

Package ‘R2jags’

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Title Using R to Run 'JAGS'

Author Yu-Sung Su <suyusung@tsinghua.edu.cn>,
Masanao Yajima <yajima@stat.ucla.edu>

Maintainer Yu-Sung Su <suyusung@tsinghua.edu.cn>

Depends R (>= 2.14.0), rjags (>= 3-3)

Imports abind, coda (>= 0.13), graphics, grDevices, methods,
R2WinBUGS, parallel, stats, utils

SystemRequirements JAGS (<http://mcmc-jags.sourceforge.net>)

Description Providing wrapper functions to implement Bayesian analysis in JAGS. Some major features include monitoring convergence of a MCMC model using Rubin and Gelman Rhat statistics, automatically running a MCMC model till it converges, and implementing parallel processing of a MCMC model for multiple chains.

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`attach.jags`*Attach/detach elements of 'JAGS' objects to search path*

Description

These are wrapper functions for [attach.bugs](#) and [detach.bugs](#), which attach or detach three-way-simulation array of bugs object to the search path. See [attach.all](#) for details.

Usage

```
attach.jags(x, overwrite = NA)
detach.jags()
```

Arguments

<code>x</code>	An <code>rjags</code> object.
<code>overwrite</code>	If TRUE, objects with identical names in the Workspace (<code>.GlobalEnv</code>) that are masking objects in the database to be attached will be deleted. If NA (the default) and an interactive session is running, a dialog box asks the user whether masking objects should be deleted. In non-interactive mode, behaviour is identical to <code>overwrite=FALSE</code> , i.e. nothing will be deleted.

Details

See [attach.bugs](#) for details

Author(s)

Yu-Sung Su <suyusung@tsinghua.edu.cn>

References

Sibylle Sturtz and Uwe Ligges and Andrew Gelman. (2005). "R2WinBUGS: A Package for Running WinBUGS from R." *Journal of Statistical Software* 3 (12): 1–6.

Examples

```
# See the example in ?jags for the usage.
```

`autojags`*Function for auto-updating 'JAGS' until the model converges*

Description

The `autojags` takes a `rjags` object as input. `autojags` will update the model until it converges.

Usage

```
## S3 method for class 'rjags'
update(object, n.iter=1000, n.thin=1,
       refresh=n.iter/50, progress.bar = "text", ...)
autojags(object, n.iter=1000, n.thin=1, Rhat=1.1, n.update=2,
        refresh=n.iter/50, progress.bar = "text", ...)
```

Arguments

<code>object</code>	an object of <code>rjags</code> class.
<code>n.iter</code>	number of total iterations per chain, default=1000
<code>n.thin</code>	thinning rate. Must be a positive integer, default=1
<code>...</code>	further arguments pass to or from other methods.
<code>Rhat</code>	convergence criterion, default=1.1.
<code>n.update</code>	the max number of updates, default=2.
<code>refresh</code>	refresh frequency for progress bar, default is <code>n.iter/50</code>
<code>progress.bar</code>	type of progress bar. Possible values are "text", "gui", and "none". Type "text" is displayed on the R console. Type "gui" is a graphical progress bar in a new window. The progress bar is suppressed if <code>progress.bar</code> is "none"

Author(s)

Yu-Sung Su <suyusung@tsinghua.edu.cn>

References

Gelman, A., Carlin, J.B., Stern, H.S., Rubin, D.B. (2003): *Bayesian Data Analysis*, 2nd edition, CRC Press.

Examples

```
# see ?jags for an example.
```

jags

Run 'JAGS' from R

Description

The `jags` function takes data and starting values as input. It automatically writes a jags script, calls the model, and saves the simulations for easy access in R.

Usage

```
jags(data, inits, parameters.to.save, model.file="model.bug",
     n.chains=3, n.iter=2000, n.burnin=floor(n.iter/2),
     n.thin=max(1, floor((n.iter - n.burnin) / 1000)),
     DIC=TRUE, working.directory=NULL, jags.seed = 123,
     refresh = n.iter/50, progress.bar = "text", digits=5,
     RNGname = c("Wichmann-Hill", "Marsaglia-Multicarry",
                 "Super-Duper", "Mersenne-Twister"),
     jags.module = c("glm","dic")
)
```

```
jags.parallel(data, inits, parameters.to.save, model.file = "model.bug",
              n.chains = 2, n.iter = 2000, n.burnin = floor(n.iter/2),
              n.thin = max(1, floor((n.iter - n.burnin)/1000)),
              n.cluster= n.chains, DIC = TRUE,
              working.directory = NULL, jags.seed = 123, digits=5,
              RNGname = c("Wichmann-Hill", "Marsaglia-Multicarry",
                          "Super-Duper", "Mersenne-Twister"),
              jags.module = c("glm","dic"),
              export_obj_names=NULL,
              envir = .GlobalEnv
)
```

```
jags2(data, inits, parameters.to.save, model.file="model.bug",
      n.chains=3, n.iter=2000, n.burnin=floor(n.iter/2),
      n.thin=max(1, floor((n.iter - n.burnin) / 1000)),
      DIC=TRUE, jags.path="",
      working.directory=NULL, clearWD=TRUE,
      refresh = n.iter/50)
```

