Package 'MicrobiomeSurv'

October 12, 2023

Type Package

Title Biomarker Validation for Microbiome-Based Survival Classification and Prediction

Version 0.1.0

Maintainer Thi Huyen Nguyen <thihuyen.nguyen@uhasselt.be>

Description An approach to identify microbiome biomarker for time to event data by discovering microbiome for predicting survival and classifying subjects into risk groups.
Classifiers are constructed as a linear combination of important microbiome and treatment effects if necessary.
Several methods were implemented to estimate the microbiome risk score such as the LASSO method by Robert Tibshirani (1998) <doi:10.1002/(SICI)1097-0258(19970228)16:4%3C385::AID-SIM380%3E3.0.CO;2-3>, Elastic net approach by Hui Zou and Trevor Hastie (2005) <doi:10.1111/j.1467-9868.2005.00503.x>, supervised principle component analysis of Wold Svante et al. (1987) <doi:10.1016/0169-7439(87)80084-9>, and supervised partial least squares analysis by Inge S. Helland <https://www.jstor.org/stable/4616159>.
Sensitivity analysis on the quantile used for the classification can also be accessed to check the deviation of the classification group based on the quantile specified. Large scale cross validation can be performed in order to investigate the mostly selected microbiome and for internal validation.
During the evaluation process, validation is accessed using the hazard ratios (HR) distribution of the test set and inference is mainly based on resampling and permutations technique.

URL https://github.com/N-T-Huyen/MicrobiomeSurv

BugReports https://github.com/N-T-Huyen/MicrobiomeSurv/issues/new

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.2.3

Imports graphics, stats, ggplot2, survival, survminer, glmnet, methods, superpc, lmtest, gplots, tidyr, dplyr, microbiome, pls, grDevices

Suggests knitr, rmarkdown

VignetteBuilder knitr

Depends R (>= 2.10)

NeedsCompilation no

Author Thi Huyen Nguyen [aut, cre],
Olajumoke Evangelina Owokotomo [aut],
Ziv Shkedy [aut]

Repository CRAN

Date/Publication 2023-10-12 06:20:02 UTC

R topics documented:

CoxPHUni . . . 3
CVLasoelascox . . . 4
cvle-class . . . 7
CVMajorityvotes . . . 8
cvmm-class . . . 10
CVMSpecificCoxPh . . . 11
cvmv-class . . . 14
CVPcaPls . . . 15
cvpp-class . . . 17
cvsit-class . . . 18
CVSITaxa . . . 19
data_zero_per_group_otu_w3 . . . 21
DistHR . . . 22
EstimateHR . . . 24
fam_info_w3 . . . 26
fam_shan_trim_w3 . . . 27
FirstFilter . . . 27
GetRA . . . 28
Lasoelascox . . . 29
Majorityvotes . . . 32
metadata_taxonomy . . . 33
MiFreq . . . 34
ms-class . . . 35
MSpecificCoxPh . . . 37
perm-class . . . 39
QuantileAnalysis . . . 40
SecondFilter . . . 42
SITaxa . . . 43
SummaryData . . . 45
SurvPcaClass . . . 46
SurvPlsClass . . . 48
Top1Uni . . . 51
Week3_otu . . . 52
Week3_response . . . 127

ZerosPerGroup 127

Index **130**

`CoxPHUni` *This function will fit the full and reduced models and calculate LRT raw p-value and adjusted p-value based on BH Method*

Description

This function will fit the full and reduced models and calculate LRT raw p-value and adjusted p-value based on BH Method

Usage

```
CoxPHUni(Survival, Censor, Prognostic, Micro.mat, Method = "BH")
```

Arguments

`Survival`	The time to event outcome.
`Censor`	An indicator variable indicate the subject is censored or not.
`Prognostic`	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
`Micro.mat`	a microbiome matrix, can be at otu, family or any level of the ecosystem. Rows are taxa, columns are subjectsc.
`Method`	A multiplicity adjustment Method that user can choose. The default is BH Method.

Value

A relative abundance matrix of OTUs

`coef`	coefficient of one microbiome (OTU or family, ...)
`exp.coef`	exponential of the coefficient
`p.value.LRT`	raw LRT p-value
`p.value`	adjusted p-value based on chosen Method

Author(s)

Thi Huyen Nguyen, `<thihuyen.nguyen@uhasselt.be>`

Olajumoke Evangelina Owokotomo, `<olajumoke.x.owokotomo@gsk.com>`

Ziv Shkedy

See Also

`CoxPHUni`

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the funtion
summary_fam_shan_w3 = CoxPHUni(Survival = surv_fam_shan_w3$Survival,
                               Censor = surv_fam_shan_w3$Censor,
                               Prognostic = prog_fam_shan_w3,
                               Micro.mat = fam_shan_trim_w3,
                               Method = "BH")
```

`CVLasoelascox` *Cross Validations for Lasso Elastic Net Survival predictive models and Classification*

Description

The function does cross validation for Lasso, Elastic net and Ridge regressions models before the survial analysis and classification. The survival analysis is based on the selected taxa in the presence or absence of prognostic factors.

Usage

```
CVLasoelascox(
  Survival,
  Censor,
  Micro.mat,
  Prognostic,
  Standardize = TRUE,
  Alpha = 1,
  Fold = 4,
  Ncv = 10,
  nlambda = 100,
  Mean = TRUE,
  Quantile = 0.5
)
```

Arguments

Survival	A vector of survival time with length equals to number of subjects.
Censor	A vector of censoring indicator.
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows is equal to the number of taxa and number of columns is equal to number of patients.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Standardize	A Logical flag for the standardization of the microbiome matrix, prior to fitting the model sequence. The coefficients are always returned on the original scale. Default is standardize=TRUE.
Alpha	The mixing parameter for glmnet (see glmnet). The range is 0<= Alpha <= 1. The Default is 1.
Fold	Number of folds to be used for the cross validation. Its value ranges between 3 and the number of subjects in the dataset.
Ncv	Number of validations to be carried out. The default is 10.
nlambda	The number of lambda values - default is 100 as in glmnet.
Mean	The cut off value for the classifier, default is the mean cutoff.
Quantile	If users want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they wish to use. The default is the median cutoff.

Details

The function performs the cross validations for Lasso, Elastic net and Ridge regressions models for Cox proportional hazard model. Taxa are selected at each iteration and then use for the classifier. Which implies that predictive taxa is varied from one cross validation to the other depending on selection. The underline idea is to investigate the Hazard Ratio for the train and test data based on the optimal lambda selected for the non-zero shrinkage coefficients, the nonzero selected taxa will thus be used in the survival analysis and in calculation of the risk scores for each sets of data.

Value

A object of class cvle is returned with the following values

Coef.mat	A matrix of coefficients with rows equals to number of cross validations and columns equals to number of taxa.
lambda	A vector of estimated optimum lambda for each iterations.
n	A vector of the number of selected taxa.
HRTrain	A matrix of survival information for the training dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.
HRTest	A matrix of survival information for the test dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.

pld	A vector of partial likelihood deviance at each cross validations.
Mi.mat	A matrix with 0 and 1. Number of rows equals to number of iterations and number of columns equals to number of 1 taxon indicates that the particular taxon was selected or had nonzero coefficient and otherwise it is zero.
Micro.mat	The Microbiome data matrix that was used for the analysis either same as Mdata or a reduced version.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR, glmnet, Lasoelascox

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3

# Using the function
CV_lasso_fam_shan_w3 = CVLasoelascox(Survival = surv_fam_shan_w3$Survival,
                                     Censor = surv_fam_shan_w3$Censor,
                                     Micro.mat = fam_shan_trim_w3,
                                     Prognostic = prog_fam_shan_w3,
                                     Standardize = TRUE,
                                     Alpha = 1,
                                     Fold = 4,
                                     Ncv = 10,
                                     nlambda = 100)

# Number of selected taxa per CV
CV_lasso_fam_shan_w3@n

# Get the matrix of coefficients
CV_lasso_fam_shan_w3@Coef.mat

# Survival information of the train dataset
```

```
CV_lasso_fam_shan_w3@HRTrain

# Survival information of the test dataset
CV_lasso_fam_shan_w3@HRTest
```

---

cvle-class *The cvle Class.*

Description

Class of object returned by function CVLasoelascox.

Usage

```
## S4 method for signature 'cvle'
show(object)

## S4 method for signature 'cvle'
summary(object)

## S4 method for signature 'cvle,missing'
plot(x, y, type = 1, ...)
```

Arguments

object	A cvle class object
x	A cvle class object
y	missing
type	Plot type. 1 distribution of the HR under training and test set. 2 HR vs number selected taxa.
...	The usual extra arguments to generic functions — see plot, plot.default

Slots

Coef.mat A matrix of coefficients with rows equals to number of cross validations and columns equals to number of taxa,

lambda A vector of estimated optimum lambda for each iterations.

n A vector of the number of selected taxa.

mi.mat A matrix with 0 and 1. Number of rows equals to number of iterations and number of columns equals to number of taxa. 1 indicates that the particular taxon was selected or had nonzero coefficient and otherwise it is zero.

HRTrain A matrix of survival information for the training dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.

HRTest A matrix of survival information for the test dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.

`pld` A vector of partial likelihood deviance at each cross validations.

`Micro.mat` The microbiome matrix that was used for the analysis which can either be the full the full data or a reduced supervised PCA version.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

`EstimateHR`, `glmnet`, `Lasoelascox`

`CVMajorityvotes` *Cross validation for majority votes*

Description

This function does cross validation for the Majority votes based classification which is a cross validated approach to `Majorityvotes`.

Usage

```
CVMajorityvotes(
  Survival,
  Censor,
  Prognostic = NULL,
  Micro.mat,
  Reduce = TRUE,
  Select = 5,
  Fold = 3,
  Ncv = 100,
  Mean = TRUE,
  Quantile = 0.5
)
```

Arguments

`Survival`	A vector of survival time with length equals to number of subjects.
`Censor`	A vector of censoring indicator.
`Prognostic`	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
`Micro.mat`	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.

Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach.
Select	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE.
Fold	Number of times in which the dataset is divided. Default is 3 which implies dataset will be divided into three groups and 2/3 of the dataset will be the train datset and 1/3 will be to train the results.
Ncv	The Number of cross validation loop. Default is 100.
Mean	The cut off value for the classifier, default is the mean cutoff.
Quantile	If users want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they wish to use. The default is the median cutoff.

