# *STATISTICAL INFERENCE PACKAGE SIP*


PACKAGE FOR STATISTICAL INFERENCE USING CONCEPTS AND CONSTRUCTS OF TEACHING, WRITING, AND APPLYING.

*SIP* makes it easy for the user to do classical likelihood based statistical inference. It contains procedures for maximum likelihood estimation, likelihood ratio tests of general hypotheses concerning parameters, and profile likelihood based confidence intervals for general interest functions of parameters.

*SIP* contains large collection of discrete and absolutely continuous univariate distributions and also multivariate distributions. It gives user possibility to form complicated models from the simpler ones.

*SIP* contains many sophisticated statistical models such as univariate/multivariate linear/nonlinear regression model, logistic regression models, Poisson regression models, multinomial regression models etc.

*SIP* uses a new method for calculation of profile likelihood based confidence intervals for general parameter functions of interest in general parametric statistical models.

*SIP* gives in addition to the statistical analysis procedures easy access to the powerful tools in MATHEMATICA® for doing mathematics, graphics, programming, and presentation.

## KEY BENEFITS

- Provides likelihood based statistical inference for sophisticated statistical models.
- Contains 30 functions for defining univariate/multivariate and discrete/continuous distributions. It contains also 19 functions for defining various statistical models. These include sampling model, submodel, regression models, models for stochastic processes, and hierarchical models. Statistical model functions accept as arguments any statistical distributions and models. This recursive way of defining statistical models in *SIP* allows users to generate and analyse very complicated models.
- Provides profile likelihood based confidence interval for any linear or smooth nonlinear interest function of parameters.
- Can handle statistical hypotheses corresponding restricted statistical models defined by any linear or smooth nonlinear functions of the parameters.
- Handles automatically interval censored data. Observations can be censored from below, from above, or more generally belong to any finite union of intervals.
- Provides random observation from any statistical distribution or model which can be defined in the package.
- Contains 32 functions for calculating properties of statistical distributions and models. In addition to numerical arguments and results, almost all of these functions accept symbolic arguments and give symbolic results. The package has been designed so that the results of various functions in it can easily be given as input to other MATHEMATICA® functions.

For more information, visit **www.wolfram.com/products/applications/sip/.**

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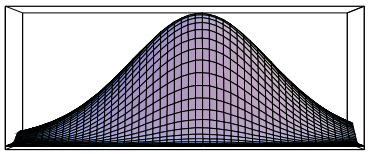

## *SIP* Features

### Statistical Distributions

Bernoulli ▪ Beta ▪ Beta – binomial ▪ Binomial ▪ Cauchy ▪ Chi – square ▪ Degenerate ▪ Dirichlet ▪ Discrete ▪ Empirical ▪ Exponential ▪ Extreme value ▪ F – ratio ▪ Gamma ▪ Geometric ▪ Hypergeometric ▪ Inverse gaussian ▪ Laplace ▪ Logistic ▪ Logarithmic series ▪ Log – normal ▪ Multinomial ▪ Multivariate normal ▪ Negative binomial ▪ Normal ▪ Poisson ▪ Rayleigh ▪ Student t ▪ Weibull ▪ Zeta

### Statistical Inference

- Maximum likelihood estimate
- Profile likelihood based confidence interval for real – valued linear or nonlinear smooth function of parameters
- Likelihood ratio test of statistical hypothesis defined by a set of real – valued linear or nonlinear smooth functions

### Statistical Models

One sample ▪ Independent samples ▪ Independent samples with common parameters ▪ Submodel ▪ General linear model ▪ Nonlinear regression ▪ Logistic regression ▪ Poisson regression ▪ Generalized linear model ▪ Multivariate linear regression ▪ Multinomial regression ▪ General regression ▪ Markov chain ▪ Markov process ▪ Stochastic process ▪ Mixture ▪ Mixed ▪ Hidden Markov Model ▪ Hidden Markov regression

### Properties

Density function ▪ Cumulative distribution function ▪ Likelihood function ▪ Logarithmic likelihood function ▪ Score function ▪ Observed information function ▪ Characteristic function ▪ Moment generating function ▪ Cumulant generating function ▪ Probability generating function ▪ Mean ▪ Variance ▪ Deviance ▪ Skewness ▪ Kurtosis ▪ Moment ▪ Central moment ▪ Cumulant ▪ Covariance ▪ Correlation ▪ Quantile ▪ Random observation ▪ Random sample

## Technical Requirements

*Statistical Inference Package SIP* requires *Mathematica* 5.0 or later and is available for Windows, Mac OS X and Linux.

## Related Products

Some of the software packages available are :

*Experimental Data Analyst* ▪ *Time Series* ▪ *mathStatica* *Wavelet Explorer* ▪ *Neural Networks* ▪ *Signals and Systems*

For more information, visit **www.wolfram.com/products/applications/sip/.**


Statistical Inference Software SIP

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