Package ‘GeoRiskR’

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Type Package

Title Data and functions for Geotechnical Risk Assessment

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Description Data sets and functions for geotechnical reliability analysis. The GeoRiskR develops for geotechnical engineers to perform reliability analysis, in which several existing data sets (soil shear strengths, rock shear strengths, GCL shear strengths, soil texture, and the relation between initial void ratio and compression index) are compiled. The collected datasets are adopted from the existing literature, for instance,the data of shear strength parameters of soils composed by 509 paired parameters (including cohesion and inner friction angle) observed at 22 locations from 12 published papers.

Depends R(>= 2.15.0), fitdistrplus, copula

License GPL (>= 3)

LazyLoad true

LazyData true

Suggests MASS

R topics documented:

GeoRiskR-package *GeoRisk-package*

Description

Shear strength parameters of soils, rocks, geosynthetics, some useful functions for multivariate analysis and reliability analysis in geotechnical engineering

Details

Package:	GeoRiskR
Type:	Package
Version:	1.0
Date:	2013-11-27
License:	GNU 2.15 or later
LazyLoad:	yes

Author(s)

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References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. in press

Examples

```
## listing the data for soils
SoilShear
## listing the data for rocks
RockShear
## listing the data for geosynthetic
GCLShear
## listing the data for soils by Mousavi et al. 2011
MousaviSet
## listing the data for initial void ratio e0 vs compression index cc
e0cc
```

e0cc *initial void ratio and compression index for settlements*

Description

Data sets covers the initial void ratio and copression index from soils

Arguments

`e0`	a numeric for the initial void ratio
`cc`	a numeric for compression index

Details

The data set contains several columns : e0, cc, e1, investigator, published year, soil name.

Value

Returns a matrix that contains above values for each soils included in the data set.

Note

Please read the following references for the original data (adopted from):

[1] Abbasi N, Javadi AA, Bahramloo R. 2012. Prediction of compression behaviour of normally consolidated fine-grained soils, World Applied Sciences Journal, 18(1): 6-14.

[2] Keller T., Lamande M., Schjoning, P., Dexter, A. R. 2011. Analysis of soil compression curves from uniaxial confined compression tests. Geoderma. 163, (1-2): 13-23.

[3] Krizek, R.J., Corotis, R.B., and El-Moursi, H.H. 1977. Probabilistic analysis of predicted and measured settlements. Canadian Geotechnical Journal, 14(17): 17-33.

[4] Leroueil, S., Tavenas, F., Le Bihan, J. P., 1983. Proprietes caracteristiques des argiles de l'est du Canada. Canadian Geotechnical Journal, 20, 681-705.

[5] Tan Y.C. Gue S.S., Ng H.B., Lee P.T. 2004. Some geotechnical properties of klang clay. Proceedings of Malaysian Geotechnical Conference 2004. Selangor, 179-186.

Author(s)

Xingzheng Wu <xingzhengwu@gmail.com>

References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. submitted.

Examples

```
##---- Should be DIRECTLY executable !! ----
##--listing data.
e0cc[["name"]]  ##column named "name"

which(e0cc[["name"]]=='Keller-et-al')  ##returns a vector of the indices of x
which(e0cc[["type"]]=='fine-grained')  ##returns a vector of the indices of x
e0cc[which(e0cc[["type"]]=='fine-grained'),]
      ##listing a matrix where the soil type = 'fine-grained'
```

GCLShear *Shear strengths of GCLs*

Description

Data sets covers the shear strengths from geosynthetics

Arguments

`cohesion`	a numeric for the cohesion, in kPa
`friction angle`	a numeric for the inner friction angle, in degree

Details

The data set contains several columns : cohesion, friction angle, unit grivity, investigator, published year, rock name.

Value

Returns a matrix that contains above values for each GCL included in the data set.

Note

Please read the following references for the original data (adopted from):

[1] McCartney, J.S., Zornberg, J.G., Swan Jr., R.H., Gilbert, R.B., 2004. Reliability-based stability analysis considering GCL shear strength variability. Geosynthetics International 11 (3), 212-232.

Author(s)

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References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. submitted.

See Also

Wu XZ. 2013. Probabilistic stability analysis considering correlated GCL shear strengths. Geosynthetic International. 20(5): 344-357.

