

# Mathematica 5 support material

to accompany the book

## "Bayesian Logical Data Analysis for the Physical Sciences"

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### Introduction

This support material is designed to empower the reader to explore Bayesian data analysis on their own. To do this, one needs an efficient computing environment for visualizing and manipulating the data. The majority of my students have found *Mathematica* to provide such an environment. The first part of this document is aimed at addressing the question, "How do I come up to speed in *Mathematica* for doing data analysis if I have no previous experience with this software." The latter sections, beginning with chapter numbers, illustrate real Bayesian solutions to problems or issues relevant to the chapters of my book.

**List of topics** ( this is an outline only, download the *Mathematica 5 tutorial* for the code)

Disclaimer

CleanUp

Numbers

Manipulating algebraic expressions

Lists, data as a list, replacing elements in a list, rotating lists, sorting

Plotting functions and data

Outputting a graph as an EPS file with *Mathematica* fonts included

Vectors

Matrices

Writing and Reading data files

Write and Read multiple files (also histogram data)

Solving equations

Simple programming

Naming symbols and Context

Calculus

Different forms of expressions

Differential equations

**Load Some statistical packages**

**Ch. 1: Bayesian analysis of simulated hurricane data**

**Ch. 1: Joint probability distributions and marginalization**

**Ch. 3: Draw contour containing 95% of a joint probability distribution.**

**Ch. 5: Random numbers and Central Limit Theorem**

**Ch. 5: Central Limit Theorem using convolution and the FFT**

**Ch. 5: Fourier test of random numbers**

**Ch. 9: Bayesian analysis of two independent samples**

**Ch. 10: Joint credible region contouring**

**CH. 11: Nonlinear Least-Squares Fitting**

**Ch. 12: Metropolis-Hastings Markov chain Monte Carlo**

**Ch. 12: Automatic parallel tempering (APT) Markov chain Monte Carlo**

*(Greatly improved version in [Mathematica 6 tutorial](#))*

**Ch. 12: APT Markov chain Monte Carlo Kepler periodogram**

*(Greatly improved version in [Mathematica 6 tutorial](#))*

**Ch. 13: Lomb-Scargle periodogram and Bayesian generalization**

**App. B: Exercise on DFT, zero padding and Nyquist sampling**

**App. B: Fourier image convolution & deconvolution**

**App. B: Power spectrum of a time series**

**Hyperlinks**