Arguments

`data` (1) a vector or list of the names of the data objects used by the model, (2) a (named) list of the data objects themselves, or (3) the name of a "dump" format file containing the data objects, which must end in ".txt", see example below for details.

<code>inits</code>	a list with <code>n.chains</code> elements; each element of the list is itself a list of starting values for the BUGS model, <i>or</i> a function creating (possibly random) initial values. If <code>inits</code> is NULL, JAGS will generate initial values for parameters.
<code>parameters.to.save</code>	character vector of the names of the parameters to save which should be monitored.
<code>model.file</code>	file containing the model written in BUGS code. Alternatively, as in R2WinBUGS , <code>model.file</code> can be an R function that contains a BUGS model that is written to a temporary model file (see <code>tempfile</code>) using <code>write.model</code>
<code>n.chains</code>	number of Markov chains (default: 3)
<code>n.iter</code>	number of total iterations per chain (including burn in; default: 2000)
<code>n.burnin</code>	length of burn in, i.e. number of iterations to discard at the beginning. Default is <code>n.iter/2</code> , that is, discarding the first half of the simulations. If <code>n.burnin</code> is 0, <code>jags()</code> will run 100 iterations for adaption.
<code>n.cluster</code>	number of clusters to use to run parallel chains. Default equals <code>n.chains</code> .
<code>n.thin</code>	thinning rate. Must be a positive integer. Set <code>n.thin > 1</code> to save memory and computation time if <code>n.iter</code> is large. Default is <code>max(1, floor(n.chains * (n.iter - n.burnin) / 1000))</code> which will only thin if there are at least 2000 simulations.
DIC	logical; if TRUE (default), compute deviance, pD, and DIC. The rule $pD = \text{var}(\text{deviance}) / 2$ is used.
<code>working.directory</code>	sets working directory during execution of this function; This should be the directory where model file is.
<code>jags.seed</code>	random seed for JAGS, default is 123. This function is used for <code>jags.parallell()</code> and does not work for <code>jags()</code> . Use <code>set.seed()</code> instead if you want to produce identical result with <code>jags()</code> .
<code>jags.path</code>	directory that contains the JAGS executable. The default is "".
<code>clearWD</code>	indicating whether the files 'data.txt', 'inits[1:n.chains].txt', 'codaIndex.txt', 'jagsscript.txt', and 'CODAchain[1:nchains].txt' should be removed after <code>jags</code> has finished, default=TRUE.
<code>refresh</code>	refresh frequency for progress bar, default is <code>n.iter/50</code>
<code>progress.bar</code>	type of progress bar. Possible values are "text", "gui", and "none". Type "text" is displayed on the R console. Type "gui" is a graphical progress bar in a new window. The progress bar is suppressed if <code>progress.bar</code> is "none"
<code>digits</code>	as in <code>write.model</code> in the R2WinBUGS package: number of significant digits used for BUGS input, see <code>formatC</code> . Only used if specifying a BUGS model as an R function.
<code>RNGname</code>	the name for random number generator used in JAGS. There are four RNGS supplied by the base module in JAGS: Wichmann-Hill, Marsaglia-Multicarry, Super-Duper, Mersenne-Twister
<code>jags.module</code>	the vector of <code>jags</code> modules to be loaded. Default are "glm" and "dic". Input NULL if you don't want to load any <code>jags</code> module.
<code>export_obj_names</code>	character vector of objects to export to the clusters.
<code>envir</code>	default is <code>.GlobalEnv</code>

Details

To run:

1. Write a BUGS model in an ASCII file.
2. Go into R.
3. Prepare the inputs for the `jags` function and run it (see Example section).
4. The model will now run in JAGS. It might take awhile. You will see things happening in the R console.

