# III Advanced Course on Astrostatistics: Hands-on activities

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# Outline

First day:

- Brief introduction to R
- Some statistical functions and graphic tools
- Time series analysis using astronomical (univariate and multivariate) datasets
- Spectral analysis: periodogram

# Outline (cont.)

Second day:

- Examples with likelihood, prior and posterior density
- Integration methods (MC integration, importance sampling) with examples
- Exploratory data analysis and regression models (Bayesian and classical approach)

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Third day:

- MCMC algorithm in R (examples)
- Examples using OpenBugs/WinBugs

# Statistical softwares

Software:  is a free software environment for statistical computing and graphics

`www.r-project.org`

Code editor: Tinn-R, edit code and run it in R (for Windows)

`www.sciviews.org/Tinn-R`

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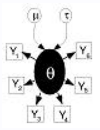
Additional software:  OpenBUGS (for Linux and Windows) to make practical MCMC methods available to applied statisticians

`http://mathstat.helsinki.fi/openbugs`

# About R:

- It compiles and runs on a wide variety of UNIX platforms, Windows and Mac OS
- Basic functions and techniques: arithmetic, operations with matrices, linear algebra, exploratory data analysis/descriptive statistics, algebra, graphical tools, etc.
- Statistical techniques: linear and nonlinear modeling, statistical tests, time series analysis, classification, clustering, maximum likelihood estimation, bayesian inference, etc

# About R: (cont.)

- Contributed extension packages for additional techniques: **ts** (time series included in the R release), **geoR** (analysis of geostatistical data), **geoRglm** (generalised linear spatial models), **ads** (spatial point patterns analysis), **dlm** (Bayesian and likelihood analysis of Dynamic Linear Models), etc

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# Examples using R