Value

A object of class cvmv is returned with the following values

HRTrain	A matrix of survival information for the training dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.
HRTest	A matrix of survival information for the test dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.
Ncv	The number of cross validation used.
Micro.mat	The microbiome data matrix that was used for the analysis either same as Micro.mat or a reduced version.
Progfact	The names of prognostic factors used.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

Majorityvotes

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
```

```
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
CVMajority_fam_shan_w3 = CVMajorityvotes(Survival = surv_fam_shan_w3$Survival,
                                         Micro.mat = fam_shan_trim_w3,
                                         Censor = surv_fam_shan_w3$Censor,
                                         Reduce=TRUE,
                                         Select=5,
                                         Mean = TRUE,
                                         Prognostic = prog_fam_shan_w3,
                                         Fold=3,
                                         Ncv=10)

# Get the class of the object
class(CVMajority_fam_shan_w3)     # An "cvmv" Class

# Method that can be used for the result
show(CVMajority_fam_shan_w3)
summary(CVMajority_fam_shan_w3)
plot(CVMajority_fam_shan_w3)
```

`cvmm-class` *The cvmm Class.*

Description

Class of object returned by function `CVMSpecificCoxPh`.

Usage

```
## S4 method for signature 'cvmm'
show(object)

## S4 method for signature 'cvmm'
summary(object, which = 1)

## S4 method for signature 'cvmm,ANY'
plot(x, y, which = 1, ...)
```

Arguments

`object`	A CVMSpecificCoxPh class object
`which`	This specify which taxon for which estimated HR information need to be visualized. By default results of the first taxon is used.
`x`	A CVMSpecificCoxPh class object `CVMSpecificCoxPh`

y	missing
...	The usual extra arguments to generic functions — see plot, plot.default

Details

plot signature(x = "cvmm"): Plots for CVMSpecificCoxPh class analysis results.

Any parameters of plot.default may be passed on to this particular plot method.

Slots

HRTrain A 3-way array, The first dimension is the number of taxa, the second dimension is the HR statistics for the low risk group in the train dataset (HR,1/HR LCI, UCI) while the third dimension is the number of cross validation performed.

HRTest A 3-way array, The first dimension is the number of taxa, the second dimension is the HR statistics for the low risk group in the test dataset (HR,1/HR LCI, UCI) while the third dimension is the number of cross validation performed.

train The selected subjects for each CV in the train dataset.

test The selected subjects for each CV in the test dataset.

n.mi The number of taxa used in the analysis.

Ncv The number of cross validation performed.

Rdata The microbiome data matrix that was used for the analysis either same as Micro.mat or a reduced version

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

CVMSpecificCoxPh

CVMSpecificCoxPh *Cross validation for the Taxon specific analysis*

Description

The function performs cross validation for each taxon depending the number of fold which guides the division into the train and testing dataset. The classifier is then obtained on the training dataset to be validated on the test dataset.

Usage

```
CVMSpecificCoxPh(
  Fold = 3,
  Survival,
  Micro.mat,
  Censor,
  Reduce = TRUE,
  Select = 5,
  Prognostic = NULL,
  Mean = TRUE,
  Quantile = 0.5,
  Ncv = 100
)
```

Arguments

Fold	Number of times in which the dataset is divided. Default is 3 which implies dataset will be divided into three groups and 2/3 of the dataset will be the train datset and 1/3 will be to test the results.
Survival	A vector of survival time with length equals to number of subjects
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
Censor	A vector of censoring indicator.
Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.
Select	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if th argument Reduce=TRUE.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Mean	The cut off value for the classifier, default is the mean cutoff.
Quantile	If users want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they wish to use. The default is the median cutoff.
Ncv	The Number of cross validation loop. Default is 100.

Details

This function performs the cross validation for taxon by taxon analysis. The data will firstly be divided into data train dataset and test datset. Furthermore, a taxon-specific model is fitted on train data and a classifier is built. In addition, the classifier is then evaluated on test dataset for each particular taxon. The Process is repeated for all the full or reduced taxa to obtaind the HR statistics of the low risk group. The following steps depends on the number of cross validation specified.

Value

A object of class cvmm is returned with the following values.

HRTrain	The Train dataset HR statistics for each taxon by the number of CV.
HRTest	The Test dataset HR statistics for each taxon by the number of CV.
train	The selected subjects for each CV in the train dataset.
test	The selected subjects for each CV in the test dataset.
n.mi	The number of taxa used in the analysis.
Ncv	The number of cross validation performed.
Rdata	The Microbiome data matrix that was used for the analysis either same as Micro.mat or a reduced version.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR, MSpecificCoxPh,

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
CVCox_taxon_fam_shan_w3 = CVMSpecificCoxPh(Fold=3,
                                           Survival = surv_fam_shan_w3$Survival,
                                           Micro.mat = fam_shan_trim_w3,
                                           Censor = surv_fam_shan_w3$Censor,
                                           Reduce=TRUE,
                                           Select=5,
                                           Prognostic=prog_fam_shan_w3,
                                           Mean = TRUE,
                                           Ncv=10)
```

```
# Get the class of the object
class(CVCox_taxon_fam_shan_w3)     # An "cvmm" Class

# Method that can be used for the result
show(CVCox_taxon_fam_shan_w3)
summary(CVCox_taxon_fam_shan_w3)
plot(CVCox_taxon_fam_shan_w3)
```

`cvmv-class` *The cvmv Class.*

Description

Class of object returned by function `CVMajorityvotes`.

Usage

```
## S4 method for signature 'cvmv'
show(object)

## S4 method for signature 'cvmv'
summary(object)

## S4 method for signature 'cvmv,ANY'
plot(x, y, ...)
```

Arguments

`object`	A cvmv class object
`x`	A cvmv class object
`y`	missing
`...`	The usual extra arguments to generic functions — see `plot`, `plot.default`

Slots

`HRTrain` A matrix of survival information for the training dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.

`HRTest` A matrix of survival information for the test dataset. It has three columns representing the estimated HR, the 95% lower confidence interval and the 95% upper confidence interval.

`Ncv` The number of cross validation used.

`Micro.mat` The microbiome data matrix that was used for the analysis either same as Micro.mat or a reduced version.

`Progfact` The names of prognostic factors used.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

Majorityvotes, CVPcaPls, SurvPcaClass, SurvPlsClass

CVPcaPls *Cross Validations for PCA and PLS based methods*

Description

This function does cross validation for the analysis performs by SurvPcaClass and SurvPlsClass functions where the dimension reduction methods can either be PCA and PLS.

Usage

```
CVPcaPls(
  Fold = 3,
  Survival,
  Micro.mat,
  Censor,
  Reduce = TRUE,
  Select = 15,
  Prognostic = NULL,
  Ncv = 5,
  DR = "PCA"
)
```

Arguments

Fold	Number of times in which the dataset is divided. Default is 3 which implies dataset will be divided into three groups and 2/3 of the dataset will be the train datset and 1/3 will be to test the results.
Survival	A vector of survival time with length equals to number of subjects.
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
Censor	A vector of censoring indicator.
Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.

Select	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Ncv	The Number of cross validation loop. Default is 100.
DR	The dimension reduction method. It can be either "PCA" for Principle components analysis or "PLS" for Partial least squares.

Details

This function does cross validation for the analysis using two reduction method. The reduction method can be PCA or PLS. If it is PCA then the SurvPcaClass is internally used for the cross validation and SurvPlsClass otherwise.

Value

A object of class cvpp is returned with the following values

Result	A dataframe containg the estimated Hazard ratio of the test dataset and the training dataset.
Ncv	The number of cross validation performed.
Method	The dimesion reduction method used.
CVtrain	The training dataset indices matrix used for the cross validation.
CVtest	The test dataset indices matrix used for the cross validation.
Select	The number of taxa used for the dimesion reduction method used.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

SurvPlsClass, SurvPcaClass

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
```

```
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
CVPls_fam_shan_w3 = CVPcaPls(Fold = 3,
                             Survival = surv_fam_shan_w3$Survival,
                             Micro.mat = fam_shan_trim_w3,
                             Censor = surv_fam_shan_w3$Censor,
                             Reduce=TRUE,
                             Select=5,
                             Prognostic = prog_fam_shan_w3,
                             Ncv=10,
                             DR = "PLS")

# Get the class of the object
class(CVPls_fam_shan_w3)     # An "cvpp" Class

# Method that can be used for the result
show(CVPls_fam_shan_w3)
summary(CVPls_fam_shan_w3)
plot(CVPls_fam_shan_w3)
```

`cvpp-class` *The cvpp Class.*

Description

Class of object returned by function `CVPcaPls`.

Usage

```
## S4 method for signature 'cvpp'
show(object)

## S4 method for signature 'cvpp'
summary(object)

## S4 method for signature 'cvpp,missing'
plot(x, y, ...)
```

Arguments

`object`	A cvpp class object
`x`	A cvpp class object
`y`	missing
`...`	The usual extra arguments to generic functions — see `plot`, `plot.default`

Slots

`Results` A dataframe containg the estimated Hazard ratio of the test dataset and the training dataset

`Ncv` The number of cross validation performed

`Method` The dimesion reduction method used

`CVtrain` The training dataset indices matrix used for the cross validation

`CVtest` The test dataset indices matrix used for the cross validation

`Select` The number of taxa used for the dimesion reduction method used

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

`CVPcaPls`, `SurvPcaClass`, `SurvPlsClass`

`cvsit-class` *The cvsit Class.*

Description

Class of object returned by function `cvsit`.

Usage

```
## S4 method for signature 'cvsit'
show(object)

## S4 method for signature 'cvsit'
summary(object)

## S4 method for signature 'cvsit,missing'
plot(x, y, type = 1, ...)
```

Arguments

`object`	A cvsit class object
`x`	A cvsit class object
`y`	missing
`type`	Plot type. 1 distribution of the HR under test For the Top K taxa using PCA. 2 distribution of the HR under test For the Top K taxa using PLS.
`...`	The usual extra arguments to generic functions — see `plot`, `plot.default`

Slots

HRpca A 3-way array in which first, second, and third dimensions correspond to number of taxa, Hazard ratio information (Estimated HR, LowerCI and UpperCI), and number of cross validation respectively. This contains the estimated HR on test data and dimension reduction method is PCA.

HRpls A 3-way array in which first, second, and third dimensions correspond to number of taxa, Hazard ratio information (Estimated HR, LowerCI and UpperCI), and number of cross validation respectively. This contains the estimated HR on test data and dimension reduction method is PLS.

Ntaxa The number of taxa in the reduced matrix.

Ncv The number of cross validation done.

Top A sequence of top k taxa considered. Default is Top=seq(5,100,by=5).

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

CVPcaPls, SurvPcaClass, SurvPlsClass

CVSITaxa *Cross validation for sequentially increases taxa*

Description

This function does cross validation for the taxon by taxon analysis while sequentially increasing the number of taxa as specified.

Usage

