

# Package ‘Colossus’

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**Type** Package

**Title** “Risk Model Regression and Analysis with Complex Non-Linear Models”

**Version** 1.1.3.1

**URL** <https://ericgiunta.github.io/Colossus/>,  
<https://github.com/ericgiunta/Colossus>

**BugReports** <https://github.com/ericgiunta/Colossus/issues>

**Description** Performs survival analysis using general non-linear models. Risk models can be the sum or product of terms. Each term is the product of exponential/linear functions of covariates. Additionally sub-terms can be defined as a sum of exponential, linear threshold, and step functions. Cox Proportional hazards <[https://en.wikipedia.org/wiki/Proportional\\_hazards\\_model](https://en.wikipedia.org/wiki/Proportional_hazards_model)>, Poisson <[https://en.wikipedia.org/wiki/Poisson\\_regression](https://en.wikipedia.org/wiki/Poisson_regression)>, and Fine-Grey competing risks <<https://www.publichealth.columbia.edu/research/population-health-methods/competing-risk-analysis>> regression are supported. This work was sponsored by NASA Grant 80NSSC19M0161 through a subcontract from the National Council on Radiation Protection and Measurements (NCRP). The computing for this project was performed on the Beocat Research Cluster at Kansas State University, which is funded in part by NSF grants CNS-1006860, EPS-1006860, EPS-0919443, ACI-1440548, CHE-1726332, and NIH P20GM113109.

**License** GPL (>= 3)

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## Contents

Check_Dupe_Columns . . . . .	3
Check_Trunc . . . . .	4
Check_Verbose . . . . .	5
Correct_Formula_Order . . . . .	6
Cox_Relative_Risk . . . . .	8
Date_Shift . . . . .	10
Def_Control . . . . .	11
Def_Control_Guess . . . . .	11
Def_modelform_fix . . . . .	12
Def_model_control . . . . .	13
factorize . . . . .	14
factorize_par . . . . .	15
Gather_Guesses_CPP . . . . .	16
gcc_version . . . . .	18
gen_time_dep . . . . .	18
GetCensWeight . . . . .	20
get_os . . . . .	22
interact_them . . . . .	22
Joint_Multiple_Events . . . . .	23
Likelihood_Ratio_Test . . . . .	25
Linked_Dose_Formula . . . . .	26
Linked_Lin_Exp_Para . . . . .	27
OMP_Check . . . . .	28
Rcomp_version . . . . .	28
Rcpp_version . . . . .	28
Replace_Missing . . . . .	29

RunCoxNull . . . . .	30
RunCoxPlots . . . . .	31
RunCoxRegression . . . . .	33
RunCoxRegression_Basic . . . . .	35
RunCoxRegression_CR . . . . .	36
RunCoxRegression_Guesses_CPP . . . . .	38
RunCoxRegression_Omnibus . . . . .	41
RunCoxRegression_Omnibus_Multidose . . . . .	43
RunCoxRegression_Single . . . . .	46
RunCoxRegression_STRATA . . . . .	48
RunCoxRegression_Tier_Guesses . . . . .	50
RunPoissonEventAssignment . . . . .	52
RunPoissonEventAssignment_bound . . . . .	54
RunPoissonRegression . . . . .	56
RunPoissonRegression_Guesses_CPP . . . . .	58
RunPoissonRegression_Joint_Omnibus . . . . .	60
RunPoissonRegression_Omnibus . . . . .	63
RunPoissonRegression_Residual . . . . .	65
RunPoissonRegression_Single . . . . .	67
RunPoissonRegression_STRATA . . . . .	69
RunPoissonRegression_Tier_Guesses . . . . .	71
System_Version . . . . .	74
Time_Since . . . . .	74
<b>Index</b>	<b>76</b>

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Check_Dupe_Columns	<i>checks for duplicated column names</i>
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---

## Description

Check\_Dupe\_Columns checks for duplicated columns, columns with the same values, and columns with single value. Currently not updated for multi-terms

## Usage

```
Check_Dupe_Columns(df, cols, term_n, verbose = 0, factor_check = FALSE)
```

## Arguments

df	a data.table containing the columns of interest
cols	columns to check
term_n	term numbers for each element of the model

verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.
factor_check	a boolean used to skip comparing columns of the form ?_? with the same initial string, which is used for factored columns

**Value**

returns the usable columns

**See Also**

Other Data Cleaning Functions: [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
a <- c(0,1,2,3,4,5,6)
b <- c(1,2,3,4,5,6,7)
c <- c(0,1,2,1,0,1,0)
df <- data.table::data.table("a"=a,"b"=b,"c"=c)
cols <- c("a","b","c")
term_n <- c(0,0,1)
unique_cols <- Check_Dupe_Columns(df, cols, term_n)
```

---

Check_Trunc	<i>Applies time duration truncation limits to create columns for Cox model</i>
-------------	--

---

**Description**

Check\_Trunc creates columns to use for truncation

**Usage**

```
Check_Trunc(df, ce, verbose = 0)
```

**Arguments**

df	a data.table containing the columns of interest
ce	columns to check for truncation, (t0, t1, event)
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.

**Value**

returns the updated data and time period columns

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
ce <- c("%trunc%", "Ending_Age")
val <- Check_Trunc(df, ce)
df <- val$df
ce <- val$ce
```

---

Check\_Verbose

*General purpose verbosity check*

---

**Description**

Check\_Verbose checks and assigns verbosity values

**Usage**

```
Check_Verbose(verbose)
```

**Arguments**

verbose integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.

**Value**

returns correct verbose value

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

---

Correct\_Formula\_Order *Corrects the order of terms/formula/etc*

---

**Description**

Correct\_Formula\_Order checks the order of formulas given and corrects any ordering issues, orders alphabetically, by term number, etc.

**Usage**

```
Correct_Formula_Order(
  term_n,
  tform,
  keep_constant,
  a_n,
  names,
  der_iden = 0,
  cons_mat = matrix(c(0)),
  cons_vec = c(0),
  verbose = FALSE,
  model_control = list(para_number = 0)
)
```

**Arguments**

term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
names	columns for elements of the model, used to identify data columns
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
cons_mat	Matrix containing coefficients for system of linear constraints, formatted as matrix
cons_vec	Vector containing constants for system of linear constraints, formatted as vector
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details

**Value**

returns the corrected lists

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

term_n <- c(0,1,1,0,0)
tform <- c("loglin", 'quad_slope', 'lin', "lin_int", "lin_slope")
keep_constant <- c(0,0,0,1,0)
a_n <- c(1,2,3,4,5)
names <- c("a", "a", "a", "a", "a")
val <- Correct_Formula_Order(term_n, tform, keep_constant,
                             a_n, names, cons_mat=matrix(c(0)),
                             cons_vec=c(0))
```

```

term_n <- val$term_n
tform <- val$tform
keep_constant <- val$keep_constant
a_n <- val$a_n
der_iden <- val$der_iden
names <- val$names

```

---

Cox\_Relative\_Risk      *Calculates hazard ratios for a reference vector*

---

### Description

RunCoxRegression uses user provided data, vectors specifying the model, and options to calculate relative risk for every row in the provided data

### Usage

```

Cox_Relative_Risk(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  control,
  model_control = list()
)

```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.



modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details

**Value**

returns a list of the final results

**See Also**

Other Plotting Wrapper Functions: [RunCoxPlots\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
term_n <- c(0,1,1,2)
fir <- 0
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
a_n <- c(1.1, 0.1, 0.2, 0.5) #used to test at a specific point

keep_constant <- c(0,0,0,0)

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,
  'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)

e <- Cox_Relative_Risk(df, time1, time2, event, names, term_n, tform,
  keep_constant, a_n, modelform, fir, control)
```

---

Date\_Shift

*Automates creating a date difference column*

---

### Description

Date\_Shift generates a new dataframe with a column containing time difference in a given unit

### Usage

```
Date_Shift(df, dcol0, dcol1, col_name, units = "days")
```

### Arguments

df	a data.table containing the columns of interest
dcol0	list of starting month, day, and year
dcol1	list of ending month, day, and year
col_name	vector of new column names
units	time unit to use

### Value

returns the updated dataframe

### See Also

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

### Examples

```
library(data.table)
m0 <- c(1,1,2,2)
m1 <- c(2,2,3,3)
d0 <- c(1,2,3,4)
d1 <- c(6,7,8,9)
y0 <- c(1990,1991,1997,1998)
y1 <- c(2001,2003,2005,2006)
df <- data.table::data.table("m0"=m0, "m1"=m1, "d0"=d0, "d1"=d1, "y0"=y0, "y1"=y1)
df <- Date_Shift(df, c("m0", "d0", "y0"), c("m1", "d1", "y1"), "date_since")
```