BUGS version support:

- **jags** 1.0.3default

Author(s)

Yu-Sung Su <suysung@tsinghua.edu.cn>, Masanao Yajima <yajima@stat.columbia.edu>

References

Plummer, Martyn (2003) "JAGS: A program for analysis of Bayesian graphical models using Gibbs sampling." <http://citeseer.ist.psu.edu/plummer03jags.html>.

Gelman, A., Carlin, J. B., Stern, H.S., Rubin, D.B. (2003) *Bayesian Data Analysis*, 2nd edition, CRC Press.

Sibylle Sturtz and Uwe Ligges and Andrew Gelman. (2005). "R2WinBUGS: A Package for Running WinBUGS from R." *Journal of Statistical Software* 3 (12): 1–6.

Examples

```
# An example model file is given in:
model.file <- system.file(package="R2jags", "model", "schools.txt")
# Let's take a look:
file.show(model.file)
# you can also write BUGS model as a R function, see below:

#####
# initialization #
#####

# data
J <- 8.0
y <- c(28.4,7.9,-2.8,6.8,-0.6,0.6,18.0,12.2)
sd <- c(14.9,10.2,16.3,11.0,9.4,11.4,10.4,17.6)

jags.data <- list("y","sd","J")
jags.params <- c("mu","sigma","theta")
jags.inits <- function(){
  list("mu"=rnorm(1),"sigma"=runif(1),"theta"=rnorm(J))
}
```

```

## You can input data in 4 ways
## 1) data as list of character
jagsfit <- jags(data=list("y","sd","J"), inits=jags.inits, jags.params,
               n.iter=10, model.file=model.file)

## 2) data as character vector of names
jagsfit <- jags(data=c("y","sd","J"), inits=jags.inits, jags.params,
               n.iter=10, model.file=model.file)

## 3) data as named list
jagsfit <- jags(data=list(y=y,sd=sd,J=J), inits=jags.inits, jags.params,
               n.iter=10, model.file=model.file)

## 4) data as a file
fn <- "tmpbugsdata.txt"
dump(c("y","sd","J"), file=fn)
jagsfit <- jags(data=fn, inits=jags.inits, jags.params,
               n.iter=10, model.file=model.file)
unlink("tmpbugsdata.txt")

## You can write bugs model in R as a function

schoolsmodel <- function() {
  for (j in 1:J){
    # J=8, the number of schools
    y[j] ~ dnorm (theta[j], tau.y[j]) # data model: the likelihood
    tau.y[j] <- pow(sd[j], -2)      # tau = 1/sigma^2
  }
  for (j in 1:J){
    theta[j] ~ dnorm (mu, tau)      # hierarchical model for theta
  }
  tau <- pow(sigma, -2)             # tau = 1/sigma^2
  mu ~ dnorm (0.0, 1.0E-6)         # noninformative prior on mu
  sigma ~ dunif (0, 1000)          # noninformative prior on sigma
}

jagsfit <- jags(data=jags.data, inits=jags.inits, jags.params,
               n.iter=10, model.file=schoolsmodel)

#####
# RUN jags and postprocessing #
#####
jagsfit <- jags(data=jags.data, inits=jags.inits, jags.params,
               n.iter=5000, model.file=model.file)

# Run jags parallely, no progress bar. R may be frozen for a while,
# Be patient. Currentlty update afterward does not run parallely
#
jagsfit.p <- jags.parallel(data=jags.data, inits=jags.inits, jags.params,
                           n.iter=5000, model.file=model.file)

# display the output
print(jagsfit)

```

```

plot(jagsfit)

# traceplot
traceplot(jagsfit.p)
traceplot(jagsfit)

# or to use some plots in coda
# use as.mcmc to convert rjags object into mcmc.list
jagsfit.mcmc <- as.mcmc(jagsfit.p)
jagsfit.mcmc <- as.mcmc(jagsfit)
## now we can use the plotting methods from coda
#require(lattice)
#xyplot(jagsfit.mcmc)
#densityplot(jagsfit.mcmc)

# if the model does not converge, update it!
jagsfit.upd <- update(jagsfit, n.iter=100)
print(jagsfit.upd)
print(jagsfit.upd, intervals=c(0.025, 0.5, 0.975))
plot(jagsfit.upd)

# before update parallel jags object, do recompile it
recompile(jagsfit.p)
jagsfit.upd <- update(jagsfit.p, n.iter=100)

# or auto update it until it converges! see ?autojags for details
# recompile(jagsfit.p)
jagsfit.upd <- autojags(jagsfit.p)
jagsfit.upd <- autojags(jagsfit)

# to get DIC or specify DIC=TRUE in jags() or do the following#
dic.samples(jagsfit.upd$model, n.iter=1000, type="pD")

# attach jags object into search path see "attach.bugs" for details
attach.jags(jagsfit.upd)

# this will show a 3-way array of the bugs.sim object, for example:
mu

# detach jags object into search path see "attach.bugs" for details
detach.jags()

# to pick up the last save session
# for example, load("RWorkspace.Rdata")
recompile(jagsfit)
jagsfit.upd <- update(jagsfit, n.iter=100)

recompile(jagsfit.p)
jagsfit.upd <- update(jagsfit, n.iter=100)

#=====#

