

Package ‘aplore3’

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Title Datasets from Hosmer, Lemeshow and Sturdivant, ``Applied Logistic Regression" (3rd Ed., 2013)

Version 0.9

Description An unofficial companion to ``Applied Logistic Regression" by D.W. Hosmer, S. Lemeshow and R.X. Sturdivant (3rd ed., 2013) containing the dataset used in the book.

URL <https://github.com/lbraglia/aplore3>

BugReports <https://github.com/lbraglia/aplore3/issues>

Depends R (>= 3.1.1)

License GPL-3

LazyData true

VignetteBuilder knitr

Suggests knitr, MASS, vcdExtra, nnet, survival, pROC

RoxygenNote 5.0.1

NeedsCompilation no

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aplore3	<i>Datasets from Hosmer, Lemeshow and Sturdivant, "Applied Logistic Regression" (3rd ed., 2013)</i>
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Description

This package is an unofficial companion to the textbook "Applied Logistic Regression" by D.W. Hosmer, S. Lemeshow and R.X. Sturdivant (3rd ed., 2013).

Details

It includes all the datasets used in the book, both for easy reproducibility and algorithms benchmarking purposes.

Some analysis proposed in the text are reproduced in the examples, in order to provide data testing and code demos at the same time.

The vignette includes all the examples (with graphics too); therefore is organized per-dataset.

Datasets and variables have lower-case name with respect to the original sources. Categorical data were packaged as factor.

Regarding data coding, help pages list the internal/factor representation of the data (eg 1: No, 2: Yes), not the original one (eg 0: No, 1: Yes). This is intended to allow easier/safer recoding based on as.integer, especially for multinomial variables.

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

aps

APS data

Description

aps dataset.

Usage

aps

Format

A data.frame with 508 rows and 11 variables:

id Identification Code (1 - 508)

place Placement (1: Outpatient, 2: Day Treatment, 3: Intermediate Residential, 4: Residential)

place3 Placement Combined (1: Outpatient or Day Treatment, 2: Intermediate Residential, 3: Residential)

age Age at Admission (Years)

race Race (1: White, 2: Non-white)

gender Gender (1: Female, 2: Male)

neuro Neuropsychiatric Disturbance (1: None, 2: Mild, 3: Moderate, 4: Severe)

emot Emotional Disturbance (1: Not Severe, 2: Severe)

danger Danger to Others (1: Unlikely, 2: Possible, 3: Probable, 4: Likely)

elope Elopement Risk (1: No Risk, 2: At Risk)

los Length of Hospitalization (Days)

behav Behavioral Symptoms Score (0 - 9)

custd State Custody (1: No, 2: Yes)

viol History of Violence (1: No, 2: Yes)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(aps, n = 10)
summary(aps)
```

```
## Table 8.2 p. 274
library(nnet)
```

```

modt8.2 <- multinom(place3 ~ viol, data = aps)
summary(modt8.2)
exp(coef(modt8.2)[, "violYes"])
t(exp(confint(modt8.2)["violYes", ,]))
## To test differences between b_2 and b_1 we need the estimated variance
## covariance matrix for the fitted model (Table 8.3 p. 274).
vcov(modt8.2) # 'raw'
## To have exactly the same output as the text we need to rearrange just a
## minimum
VarCovM <- vcov(modt8.2)[c(2, 1, 4, 3), c(2, 1, 4, 3)]
VarCovM[upper.tri(VarCovM)] <- NA
VarCovM
## Testing against null model.
modt8.2Null <- multinom(place3 ~ 1, data = aps)
anova(modt8.2, modt8.2Null, test = "Chisq")

```

burn1000

BURN1000 data

Description

burn1000 dataset.

Usage

burn1000

Format

A data.frame with 1000 rows and 9 variables:

id Identification code (1 - 1000)

facility Burn facility (1 - 40)

death Hospital discharge status (1: Alive, 2: Dead)

age Age at admission (Years)

gender Gender (1: Female, 2: Male)

race Race (1: Non-White, 2: White)

tbsa Total burn surface area (0 - 100%)

inh_inj Burn involved inhalation injury (1: No, 2: Yes)

flame Flame involved in burn injury (1: No, 2: Yes)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(burn1000, n = 10)
summary(burn1000)

## Table 3.15 p. 80
summary(mod3.15 <- glm(death ~ tbsa + inh_inj + age + gender + flame + race,
                      family = binomial, data = burn1000 ))
```

burn13m	<i>BURN13M data</i>
---------	---------------------

Description

burn13m dataset.