---

Def_Control	<i>Automatically assigns missing control values</i>
-------------	---

---

**Description**

Def\_Control checks and assigns default values

**Usage**

```
Def_Control(control)
```

**Arguments**

control            list of parameters controlling the convergence, see Def\_Control() for options or vignette("Control\_Options")

**Value**

returns a filled list

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 5, 'ties'='breslow', 'double_step'=1)
control <- Def_Control(control)
```

---

Def_Control_Guess	<i>Automatically assigns missing guessing control values</i>
-------------------	--

---

**Description**

Def\_Control\_Guess checks and assigns default values

**Usage**

```
Def_Control_Guess(guesses_control, a_n)
```

**Arguments**

- `guesses_control` list of parameters to control how the guessing works, see `Def_Control_Guess()` for options or `vignette("Control_Options")`
- `a_n` list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.

**Value**

returns a filled list

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
guesses_control <- list("maxiter"=10,"guesses"=10,
  "loglin_min"=-1,"loglin_max"=1,"loglin_method"="uniform")
a_n <- c(0.1,2,1.3)
guesses_control <- Def_Control_Guess(guesses_control, a_n)
```

---

<code>Def_modelform_fix</code>	<i>Automatically assigns geometric-mixture values and checks that a valid modelform is used</i>
--------------------------------	---

---

**Description**

`Def_model_control` checks and assigns default values for modelform options

**Usage**

```
Def_modelform_fix(control, model_control, modelform, term_n)
```

**Arguments**

- `control` list of parameters controlling the convergence, see `Def_Control()` for options or `vignette("Control_Options")`
- `model_control` controls which alternative model options are used, see `Def_model_control()` for options and `vignette("Control_Options")` for further details
- `modelform` string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
- `term_n` term numbers for each element of the model

**Value**

returns a filled list

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 5, 'ties'='breslow', 'double_step'=1)
control <- Def_Control(control)
model_control <- list("single"=TRUE)
model_control <- Def_model_control(model_control)
term_n <- c(0,1,1)
modelform <- 'a'
val <- Def_modelform_fix(control,model_control,modelform,term_n)
model_control <- val$model_control
modelform <- val$modelform
```

---

Def\_model\_control      *Automatically assigns missing model control values*

---

**Description**

Def\_model\_control checks and assigns default values

**Usage**

```
Def_model_control(control)
```

**Arguments**

control            list of parameters controlling the convergence, see [Def\\_Control\(\)](#) for options or [vignette\("Control\\_Options"\)](#)

**Value**

returns a filled list

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
control <- list("single"=TRUE)
control <- Def_model_control(control)
```

---

factorize

*Splits a parameter into factors*

---

**Description**

factorize uses user provided list of columns to define new parameter for each unique value and update the data.table. Not for interaction terms

**Usage**

```
factorize(df, col_list, verbose = 0)
```

**Arguments**

df	a data.table containing the columns of interest
col_list	an array of column names that should have factor terms defined
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.

**Value**

returns a list with two named fields. df for the updated dataframe, and cols for the new column names

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```

library(data.table)
a <- c(0,1,2,3,4,5,6)
b <- c(1,2,3,4,5,6,7)
c <- c(0,1,2,1,0,1,0)
df <- data.table::data.table("a"=a,"b"=b,"c"=c)
col_list <- c("c")
val <- factorize(df,col_list)
df <- val$df
new_col <- val$cols

```

factorize\_par

*Splits a parameter into factors in parallel***Description**

factorize\_par uses user provided list of columns to define new parameter for each unique value and update the data.table. Not for interaction terms

**Usage**

```
factorize_par(df, col_list, verbose = 0, nthreads = as.numeric(detectCores()))
```

**Arguments**

df	a data.table containing the columns of interest
col_list	an array of column names that should have factor terms defined
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.
nthreads	number of threads to use, do not use more threads than available on your machine

**Value**

returns a list with two named fields. df for the updated dataframe, and cols for the new column names

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```

library(data.table)
a <- c(0,1,2,3,4,5,6)
b <- c(1,2,3,4,5,6,7)
c <- c(0,1,2,1,0,1,0)
df <- data.table::data.table("a"=a,"b"=b,"c"=c)
col_list <- c("c")
val <- factorize_par(df,col_list,FALSE,2)
df <- val$df
new_col <- val$cols

```

---

Gather_Guesses_CPP	<i>Performs checks to gather a list of guesses and iterations</i>
--------------------	---

---

**Description**

Gather\_Guesses\_CPP called from within R, uses a list of options and the model definition to generate a list of parameters and iterations that do not produce errors

**Usage**

```

Gather_Guesses_CPP(
  df,
  dfc,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  x_all,
  a_n_default,
  modelform,
  fir,
  control,
  guesses_control,
  model_control = list()
)

```

**Arguments**

df	a data.table containing the columns of interest
dfc	vector matching subterm number to matrix column
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step



keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
x_all	covariate matrix
a_n_default	center of parameter distribution guessing scope
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
guesses_control	list of parameters to control how the guessing works, see Def_Control_Guess() for options or vignette("Control_Options")
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details

### Value

returns a list of the final results

### Examples

```
library(data.table)
a <- c(0,1,2,3,4,5,6)
b <- c(1,2,3,4,5,6,7)
c <- c(0,1,0,0,0,1,0)
d <- c(3,4,5,6,7,8,9)
df <- data.table::data.table("a"=a,"b"=b,"c"=c,"d"=d)
time1 <- "a"
time2 <- "b"
event <- "c"
names <- c("d")
term_n <- c(0)
tform <- c("loglin")
keep_constant <- c(0)
a_n <- c(-0.1)
a_n_default <- a_n
modelform <- "M"
fir <- 0
der_iden <- 0
control <- list("ncores"=2,'lr' = 0.75,'maxiter' = -1,'halfmax' = 5,'epsilon' = 1e-9,
               'deriv_epsilon' = 1e-9, 'abs_max'=1.0,'change_all'=TRUE,
               'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list()
model_control <- list()
all_names <- unique(names(df))
dfc <- match(names,all_names)
term_tot <- max(term_n)+1
```

```
x_all <- as.matrix(df[,all_names, with = FALSE])
control <- Def_Control(control)
guesses_control <- Def_Control_Guess(guesses_control, a_n)
model_control <- Def_model_control(model_control)
Gather_Guesses_CPP(df, dfc, names, term_n, tform, keep_constant, a_n, x_all, a_n_default,
                  modelform, fir, control, guesses_control)
```

---

gcc\_version                      *Checks default c++ compiler*

---

### Description

gcc\_version Checks default c++ compiler, part of configuration script

### Usage

```
gcc_version()
```

### Value

returns a string representation of gcc, clang, or c++ output

---

gen\_time\_dep                      *Applies time dependence to parameters*

---

### Description

gen\_time\_dep generates a new dataframe with time dependent covariates by applying a grid in time

### Usage

```
gen_time_dep(
  df,
  time1,
  time2,
  event0,
  iscox,
  dt,
  new_names,
  dep_cols,
  func_form,
  fname,
  tform,
  nthreads = as.numeric(detectCores())
)
```

**Arguments**

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
iscox	boolean if rows not at event times should not be kept, rows are removed if true. a Cox proportional hazards model does not use rows with intervals not containing event times
dt	spacing in time for new rows
new_names	list of new names to use instead of default, default used if entry is ""
dep_cols	columns that are not needed in the new dataframe
func_form	vector of functions to apply to each time-dependent covariate. Of the form func(df, time) returning a vector of the new column value
fname	filename used for new dataframe
tform	list of string function identifiers, used for linear/step
nthreads	number of threads to use, do not use more threads than available on your machine

**Value**

returns the updated dataframe

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
#Adapted from the tests
a <- c(20,20,5,10,15)
b <- c(1,2,1,1,2)
c <- c(0,0,1,1,1)
df <- data.table::data.table("a"=a,"b"=b,"c"=c)
time1 <- "%trunc%"
time2 <- "a"
event <- "c"
control <- list('lr' = 0.75,'maxiter' = -1,'halfmax' = 5,'epsilon' = 1e-9,
               'deriv_epsilon' = 1e-9, 'abs_max'=1.0,'change_all'=TRUE,'dose_abs_max'=100.0,
               'verbose'=FALSE, 'ties'='breslow','double_step'=1)
grt_f <- function(df,time_col){
  return ((df[, "b"] * df[,get(time_col)])[[1]])
}
```

