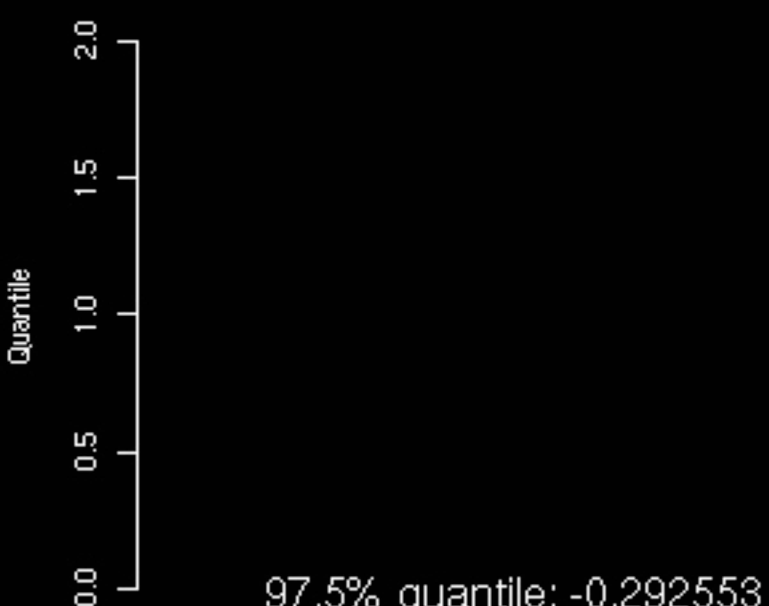
Bayesian Revolution

- explosion of interest in Bayesian approaches in the 1990s
- (re-)discovery of Markov chain Monte Carlo methods (MCMC)
- advent of cheap, high-performance computing
- can now handle models with many parameters with Bayesian tools