Usage

burn13m

Format

A data.frame with 388 rows and 11 variables: the covariate are the same as those from [burn1000](#) with the addition of

pair Pair Identification Code (1-119)

pairid Subject Identification Code within pair (1-4)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(burn13m, n = 10)
summary(burn13m)
```

burn_eval_1	<i>BURN_EVAL_1 data</i>
-------------	-------------------------

Description

burn_eval_1 dataset.

Usage

```
burn_eval_1
```

Format

A data.frame with 500 rows and 9 variables: the covariate are the same as those from [burn1000](#).

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(burn_eval_1, n = 10)
summary(burn_eval_1)
```

burn_eval_2	<i>BURN_EVAL_2 data</i>
-------------	-------------------------

Description

burn_eval_2 dataset.

Usage

```
burn_eval_2
```

Format

A data.frame with 500 rows and 9 variables: the covariate are the same as those from [burn1000](#).

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(burn_eval_2, n = 10)
summary(burn_eval_2)
```

chdage	<i>CHDAGE data</i>
--------	--------------------

Description

chdage dataset.

Usage

chdage

Format

A data.frame with 100 rows and 4 variables:

id Identification code (1 - 100)

age Age (Years)

agegrp Age group (1: 20-39, 2: 30-34, 3: 35-39, 4: 40-44, 5: 45-49, 6: 50-54, 7: 55-59, 8: 60-69)

chd Presence of CHD (1: No, 2: Yes)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(chdage, n = 10)
summary(chdage)

## Figure 1.1 p. 5
plot(as.integer(chd)-1 ~ age,
     pch = 20,
     main = "Figure 1.1 p. 5",
     ylab = "Coronary heart disease",
     xlab = "Age (years)",
     data = chdage)

## Table 1.2
with(chdage, addmargins(table(agegrp)))
with(chdage, addmargins(table(agegrp, chd)))
(Means <- with(chdage, tapply(as.integer(chd)-1, list(agegrp), mean)))

## Figure 1.2 p. 6
midPoints <- c(24.5, seq(32, 57, 5), 64.5)
plot(midPoints, Means, pch = 20,
     ylab = "Coronary heart disease (mean)",
     xlab = "Age (years)", ylim = 0:1,
     main = "Figure 1.2 p. 6")
```

```

lines(midPoints, Means)

## Table 1.3
summary( mod1.3 <- glm( chd ~ age, family = binomial, data = chdage ))

## Table 1.4
vcov(mod1.3)

## Computing OddsRatio and confidence intervals for age ...
exp(coef(mod1.3))[-1]
exp(confint(mod1.3))[-1, ]

```

glow11m

GLOW11M data

Description

glow11m dataset.

Usage

```
glow11m
```

Format

A data.frame with 238 rows and 16 variables: the covariate are the same as those from [glow500](#) with the addition of

pair Pair Identification Code (1-119)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```

head(glow11m, n = 10)
summary(glow11m)