```
func_form <- c("lin")
df_new <- gen_time_dep(df,time1,time2,event,TRUE,0.01,c("grt"),c(),
  c(grt_f),paste("test","_new.csv",sep=""), func_form,2)
file.remove('test_new.csv')
```

---

GetCensWeight	<i>Calculates and returns data for time by hazard and survival to estimate censoring rate</i>
---------------	---

---

### Description

GetCensWeight uses user provided data, time/event columns, vectors specifying the model, and options generate an estimate of the censoring rate, plots, and returns the data

### Usage

```
GetCensWeight(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  control,
  plot_options,
  model_control = list(),
  strat_col = "e"
)
```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change

a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
plot_options	list of parameters controlling the plot options, see RunCoxPlots() for different options
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details
strat_col	column to stratify by if needed

### Value

saves the plots in the current directory and returns a data.table of time and corresponding hazard, cumulative hazard, and survival

### Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a', 'b', 'c', 'd')
term_n <- c(0,1,1,2)
tform <- c("loglin", "lin", "lin", "plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)
der_iden <- 0
df$censor <- (df$Cancer_Status==0)
event <- "censor"
control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 20, 'halfmax' = 5,
  'epsilon' = 1e-6, 'deriv_epsilon' = 1e-6,
  'abs_max'=1.0, 'change_all'=TRUE, 'dose_abs_max'=100.0, 'verbose'=FALSE,
```

```

    'ties'='breslow','double_step'=1)
plot_options <- list("name"=paste(tempfile(),"run_06",sep=""),"verbose"=FALSE,
                    "studyID"="studyID","age_unit"="years")
dft <- GetCensWeight(df, time1, time2, event, names, term_n, tform,
                    keep_constant, a_n, modelform, fir, control, plot_options)
t_ref <- dft$t
surv_ref <- dft$surv
t_c <- df$t1
cens_weight <- approx(t_ref, surv_ref, t_c,rule=2)$y

```

---

get_os	<i>Checks system OS</i>
--------	-------------------------

---

### Description

get\_os checks the system OS, part of configuration script

### Usage

```
get_os()
```

### Value

returns a string representation of OS

---

interact_them	<i>Defines Interactions</i>
---------------	-----------------------------

---

### Description

interact\_them uses user provided interactions define interaction terms and update the data.table. assumes interaction is "+" or "\*" and applies basic anti-aliasing to avoid duplicates

### Usage

```
interact_them(df, interactions, new_names, verbose = 0)
```

### Arguments

df	a data.table containing the columns of interest
interactions	array of strings, each one is of form term1?*?term2" for term1 interaction of type * or + with term2, "?" dlimits
new_names	list of new names to use instead of default, default used if entry is ""

`verbose` integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and `True/False` is converted to 3/0.

### Value

returns a list with two named fields. `df` for the updated dataframe, and `cols` for the new column names

### See Also

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#)

### Examples

```
library(data.table)
a <- c(0,1,2,3,4,5,6)
b <- c(1,2,3,4,5,6,7)
c <- c(0,1,2,1,0,1,0)
df <- data.table::data.table("a"=a,"b"=b,"c"=c)
interactions <- c("a?+?b","a?*?c")
new_names <- c("ab","ac")
vals <- interact_them(df, interactions, new_names)
df <- vals$df
new_col <- vals$cols
```

---

Joint\_Multiple\_Events *Automates creating data for a joint competing risks analysis*

---

### Description

`Joint_Multiple_Events` generates input for a regression with multiple non-independent events and models

### Usage

```
Joint_Multiple_Events(
  df,
  events,
  name_list,
```

```

    term_n_list = list(),
    tform_list = list(),
    keep_constant_list = list(),
    a_n_list = list()
  )

```

### Arguments

<code>df</code>	a <code>data.table</code> containing the columns of interest
<code>events</code>	vector of event column names
<code>name_list</code>	list of vectors for columns for event specific or shared model elements, required
<code>term_n_list</code>	list of vectors for term numbers for event specific or shared model elements, defaults to term 0
<code>tform_list</code>	list of vectors for subterm types for event specific or shared model elements, defaults to loglinear
<code>keep_constant_list</code>	list of vectors for constant elements for event specific or shared model elements, defaults to free (0)
<code>a_n_list</code>	list of vectors for parameter values for event specific or shared model elements, defaults to term 0

### Value

returns the updated dataframe and model inputs

### See Also

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Replace\\_Missing\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

### Examples

```

library(data.table)
a <- c(0,0,0,1,1,1)
b <- c(1,1,1,2,2,2)
c <- c(0,1,2,2,1,0)
d <- c(1,1,0,0,1,1)
e <- c(0,1,1,1,0,0)
df <- data.table('t0'=a, 't1'=b, 'e0'=c, 'e1'=d, 'fac'=e)
time1 <- "t0"
time2 <- "t1"
df$pyr <- df$t1 - df$t0
pyr <- "pyr"
events <- c('e0', 'e1')
names_e0 <- c('fac')
names_e1 <- c('fac')
names_shared <- c('t0', 't0')

```



```

term_n_e0 <- c(0)
term_n_e1 <- c(0)
term_n_shared <- c(0,0)
tform_e0 <- c("loglin")
tform_e1 <- c("loglin")
tform_shared <- c("quad_slope", "loglin_top")
keep_constant_e0 <- c(0)
keep_constant_e1 <- c(0)
keep_constant_shared <- c(0,0)
a_n_e0 <- c(-0.1)
a_n_e1 <- c(0.1)
a_n_shared <- c(0.001, -0.02)
name_list <- list('shared'=names_shared, 'e0'=names_e0, 'e1'=names_e1)
term_n_list <- list('shared'=term_n_shared, 'e0'=term_n_e0, 'e1'=term_n_e1)
tform_list <- list('shared'=tform_shared, 'e0'=tform_e0, 'e1'=tform_e1)
keep_constant_list <- list('shared'=keep_constant_shared,
                           'e0'=keep_constant_e0, 'e1'=keep_constant_e1)
a_n_list <- list('shared'=a_n_shared, 'e0'=a_n_e0, 'e1'=a_n_e1)
val <- Joint_Multiple_Events(df, events, name_list, term_n_list,
                             tform_list, keep_constant_list, a_n_list)

```

---

Likelihood\_Ratio\_Test *Defines the likelihood ratio test*

---

### Description

Likelihood\_Ratio\_Test uses two models and calculates the ratio

### Usage

```
Likelihood_Ratio_Test(alternative_model, null_model)
```

### Arguments

alternative\_model      the new model of interest in list form, output from a poisson regression

null\_model              a model to compare against, in list form

### Value

returns the score statistic

### Examples

```

library(data.table)
#In an actual example, one would run two separate RunCoxRegression regressions,
# assigning the results to e0 and e1
e0 <- list("name"="First Model", "LogLik"=-120)

```

```
e1 <- list("name"="New Model", "LogLik"=-100)
score <- Likelihood_Ratio_Test(e1, e0)
```

---

Linked\_Dose\_Formula     *Calculates Full Parameter list for Special Dose Formula*

---

### Description

Linked\_Dose\_Formula Calculates all parameters for linear-quadratic and linear-exponential linked formulas

### Usage

```
Linked_Dose_Formula(tforms, paras, verbose = 0)
```

### Arguments

tforms	list of formula types
paras	list of formula parameters
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.

### Value

returns list of full parameters

### Examples

```
library(data.table)
tforms <- list("cov_0"="quad", "cov_1"="exp")
paras <- list("cov_0"=c(1,3.45), "cov_1"=c(1.2, 4.5, 0.1))
full_paras <- Linked_Dose_Formula(tforms, paras)
```

---

Linked\_Lin\_Exp\_Para     *Calculates The Additional Parameter For a linear-exponential formula with known maximum*

---

### Description

Linked\_Lin\_Exp\_Para Calculates what the additional parameter would be for a desired maximum

### Usage

```
Linked_Lin_Exp_Para(y, a0, a1_goal, verbose = 0)
```

### Arguments

y	point formula switch
a0	linear slope
a1_goal	exponential maximum desired
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.