```
CVSITaxa(
  Object,
  Top = seq(5, 100, by = 5),
  Survival,
  Censor,
  Prognostic = NULL
)
```

Arguments

Object	An object of class cvmm.
Top	The Top k number of taxa to be used.
Survival	A vector of survival time with length equals to number of subjects.
Censor	A vector of censoring indicator.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.

Details

The function is a cross validation version of the function SITaxa. This function firstly processes the cross validation for the taxon by taxon analysis results, and then sequentially considers top k taxa. The function recompute first PCA or PLS on train data and estimate risk scores on both test and train data only on the microbiome matrix with top k taxa. Patients are then classified as having low or high risk based on the test data where the cutoff used is mean of the risk score. The process is repeated for each top K taxa sets.

Value

A object of class cvsit is returned with the following values

HRpca	A 3-way array in which first, second, and third dimensions correspond to number of taxa, Hazard ratio infromation(Estimated HR, LowerCI and UpperCI), and number of cross validation respectively. This contains the estimated HR on test data and dimension reduction method is PCA.
HRpls	A 3-way array in which first, second, and third dimensions correspond to number of taxa, Hazard ratio infromation(Estimated HR, LowerCI and UpperCI), and number of cross validation respectively. This contains the estimated HR on test data and dimension reduction method is PLS.
Ntaxa	The number of taxa in the reduced matrix.
Ncv	The number of cross validation done.
Top	A sequence of top k taxa considered. Default is Top = seq(5, 100, by=5)

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

MSpecificCoxPh, SITaxa

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Getting the cvmm object
CVCox_taxon_fam_shan_w3 = CVMSpecificCoxPh(Fold=3,
                                           Survival = surv_fam_shan_w3$Survival,
                                           Micro.mat = fam_shan_trim_w3,
                                           Censor = surv_fam_shan_w3$Censor,
                                           Reduce=TRUE,
                                           Select=5,
                                           Prognostic=prog_fam_shan_w3,
                                           Mean = TRUE,
                                           Ncv=10)

# Using the function
 CVSITaxa_fam_shan_w3 = CVSITaxa(Object = CVCox_taxon_fam_shan_w3,
                                 Top=seq(1, 6, by=2),
                                 Survival = surv_fam_shan_w3$Survival,
                                 Censor = surv_fam_shan_w3$Censor,
                                 Prognostic=prog_fam_shan_w3)

# Get the class of the object
class(CVSITaxa_fam_shan_w3)     # An "cvsit" Class
```

---

data_zero_per_group_otu_w3

Zero per treatment groups.

Description

A dataset containing the information of zeros per treatment groups at OTU level.

Usage

```
data(data_zero_per_group_otu_w3)
```

Format

A data frame with 2720 rows and 10 variables:

OTU Name of OTUs

zero.ctrl Number of zeros in control group

propzero.ctrl Percentage of zeros in the control group

nCtrl Number of subjects in the control group

zero.Treated Number of zeros in treated group

propzero.Treated Percentage of zeros in the treated group

nTreated Number of subjects in the treated group

zero.total Number of zeros in total

propzero.total Percentage of zeros in total

nTotal Number of subjects in the experiment

Source

https://github.com/N-T-Huyen

DistHR *Null Distribution of the Estimated HR*

Description

This function generates the null distribution of the HR by permutation approach either using a large microbiome matrix or a reduced version by supervised pca approach. Several ways of permutation setting can be implemented. That is, the function can be used to generate null distributions for four different validation schemes which are PLS based, PCA based, Majority votes based and Lasso based. Note this function internally calls function SurvPcaClass, SurvPlsClass, Majorityvotes, and Lasoelascox.

Usage

```
DistHR(
  Survival,
  Censor,
  Micro.mat,
  Prognostic = NULL,
  Mean = TRUE,
  Quantile = 0.5,
  Reduce = FALSE,
  Select = 5,
  nperm = 100,
  case = 2,
  Method = "BH",
  Validation = c("PLSbased", "PCAbased", "L1based", "MVbased")
)
```

Arguments

Survival	A vector of survival time with length equals to number of subjects.
Censor	A vector of censoring indicator.
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Mean	The cut off value for the classifier, default is the mean cutoff.
Quantile	If user want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they want to use. The default is the median cutoff.
Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.
Select	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE.
nperm	Number of permutations to be used and default 100.
case	There are seven different ways on how to call this argument: 1. Permute survival only. 2. Permute survival and rows of data frame of the prognostic factors. 3. Permute survival, rows of data frame of the prognostic factors, columns of microbiome matrix independently. 4. Permute microbiome matrix only.
Method	A multiplicity adjustment Method that user can choose. The default is BH Method.
Validation	There are four different validation schemes where the null distribution can be estimated. That is c("PLSbased","PCAbased","L1based","MVbased").

Value

A object of class perm is returned with the following values

HRobs	Estimated HR for low risk group on the original data.
HRperm	Estimated HR for low risk group on the permuted data.
nperm	Number of permutations carried out.
Validation	The validation scheme that was used.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR, SurvPcaClass, SurvPlsClass, Majorityvotes, Lasoelascox

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
DistHR_fam_shan_w3 = DistHR(Survival = surv_fam_shan_w3$Survival,
                            Micro.mat = fam_shan_trim_w3,
                            Censor = surv_fam_shan_w3$Censor,
                            Prognostic=prog_fam_shan_w3,
                            Mean = TRUE,
                            Quantile=0.5,
                            Reduce= FALSE,
                            Select = 5,
                            nperm=100,
                            case=4,
                            Method = "BH",
                            Validation="PCAbased")

# Method that can be used for the result
show(DistHR_fam_shan_w3)
summary(DistHR_fam_shan_w3)
plot(DistHR_fam_shan_w3)
```

EstimateHR *Classification, Survival Estimation and Visualization*

Description

The function classifies subjects into Low and High risk groups using the risk scores based on the cut-off point which is the mean of the risk score. Also visualize survival fit along with HR estimates.

Usage

```
EstimateHR(
  Risk.Scores,
  Data.Survival,
  Prognostic = NULL,
  Plots = FALSE,
  Mean = TRUE,
  Quantile = 0.5
)
```

Arguments

Risk.Scores	A vector of risk scores with size equals to number of subjects obtained from (Lasoelascox).
Data.Survival	A dataframe in which the first column is the Survival and the second column is the Censoring indicator for each subject.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect
Plots	A boolean parameter indicating if plots should be shown. Default is FALSE.
Mean	The cut off value for the classifier, default is the mean cutoff
Quantile	If user want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they want to use. The default is the median cutoff

Details

The risk scores obtained using the taxa is then used to generate the risk group by dividing subjects into low and high risk groups. A Cox model is then fitted with the risk group as covariate in the presence or absence of prognostic factors and or treatment effect. The extent of survival in the risk groups is known

Value

An object of is returned, which is a list with the results of the cox regression and some informative plot concerning survival of the risk group.

SurvResult	The cox proportional regression result
Riskgroup	The riskgroup based on the riskscore and the cut off value and length is equal to number of subjects
KMplot	The Kaplan-Meier survival plot of the riskgroup
SurvBPlot	The distribution of the survival in the riskgroup

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, Lasoelascox

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Obtaning the risk score and data survival
lasso_fam_shan_w3 = Lasoelascox(Survival = surv_fam_shan_w3$Survival,
                                Censor = surv_fam_shan_w3$Censor,
                                Micro.mat = fam_shan_trim_w3,
                                Prognostic = prog_fam_shan_w3,
                                Plots = TRUE,
                                Standardize = TRUE,
                                Alpha = 1,
                                Fold = 4,
                                nlambda = 100,
                                Mean = TRUE)

# Using the function
est_HR_fam_shan_w3 = EstimateHR(Risk.Scores = lasso_fam_shan_w3$Risk.Scores,
                                Data.Survival = lasso_fam_shan_w3$Data.Survival,
                                Prognostic = prog_fam_shan_w3, Plots = TRUE,
                                Mean = TRUE)
```

---

fam_info_w3 *Information at family level.*

Description

A dataset containing the information at family level.

Usage

```
data(fam_info_w3)
```

Format

A data frame with 2720 rows and 2 variables:

OTUID ID of OTU

Family Family name

Source

https://github.com/N-T-Huyen

`fam_shan_trim_w3` *Dataset at family level.*

Description

A dataset containing the Shannon index of 6 families after filtering.

Usage

```
data(fam_shan_trim_w3)
```

Format

A data frame with 6 rows and 82 variables:

Rows are family names and columns are names of subjects.

Source

https://github.com/N-T-Huyen

`FirstFilter` *This function is used for the first step of filtering which removes OTUs having all zeros (inactive OTUs). The input is an OTU matrix with rows are OTUs and columns are subjects.*

Description

This function is used for the first step of filtering which removes OTUs having all zeros (inactive OTUs). The input is an OTU matrix with rows are OTUs and columns are subjects.

Usage

```
FirstFilter(Micro.mat)
```

Arguments

Micro.mat	A large or small microbiome matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.

Value

A smaller microbiome matrix.

Micro.mat.trim	The OTU matrix after removing all inactive OTUs

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

FirstFilter

Examples

```
# Preparing data for analysis at OTU level
data(Week3_otu)
Week3_otu = data.frame(Week3_otu)
otu_mat_w3 = t(data.matrix(Week3_otu[ , 1:2720]))
colnames(otu_mat_w3) = Week3_otu$SampleID
# Filtering first step
otu_w3 = FirstFilter(Micro.mat = otu_mat_w3)
```

GetRA *This function convert OTU matrix to RA matrix.*

Description

This function convert OTU matrix to RA matrix.

Usage

```
GetRA(Micro.mat)
```

Arguments

Micro.mat	an OTU matrix with OTUs in rows and subjects in columns.