## Table 7.2 p. 252
library(survival)
mod7.2 <- clogit(as.numeric(fracture) ~ height + weight + bmi +
                 priorfrac + premeno + momfrac + armassist + raterisk +
                 strata(pair), data = glow11m)
summary(mod7.2)

```

glow500

*GLOW500 data***Description**

glow500 dataset.

Usage

glow500

Format

A data.frame with 500 rows and 15 variables:

sub_id Identification Code (1 - n)**site_id** Study Site (1 - 6)**phy_id** Physician ID code (128 unique codes)**priorfrac** History of Prior Fracture (1: No, 2: Yes)**age** Age at Enrollment (Years)**weight** Weight at enrollment (Kilograms)**height** Height at enrollment (Centimeters)**bmi** Body Mass Index (Kg/m^2)**premeno** Menopause before age 45 (1: No, 2: Yes)**momfrac** Mother had hip fracture (1: No, 2: Yes)**armassist** Arms are needed to stand from a chair (1: No, 2: Yes)**smoke** Former or current smoker (1: No, 2: Yes)**raterisk** Self-reported risk of fracture (1: Less than others of the same age, 2: Same as others of the same age, 3: Greater than others of the same age)**fracscore** Fracture Risk Score (Composite Risk Score)**fracture** Any fracture in first year (1: No, 2: Yes)**Source**

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```

head(glow500, n = 10)
summary(glow500)

## Table 2.2 p. 39
summary(mod2.2 <- glm(fracture ~ age + weight + priorfrac +
                      premeno + raterisk,
                      family = binomial,
                      data = glow500))

## Table 2.3 p. 40
summary(mod2.3 <- update(mod2.2, . ~ . - weight - premeno))

## Table 2.4 p. 44
vcov(mod2.3)

## Table 3.6 p. 58
contrasts(glow500$raterisk)

## Contrasts: Table 3.8 and 3.9 p. 60
contrasts(glow500$raterisk) <- matrix(c(-1,-1,1,0,0,1), byrow= TRUE, ncol = 2)
summary(mod3.9 <- glm(fracture ~ raterisk, family = binomial,
                      data = glow500))
# cleaning modified dataset ...
rm(glow500)

## Table 5.1 pg 160 - Hosmer-Lemeshow test (with vcdExtra package)
mod4.16 <- glm(fracture ~ age * priorfrac + height + momfrac * armassist +
               I(as.integer(raterisk) == 3) ,
               family = binomial,
               data = glow500)
library(vcdExtra)
summary(HLtest(mod4.16))

## Table 5.3 p. 171 - Classification table
glow500$pred4.16 <- predict(mod4.16, type = "response")
with(glow500, addmargins(table( pred4.16 > 0.5, fracture)))

## Sensitivity, specificity, ROC (using pROC)
library(pROC)

## Figure 5.3 p. 177 - ROC curve (using pROC package)
print(roc4.16 <- roc(fracture ~ pred4.16, data = glow500))
plot(roc4.16, main = "Figure 5.3 p. 177")

## Table 5.8 p. 175
vars <- c("thresholds", "sensitivities", "specificities")
tab5.8 <- data.frame(roc4.16[vars])
## Now, for printing/comparison purposes, steps below in order to find
## threshold values most similar to those in the table
findIndex <- function(x, y) which.min( (x-y)^2 )
cutPoints <- seq(0.05, 0.75, by = 0.05)

```

```

tableIndex <- mapply(findIndex, y = cutPoints,
                     MoreArgs = list(x = roc4.16$thresholds))
## And finally, let's print a reasonable approximation of table 5.8
writeLines("\nTable 5.8 p. 175\n")
tab5.8[tableIndex, ]

## Figure 5.1 p. 175
plot(specificities ~ thresholds, xlim = c(0, 1), type = "l",
     xlab = "Probabilty cutoff", ylab = "Sensitivity/specificity",
     ylim = c(0, 1), data = tab5.8, main = "Figure 5.1 p. 175")
with(tab5.8, lines(thresholds, sensitivities, col = "red"))
legend(x = 0.75, y = 0.55, legend = c("Sensitivity", "Specificity"),
       lty = 1, col = c("red", "black"))
abline(h = c(0, 1), col = "grey80", lty = "dotted")

```

glow_bonemed

*GLOW_BONEMED data***Description**

glow_bonemed dataset.