### Value

returns parameter used by Colossus

### Examples

```
library(data.table)
y <- 7.6
a0 <- 1.2
a1_goal <- 15
full_paras <- Linked_Lin_Exp_Para(y,a0,a1_goal)
```

---

OMP_Check	<i>Checks the OMP flag</i>
-----------	----------------------------

---

**Description**

OMP\_Check Called directly from R, checks the omp flag and returns if omp is enabled

**Usage**

OMP\_Check()

**Value**

boolean: True for OMP allowed

---

Rcomp_version	<i>Checks how R was compiled</i>
---------------	----------------------------------

---

**Description**

Rcomp\_version Checks how R was compiled, part of configuration script

**Usage**

Rcomp\_version()

**Value**

returns a string representation of gcc, clang, or R CMD config CC output

---

Rcpp_version	<i>Checks default R c++ compiler</i>
--------------	--------------------------------------

---

**Description**

Rcpp\_version checks ~/.R/Makevars script for default compilers set, part of configuration script

**Usage**

Rcpp\_version()

**Value**

returns a string representation of gcc, clang, or head ~/.R/Makevars

---

Replace_Missing	<i>Automatically assigns missing values in listed columns</i>
-----------------	---

---

### Description

Replace\_Missing checks each column and fills in NA values

### Usage

```
Replace_Missing(df, name_list, msv, verbose = FALSE)
```

### Arguments

df	a data.table containing the columns of interest
name_list	vector of string column names to check
msv	value to replace na with, same used for every column used
verbose	integer valued 0-4 controlling what information is printed to the terminal. Each level includes the lower levels. 0: silent, 1: errors printed, 2: warnings printed, 3: notes printed, 4: debug information printed. Errors are situations that stop the regression, warnings are situations that assume default values that the user might not have intended, notes provide information on regression progress, and debug prints out C++ progress and intermediate results. The default level is 2 and True/False is converted to 3/0.

### Value

returns a filled datatable

### See Also

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Time\\_Since\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

### Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, NA, 47, 36, NA, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0))
df <- Replace_Missing(df, c("Starting_Age", "Ending_Age"), 70)
```

---

RunCoxNull	<i>Performs basic Cox Proportional Hazards regression with the null model</i>
------------	---

---

## Description

RunCoxRegression uses user provided data and time/event columns to calculate the log-likelihood with constant hazard ratio

## Usage

```
RunCoxNull(df, time1, time2, event0, control)
```

## Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")

## Value

returns a list of the final results

## See Also

Other Cox Wrapper Functions: [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

## Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0))
# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"

control <- list("ncores"=2, 'verbose'=FALSE, 'ties'='breslow', 'double_step'=1)
```

```
e <- RunCoxNull(df, time1, time2, event, control)
```

---

RunCoxPlots	<i>Performs Cox Proportional Hazard model plots</i>
-------------	---

---

### Description

RunCoxPlots uses user provided data, time/event columns, vectors specifying the model, and options to choose and save plots

### Usage

```
RunCoxPlots(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  control,
  plot_options,
  model_control = list()
)
```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E

<code>fir</code>	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
<code>control</code>	list of parameters controlling the convergence, see <code>Def_Control()</code> for options or <code>vignette("Control_Options")</code>
<code>plot_options</code>	list of parameters controlling the plot options, see <code>RunCoxPlots()</code> for different options
<code>model_control</code>	controls which alternative model options are used, see <code>Def_model_control()</code> for options and <code>vignette("Control_Options")</code> for further details

**Value**

saves the plots in the current directory and returns a string

**See Also**

Other Plotting Wrapper Functions: [Cox\\_Relative\\_Risk\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a', 'b', 'c', 'd')
term_n <- c(0, 1, 1, 2)
tform <- c("loglin", "lin", "lin", "plin")
modelform <- "M"
fir <- 0
a_n <- c(-0.1, 0.5, 1.1, -0.3)

keep_constant <- c(0, 0, 0, 0)
der_iden <- 0

control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = -1, 'halfmax' = 5,
  'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3,
  'abs_max'=1.0, 'change_all'=TRUE, 'dose_abs_max'=100.0,
  'verbose'=FALSE, 'ties'='breslow', 'double_step'=1)
#setting maxiter below 0 forces the function to calculate the score
# and return
plot_options <- list("type"=c("surv", paste(tempfile(), "run", sep="")), "studyid"="UserID",
```



```

        'verbose'=FALSE)

RunCoxPlots(df, time1, time2, event, names, term_n, tform, keep_constant,
            a_n, modelform, fir, control, plot_options)

```

---

RunCoxRegression	<i>Performs basic Cox Proportional Hazards regression without special options</i>
------------------	---

---

### Description

RunCoxRegression uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting position

### Usage

```

RunCoxRegression(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control
)

```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.

modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")

**Value**

returns a list of the final results

**See Also**

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a', 'b', 'c', 'd')
term_n <- c(0,1,1,2)
tform <- c("loglin", "lin", "lin", "plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 5, 'halfmax' = 5,
  'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3,
  'abs_max'=1.0, 'change_all'=TRUE, 'dose_abs_max'=100.0,
  'verbose'=FALSE, 'ties'='breslow', 'double_step'=1)
```

```
e <- RunCoxRegression(df, time1, time2, event, names, term_n, tform,
                      keep_constant, a_n, modelform, fir, der_iden, control)
```

---

RunCoxRegression\_Basic

*Performs basic Cox Proportional Hazards regression with a multiplicative log-linear model*

---

### Description

RunCoxRegression\_Basic uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions

### Usage

```
RunCoxRegression_Basic(
  df,
  time1,
  time2,
  event0,
  names,
  keep_constant,
  a_n,
  der_iden,
  control
)
```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")

**Value**

returns a list of the final results

**See Also**

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 5, 'halfmax' = 5,
  'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3, 'abs_max'=1.0,
  'change_all'=TRUE, 'dose_abs_max'=100.0, 'verbose'=FALSE,
  'ties'='breslow', 'double_step'=1)

e <- RunCoxRegression_Basic(df, time1, time2, event, names, keep_constant,
  a_n, der_iden, control)
```

---

RunCoxRegression_CR	<i>Performs basic Cox Proportional Hazards regression with competing risks</i>
---------------------	--

---

**Description**

RunCoxRegression\_CR uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence, starting positions, and censoring adjustment

**Usage**

```
RunCoxRegression_CR(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control,
  cens_weight
)
```

**Arguments**

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
cens_weight	column containing the row weights

**Value**

returns a list of the final results

**See Also**

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 2, 1, 2, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
#weights the probability that a row would continue to extend without censoring,
# for risk group calculation
df$cens_weight <- c(0.83, 0.37, 0.26, 0.34, 0.55, 0.23, 0.27)
#censoring weight is generated by the survival library finegray function, or by hand.
#The ratio of weight at event end point to weight at row endpoint is used.
e <- RunCoxRegression_CR(df, time1, time2, event, names, term_n, tform,
  keep_constant, a_n, modelform, fir, der_iden, control, 'cens_weight')
```

---

**RunCoxRegression\_Guesses\_CPP**

*Performs basic Cox Proportional Hazards regression, Generates multiple starting guesses on c++ side*

---

**Description**

RunCoxRegression\_Guesses\_CPP uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions. Has additional options to starting with several initial guesses

**Usage**

```
RunCoxRegression_Guesses_CPP(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control,
  guesses_control,
  strat_col,
  model_control = list(),
  cens_weight = "null"
)
```

**Arguments**

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0

control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
guesses_control	list of parameters to control how the guessing works, see Def_Control_Guess() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details
cens_weight	column containing the row weights

### Value

returns a list of the final results

### See Also

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

### Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 1, 0, 0, 0, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a', 'b', 'c', 'd')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin", "lin", "lin", "plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 5, 'halfmax' = 5, 'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0, 'change_all'=TRUE,
```



```
'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("maxiter"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
  "loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform","loglin_method"="uniform",strata=FALSE)
strat_col <- 'e'

e <- RunCoxRegression_Guesses_CPP(df, time1, time2, event, names, term_n,
  tform, keep_constant, a_n, modelform, fir,
  der_iden, control,guesses_control,strat_col)
```

---

RunCoxRegression\_Omnibus

*Performs Cox Proportional Hazards regression using the omnibus function*

---

## Description

RunCoxRegression\_Omnibus uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions. Has additional options for starting with several initial guesses, using stratification, multiplicative loglinear 1-term, competing risks, and calculation without derivatives

## Usage

```
RunCoxRegression_Omnibus(
  df,
  time1 = "start",
  time2 = "end",
  event0 = "event",
  names = c("CONST"),
  term_n = c(0),
  tform = "loglin",
  keep_constant = c(0),
  a_n = c(0),
  modelform = "M",
  fir = 0,
  der_iden = 0,
  control = list(),
  strat_col = "null",
  cens_weight = "null",
  model_control = list(),
  cons_mat = as.matrix(c(0)),
  cons_vec = c(0)
)
```

## Arguments

`df` a data.table containing the columns of interest

time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
cens_weight	column containing the row weights
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details
cons_mat	Matrix containing coefficients for system of linear constraints, formatted as matrix
cons_vec	Vector containing constants for system of linear constraints, formatted as vector

**Value**

returns a list of the final results

**See Also**

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
```

```

      "a"=c(0, 1, 1, 0, 1, 0, 1),
      "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
      "c"=c(10, 11, 10, 11, 12, 9, 11),
      "d"=c(0, 0, 0, 1, 1, 1, 1),
      "e"=c(0, 0, 1, 0, 0, 0, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- list(c(1.1, -0.1, 0.2, 0.5),c(1.6, -0.12, 0.3, 0.4))
#used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiters' = c(5,5,5),
  'halfmax' = 5,'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3,
  'abs_max'=1.0,'change_all'=TRUE, 'dose_abs_max'=100.0,'verbose'=FALSE,
  'ties'='breslow','double_step'=1, "guesses"=2)

e <- RunCoxRegression_Omnibus(df, time1, time2, event,
  names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control,
  model_control=list("single"=FALSE,
    "basic"=FALSE, "cr"=FALSE, 'null'=FALSE))