Value

A relative abundance matrix of OTUs

`ra` Relative abundance matrixs

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

GetRA

Examples

```
# Read dataset
data(Week3_otu)
Week3_otu = data.frame(Week3_otu)
otu_mat_w3 = t(data.matrix(Week3_otu[ , 1:2720]))

# Convert absolute abundance to relative abundance
ra_otu_trim_w3 = GetRA(Micro.mat = otu_mat_w3)
```

Lasoelascox *Wapper function for glmnet*

Description

The function uses the glmnet function to firstly do the variable selection either with Lasso, Elastic net or ridge regressions before the survial analysis. The survival analysis is based on the selected taxa in the presence or absence of prognostic factors.

Usage

```
Lasoelascox(
  Survival,
  Censor,
  Micro.mat,
  Prognostic,
  Plots = FALSE,
  Standardize = TRUE,
  Alpha = 1,
  Fold = 4,
  nlambda = 100,
  Mean = TRUE,
  Quantile = 0.5
)
```

Arguments

Survival	A vector of survival time with length equals to number of subjects
Censor	A vector of censoring indicator
Micro.mat	A large or small microbiome matrix. A matrix with microbiome profiles where the number of rows is equal to the number of taxa and number of columns is equal to number of patients.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Plots	A boolean parameter indicating if plots should be shown. Default is FALSE. If TRUE, the first plot is the partial likelihood deviance against the logarithmn of each lambda while the second is the coefficients versus the lambdas
Standardize	A Logical flag for the standardization of the microbiome matrix, prior to fitting the model sequence. The coefficients are always returned on the original scale. Default is standardize=TRUE.
Alpha	The mixing parameter for glmnet (see glmnet). The range is 0<= Alpha <= 1. The Default is 1
Fold	number of folds to be used for the cross validation. Its value ranges between 3 and the number of subjects in the dataset
nlambda	The number of lambda values - default is 100 as in glmnet.
Mean	The cut off value for the classifier, default is the mean cutoff
Quantile	If user want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they want to use. The default is the median cutoff

Details

This is a wrapper function for glmnet and it fits models using either Lasso, Elastic net and Ridge regressions. This is done in the presence or absence of prognostic factors. The prognostic factor when available will always be forced to be in the model so no penalty for it. Optimum lambda will be used to select the non-zero shrinkage coefficients, the nonzero selceted taxa will thus be used in the survival analysis and in calculation of the risk scores.

Value

A object is returned with the following values

Coefficients.NonZero	The coefficients of the selected taxa
Selected.Mi	The selected taxa
n	The number of selected taxa
Risk.scores	The risk scores of the subjects
Risk.group	The risk classification of the subjects based on the specified cutoff point
SurvFit	The cox analysis of the riskgroup based on the selected taxa and the prognostic factors

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph

coxph, EstimateHR, glmnet,

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
lasso_fam_shan_w3 = Lasoelascox(Survival = surv_fam_shan_w3$Survival,
                                Censor = surv_fam_shan_w3$Censor,
                                Micro.mat = fam_shan_trim_w3,
                                Prognostic = prog_fam_shan_w3,
                                Plots = TRUE,
                                Standardize = TRUE,
                                Alpha = 1,
                                Fold = 4,
                                nlambda = 100,
                                Mean = TRUE)

# View the selected taxa
lasso_fam_shan_w3$Selected.mi

# Number of selected taxa
lasso_fam_shan_w3$n

# View the classification group of each subject
lasso_fam_shan_w3$Risk.Group

# View the survival analysis result
lasso_fam_shan_w3$SurvFit
```

`Majorityvotes` *Classifiction for Majority Votes*

Description

The Function fits cox proportional hazard model and does classification based on the majority votes.

Usage

```
Majorityvotes(Result, Prognostic, Survival, Censor, J = 1)
```

Arguments

`Result`	An object obtained from the taxon specific analysis (`MSpecificCoxPh`) which is of class "ms"
`Prognostic`	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
`Survival`	A vector of survival time with length equals to number of subjects
`Censor`	A vector of censoring indicator
`J`	The jth set of subjects required for the visualization. The default is J=1 which is the first set of subjects. For visualization, J should be less than the number of subjects divided by 25

Details

The Function fits cox proportional hazard model and does classification based on the majority votes while estimating the Hazard ratio of the low risk group. The function firstly count the number of low risk classification for each subject based on the taxon specific analysis which determines the majority votes. In addition, function visualizes the taxon specific calssification for the subjects. 25 subjects is taken for visualization purpose.

Value

A list is returned with the following values

`Model.result`	The cox proportional regression result based on the majority vote classification
`N`	The majority vote for each subject
`Classif`	The majority vote classification for each subjects
`Group`	The classification of the subjects based on each taxon analysis

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

MSpecificCoxPh, coxph, EstimateHR

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Running the taxon specific function
Cox_taxon_fam_shan_w3 = MSpecificCoxPh(Survival = surv_fam_shan_w3$Survival,
                                       Micro.mat = fam_shan_trim_w3,
                                       Censor = surv_fam_shan_w3$Censor,
                                       Reduce=FALSE,
                                       Select=5,
                                       Prognostic = prog_fam_shan_w3,
                                       Mean = TRUE,
                                       Method = "BH")

# Using the function
Majority_fam_shan_w3 = Majorityvotes(Result = Cox_taxon_fam_shan_w3,
                                     Prognostic = prog_fam_shan_w3,
                                     Survival = surv_fam_shan_w3$Survival,
                                     Censor = surv_fam_shan_w3$Censor,
                                     J=1)

# The survival analysis for majority vote result
Majority_fam_shan_w3$Model.result

# The majority vote for each subject
Majority_fam_shan_w3$N

# The majority vote classification for each subject
Majority_fam_shan_w3$Classif

# The group for each subject based on the taxon specific analysis
Majority_fam_shan_w3$Group
```

---

metadata_taxonomy *Metadata taxonomy.*

Description

A dataset containing the information of all levels in the ecosystem: OTU, order, family, kingdom, ...

Usage

```
data(metadata_taxonomy)
```

Format

A data frame with 2720 rows and 3 variables:

OTUID,Taxon,Confidence OTU ID and information at higher levels ...

Source

https://elifesciences.org/articles/37816

`MiFreq` *Frequency of Selected Taxa from the LASSO, Elastic-net Cross-Validation*

Description

The function selects the frequency of selection from the shrinkage method (LASSO, Elastic-net) based on cross validation, that is the number of times each taxon occur during the cross-validation process. This function outputs the mostly selected taxa during the LASSO and Elastic-net cross validation. Selected top taxa are ranked based on frequency of selection and also a particular frequency can be selected. In addition, it visualizes the selected top taxa based on the minimum frequency specified.

Usage

```
MiFreq(Object, TopK = 20, N = 3)
```

Arguments

`Object`	An object of class `cvle` returned from the function `CVLasoelascox`.
`TopK`	The number of Top K taxa (5 by default) to be displayed in the frequency of selection graph.
`N`	The taxa with the specified frequency should be displayed in the frequency of selection graph.

Value

A vector of taxa and their frequency of selection. Also, a graphical representation is displayed.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

cvmm, coxph, EstimateHR, CVLasoelascox

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Cross-Validation for LASSO and ELASTIC-NET
CV_lasso_fam_shan_w3 = CVLasoelascox(Survival = surv_fam_shan_w3$Survival,
                                     Censor = surv_fam_shan_w3$Censor,
                                     Micro.mat = fam_shan_trim_w3,
                                     Prognostic = prog_fam_shan_w3,
                                     Standardize = TRUE,
                                     Alpha = 1,
                                     Fold = 4,
                                     Ncv = 10,
                                     nlambda = 100)


# Using the function
MiFreq_fam_shan_w3 = MiFreq(Object = CV_lasso_fam_shan_w3, TopK=5, N=3)
```

---

ms-class *The ms Class.*

Description

Class of object returned by function MSpecificCoxPh. plot signature(x = "ms"): Plots for ms class analysis results

Usage

```
## S4 method for signature 'ms'
show(object)

## S4 method for signature 'ms'
summary(object)

## S4 method for signature 'ms,ANY'
plot(x, y, ...)
```

Arguments

object	A ms class object
x	A ms class object
y	missing
...	The usual extra arguments to generic functions — see plot, plot.default

Details

Any parameters of plot.default may be passed on to this particular plot method.

show(ms-object)

Slots

Result A list of dataframes of each output object of coxph for the taxa.

HRRG A dataframe with estimated taxon-specific HR for low risk group and 95 percent CI.

Group A matrix of the classification group a subject belongs to for each of the taxon analysis. The taxa are on the rows and the subjects are the columns

Mi.names The names of the taxon for the analysis

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

MSpecificCoxPh

MSpecificCoxPh *Taxon by taxon Cox proportional analysis*

Description

The Function fits cox proportional hazard model and does classification for each taxon separately

Usage

```
MSpecificCoxPh(
  Survival,
  Micro.mat,
  Censor,
  Reduce = FALSE,
  Select = 5,
  Prognostic = NULL,
  Mean = TRUE,
  Quantile = 0.5,
  Method = "BH"
)
```

Arguments

Survival	A vector of survival time with length equals to number of subjects
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of subjects.
Censor	A vector of censoring indicator.
Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach.
Select	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Mean	The cut off value for the classifier, default is the mean cutoff.
Quantile	If users want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they wish to use. The default is the median cutoff.
Method	Multiplicity adjustment methods.

Details

This function fits taxon by taxon Cox proportional hazard model and perform the classification based on a microbiome risk score which has been estimated using a single taxon. Function is useful for majority vote classification method and taxon by taxon analysis and also for top K taxa.

Value

A object of class ms is returned with the following values

Result	The cox proportional regression result for each taxon
HRRG	The hazard ratio statistics (Hazard-ratio, Lower confidence interval and upper confidence interval) of the riskgroup based on the riskscore and the cut off value for each taxon
Group	The classification of the subjects based on each taxon analysis
Mi.names	The names of the taxa for the analysis

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 =
data.frame(cbind(as.numeric(Week3_response$T1Dweek), as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
Cox_taxon_fam_shan_w3 = MSpecificCoxPh(Survival = surv_fam_shan_w3$Survival,
                                       Micro.mat = fam_shan_trim_w3,
                                       Censor = surv_fam_shan_w3$Censor,
                                       Reduce=FALSE,
                                       Select=5,
                                       Prognostic = prog_fam_shan_w3,
                                       Mean = TRUE,
                                       Method = "BH")

# Results
show(Cox_taxon_fam_shan_w3)
summary(Cox_taxon_fam_shan_w3)
```

perm-class *The perm Class.*

Description

Class of object returned by function DistHR.