Usage

```
glow_bonemed
```

Format

A data.frame with 500 rows and 18 variables: the covariate are the same as those from [glow500](#) with the addition of

bonemed Bone medications at enrollment (1: No, 2: Yes)

bonemed_fu Bone medications at follow-up (1: No, 2: Yes)

bonetreat Bone medications both at enrollment and follow-up (1: No, 2: Yes)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```

head(glow_bonemed, n = 10)
summary(glow_bonemed)

```

glow_mis_comp	<i>GLOW_MIS_COMP data</i>
---------------	---------------------------

Description

glow_mis_comp dataset.

Usage

```
glow_mis_comp
```

Format

A data.frame with 500 rows and 10 variables: the covariate are the same as those from [glow500](#), without bmi, premeno, armassist, smoke and fracscore.

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(glow_mis_comp, n = 10)
summary(glow_mis_comp)
```

glow_mis_wmissing	<i>GLOW_MIS_WMISSING data</i>
-------------------	-------------------------------

Description

glow_mis_wmissing dataset.

Usage

```
glow_mis_wmissing
```

Format

A data.frame with 500 rows and 10 variables: the covariate are the same as those from [glow500](#), without bmi, premeno, armassist, smoke and fracscore.

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(glow_mis_wmissing, n = 10)
summary(glow_mis_wmissing)
```

glow_rand	<i>GLOW_RANDOM data</i>
-----------	-------------------------

Description

glow_rand dataset.

Usage

```
glow_rand
```

Format

A data.frame with 500 rows and 15 variables: the covariate are the same as those from [glow500](#).

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(glow_rand, n = 10)
summary(glow_rand)
```

icu	<i>ICU data</i>
-----	-----------------

Description

icu dataset.

Usage

```
icu
```

Format

A data.frame with 200 rows and 21 variables:

id Identification code (ID Number)
sta Vital Status at hospital discharge (1: Lived, 2: Died)
age Age (Years)
gender Gender (1: Male, 2: Female)
race Race (1: White, 2: Black, 3: Other)
ser Service at ICU admission (1: Medical, 2: Surgical)
can Cancer part of present problem (1: No, 2: Yes)
crn History of chronic renal failure (1: No, 2: Yes)
inf Infection probable at ICU admission (1: No, 2: Yes)
cpr CPR prior to ICU admission (1: No, 2: Yes)
sys Systolic blood pressure at ICU admission (mm Hg)
hra Heart rate at ICU admission (Beats/min)
pre Previous admission to an ICU within 6 months (1: No, 2: Yes)
type Type of admission (1: Elective, 2: Emergency)
fra Long bone, multiple, neck, single area, or hip fracture (1: No, 2: Yes)
po2 PO2 from initial blood gases (1: > 60, 2: <= 60)
ph PH from initial blood gases (1: >= 7.25, 2: < 7.25)
pco PCO2 from initial blood gases (1: <= 45, 2: > 45)
bic Bicarbonate from initial blood gases (1: >= 18, 2: < 18)
cre Creatinine from initial blood gases (1: <= 2.0, 2: > 2.0)
loc Level of consciousness at ICU admission (1: No coma or deep stupor, 2: Deep stupor, 3: Coma)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(icu, n = 10)
summary(icu)
```

`lowbwt`*LOWBWT data*

Description

lowbwt dataset.

Usage

`lowbwt`

Format

A data.frame with 189 rows and 11 variables:

id Identification Code

low Low birth weight (1: ≥ 2500 , 2: < 2500 g)

age Age of mother (Years)

lwt Weight of mother at last menstrual period (Pounds)

race Race (1: White, 2: Black, 3: Other)

smoke Smoking status during pregnancy (1: No, 2: Yes)

ptl History of premature labor (1: None, 2: One, 3: Two, etc)

ht History of hypertension (1: No, 2: Yes)

ui Presence of Uterine irritability (1: No, 2: Yes)

ftv Number of physician visits during the first trimester (1: None, 2: One, 3: Two, etc)

bwt Recorded birth weight (Grams)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(lowbwt, n = 10)
summary(lowbwt)
```

myopia

*MYOPIA data***Description**

myopia dataset.