```

---

RunCoxRegression\_Omnibus\_Multidose

*Performs Cox Proportional Hazards regression using the omnibus function with multiple column realizations*

---

## Description

RunCoxRegression\_Omnibus\_Multidose uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions. Used for 2DMC column uncertainty methods. Returns optimized parameters, log-likelihood, and standard deviation for each realization. Has additional options for using stratification, multiplicative loglinear 1-term, competing risks, and calculation without derivatives

## Usage

```

RunCoxRegression_Omnibus_Multidose(
  df,
  time1 = "start",

```

```

time2 = "end",
event0 = "event",
names = c("CONST"),
term_n = c(0),
tform = "loglin",
keep_constant = c(0),
a_n = c(0),
modelform = "M",
fir = 0,
der_iden = 0,
realization_columns = matrix(c("temp00", "temp01", "temp10", "temp11"), nrow = 2),
realization_index = c("temp0", "temp1"),
control = list(),
strat_col = "null",
cens_weight = "null",
model_control = list(),
cons_mat = as.matrix(c(0)),
cons_vec = c(0)
)

```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
realization_columns	used for multi-realization regressions. Matrix of column names with rows for each column with realizations, columns for each realization
realization_index	used for multi-realization regressions. Vector of column names, one for each column with realizations. each name should be used in the "names" variable in the equation definition

control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
cens_weight	column containing the row weights
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details
cons_mat	Matrix containing coefficients for system of linear constraints, formatted as matrix
cons_vec	Vector containing constants for system of linear constraints, formatted as vector

### Value

returns a list of the final results for each realization

### See Also

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

### Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 1, 0, 0, 0, 1),
  "a0"=c(0, 1, 1, 0, 1, 0, 1),
  "a1"=c(0, 1, 1, 0, 1, 0, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- list(c(1.1, -0.1, 0.2, 0.5),c(1.6, -0.12, 0.3, 0.4))
#used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0
```

```

realization_columns = matrix(c("a0", "a1"), nrow=1)
realization_index=c("a")

control <- list("ncores"=2, 'lr' = 0.75, 'maxiters' = c(5,5,5),
  'halfmax' = 5, 'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3,
  'abs_max'=1.0, 'change_all'=TRUE, 'dose_abs_max'=100.0, 'verbose'=FALSE,
  'ties'='breslow', 'double_step'=1, "guesses"=2)

#e <- RunCoxRegression_Omnibus_Multidose(df, time1, time2, event,
#                                     names, term_n, tform, keep_constant,
#                                     a_n, modelform, fir, der_iden,
#                                     realization_columns, realization_index, control,
#                                     model_control=list("single"=FALSE,
#                                     "basic"=FALSE, "cr"=FALSE, 'null'=FALSE))

```

---

### RunCoxRegression\_Single

*Performs basic Cox Proportional Hazards calculation with no derivative*

---

### Description

RunCoxRegression\_Single uses user provided data, time/event columns, vectors specifying the model, and options and returns the log-likelihood

### Usage

```

RunCoxRegression_Single(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  control
)

```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status

names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")

**Value**

returns a list of the final results

**See Also**

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point

keep_constant <- c(0,0,0,0)
```

```
control <- list("ncores"=2,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
e <- RunCoxRegression_Single(df, time1, time2, event, names, term_n, tform,
                             keep_constant, a_n, modelform, fir, control)
```

---

RunCoxRegression\_STRATA

*Performs basic Cox Proportional Hazards regression with strata effect*

---

### Description

RunCoxRegression\_STRATA uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions

### Usage

```
RunCoxRegression_STRATA(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control,
  strat_col
)
```

### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts
time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change



a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed

### Value

returns a list of the final results

### See Also

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_Single\(\)](#), [RunCoxRegression\\_Tier\\_Guesses\(\)](#)

### Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 0, 0, 1, 0, 1))

# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0
```

```

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,
  'epsilon' = 1e-3,'deriv_epsilon' = 1e-3,
  'abs_max'=1.0, 'change_all'=TRUE,'dose_abs_max'=100.0,
  'verbose'=FALSE, 'ties'='breslow','double_step'=1)
strat_col <- 'e'

e <- RunCoxRegression_STRATA(df, time1, time2, event, names, term_n,
  tform, keep_constant, a_n, modelform,
  fir, der_iden, control,strat_col)

```

---

### RunCoxRegression\_Tier\_Guesses

*Performs basic cox regression, with multiple guesses, starts with solving for a single term*

---

#### Description

RunCoxRegression\_Tier\_Guesses uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions, with additional guesses

#### Usage

```

RunCoxRegression_Tier_Guesses(
  df,
  time1,
  time2,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control,
  guesses_control,
  strat_col,
  model_control = list(),
  cens_weight = "null"
)

```

#### Arguments

df	a data.table containing the columns of interest
time1	column used for time period starts

time2	column used for time period end
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
guesses_control	list of parameters to control how the guessing works, see Def_Control_Guess() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details
cens_weight	column containing the row weights

**Value**

returns a list of the final results

**See Also**

Other Cox Wrapper Functions: [RunCoxNull\(\)](#), [RunCoxRegression\(\)](#), [RunCoxRegression\\_Basic\(\)](#), [RunCoxRegression\\_CR\(\)](#), [RunCoxRegression\\_Guesses\\_CPP\(\)](#), [RunCoxRegression\\_Omnibus\(\)](#), [RunCoxRegression\\_Omnibus\\_Multidose\(\)](#), [RunCoxRegression\\_STRATA\(\)](#), [RunCoxRegression\\_Single\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
```

```

      "c"=c(10, 11, 10, 11, 12, 9, 11),
      "d"=c(0, 0, 0, 1, 1, 1, 1),
      "e"=c(0, 0, 0, 0, 1, 0, 1))
# For the interval case
time1 <- "Starting_Age"
time2 <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,
  'epsilon' = 1e-3,'deriv_epsilon' = 1e-3,
  'abs_max'=1.0,'change_all'=TRUE,'dose_abs_max'=100.0,
  'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("iterations"=10,"guesses"=10,"lin_min"=0.001,
  "lin_max"=1,"loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform",
  "loglin_method"="uniform",strata=TRUE,term_initial = c(0,1))
strat_col <- 'e'

e <- RunCoxRegression_Tier_Guesses(df, time1, time2, event, names,
  term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden,
  control,guesses_control,
  strat_col)

```

---

RunPoissonEventAssignment

*Predicts how many events are due to baseline vs excess*

---

## Description

RunPoissonEventAssignment uses user provided data, person-year/event columns, vectors specifying the model, and options to calculate background and excess events

## Usage

```

RunPoissonEventAssignment(
  df,
  pyr0,
  event0,
  names,

```

```

    term_n,
    tform,
    keep_constant,
    a_n,
    modelform,
    fir,
    der_iden,
    control,
    strat_col = "null",
    model_control = list()
  )

```

### Arguments

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details

### Value

returns a list of the final results

### See Also

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```

library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
df$pyr <- df$Ending_Age - df$Starting_Age
pyr <- 'pyr'
event <- "Cancer_Status"
names <- c('a', 'b', 'c', 'd')
term_n <- c(0,1,1,2)
tform <- c("loglin", "lin", "lin", "plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2, 'lr' = 0.75, 'maxiter' = 5, 'halfmax' = 5, 'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0, 'change_all'=TRUE,
  'dose_abs_max'=100.0, 'verbose'=FALSE, 'double_step'=1)

e <- RunPoissonEventAssignment(df, pyr, event, names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control)

```

---

RunPoissonEventAssignment\_bound

*Predicts how many events are due to baseline vs excess at the confidence bounds of a single parameter*

---

**Description**

RunPoissonEventAssignment\_bound uses user provided data, the results of a poisson regression, and options to calculate background and excess events

**Usage**