Usage

```
## S4 method for signature 'perm'
show(object)

## S4 method for signature 'perm'
summary(object)

## S4 method for signature 'perm,ANY'
plot(x, y, ...)
```

Arguments

object	A perm class object
x	A perm class object
y	missing
...	The usual extra arguments to generic functions — see plot, plot.default

Slots

HRobs Estimated HR for low risk group on the original data.

HRperm Estimated HR for low risk group on the permuted data.

nperm Number of permutations carried out.

Validation The validation scheme that was used.

Note

The first, third and last vertical line on the plot are the lower, median and upper CI of the permuted data estimated HR while the red line is the estimated HR of the original data

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

DistHR, EstimateHR, SurvPcaClass, SurvPlsClass, Majorityvotes, Lasoelascox

`QuantileAnalysis` *Quantile sensitivity analysis*

Description

The function performs sensitivity of the cut off quantile for obtaining the risk group obtained under `SurvPlsClass`, `SurvPcaClass` or `Lasoelascox` requires for the survival analysis and classification.

Usage

```
QuantileAnalysis(
  Survival,
  Micro.mat,
  Censor,
  Reduce = TRUE,
  Select = 5,
  Prognostic = NULL,
  Plots = FALSE,
  DM = c("PLS", "PCA", "SM"),
  Alpha = 1
)
```

Arguments

`Survival`	A vector of survival time with length equals to number of subjects.
`Micro.mat`	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
`Censor`	A vector of censoring indicator.
`Reduce`	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.
`Select`	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE.
`Prognostic`	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
`Plots`	A boolean parameter indicating if the graphical represenataion of the analysis should be shown. Default is FALSE and it is only valid for the PCA or PLS dimension method.
`DM`	The dimension method to be used. PCA implies using the `SurvPcaClass`, PLS uses `SurvPcaClass` while SM uses the `Lasoelascox` which ruses the shrinkage method techniques such as lasso and elastic net.
`Alpha`	The mixing parameter for glmnet (see `glmnet`). The range is 0<= Alpha <= 1. The Default is 1.

Details

This function investigates how each analysis differs from the general median cutoff of 0.5, therefore to see the sensitive nature of the survival result different quantiles ranging from 10th percentile to 90th percentiles were used. The sensitive nature of the quantile is investigated under SurvPlsClass, SurvPcaClass or Lasoelascox while relate to the 3 different Dimension method to select from.

Value

A Dataframe is returned depending on weather a data reduction method should be used or not. The dataframe contains the HR of the low risk group for each percentile.

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph,EstimateHR, SurvPcaClass, SurvPlsClass,Lasoelascox

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the PCA method
QuantileAnalysis_PCA_fam_shan_w3 = QuantileAnalysis(Survival = surv_fam_shan_w3$Survival,
                                                    Micro.mat = fam_shan_trim_w3,
                                                    Censor = surv_fam_shan_w3$Censor,
                                                    Reduce=TRUE,
                                                    Select= 5,
                                                    Prognostic=prog_fam_shan_w3,
                                                    Plots = TRUE,
                                                    DM="PCA",
                                                    Alpha =1)
```

SecondFilter *This function is used for the second step of filtering which removes OTUs based on a threshold.*

Description

This function is used for the second step of filtering which removes OTUs based on a threshold.

Usage

```
SecondFilter(zero.per.group, Micro.mat, threshold = 0.7, week = 0)
```

Arguments

zero.per.group	a n x 9 matrix. Columns are number of zero in control groups, proportion of zeros in control group, number of subject in control group, number of zero in treated groups, proportion of zeros in treated group, number of subject in treated group, total number of zeros, proportion of zeros in total, number of subject
Micro.mat	OTU matrix (rows are otus, columns are subjects)
threshold	user can choose. For instance, if threshold is 0.7, the function will remove OTUs having at least 70% of zeros in one of two groups
week	A specific time point. To use when having different time points in the dataset.

Value

A smaller microbiome matrix.

Micro.mat.new	an smaller OTU matrix with less OTUs

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

SecondFilter

SecondFilter

Examples

```
# Read dataset
data(Week3_otu)
Week3_otu = data.frame(Week3_otu)
otu_mat_w3 = t(data.matrix(Week3_otu[ , 1:2720]))

# Import dataset from the result of zero_per_group
data(data_zero_per_group_otu_w3)

# Using the function
otu_trim_w3 = SecondFilter(zero.per.group = data_zero_per_group_otu_w3,
                           Micro.mat = otu_mat_w3, threshold = 0.7, week = 3)
```

SITaxa *Sequential Increase in Taxa for the PCA or PLS classifier*

Description

The Function fits cox proportional hazard model and does classification by sequentially increasing the taxa using either PCA or PLS based on the topK taxa specified.

Usage

```
SITaxa(
  TopK = 15,
  Survival,
  Micro.mat,
  Censor,
  Reduce = TRUE,
  Select = 5,
  Prognostic = NULL,
  Plot = FALSE,
  DM = c("PLS", "PCA"),
  ...
)
```

Arguments

TopK	Top K taxa (5 by default) to be used in the sequential analysis.
Survival	A vector of survival time with length equals to number of subjects.
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
Censor	A vector of censoring indicator.

Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.
Select	Number of taxa to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE.
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Plot	A boolean parameter indicating if Plot should be shown. Default is FALSE.
DM	Dimension reduction method which can either be PLS or PCA.
...	Additinal arguments for plotting and only valid if Plot=TRUE

Details

This function sequentially increase the number of top K taxa to be used in the PCA or PLS methods in order to obtain the risk score. This function internally calls MSpecificCoxPh to rank the taxa based on HR for each taxon. Therefore taxa can be ordered based on increasing order of the HR for low risk group. Thereafter, the function takes few top K (5 is the default) to be used in the sequential analysis.

Value

A list containing a data frame with estimated HR along with 95% CI at each TopK value for the sequential analysis.

Result	The hazard ratio statistics (HR, Lower confidence interval and upper confidence interval) of the lower riskgroup based for each sequential metabolite analysis
TopKplot	A graphical representation of the Result containing the hazard ratio statistics

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR, MSpecificCoxPh, SurvPcaClass, SurvPlsClass

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
```

```
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
SITaxa_fam_shan_w3 = SITaxa(TopK=5,
                            Survival = surv_fam_shan_w3$Survival,
                            Micro.mat = fam_shan_trim_w3,
                            Censor = surv_fam_shan_w3$Censor,
                            Reduce=TRUE,
                            Select=5,
                            Prognostic=prog_fam_shan_w3,
                            Plot = TRUE,
                            DM="PLS")

# For the HR statistics
SITaxa_fam_shan_w3$Result

# For the graphical output
SITaxa_fam_shan_w3$TopKplot
```

`SummaryData` *This function gives indices such as Observed richness, Shannon index, Inverse Simpson, ... of higher level such as levelily, order, phylum, ...*

Description

This function gives indices such as Observed richness, Shannon index, Inverse Simpson, ... of higher level such as levelily, order, phylum, ...

Usage

```
SummaryData(Micro.mat, info, measure = "observed")
```

Arguments

`Micro.mat`	an OTU matrix with OTUs in rows and subjects in columns.
`info`	A n x 2 matrix containing a column of OTU's names and a column of the corresponding information of the chosen level.
`measure`	The indices at chosen level that user wishes to use. It can be observed richness, Shannon index, inverse Simpson, ...

Value

A matrix of the selected measurement of the chosen level.

`level.measure`	A matrix of measurements at levelily level of patients

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

SummaryData

Examples

```
# Read dataset
data(Week3_otu)
Week3_otu = data.frame(Week3_otu)
otu_mat_w3 = t(data.matrix(Week3_otu[ , 1:2720]))
data(fam_info_w3)

# USing the function
fam_shan_w3 = SummaryData(Micro.mat = otu_mat_w3, info = fam_info_w3, measure = "shannon")
```

SurvPcaClass *Survival PCA and Classification for microbiome data*

Description

The function performs principal component analysis (PCA) on microbiome matrix and fit Cox proportional hazard model with covariates using also the first PCA as covariates.

Usage

```
SurvPcaClass(
  Survival,
  Micro.mat,
  Censor,
  Reduce = TRUE,
  Select = 5,
  Prognostic = NULL,
  Plots = FALSE,
  Mean = TRUE,
  Quantile = 0.5
)
```

Arguments

Survival	A vector of survival time with length equals to number of subjects
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of microbiome and number of columns should be equal to number of patients.
Censor	A vector of censoring indicator
Reduce	A boolean paramier indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.
Select	Number of microbiome (default is 15) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Plots	A boolean paramier indicating if the plots should be shown. Default is FALSE
Mean	The cut off value for the classifier, default is the mean cutoff
Quantile	If user want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they want to use. The default is the median cutoff

Details

This function can handle single and multiple microbiome. For larger microbiome matrix, this function will reduce largermicrobiome matrix to smaller version using supervised pca approach and this is by default done and can be control by using the argument Reduce. Other prognostic factors can be included to the model.