Examples

```
##---- Should be DIRECTLY executable !! ----
##--listing data.
GCLShear[["name"]]  ##column named "name"

which(GCLShear[["name"]]=='Young')  ##returns a vector of the indices of x
which(GCLShear[["type"]]=='Melange')  ##returns a vector of the indices of x
GCLShear[which(GCLShear[["type"]]=='Melange'),]
      ##listing a matrix where the soil type = 'MBC'
```

MousaviSet *Large data base by Mousavi et al. 2011*

Description

Data sets covers the shear strengths, properties from undisturbed soils by triaxial test

Arguments

`cohesion`	a numeric for the cohesion, in kPa
`friction angle`	a numeric for the inner friction angle, in degree
`unit gravity`	a numeric for the unit gravity, in kN/m^3

Details

The data set contains several columns : No. FC CC D10 D30 D60 Cu Cc LL Gamma W Gammad c phi, investigator, published year, rock name.

Value

Returns a matrix that contains above values for each soils included in the data set.

Note

Please read the following references for the original data (adopted from)

[1] Mousavi SM, Alavi AH, Gandomi AH, Mollahasani A. Nonlinear genetic-based simulation of soil shear strength parameters. J. Earth Syst. Sci.120(6): 1001-1022.

Author(s)

Xingzheng Wu <xingzhengwu@gmail.com>

References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. submitted.

Examples

```
##---- Should be DIRECTLY executable !! ----
##--listing data.
MousaviSet[["name"]]  ##column named "name"
MousaviSet[1,]  ##1st row

MousaviSet[["friction.angle"]]   ##listing a matrix where the soil type = 'friction.angle'
```

RockShear *Shear strengths of rocks*

Description

Data sets covers the shear strengths from rocks

Arguments

`cohesion`	a numeric for the cohesion, in kPa
`friction angle`	a numeric for the inner friction angle, in degree
`unit gravity`	a numeric for the unit gravity, in kN/m^3

Details

The data set contains several columns : cohesion, friction angle, unit grivity, investigator, published year, rock name.

Value

Returns a matrix that contains above values for each rocks included in the data set.

Note

Please read the following references for the original data (adopted from):

[1] Gay Geoffrey, Schad Herman, 2001. Landslides and Rockfall in Keuper. Otto-Graf-Journal. Vol. 12, 201-214.

[2] Goodman, R.E., Algren, Ch.S. 2000. Evaluating safety of concrete gravity dam on weak rock: Scott dam. J. Geot. Geoenvironmental Eng., 126(5): 429-442.

[3] Lanaro F., Fredriksson A. 2005. Rock mechanics characterisation of the rock mass summary of primary data. Preliminary site description version 1.2. R-05-21. Swedish Nuclear Fuel and Waste Management Co. http://193.235.25.3/upload/publications/pdf/R-05-21webb.pdf.

[4] Lindquist, E.S. 1994. The strength and deformation properties of melange.PhD Thesis, Dept. of Civil Engineering, University of California. Berkeley.

[5] Young DS. 1986. A generalized probabilistic approach for slope analysis: practicalapplication to an open pit iron ore mine. Int J Mining Geol Eng 4(1):3-13

[6] Wang XG, Dong YJ. Shear strength parameters of rock mass. Beijing: China Water Power Press; 2010 [in Chinese].

Author(s)

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References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. submitted.

See Also

Wu XZ. 2013. Uncertainty and statistical dependence of shear strength parameters of rocks. International Journal of Rock Mechanics and Mining Sciences. Under review.

Examples

```
##---- Should be DIRECTLY executable !! ----
##--listing data.
RockShear[["name"]]  ##column named "name"

which(RockShear[["name"]]=='Young')  ##returns a vector of the indices of x
which(RockShear[["type"]]=='Melange')  ##returns a vector of the indices of x
RockShear[which(RockShear[["type"]]=="Melange"),]
  ##listing a matrix where the soil type = 'MBC'
```

SoilShear — *Shear strengths of soils*

Description

Data sets covers the shear strengths from soils

Arguments

`cohesion`	a numeric for the cohesion, in kPa
`friction angle`	a numeric for the inner friction angle, in degree

Details

The data set contains several columns : cohesion, friction angle, unit grivity, investigator, published year, soil name.

Value

Returns a matrix that contains above values for each soils included in the data set.