```

RunPoissonEventAssignment_bound(
  df,
  pyr0,
  event0,

```

```

    alternative_model,
    keep_constant,
    modelform,
    fir,
    der_iden,
    check_num = 1,
    z = 2,
    control = list(),
    strat_col = "null",
    model_control = list()
  )

```

### Arguments

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
event0	column used for event status
alternative_model	the new model of interest in list form, output from a poisson regression
keep_constant	binary values to denote which parameters to change
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
check_num	the parameter number to check at the bounds of, indexed from 1 using the order returned by Colossus
z	Z score to use for confidence interval
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details

### Value

returns a list of the final results

### See Also

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```

library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 1, 0, 0, 0, 1))

# For the interval case
pyr <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("maxiter"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
  "loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform","loglin_method"="uniform",
  strata=FALSE)
strat_col <- 'e'
e0 <- RunPoissonRegressionOmnibus(df, pyr, event, names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control,strat_col)

e <- RunPoissonEventAssignment_bound(df, pyr, event, e0, keep_constant,
  modelform, fir, der_iden, 4, 2, control)

```

---

RunPoissonRegression *Performs basic poisson regression*

---

**Description**

RunPoissonRegression uses user provided data, person-year/event columns, vectors specifying the model, and options to control the convergence and starting positions with no special options



**Usage**

```
RunPoissonRegression(
  df,
  pyr0,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control
)
```

**Arguments**

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")

**Value**

returns a list of the final results

**See Also**

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```

library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
df$pyr <- df$Ending_Age - df$Starting_Age
pyr <- 'pyr'
event <- "Cancer_Status"
names <- c('a','b','c','d')
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0, 'change_all'=TRUE,
  'dose_abs_max'=100.0, 'verbose'=FALSE, 'double_step'=1)

e <- RunPoissonRegression(df, pyr, event, names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control)

```

---

RunPoissonRegression\_Guesses\_CPP

*Performs basic Poisson regression, generates multiple starting guesses on c++ side*

---

**Description**

RunPoissonRegression\_Guesses\_CPP uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions. Has additional options to starting with several initial guesses

**Usage**

```

RunPoissonRegression_Guesses_CPP(
  df,
  pyr0,

```

```

    event0,
    names,
    term_n,
    tform,
    keep_constant,
    a_n,
    modelform,
    fir,
    der_iden,
    control,
    guesses_control,
    strat_col = c("null"),
    model_control = list()
  )

```

### Arguments

<code>df</code>	a <code>data.table</code> containing the columns of interest
<code>pyr0</code>	column used for person-years per row
<code>event0</code>	column used for event status
<code>names</code>	columns for elements of the model, used to identify data columns
<code>term_n</code>	term numbers for each element of the model
<code>tform</code>	list of string function identifiers, used for linear/step
<code>keep_constant</code>	binary values to denote which parameters to change
<code>a_n</code>	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
<code>modelform</code>	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
<code>fir</code>	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
<code>der_iden</code>	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
<code>control</code>	list of parameters controlling the convergence, see <code>Def_Control()</code> for options or <code>vignette("Control_Options")</code>
<code>guesses_control</code>	list of parameters to control how the guessing works, see <code>Def_Control_Guess()</code> for options or <code>vignette("Control_Options")</code>
<code>strat_col</code>	column to stratify by if needed
<code>model_control</code>	controls which alternative model options are used, see <code>Def_model_control()</code> for options and <code>vignette("Control_Options")</code> for further details

### Value

returns a list of the final results

**See Also**

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 1, 0, 0, 0, 1))

# For the interval case
pyr <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("maxiter"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
  "loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform","loglin_method"="uniform",strata=FALSE)
strat_col <- 'e'

e <- RunPoissonRegression_Guesses_CPP(df, pyr, event, names, term_n,
  tform, keep_constant, a_n, modelform, fir,
  der_iden, control,guesses_control,strat_col)
```

---

RunPoissonRegression\_Joint\_Omnibus

*Performs joint Poisson regression using the omnibus function*

---

**Description**

RunPoissonRegression\_Joint\_Omnibus uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions. Has additional options to starting with several initial guesses, uses joint competing risks equation

**Usage**

```
RunPoissonRegression_Joint_Omnibus(
  df,
  pyr0,
  events,
  name_list,
  term_n_list = list(),
  tform_list = list(),
  keep_constant_list = list(),
  a_n_list = list(),
  modelform = "M",
  fir = 0,
  der_iden = 0,
  control = list(),
  strat_col = "null",
  model_control = list(),
  cons_mat = as.matrix(c(0)),
  cons_vec = c(0)
)
```

**Arguments**

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
events	vector of event column names
name_list	list of vectors for columns for event specific or shared model elements, required
term_n_list	list of vectors for term numbers for event specific or shared model elements, defaults to term 0
tform_list	list of vectors for subterm types for event specific or shared model elements, defaults to loglinear
keep_constant_list	list of vectors for constant elements for event specific or shared model elements, defaults to free (0)
a_n_list	list of vectors for parameter values for event specific or shared model elements, defaults to term 0
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T0*f(Ti)$ in which the order matters

der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details
cons_mat	Matrix containing coefficients for system of linear constraints, formatted as matrix
cons_vec	Vector containing constants for system of linear constraints, formatted as vector

### Value

returns a list of the final results

### See Also

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

### Examples

```
library(data.table)
## basic example code reproduced from the starting-description vignette

a <- c(0,0,0,1,1,1)
b <- c(1,1,1,2,2,2)
c <- c(0,1,2,2,1,0)
d <- c(1,1,0,0,1,1)
e <- c(0,1,1,1,0,0)
f <- c(0,1,0,0,1,1)
df <- data.table('t0'=a, 't1'=b, 'e0'=c, 'e1'=d, 'fac'=e)
time1 <- "t0"
time2 <- "t1"
df$pyr <- df$t1 - df$t0
pyr <- "pyr"
events <- c('e0', 'e1')
names_e0 <- c('fac')
names_e1 <- c('fac')
names_shared <- c('t0', 't0')
term_n_e0 <- c(0)
term_n_e1 <- c(0)
term_n_shared <- c(0,0)
tform_e0 <- c("loglin")
tform_e1 <- c("loglin")
tform_shared <- c("quad_slope", "loglin_top")
keep_constant_e0 <- c(0)
```

```

keep_constant_e1 <- c(0)
keep_constant_shared <- c(0,0)
a_n_e0 <- c(-0.1)
a_n_e1 <- c(0.1)
a_n_shared <- c(0.001, -0.02)
name_list <- list('shared'=names_shared,'e0'=names_e0,'e1'=names_e1)
term_n_list <- list('shared'=term_n_shared,'e0'=term_n_e0,'e1'=term_n_e1)
tform_list <- list('shared'=tform_shared,'e0'=tform_e0,'e1'=tform_e1)
keep_constant_list <- list('shared'=keep_constant_shared,
                           'e0'=keep_constant_e0,'e1'=keep_constant_e1)
a_n_list <- list('shared'=a_n_shared,'e0'=a_n_e0,'e1'=a_n_e1)

der_iden <- 0
modelform <- "M"
fir <- 0
control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
               'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
               'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("maxiter"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
                       "loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform","loglin_method"="uniform",
                       strata=FALSE)
strat_col <- 'f'
e <- RunPoissonRegression_Joint_Omnibus(df, pyr, events, name_list, term_n_list,
                                       tform_list, keep_constant_list, a_n_list,
                                       modelform, fir, der_iden, control,strat_col)

```

---

RunPoissonRegression\_Omnibus

*Performs basic Poisson regression using the omnibus function*

---

## Description

RunPoissonRegression\_Omnibus uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions. Has additional options to starting with several initial guesses

## Usage

```

RunPoissonRegression_Omnibus(
  df,
  pyr0 = "pyr",
  event0 = "event",
  names = c("CONST"),
  term_n = c(0),
  tform = "loglin",
  keep_constant = c(0),
  a_n = c(0),
  modelform = "M",

```

```

    fir = 0,
    der_iden = 0,
    control = list(),
    strat_col = "null",
    model_control = list(),
    cons_mat = as.matrix(c(0)),
    cons_vec = c(0)
  )

```

### Arguments

<code>df</code>	a <code>data.table</code> containing the columns of interest
<code>pyr0</code>	column used for person-years per row
<code>event0</code>	column used for event status
<code>names</code>	columns for elements of the model, used to identify data columns
<code>term_n</code>	term numbers for each element of the model
<code>tform</code>	list of string function identifiers, used for linear/step
<code>keep_constant</code>	binary values to denote which parameters to change
<code>a_n</code>	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
<code>modelform</code>	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
<code>fir</code>	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
<code>der_iden</code>	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
<code>control</code>	list of parameters controlling the convergence, see <code>Def_Control()</code> for options or <code>vignette("Control_Options")</code>
<code>strat_col</code>	column to stratify by if needed
<code>model_control</code>	controls which alternative model options are used, see <code>Def_model_control()</code> for options and <code>vignette("Control_Options")</code> for further details
<code>cons_mat</code>	Matrix containing coefficients for system of linear constraints, formatted as matrix
<code>cons_vec</code>	Vector containing constants for system of linear constraints, formatted as vector