Usage

myopia

Format

A data.frame with 618 rows and 18 variables:

id Subject identifier (1-1503)**studyyear** Year subject entered the study (Year)**myopic** Myopia within the first five years of follow up (1: No, 2: Yes)**age** Age at first visit (Years)**gender** Gender (1: Male, 2: Female)**spheq** Spherical Equivalent Refraction (diopter)**al** Axial Length (mm)**acd** Anterior Chamber Depth (mm)**lt** Lens Thickness (mm)**vcd** Vitreous Chamber Depth (mm)**sporthr** How many hours per week outside of school the child spent engaging in sports/outdoor activities (Hours per week)**readhr** How many hours per week outside of school the child spent reading for pleasure (Hours per week)**comphr** How many hours per week outside of school the child spent playing video/computer games or working on the computer (Hours per week)**studyhr** How many hours per week outside of school the child spent reading or studying for school assignments (Hours per week)**tvhr** How many hours per week outside of school the child spent watching television (Hours per week)**dioptherhr** Composite of near-work activities (Hours per week)**mommy** Was the subject's mother myopic? (1: No, 2: Yes)**dadmy** Was the subject's father myopic? (1: No, 2: Yes)**Source**

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(myopia, n = 10)
summary(myopia)
```

nhanes

*NHANES data***Description**

nhanes dataset.

Usage

```
nhanes
```

Format

A data.frame with 6482 rows and 21 variables:

id Identification Code (1 - 6482)

gender Gender (1: Male, 2: Female)

age Age at Screening (Years)

marstat Marital Status (1: Married, 2: Widowed, 3: Divorced, 4: Separated, 5: Never Married, 6: Living Together)

samplewt Statistical Weight (4084.478 - 153810.3)

psu Pseudo-PSU (1, 2)

strata Pseudo-Stratum (1 - 15)

tchol Total Cholesterol (mg/dL)

hdl HDL-Cholesterol (mg/dL)

sysbp Systolic Blood Pressure (mm Hg)

dbp Diastolic Blood Pressure (mm Hg)

wt Weight (kg)

ht Standing Height (cm)

bmi Body mass Index (Kg/m²)

vigwrk Vigorous Work Activity (1: Yes, 2: No)

modwrk Moderate Work Activity (1: Yes, 2: No)

wlkbik Walk or Bicycle (1: Yes, 2: No)

vigrecox Vigorous Recreational Activities (1: Yes, 2: No)

modrecox Moderate Recreational Activities (1: Yes, 2: No)

sedmin Minutes of Sedentary Activity per Week (1: Yes, 2: No)

obese BMI>35 (1: No, 2: Yes)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(nhanes, n = 10)
summary(nhanes)
```

polypharm

POLYPHARM data

Description

polypharm dataset.

Usage

polypharm

Format

A data.frame with 3500 rows and 14 variables:

id Subject ID (1 - 500)

polypharmacy Outcome; taking drugs from more than three different classes (1: No, 2: Yes)

mhv4 Number of outpatient Mental Health Visits (1: none, 2: one to five, 3: six to fourteen, 4: greater than 14)

inptmhv3 Number of inpatient Mental Health Visits (1: none, 2: one, 3: more than one)

year Year (2002 to 2008)

group Group (1: Covered Families and Children - CFC, 2: Aged, Blind or Disabled - ABD, 3: Foster Care - FOS)

urban Location (1: Urban, 2: Rural)

comorbid Comorbidity (1: No, 2: Yes)

anyprim Any primary diagnosis (bipolar, depression, etc.) (1: No, 2: Yes)

numprim Number of primary diagnosis (1: none, 2: one, 3: more than one)

gender Gender (1: Female, 2: Male)

race Race (1: White, 2: Black, 3: Other)

ethnic Ethnic category (1: Non-Hispanic, 2: Hispanic)

age Age (Years and months, two decimal places)

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(polypharm, n = 10)
summary(polypharm)
```

scale_example	<i>SCALE_EXAMPLE data</i>
---------------	---------------------------

Description

scale_example dataset.

Usage

```
scale_example
```

Format

A data.frame with 500 rows and 2 variables:

y a dicotomic variable (say 1: No, 2: Yes)

x a numeric variable

Source

Hosmer, D.W., Lemeshow, S. and Sturdivant, R.X. (2013) Applied Logistic Regression, 3rd ed., New York: Wiley

Examples

```
head(scale_example, n = 10)
summary(scale_example)
```

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