Note

Please read the following references for the original data (adopted from):

[1] Cherubini, C., 2000. Reliability evaluation of shallow foundation bearing capacity on c-phi soils. Canadian Geotechnical Journal, 37, 264-269.

[2] Forrest William S. and Orr Trevor L.L. 2010. Reliability of shallow foundations designed to Eurocode 7, Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards, 4:4, 186-207.

[3] Hata Yoshiya, Ichii Koji and Tokida Ken-ichi. 2011. A probabilistic evaluation of the size of earthquake induced slope failure for an embankment, Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards, 6(2): 73-88.

[4] Hatanaka M. and Uchida A. 1996. Empirical correlation between penetration resistance and internal friction angle of sandy soils. Soils and Foundations, 36(4):1-9.

[5] Lumb, P. 1970. Safety factors and the probability distribution of soil strength. Can. Geotech. J., 7(3), 225-242.

[6] Matsuo, M., and Kuroda, K., 1974. Probabilistic approach to design of embankments: Jour. Japanese Society of Soil Mechanics and Foundation Engineering, 14(2): 1-17.

[7] Schultze E. 1971. Frequency distributions and correlations of soil properties. In Lumb, P. (ed.) Statistics and Probability in Civil Engineering (Int. Conf. Appl. Stat. Prob. Soil Struct. Eng.). Hong Kong Univ. Press, 372-387.

[8] Parker, C., Simon, A., Thorne, C.R., 2008. The effects of variability in bank material properties on riverbank stability: Goodwin Creek, Mississippi. Geomorphology, 101, 533-543.

[9] Ngoc PQ. An investigation on petrophysical and geotechnical properties of soils uing multivariate statistics. Clausthal University of Technology. Germany, 2012.

[10] Kadar I. Some characteristic values of the stability analysis of MAL dams. Second Conference of Junior Researchers in Civil Engineering. 2013. pp100-104.

[11] Onodera T., Oda M., Minami K. Shear strength of undisturbed sample of decomposed granite soil. Soils and Foundations. 1976. 16(1), 17-26.

[12] Speedie, M. G. Selection of design value from shear test results. New Zealand Engineering. 1955. 10(1): 377-378.

Author(s)

Xingzheng Wu <xingzhengwu@gmail.com>

References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. submitted.

See Also

Wu XZ, 2013. Probabilistic slope stability analysis by a copula-based sampling method. Computational Geosciences. 17(5): 739-755.

Wu XZ, 2013. Trivariate analysis of soil ranking correlated characteristics and application on probabilistic stability assessment in geotechnical engineering problems. Soils and Foundations. 53(4): 540-556.

Examples

```
##---- Should be DIRECTLY executable !! ----
##--listing data.
SoilShear[["name"]]  ##column named "name"

which(SoilShear[["name"]]=='Lumb')  ##returns a vector of the indices of x
which(SoilShear[["type"]]=='MBC')  ##returns a vector of the indices of x
SoilShear[which(SoilShear[["type"]]=='MBC'),]
      ##listing a matrix where the soil type = 'MBC'
```

`texture` *grain size (including sand, silt, and clay) distribution for soil classification*

Description

Data sets covers the ratio of sand-silt-clay from soils

Arguments

`sand`	a numeric for the ratio of sand
`silt`	a numeric for the ratio of silt
`clay`	a numeric for the ratio of clay

Details

The data set contains several columns : sand, silt, clay, optimum water content, dry density, liquid limit, plastic limit, shrinkage limit, USCS classification, investigator, published year, soil name.

Value

Returns a matrix that contains above values for each soils included in the data set.

Note

Please read the following references for the original data (adopted from):

[1] Abbasi N, Javadi AA, Bahramloo R. 2012. Prediction of compression behaviour of normally consolidated fine-grained soils, World Applied Sciences Journal, volume 18, no. 1, pages 6-14.

Author(s)

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References

Wu XZ. 2013. Implementing reproducible data analysis and statistical computing for the geosciences in R. Computers and Geosciences. submitted.

Examples

```
##---- Should be DIRECTLY executable !! ----
##--listing data.
texture[["name"]]  ##column named "name"

which(texture[["name"]]=='Abbasi-et-al')  ##returns a vector of the indices of x
which(texture[["type"]]=='fine-grained')  ##returns a vector of the indices of x
texture[which(texture[["type"]]=='fine-grained'),] ##
##listing a matrix where the soil type = 'fine-grained'
```

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