### Value

returns a list of the final results

### See Also

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)



**Examples**

```

library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 1, 0, 0, 0, 1))

# For the interval case
pyr <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("maxiter"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
  "loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform","loglin_method"="uniform",
  strata=FALSE)
strat_col <- 'e'
e <- RunPoissonRegression_Omnibus(df, pyr, event, names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control,strat_col)

```

---

RunPoissonRegression\_Residual

*Calculates poisson residuals*


---

**Description**

RunPoissonRegression\_Residual uses user provided data, time/event columns, vectors specifying the model, and options. Calculates residuals or sum of residuals

**Usage**

```

RunPoissonRegression_Residual(
  df,

```

```

pyr0 = "pyr",
event0 = "event",
names = c("CONST"),
term_n = c(0),
tform = "loglin",
keep_constant = c(0),
a_n = c(0),
modelform = "M",
fir = 0,
der_iden = 0,
control = list(),
strat_col = "null",
model_control = list()
)

```

### Arguments

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
strat_col	column to stratify by if needed
model_control	controls which alternative model options are used, see Def_model_control() for options and vignette("Control_Options") for further details

### Value

returns a list of the final results

**See Also**

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 1, 0, 0, 0, 1))

# For the interval case
pyr <- "Ending_Age"
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE, 'ties'='breslow','double_step'=1)
guesses_control <- list("maxiter"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
  "loglin_min"=-1,"loglin_max"=1, "lin_method"="uniform","loglin_method"="uniform",
  strata=FALSE)
strat_col <- 'e'
e <- RunPoissonRegression_Residual(df, pyr, event, names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control,strat_col)
```

---

RunPoissonRegression\_Single

*Performs poisson regression with no derivative calculations*

---

**Description**

RunPoissonRegression\_Single uses user provided data, person-year/event columns, vectors specifying the model, and returns the results

**Usage**

```
RunPoissonRegression_Single(
  df,
  pyr0,
  event0,
  names,
  term_n,
  tform,
  a_n,
  modelform,
  fir,
  control,
  keep_constant = rep(0, length(names))
)
```

**Arguments**

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")
keep_constant	binary values to denote which parameters to change

**Value**

returns a list of the final results

**See Also**

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1))

# For the interval case
df$pyr <- df$Ending_Age - df$Starting_Age
pyr <- 'pyr'
event <- "Cancer_Status"
names <- c('a','b','c','d')
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,
  'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3,
  'abs_max'=1.0,'change_all'=TRUE,'dose_abs_max'=100.0,
  'verbose'=FALSE, 'double_step'=1)

e <- RunPoissonRegression_Single(df, pyr, event, names, term_n, tform, a_n, modelform, fir, control)
```

---

RunPoissonRegression\_STRATA

*Performs poisson regression with strata effect*

---

**Description**

RunPoissonRegression\_STRATA uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions

**Usage**

```
RunPoissonRegression_STRATA(
  df,
  pyr0,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control,
  strat_col
)
```

**Arguments**

<code>df</code>	a data.table containing the columns of interest
<code>pyr0</code>	column used for person-years per row
<code>event0</code>	column used for event status
<code>names</code>	columns for elements of the model, used to identify data columns
<code>term_n</code>	term numbers for each element of the model
<code>tform</code>	list of string function identifiers, used for linear/step
<code>keep_constant</code>	binary values to denote which parameters to change
<code>a_n</code>	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
<code>modelform</code>	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
<code>fir</code>	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
<code>der_iden</code>	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
<code>control</code>	list of parameters controlling the convergence, see <code>Def_Control()</code> for options or <code>vignette("Control_Options")</code>
<code>strat_col</code>	column to stratify by if needed

**Value**

returns a list of the final results

**See Also**

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_Single\(\)](#), [RunPoissonRegression\\_Tier\\_Guesses\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 0, 0, 1, 0, 1))

# For the interval case
df$pyr <- df$Ending_Age - df$Starting_Age
pyr <- 'pyr'
event <- "Cancer_Status"
names <- c('a','b','c','d')
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0
a_n <- c(0.1, 0.1, 0.1, 0.1)

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,
  'epsilon' = 1e-3, 'deriv_epsilon' = 1e-3,
  'abs_max'=1.0,'change_all'=TRUE,'dose_abs_max'=100.0,
  'verbose'=FALSE, 'double_step'=1)
strat_col <- c("e")
e <- RunPoissonRegression_STRATA(df, pyr, event, names, term_n, tform, keep_constant,
  a_n, modelform, fir, der_iden, control, strat_col)
```

---

RunPoissonRegression\_Tier\_Guesses

*Performs basic poisson regression, with multiple guesses, starts with a single term*

---

**Description**

RunPoissonRegression\_Tier\_Guesses uses user provided data, time/event columns, vectors specifying the model, and options to control the convergence and starting positions, with additional guesses

**Usage**

```
RunPoissonRegression_Tier_Guesses(
  df,
  pyr0,
  event0,
  names,
  term_n,
  tform,
  keep_constant,
  a_n,
  modelform,
  fir,
  der_iden,
  control,
  guesses_control,
  strat_col
)
```

**Arguments**

df	a data.table containing the columns of interest
pyr0	column used for person-years per row
event0	column used for event status
names	columns for elements of the model, used to identify data columns
term_n	term numbers for each element of the model
tform	list of string function identifiers, used for linear/step
keep_constant	binary values to denote which parameters to change
a_n	list of initial parameter values, used to determine number of parameters. May be either a list of vectors or a single vector.
modelform	string specifying the model type: M, ME, A, PA, PAE, GMIX, GMIX-R, GMIX-E
fir	term number for the initial term, used for models of the form $T_0 * f(T_i)$ in which the order matters
der_iden	number for the subterm to test derivative at, only used for testing runs with a single varying parameter, should be smaller than total number of parameters. indexed starting at 0
control	list of parameters controlling the convergence, see Def_Control() for options or vignette("Control_Options")



guesses\_control      list of parameters to control how the guessing works, see Def\_Control\_Guess() for options or vignette("Control\_Options")

strat\_col            column to stratify by if needed

**Value**

returns a list of the final results

**See Also**

Other Poisson Wrapper Functions: [RunPoissonEventAssignment\(\)](#), [RunPoissonEventAssignment\\_bound\(\)](#), [RunPoissonRegression\(\)](#), [RunPoissonRegression\\_Guesses\\_CPP\(\)](#), [RunPoissonRegression\\_Joint\\_Omnibus\(\)](#), [RunPoissonRegression\\_Omnibus\(\)](#), [RunPoissonRegression\\_Residual\(\)](#), [RunPoissonRegression\\_STRATA\(\)](#), [RunPoissonRegression\\_Single\(\)](#)

**Examples**

```
library(data.table)
## basic example code reproduced from the starting-description vignette

df <- data.table::data.table("UserID"=c(112, 114, 213, 214, 115, 116, 117),
  "Starting_Age"=c(18, 20, 18, 19, 21, 20, 18),
  "Ending_Age"=c(30, 45, 57, 47, 36, 60, 55),
  "Cancer_Status"=c(0, 0, 1, 0, 1, 0, 0),
  "a"=c(0, 1, 1, 0, 1, 0, 1),
  "b"=c(1, 1.1, 2.1, 2, 0.1, 1, 0.2),
  "c"=c(10, 11, 10, 11, 12, 9, 11),
  "d"=c(0, 0, 0, 1, 1, 1, 1),
  "e"=c(0, 0, 0, 0, 1, 0, 1))

# For the interval case
df$pyr <- df$Ending_Age - df$Starting_Age
pyr <- 'pyr'
event <- "Cancer_Status"
names <- c('a','b','c','d')
a_n <- c(1.1, -0.1, 0.2, 0.5) #used to test at a specific point
term_n <- c(0,1,1,2)
tform <- c("loglin","lin","lin","plin")
modelform <- "M"
fir <- 0

keep_constant <- c(0,0,0,0)
der_iden <- 0

control <- list("ncores"=2,'lr' = 0.75,'maxiter' = 5,'halfmax' = 5,'epsilon' = 1e-3,
  'deriv_epsilon' = 1e-3, 'abs_max'=1.0,'change_all'=TRUE,
  'dose_abs_max'=100.0,'verbose'=FALSE,'double_step'=1)
guesses_control <- list("iterations"=10,"guesses"=10,"lin_min"=0.001,"lin_max"=1,
  "loglin_min"=-1,"loglin_max"=1,"lin_method"="uniform",
  "loglin_method"="uniform",strata=TRUE,term_initial = c(0,1))
strat_col=c('e')
```