Value

A object of class SurvPca is returned with the following values

Survfit	The cox proportional regression result using the first PCA
Riskscores	A vector of risk scores which is equal to the number of patents.
Riskgroup	The classification of the subjects based on the PCA into low or high risk group
pc1	The First PCA scores based on either the reduced microbiome matrix or the full matrix
KMplot	The Kaplan-Meier survival plot of the riskgroup
SurvBPlot	The distribution of the survival in the riskgroup
Riskpca	The plot of Risk scores vs first PCA

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR, princomp, SurvPlsClass

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
SPCA_fam_shan_w3 = SurvPcaClass(Survival = surv_fam_shan_w3$Survival,
                                Micro.mat = fam_shan_trim_w3,
                                Censor = surv_fam_shan_w3$Censor,
                                Reduce=TRUE,
                                Select=5,
                                Prognostic = prog_fam_shan_w3,
                                Plots = TRUE,
                                Mean = TRUE)

# Getting the survival regression output
SPCA_fam_shan_w3$SurvFit

# Getting the riskscores
SPCA_fam_shan_w3$Riskscores

# Getting the riskgroup
SPCA_fam_shan_w3$Riskgroup

# Obtaining the first principal component scores
SPCA_fam_shan_w3$pc1
```

SurvPlsClass *Survival PLS and Classification for microbiome data*

Description

The function performs partial least squares (PLS) and principal component regression on microbiome matrix and fit Cox proportional hazard model with covariates using the first PLS scores as covariates.

Usage

```
SurvPlsClass(
  Survival,
  Micro.mat,
  Censor,
  Reduce = TRUE,
  Select = 150,
  Prognostic = NULL,
  Plots = FALSE,
  Mean = TRUE,
  Quantile = 0.5
)
```

Arguments

Survival	A vector of survival time with length equals to number of subjects
Micro.mat	A large or small microbiome profile matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
Censor	A vector of censoring indicator
Reduce	A boolean parameter indicating if the microbiome profile matrix should be reduced, default is TRUE and larger microbiome profile matrix is reduced by supervised pca approach and first pca is extracted from the reduced matrix to be used in the classifier.
Select	Number of taxa (default is 5) to be selected from supervised PCA. This is valid only if the argument Reduce=TRUE
Prognostic	A dataframe containing possible prognostic(s) factor and/or treatment effect to be used in the model.
Plots	A boolean parameter indicating if the plots should be shown. Default is FALSE
Mean	The cut off value for the classifier, default is the mean cutoff
Quantile	If user want to use quantile as cutoff point. They need to specify Mean = FALSE and a quantile that they want to use. The default is the median cutoff

Details

This function reduces larger microbiome matrix to smaller version using supervised pca approach. The function performs the PLS on the reduced microbiome matrix and fit Cox proportional hazard model with first PLS scores as a covariate afterwards. And classifier is then built based on the first PLS scores multiplied by its estimated regression coefficient. Patients are classified using mean of the risk scores as default. However, user can choose any quantile. This function can handle single and multiple taxa. Prognostic factors can also be included to enhance classification.

Value

A object is returned with the following values

Survfit	The cox proportional regression result using the first PCA

Riskscores	A vector of risk scores which is equal to the number of patents.
Riskgroup	The classification of the subjects based on the PCA into low or high risk group
pc1	The First PCA scores based on either the reduced Metabolite matrix or the full matrix
KMplot	The Kaplan-Meier survival plot of the riskgroup
SurvBPlot	The distribution of the survival in the riskgroup
Riskpls	The plot of Risk scores vs first PLS

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

coxph, EstimateHR, plsr, SurvPcaClass

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Using the function
SPLS_fam_shan_w3 = SurvPlsClass(Survival = surv_fam_shan_w3$Survival,
                                Micro.mat = fam_shan_trim_w3,
                                Censor = surv_fam_shan_w3$Censor,
                                Reduce=TRUE,
                                Select=5,
                                Prognostic = prog_fam_shan_w3,
                                Plots = TRUE,
                                Mean = TRUE)

# Getting the survival regression output
SPLS_fam_shan_w3$SurvFit

# Getting the riskscores
SPLS_fam_shan_w3$Riskscores
```

```
# Getting the riskgroup
SPLS_fam_shan_w3$Riskgroup

# Obtaining the first principal component scores
SPLS_fam_shan_w3$pc1
```

`Top1Uni` *This function finds out the taxon has the smallest p-value, then calculate risk score of patients based on that taxon. Categorized subjects into high or low risk groups based on the mean of the risk score as a cutoff point Checking whether the two groups are significant difference in the probability to be survival.*

Description

This function finds out the taxon has the smallest p-value, then calculate risk score of patients based on that taxon. Categorized subjects into high or low risk groups based on the mean of the risk score as a cutoff point Checking whether the two groups are significant difference in the probability to be survival.

Usage

```
Top1Uni(Result, Micro.mat, Survival, Censor, Plots = FALSE)
```

Arguments

`Result`	A Result statistic of all taxon.
`Micro.mat`	A large or small microbiome matrix. A matrix with microbiome profiles where the number of rows should be equal to the number of taxa and number of columns should be equal to number of patients.
`Survival`	Survival A vector of survival time with length equals to number of subjects
`Censor`	A vector of censoring indicator
`Plots`	A boolean parameter indicating if plots should be shown. Default is FALSE. If TRUE, the first plot is plot of the observed Kaplan-Meier curves per group while the second is boxplot of the two groups.

Value

A list is returned with the following values

`name.top1`	Taxon having the smallest p-value in the univariate coxPH model
`sum.top1`	Result statistic of the taxon containing coefficient, exponential of coefficient, raw p.value using LRT, and p.value after using BH adjustment
`KMplot.top1`	Kaplan-Meier plot
`log.rank.top1`	Log-rank test

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy Top1Uni

Examples

```
# Prepare data
data(Week3_response)
Week3_response = data.frame(Week3_response)
surv_fam_shan_w3 = data.frame(cbind(as.numeric(Week3_response$T1Dweek),
as.numeric(Week3_response$T1D)))
colnames(surv_fam_shan_w3) = c("Survival", "Censor")
prog_fam_shan_w3 = data.frame(factor(Week3_response$Treatment_new))
colnames(prog_fam_shan_w3) = c("Treatment")
data(fam_shan_trim_w3)
names_fam_shan_trim_w3 =
c("Unknown", "Lachnospiraceae", "S24.7", "Lactobacillaceae", "Enterobacteriaceae", "Rikenellaceae")
fam_shan_trim_w3 = data.matrix(fam_shan_trim_w3[ ,2:82])
rownames(fam_shan_trim_w3) = names_fam_shan_trim_w3
# Obtain summary statistics for families
summary_fam_shan_w3 = CoxPHUni(Survival = surv_fam_shan_w3$Survival,
                               Censor = surv_fam_shan_w3$Censor,
                               Prognostic = prog_fam_shan_w3,
                               Micro.mat = fam_shan_trim_w3,
                               Method = "BH")

# Analysis of the taxon having smallest p-value (in the result of using CoxPHUni function)
top1_fam_shan_w3 = Top1Uni(Result = summary_fam_shan_w3,
                           Micro.mat = fam_shan_trim_w3,
                           Survival = surv_fam_shan_w3$Survival,
                           Censor = surv_fam_shan_w3$Censor,
                           Plots = TRUE)
```

Week3_otu *OTU table at week 3.*

Description

A dataset containing the count of OTUs.

Usage

```
data(Week3_otu)
```

Format

A data frame with 81 rows and 2724 variables, we only use 2720 first variables:

X226097bd7a1661a286a3b62d1c1f0e3a An OTU
X30907231438cda380cbac09516004cba An OTU
X45290f2590774f6d0e28f5e7a2b0c893 An OTU
X2b287d1a3efae7a71d338382047be8ab An OTU
e10910740b8641a3e2522a9f63253439 An OTU
d963b59f19db6517a9f26908f684545d An OTU
cb2baaee84e10e1ab02fa44b88e47b5b An OTU
c55c5f970b1e22a7579add20cf23a467 An OTU
d75501c3831fd9234ea596d191ad5c03 An OTU
X853bc0df4f511a52189a133d996cd9fb An OTU
X5eefe1c67a4852bd62c90dbcd2053008 An OTU
X9283e2f92443d7acf69111eef50468ae An OTU
X85dfa2113234831ec4bdf5d3da907de5 An OTU
X2b7d5d8734d57b16e48222b681fc1ae7 An OTU
a8232b9e5fc8ad81ceda57fce3f52622 An OTU
X4f10c5d3a3bc951c29d021c26d6c67d3 An OTU
X99d6b465e7396705233cda56b3ea7564 An OTU
X751a5410e17195c1bf70f08341fb6fd1 An OTU
X9016627fed4f065979235157c5d63569 An OTU
b6d04a7a2616f6f22ad1449ae54de849 An OTU
c103f98c401e3b314cf93017a779368c An OTU
e695cbb10adba5a1ca25f64fda10d632 An OTU
X21c47ce7835c803aede78d5bf66c8791 An OTU
f76da2288cca0579fadecbccdeb4261a An OTU
X96936aea37c92896ee7b425faaa44f30 An OTU
a96e26d91acd6f389a2da2e5a8d1efdc An OTU
X2c8a57fa519e7a8e80f833015d71e858 An OTU
X15f79c25b1792a6b20d3beec2a2c2662 An OTU
X80602033de6305407d958a99682c1453 An OTU
bdf843c35f8cd73c22c72675e9f93bb7 An OTU
X17f016e3298748a0eb03b67eb9267a19 An OTU
b2e048ac958cc2b750587a5ee6e2b327 An OTU
X767fd5365616fbb59a0a5fb371bd0f17 An OTU
X733241048b15525ce4ad77330ac12571 An OTU
X228b79fb747266afbddc1801db868224 An OTU

X960cc8af637463a510307d044c251fc1 An OTU
X2b7b5b3f7fc005ae8c623d6d61947eca An OTU
f636513c12e936190cdf634af3db0949 An OTU
X6a0f79733f56aa0089569a95136bf180 An OTU
X40394bfe4a2f991e0651e5a311f3ee24 An OTU
X66c44baa73385bb6e2a2fb583dc5f30b An OTU
X3f31120e85434d3168b879b2155dca2a An OTU
X2084437ee2c4f463e8142140a3b3b6ae An OTU
X88ab9af7bd6d8a09c14a812cb2082a79 An OTU
cf0bc98d1fce7674ae2be6bc15c5f31f An OTU
e5e5ae44d094bd526a63079e658e8642 An OTU
b61cbccae82bfeb94bc752b6c1efe1ba An OTU
X1236850e8f52619d1a57f966f1f15c44 An OTU
X2092cc518e136fe01873b6753ce64e3c An OTU
d11f4ac3ce27ba5630093dce2cb82572 An OTU
a653d2e8c495970f57c1fc1d8d5a3eb8 An OTU
X314fb240e13c209f087078a499b6a599 An OTU
e176441fb5064973ee3a5222838d750b An OTU
X4116289f43cd2525beef757dd612dbb1 An OTU
X9669ab51cce354f64346f8ac1a6e5355 An OTU
X3ea5217b55bd97cd9bdc8b95a2455a95 An OTU
X789616182e504356699ff06d3e72c6e3 An OTU
a5f16692679327695f578a1acddc057b An OTU
b40746dad7d631fd5c9ba70de82e2572 An OTU
X0dfb156911e882a85d5c2d3188c04a99 An OTU
X3a7eecd8f98ecf1e867c46cef443a53b An OTU
X300388705eeaf70cdff4269252d2afc3 An OTU
X3e3551fdb1d0737d832da4e7f882e3ed An OTU
X003282dc088aaf9cc542141231b22493 An OTU
b586ba0e40e105e016f7a7616816fff5 An OTU
X13e52764e1c08c4fd9902769bf9e022e An OTU
ed731f07a20332ea13fc88a1752b45ed An OTU
X0e928dfcf41c729ab6c912a4848ef1f2 An OTU
X43418c2b35fe9a3f1961c3a87d645ea6 An OTU
f0d150e758d0b83ac132d605c30a60ce An OTU
e5bffb37f62dfdf445ef322606a670e2 An OTU
X837db9efa7c388ac65d7c49853d8335d An OTU