```



```

# using jags2 #
#####
## jags can be run and produces coda files, but cannot be updated once it's done
## You may need to edit "jags.path" to make this work,
## also you need a write access in the working directory:
## e.g. setwd("d:/")

## NOT RUN HERE
## Not run:
jagsfit <- jags2(data=jags.data, inits=jags.inits, jags.params,
  n.iter=5000, model.file=model.file)
print(jagsfit)
plot(jagsfit)
# or to use some plots in coda
# use as.mcmc to convert rjags object into mcmc.list
jagsfit.mcmc <- as.mcmc.list(jagsfit)
traceplot(jagsfit.mcmc)
#require(lattice)
#xyplot(jagsfit.mcmc)
#densityplot(jagsfit.mcmc)

## End(Not run)

```

jags2bugs

Read jags output files in CODA format

Description

This function reads Markov Chain Monte Carlo output in the CODA format produced by **jags** and returns an object of class `mcmc.list` for further output analysis using the **coda** package.

Usage

```

jags2bugs(path=getwd(), parameters.to.save,
  n.chains=3, n.iter=2000, n.burnin=1000, n.thin=2,
  DIC=TRUE)

```

Arguments

<code>path</code>	sets working directory during execution of this function; This should be the directory where CODA files are.
<code>parameters.to.save</code>	character vector of the names of the parameters to save which should be monitored.
<code>n.chains</code>	number of Markov chains (default: 3)
<code>n.iter</code>	number of total iterations per chain (including burn in; default: 2000)

n.burnin	length of burn in, i.e. number of iterations to discard at the beginning. Default is $n.iter/2$, that is, discarding the first half of the simulations.
n.thin	thinning rate, default is 2
DIC	logical; if TRUE (default), compute deviance, pD, and DIC. The rule $pD = \text{var}(\text{deviance}) / 2$ is used.

Author(s)

Yu-Sung Su <suyusung@tsinghua.edu.cn>, Masanao Yajima <yajima@stat.columbia.edu>

recompile	<i>Function for recompiling rjags object</i>
-----------	--

Description

The recompile takes a rjags object as input. recompile will re-compile the previous saved rjags object.

Usage

```
recompile(object, n.iter, refresh, progress.bar)
## S3 method for class 'rjags'
recompile(object, n.iter=100, refresh=n.iter/50,
          progress.bar = "text")
```

Arguments

object	an object of rjags class.
n.iter	number of iteration for adapting, default is 100
refresh	refresh frequency for progress bar, default is $n.iter/50$
progress.bar	type of progress bar. Possible values are “text”, “gui”, and “none”. Type “text” is displayed on the R console. Type “gui” is a graphical progress bar in a new window. The progress bar is suppressed if progress.bar is “none”

Author(s)

Yu-Sung Su <suyusung@tsinghua.edu.cn>

Examples

```
# see ?jags for an example.
```

traceplot	<i>Trace plot of bugs object</i>
-----------	----------------------------------

Description

Displays a plot of iterations *vs.* sampled values for each variable in the chain, with a separate plot per variable.

Usage

```
traceplot(x, ...)
## S4 method for signature 'rjags'
traceplot(x, mfrow = c(1, 1), varname = NULL,
  match.head = TRUE, ask = TRUE,
  col = rainbow( x$n.chains ),
  lty = 1, lwd = 1, ...)
```

Arguments

x	A bugs object
mfrow	graphical parameter (see par)
varname	vector of variable names to plot
match.head	matches the variable names by the beginning of the variable names in bugs object
ask	logical; if TRUE, the user is <i>asked</i> before each plot, see par(ask=.).
col	graphical parameter (see par)
lty	graphical parameter (see par)
lwd	graphical parameter (see par)
...	further graphical parameters

Author(s)

Masanao Yajima <yajima@stat.columbia.edu>.

See Also

[densplot](#), [plot.mcmc](#), [traceplot](#)

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