```
e <- RunPoissonRegression_Tier_Guesses(df, pyr, event, names,
  term_n, tform, keep_constant, a_n, modelform,
  fir, der_iden, control, guesses_control, strat_col)
```

---

System_Version	<i>Checks OS, compilers, and OMP</i>
----------------	--------------------------------------

---

### Description

System\_Version checks OS, default R c++ compiler, and if OMP is enabled

### Usage

```
System_Version()
```

### Value

returns a list of results

---

Time_Since	<i>Automates creating a date since a reference column</i>
------------	---

---

### Description

Time\_Since generates a new dataframe with a column containing time since a reference in a given unit

### Usage

```
Time_Since(df, dcol0, tref, col_name, units = "days")
```

### Arguments

df	a data.table containing the columns of interest
dcol0	list of ending month, day, and year
tref	reference time in date format
col_name	vector of new column names
units	time unit to use

### Value

returns the updated dataframe

**See Also**

Other Data Cleaning Functions: [Check\\_Dupe\\_Columns\(\)](#), [Check\\_Trunc\(\)](#), [Check\\_Verbose\(\)](#), [Correct\\_Formula\\_Order\(\)](#), [Date\\_Shift\(\)](#), [Def\\_Control\(\)](#), [Def\\_Control\\_Guess\(\)](#), [Def\\_model\\_control\(\)](#), [Def\\_modelform\\_fix\(\)](#), [Joint\\_Multiple\\_Events\(\)](#), [Replace\\_Missing\(\)](#), [factorize\(\)](#), [factorize\\_par\(\)](#), [gen\\_time\\_dep\(\)](#), [interact\\_them\(\)](#)

**Examples**

```
library(data.table)
m0 <- c(1,1,2,2)
m1 <- c(2,2,3,3)
d0 <- c(1,2,3,4)
d1 <- c(6,7,8,9)
y0 <- c(1990,1991,1997,1998)
y1 <- c(2001,2003,2005,2006)
df <- data.table::data.table("m0"=m0,"m1"=m1,"d0"=d0,"d1"=d1,"y0"=y0,"y1"=y1)
tref <- strptime("3-22-1997", format = "%m-%d-%Y", tz = 'UTC')
df <- Time_Since(df,c("m1","d1","y1"),tref,"date_since")
```

# Index

## \* Cox Wrapper Functions

RunCoxNull, [30](#)  
RunCoxRegression, [33](#)  
RunCoxRegression\_Basic, [35](#)  
RunCoxRegression\_CR, [36](#)  
RunCoxRegression\_Guesses\_CPP, [38](#)  
RunCoxRegression\_Omnibus, [41](#)  
RunCoxRegression\_Omnibus\_Multidose, [43](#)  
RunCoxRegression\_Single, [46](#)  
RunCoxRegression\_STRATA, [48](#)  
RunCoxRegression\_Tier\_Guesses, [50](#)

## \* Data Cleaning Functions

Check\_Dupe\_Columns, [3](#)  
Check\_Trunc, [4](#)  
Check\_Verbose, [5](#)  
Correct\_Formula\_Order, [6](#)  
Date\_Shift, [10](#)  
Def\_Control, [11](#)  
Def\_Control\_Guess, [11](#)  
Def\_model\_control, [13](#)  
Def\_modelform\_fix, [12](#)  
factorize, [14](#)  
factorize\_par, [15](#)  
gen\_time\_dep, [18](#)  
interact\_them, [22](#)  
Joint\_Multiple\_Events, [23](#)  
Replace\_Missing, [29](#)  
Time\_Since, [74](#)

## \* Plotting Functions

GetCensWeight, [20](#)

## \* Plotting Wrapper Functions

Cox\_Relative\_Risk, [8](#)  
RunCoxPlots, [31](#)

## \* Poisson Wrapper Functions

RunPoissonEventAssignment, [52](#)  
RunPoissonEventAssignment\_bound, [54](#)  
RunPoissonRegression, [56](#)

RunPoissonRegression\_Guesses\_CPP, [58](#)  
RunPoissonRegression\_Joint\_Omnibus, [60](#)  
RunPoissonRegression\_Omnibus, [63](#)  
RunPoissonRegression\_Residual, [65](#)  
RunPoissonRegression\_Single, [67](#)  
RunPoissonRegression\_STRATA, [69](#)  
RunPoissonRegression\_Tier\_Guesses, [71](#)

Check\_Dupe\_Columns, [3](#), [5–7](#), [10–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Check\_Trunc, [4](#), [4](#), [6](#), [7](#), [10–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Check\_Verbose, [4](#), [5](#), [5](#), [7](#), [10–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Correct\_Formula\_Order, [4–6](#), [6](#), [10–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Cox\_Relative\_Risk, [8](#), [32](#)  
Date\_Shift, [4–7](#), [10](#), [11–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Def\_Control, [4–7](#), [10](#), [11](#), [12–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Def\_Control\_Guess, [4–7](#), [10](#), [11](#), [11](#), [13–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Def\_model\_control, [4–7](#), [10–13](#), [13](#), [14](#), [15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Def\_modelform\_fix, [4–7](#), [10–12](#), [12](#), [13–15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
factorize, [4–7](#), [10–13](#), [14](#), [15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
factorize\_par, [4–7](#), [10–14](#), [15](#), [19](#), [23](#), [24](#), [29](#), [75](#)  
Gather\_Guesses\_CPP, [16](#)  
gcc\_version, [18](#)  
gen\_time\_dep, [4–7](#), [10–15](#), [18](#), [23](#), [24](#), [29](#), [75](#)  
get\_os, [22](#)

- GetCensWeight, 20
- interact\_them, 4–7, 10–15, 19, 22, 24, 29, 75
- Joint\_Multiple\_Events, 4–7, 10–15, 19, 23, 23, 29, 75
- Likelihood\_Ratio\_Test, 25
- Linked\_Dose\_Formula, 26
- Linked\_Lin\_Exp\_Para, 27
- OMP\_Check, 28
- Rcomp\_version, 28
- Rcpp\_version, 28
- Replace\_Missing, 4–7, 10–15, 19, 23, 24, 29, 75
- RunCoxNull, 30, 34, 36, 38, 40, 42, 45, 47, 49, 51
- RunCoxPlots, 9, 31
- RunCoxRegression, 30, 33, 36, 38, 40, 42, 45, 47, 49, 51
- RunCoxRegression\_Basic, 30, 34, 35, 38, 40, 42, 45, 47, 49, 51
- RunCoxRegression\_CR, 30, 34, 36, 36, 40, 42, 45, 47, 49, 51
- RunCoxRegression\_Guesses\_CPP, 30, 34, 36, 38, 38, 42, 45, 47, 49, 51
- RunCoxRegression\_Omnibus, 30, 34, 36, 38, 40, 41, 45, 47, 49, 51
- RunCoxRegression\_Omnibus\_Multidose, 30, 34, 36, 38, 40, 42, 43, 47, 49, 51
- RunCoxRegression\_Single, 30, 34, 36, 38, 40, 42, 45, 46, 49, 51
- RunCoxRegression\_STRATA, 30, 34, 36, 38, 40, 42, 45, 47, 48, 51
- RunCoxRegression\_Tier\_Guesses, 30, 34, 36, 38, 40, 42, 45, 47, 49, 50
- RunPoissonEventAssignment, 52, 55, 57, 60, 62, 64, 67, 69, 71, 73
- RunPoissonEventAssignment\_bound, 53, 54, 57, 60, 62, 64, 67, 69, 71, 73
- RunPoissonRegression, 53, 55, 56, 60, 62, 64, 67, 69, 71, 73
- RunPoissonRegression\_Guesses\_CPP, 53, 55, 57, 58, 62, 64, 67, 69, 71, 73
- RunPoissonRegression\_Joint\_Omnibus, 53, 55, 57, 60, 60, 64, 67, 69, 71, 73
- RunPoissonRegression\_Omnibus, 53, 55, 57, 60, 62, 63, 67, 69, 71, 73
- RunPoissonRegression\_Residual, 53, 55, 57, 60, 62, 64, 65, 69, 71, 73
- RunPoissonRegression\_Single, 53, 55, 57, 60, 62, 64, 67, 67, 71, 73
- RunPoissonRegression\_STRATA, 53, 55, 57, 60, 62, 64, 67, 69, 69, 73
- RunPoissonRegression\_Tier\_Guesses, 53, 55, 57, 60, 62, 64, 67, 69, 71, 71
- System\_Version, 74
- Time\_Since, 4–7, 10–15, 19, 23, 24, 29, 74