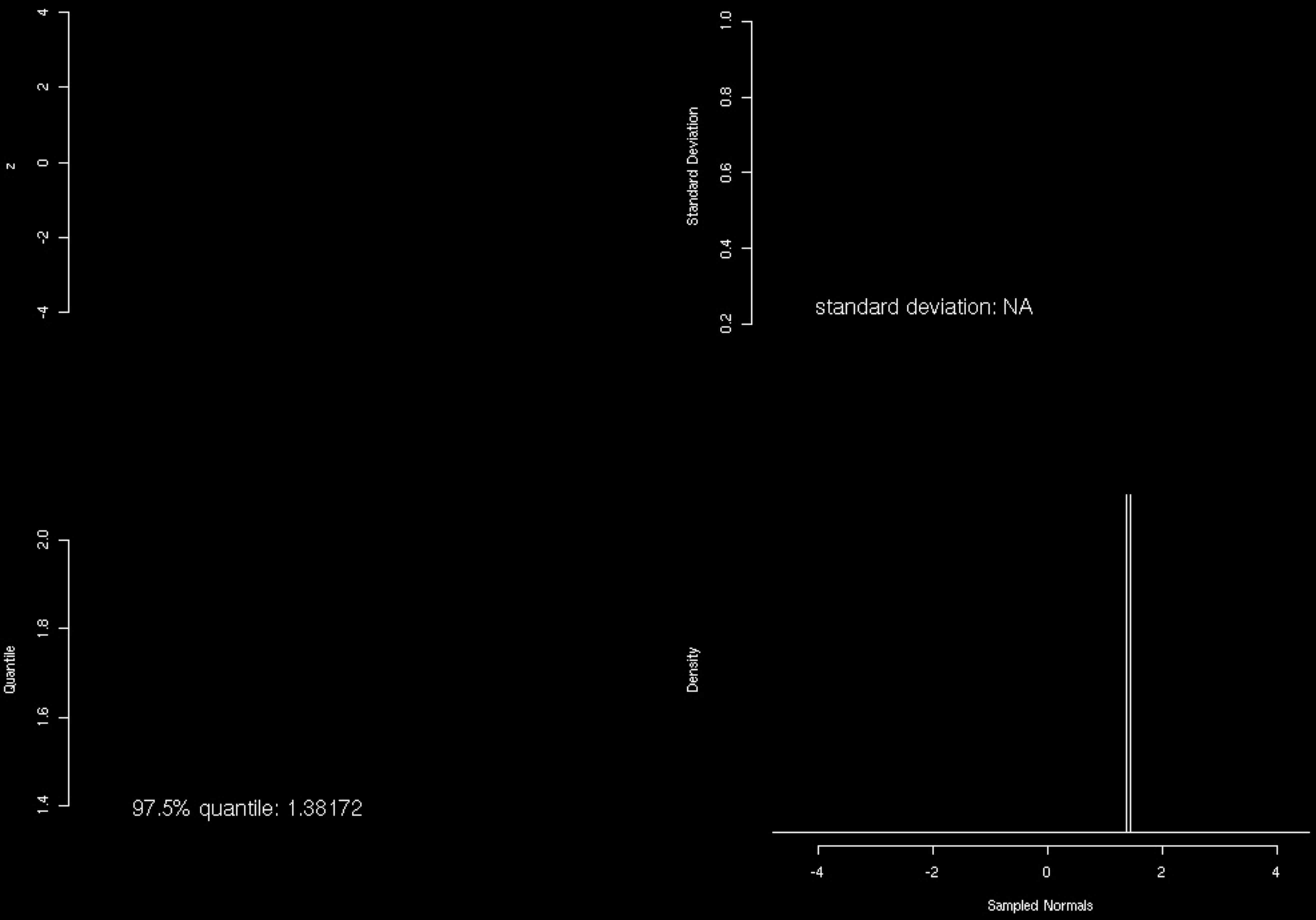
Sample 1


z
4
2
0
-2
-4


Standard Deviation
1.0
0.8
0.6
0.4
0.2
standard deviation: NA


Quantile
2.0
1.5
1.0
0.5
0.0
97.5% quantile: -0.292553

AR(1) = .99, Sample 1



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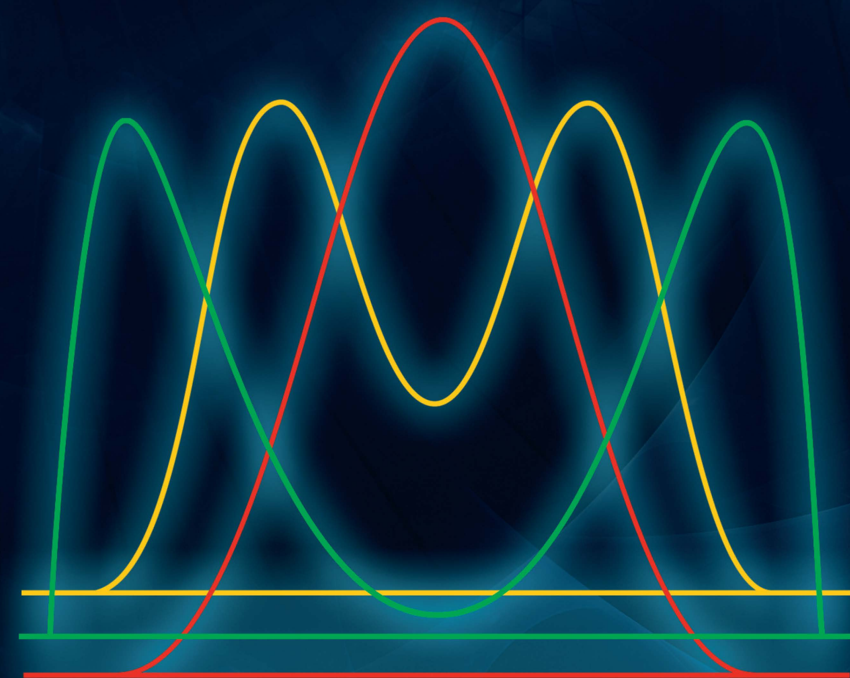
Bayesian Analysis for the Social Sciences



Simon Jackman

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