X9656a4150db54964e072f0d958d8dda4 An OTU
X4dd2a0af2c93678a2c272dbaabdc4f0b An OTU
X2be73fff463e798921f0bf5e2fb3f615 An OTU
f7f74da4ecaa75b66dc11c8addf76eca An OTU
X8f7355277135b7c4968e95ec77ad4271 An OTU
d4044a262b10cef42e065d472e3b4a22 An OTU
X6ce98b1b979e9149228fb034961f0bf8 An OTU
X652c802f707157861cc2c154b9a10897 An OTU
X3bcd8b88929da3aeb3e1b22bc09f90c4 An OTU
cfbf80a837c7b87a736a40393d057817 An OTU
X6672e1b6c1cd1670b7497502bd45dac1 An OTU
X4c606c6bd029c4b086891f2af6f9d324 An OTU
X71d366a95177ced1c8adb3f21db0fd6e An OTU
X60d38a56c64b47899fa21068df22d7b2 An OTU
X5fe350f591d1f82ee5f2a0c8a8b9bca8 An OTU
e244e925f6bf2995d2beb4127ec14715 An OTU
a9a1920e1897221e52e344ed788d07df An OTU
X061f659d843606a68949ec8213e5d49b An OTU
X2eb740e16c42b166015d4db2d849c424 An OTU
d4a52d65b2e49ba1e90417a7a80ddcd9 An OTU
e373265bb547de5e6154400c40ed985d An OTU
f604eaf423fd1be0dac516c2627b5359 An OTU
f5b87f21345b27fae03e314619a16908 An OTU
e6ff13e9c8f2853d94bce897c97ebeaf An OTU
X24beb9000ec010ae3b9fa7ce3b0ba847 An OTU
ce032928ea07c2695a8ee2591b379b1c An OTU
X56806093f1e8cd1ddcacbfd93a7678d4 An OTU
X53cdd3bb135836001114532e68b29c93 An OTU
X7156c6cf01920e6f2825ed6b6b9bc46d An OTU
X961456b2721190d5251b9c0d168bb29c An OTU
X771e5dd74d0fe1e6ae5a38f720a92e50 An OTU
X539f049bd3eae43fe41be294bfa6b8b5 An OTU
X712f0eae857a41acdc1d9d7f9293443b An OTU
X947c41b884a84f94db71834935b84761 An OTU
X8ed5d1539276db9fe652f0543e96725f An OTU
X9f7ad8fe3521c13ff238664fd990ceaa An OTU
X4a78a0746a19e9ef9880fe57439fbaa1 An OTU

X416325e1c05d7417f2d280548b6b9b72 An OTU
ac3b781d52eacd79478a39274e4e6d21 An OTU
X4280149e57f3f9b0d1b190799f6c3a48 An OTU
X898aff209c40340b93f88193efc5d849 An OTU
e880fd44e2ff90c9d106e57c337745c4 An OTU
c4fce517571e2bb80437ffd05e6faab8 An OTU
X0b2ec754114dfcb1b8e85c47d0c7b898 An OTU
b70adab3f7628c88f4671819886e116d An OTU
cae2da4e292bc63db3f85b6febdab924 An OTU
X149333c6d2f4279dc8d41b1cbca0d80b An OTU
X736e753e82b880299283a531fcb7e273 An OTU
X62f44542e9a00710375475f25bff0d86 An OTU
X897ddb13b3360125c15ff11facb676d9 An OTU
af9bd339e74d03e3a08e6bf87b3b1c00 An OTU
a63fe8fdee37e01186364a092a13599b An OTU
X064168e52e0097e78244779b2530bacc An OTU
X088cf35f30ea7a5ba1af3ea2f8cabdff An OTU
b8131570ad29231979f46df3359899a0 An OTU
bf141ce59fb1d98ba2e9f51a97c603e8 An OTU
dda1bc25ef596a7da41f42b360bbd3ec An OTU
X81130df1bed6e198d82304f9995c455b An OTU
X5e5d92f0552cd0063de7a7bcdc3fcfaf An OTU
X4123329ee76cb8225d69eb57ea6a8529 An OTU
X3ca4457124930f775393c8ee12b96df7 An OTU
X65f87cb87ee9a589a3f2d8b13cdccd11 An OTU
d0a08a6ccc08f2e5fff18d2211c5109e An OTU
X2eeb940ed577dc833f4bbe049ee159a9 An OTU
ccd63a1df3f128611c9267dacf3a7562 An OTU
ac020243e7a04137a13d5854330d0241 An OTU
X8ba2d9b7e26550bcd387b3947d9458a4 An OTU
X7d8dc9e6576588672e3fa0459f93e8ce An OTU
e001359f08b50959eef4b14cc9b07e01 An OTU
X9cff01d4f1801dd3fff999f42053a819 An OTU
X807aefdb6f784476194146b342d3a299 An OTU
X9677010f7d64a2907fe7088970a9e268 An OTU
X54e3f8369dd2263b6ca12b9492fe419d An OTU
c90b5244f886925e433bf52f5850d043 An OTU

aa4e7d8d92540d2994e3910c18703b87 An OTU
X929ffcf33f4469db3f7fa7b750444799 An OTU
c910e3344563f183354b3669fbe15c10 An OTU
X0ea968e8470c11541f72dfcede4c8d8f An OTU
a14fb58e8df8f8e8c9af10c59595f93a An OTU
f1a19f355668a8aab3c8152791b1cffc An OTU
X44e946a30c5ef2f7ec84ada89e573d7c An OTU
X854b02ca6022cde33e29a78a58483d78 An OTU
X218d58bd42c5767368bb9b23ecf7e032 An OTU
X8fdff9055dfa258707388335227e6c53 An OTU
X5e74963289b7cd494d2a7a8e2741b310 An OTU
ca0e4cbe4a6753021de7f2e677c03730 An OTU
X285977cd915c6724933df9135a2ee853 An OTU
X6daaab985c7de31a7dd638fcbc4e6d1b An OTU
d357b6e47248af689125119c1e487510 An OTU
X19440d090612bca6f0428463472b95bd An OTU
X5e0a32fd0403b5350ffe9ee97d42c6a6 An OTU
eea184777df33995fd531ab348693bfd An OTU
X0203f969920901394b0b659701c31957 An OTU
X81e1d95b5366af2cd6baad9ef185166b An OTU
X4bcf61a7c6e38ee3264ff7654b83cebb An OTU
fff53fd886764a148fc49612fcb35916 An OTU
X0aeb498b89f3c0464e4d2429eb97d7c1 An OTU
b51a3362aebc104b9892c1f13bc7f45d An OTU
f230221b4e9ba8d71556212a3ce19c7e An OTU
a8e363613c35286b8cc6303aa1b0dddf An OTU
dfb0b6016c97e2296b83bee082d99500 An OTU
X0d71c12227f08234d9185ff62fbae7cd An OTU
X27c3d68ac58be2eebd6b9064bfb8e0c7 An OTU
ebd206d30bc62ea5c3498da3d1113862 An OTU
X1a93c8561fbe223dcac5cb9f56d7b979 An OTU
f02ccb4b14c74c9d4e485d482bb8c61c An OTU
X70f3d24c8a1593fe01629b3c32bc865b An OTU
ec9c9da1ab48744fac997f89ba5b3a57 An OTU
X99d2a87b605975cc09a3a76246060920 An OTU
X86a4afc48ac2d43e898aea4d3900be78 An OTU
X24c51df570756f1f5da7d9980208ee7c An OTU

X1a503b8d15cda6614bc92e3700fa8e69 An OTU
fc68683fe31628fc2c4135eb23a1c852 An OTU
X7c324c9774c3c0884d1e7487b1427a49 An OTU
e64f6403d1bac7c20abae33417a4a4cd An OTU
X02a81c38c758a57c04c0d9373ddd4867 An OTU
X5d036464545a399d2f57cebb8aee599c An OTU
X7729aa38b32eb55fd7b00290a2cb910a An OTU
ac211f45f1c8a9ba079af24d51e3d248 An OTU
X2fab788a8c5b8406916b0416512c2394 An OTU
afa196b734f4eecc35fc487646d6adbf An OTU
X73e581aa79e8a1d0f5dc5c2e03dcea57 An OTU
bb6ce885e970ab67232d9c590642184a An OTU
X39fc6d20f0a4291ba324dedbee9868ad An OTU
X57874f7d33e77f29670952b1cec0b232 An OTU
X4820daf62855c8abd0bdefb9913e3015 An OTU
cea9942f93bfcaf3fd2c18d98259732b An OTU
cb34e1fa766890be7c34cc7d2dc08b1b An OTU
af1ee8b992de0516463b4364be9f24e2 An OTU
cd1ae47e1f9de6c0660b77cd9e0e22ab An OTU
X92c099f3482d20fcdf569983eed63e62 An OTU
X7e4795b23ae62046d864e9f1e28811da An OTU
de6d866323f8248bce40096babc28019 An OTU
c29240d7cccbbbac2bc7ba295f9b2bd5 An OTU
e35528f6aaa72ec05c0d6b5fe8897d8c An OTU
c932a6d2afbafa7d4ec4b966fe874e57 An OTU
X67ef0c6c1fb800803cd8a3bf5985488a An OTU
X4a8ce2a32add3b91a8990546ec5523fc An OTU
c1053bf38ff01f54f42b95980561ed6c An OTU
e17671baf9f4a84784c8f562df8d85c9 An OTU
X401e2eee39fcf5966f61be05f7df50e6 An OTU
X1be460be3b666ce964dda4722d84ad8e An OTU
X5b66f3fca59b461778bc9047f49f8f9b An OTU
e65c5e2e3780a2f24ea0f5901ffaa4c8 An OTU
X55d263941c18518b38080c592892c949 An OTU
e1d0794790521a5fa5fd22f9628cb981 An OTU
X8e9a3fd92024c67eca6787f6b6266593 An OTU
X824b224d9565eb2bd345c8fa598dfec6 An OTU

X8659f12bab87bc12c0b096be47238c98 An OTU
a184aae7050a60b457f33935c2707fa3 An OTU
X8e73f0e5b2261d9caf612c5ea9ade0c3 An OTU
bddee2e4bc248ebe2db8faf61587ace2 An OTU
X662cdd186b4dcb62a6fbe1d13b099887 An OTU
fefe4f9e984c4ec8c926e90fb3830388 An OTU
cab1f3ff63df5a854dcf58cf595623cc An OTU
X084959aa1f586bf2382b3eaa25631eab An OTU
X47234d61bbfab8867f9d390eb7f26dd1 An OTU
X98a00f91a393a9db8fe47d98a1fa8910 An OTU
X61b0fc1a40125b67d8eb4e2b3bb55033 An OTU
X9b9b4a9a674d7457dd8cd384200dacaf An OTU
a41b243847773bee562128a85a1c8d1f An OTU
be8b95457e0211cac08defa1e311b6f8 An OTU
X770d503e62a247c4eb67631e04f72500 An OTU
X163bac3b9296ee6d7985f866182a1d28 An OTU
a97b9c6965c462fef8abb8026c8469ad An OTU
X2f5ac7adc4f16fcbcb0a5c0f0ef6ca18 An OTU
X026ac7fd8279b1b99448929b4823e29e An OTU
e23e4f0b8fa765d71339a609c9949645 An OTU
X8c823713f7a77ce67cbf79858fbb58f5 An OTU
X63ebe7e5a082d46b9579a3e08fcdd0f4 An OTU
X743653ee83c99740a77683635c3037fe An OTU
X0098f1001e2269083cb80958987091ca An OTU
X7f26be96f4d5295ca038bb284ee22a23 An OTU
X587e5a487daff058b1f531372dc06d25 An OTU
X490fff288d8ab53d66031a6116de406e An OTU
X98b130d293e8f892f43eb8cd1cab1e71 An OTU
ac98106b035b8324b37b59302fd1ea8a An OTU
X4f8a48f1545d27e7eaeb70a11546c9f4 An OTU
ee6668c94ad92f6f63d4285603624db0 An OTU
fe44227fc4df02a265b744c2e090c222 An OTU
X34f6235027146eff6799e59bba00bbe5 An OTU
X8256026d0a95ae3b3717727b7a4630dc An OTU
X3dee2eabecfed0b29f0f6809dbfb4218 An OTU
d4ec7fad44f4bcef8373df99751e29b4 An OTU
b0821fab26e60ee6de583c9727ccb0f0 An OTU

X031214385f7dc917bfeefc2d64e90359 An OTU
eebf0292b58228185200af7805e298d2 An OTU
X429628aacbaf684b36db625b021978eb An OTU
e8fd5815dbcf298cdf9c59390195fa90 An OTU
c830504818b8c2d446df2a26e93b80c3 An OTU
db0ffd9e32c0e69fcf0180781512c508 An OTU
a82b21ad406b3c786a748deafb94ad1d An OTU
e2bebd0eb850939e3ab5c3627bc5f261 An OTU
b853b65b357cb62031c76bec19d71b1e An OTU
X45697db377663a5736f2a7efffdfbb62 An OTU
f06101e02544b173d92c9e7bab6540a9 An OTU
X08b39cf76131fdc5f8d1f1f6be0c2feb An OTU
e486752d5c306ad2f389200323684a48 An OTU
X2f7fdbe6d23d4e50f545e94987ffc102 An OTU
f76e07facaf8c4f86c0364fe5b3f1d76 An OTU
X799d7acd7de03a4e10f9bbc965850856 An OTU
X975ba31449a71d4288ba59c309a2615f An OTU
f7f14c67a1c50840a8ef794692062cb6 An OTU
X8480b5ac155d0d08663454ed159b040e An OTU
b7c7bf45ad9c008e4e9e023ce7c614ac An OTU
a7af4ed23f7238917cea90271e12294f An OTU
e7b1e43521cc51a6a9ddf5db2a8220e5 An OTU
d45e29d9587d400c97b1cf9904dc1bea An OTU
X93ce7133811806fe8687dd2945b4ecb2 An OTU
X3bc0d26f0f3b6649efea6baf46febf16 An OTU
X0ec2e0ccb96997982b7f8741fd743219 An OTU
fe061b4d7bf9b15021415e593d330c30 An OTU
X9b61cf0b02e2c2acf0e008b2136a8de3 An OTU
X047405cee7979691f8abd0794a452db5 An OTU
X842dd9bb631159645ac21c855d34d3f1 An OTU
X1cb09bc216e43e3538a040db8d8419dd An OTU
X9d7c729b1fed8ce40b0380a9466e094d An OTU
b767e958238245c01873a60fde9ac622 An OTU
be83dd17050e541ef49076b23d2c38e6 An OTU
X7044780b55e75992e1baa09eb8412297 An OTU
X5e1aab211195dace29ab9f4371a765b3 An OTU
a4ac217c75ab212de93e13c021eaeec2 An OTU

f58f132cce394378b76d430c71206ca3 An OTU
X9d8da14f20bf69d4450e9f0851873636 An OTU
X748aae587ef46c6803f04c11841b593c An OTU
X35822a75748958d662e631f01a78410c An OTU
X9fecaa6738931370d6abbb586b2f8572 An OTU
a223944dd31c0a5968018fd684a73c25 An OTU
f60814c557f86851d640853b79aa1364 An OTU
X49944ff53cbedf96aaa98bf53fbfec2f An OTU
X8624c1481db8bd076d0ee80b779d9aa2 An OTU
X6a3084bb5af74b149c67c8b399ba623a An OTU
c80a12499c43deae4b8b8a3ffe6e5767 An OTU
fd203e2f7d89f10e908a686f50ec9b37 An OTU
X51c1659c1498251c9711b2ef13878d83 An OTU
X8e06057371209aa51d66bf493840a414 An OTU
c035e8d7003caace6b79ace61b6ffa8b An OTU
afe06cb6d1ab516f5a16f807c2b5331d An OTU
f1806026ce4cc4ca29f629985cd54efc An OTU
f3f08c9da3b6a3818b28a7aed9e35d61 An OTU
b23fa24370f05653d2b42b8af43dafcb An OTU
X5cae8d12b563893dad757a068fef6acb An OTU
X44698614a29e2e336d3d1dffb32cdee9 An OTU
X746cfd61ce88055aa0b12bb94834ff9e An OTU
f5db17dce08a55088ceecbd2ac34df49 An OTU
X334c2740f01aaf823b86d8097876525a An OTU
X603abafbd5fd3289bdd917e42350b7e9 An OTU
b48e57077b52507a46ca083a920c59a4 An OTU
ec24e43c814761402b8f7dac5876c93d An OTU
a23c270b00d19dc6fd62c6cf0a098351 An OTU
ca745f3dca5a97f00681cd65a52a7b44 An OTU
X06aab1f464dfb079209df8e126e7781f An OTU
X9bc69f492236a6e956953769464218a3 An OTU
e37dbc785bdc0e27c842ce37a17b5302 An OTU
be2be09304105b2fbb3bf5649cd3cfe1 An OTU
X6eeef1968e956efec20024741233a10c An OTU
fcfac5e293cfe4e600f6094b3f8c8e36 An OTU
dc75096c47c90b9b802cab1bf9c89966 An OTU
d3465fc7ba19dd7fc80856c48bdf930f An OTU

b7f0d7188f454cf40ee1d7a1e40eae4f An OTU
X728e2262b9c9e1bb7b3a6114fc9a1e2d An OTU
X3641a26581c67658b40a2a79c34c0a7b An OTU
X43f26f68a504f250e3a0819b6e7bc9d8 An OTU
X2ba93cf4976c1d60e0b8dd1f67798107 An OTU
X7116d65582418058d5a84741f433da02 An OTU
X90c6228ee0d0243c48810476bfa34316 An OTU
X15c3c05ac1666ec2d80920d90684a36b An OTU
c450db92b00c915bc5116dcbc58ec133 An OTU
X2f8fb9f33ead03470795e5ecb22f0e4c An OTU
b0515e7a75bf8a9089c3b30d04946be8 An OTU
X4ce31ad5678f8d1984c2fb93ae0b1c96 An OTU
X41742e464c162c16e09f978843333e8d An OTU
X8928f31803f95ef4376d337e7741b6fd An OTU
X687afd10d9f0b9ab007a3e396147ea52 An OTU
bd827f0a6c431d4294521326d61e1f6d An OTU
X901e0637248dcf6ae76651198b710914 An OTU
X1862a9defd66e3b403fe8f12cfb776b5 An OTU
cc4b7970a62b4f01cb148233c2fbd287 An OTU
c105dd10cc034de47bb10bd567501178 An OTU
X87567232ee82aec2ef9b3a4829303e45 An OTU
X9021050f9517b47ea7ddb169654f0f3e An OTU
X52aaa79de05ce7a2308a58495a26bef7 An OTU
X24377dcba110ea08f6a3a6140f93b439 An OTU
X9359e18b074964da9d93efb4a298253b An OTU
fd2a9303e201839ddc223b25b6df6bcd An OTU
cff6801c06e1e1c5e9179e77dbccaa58 An OTU
X624ee3bf76f1a2bef924dac8cad49340 An OTU
X14f91189a72da8551139f0a0e1f785b9 An OTU
d2266ce61b922de81d5ed2de5aaefd5f An OTU
bd30c727eac00b6bd8491c9e736462d6 An OTU
X914e15be1af684ca056a0964caeb6458 An OTU
X4b433d054320cbbc1c5d21bd3fa5445e An OTU
X7ff2bb8a5bd3fbdb64dd547f336c1feb An OTU
dd3d4fd4175f331d52749145db650b2c An OTU
c3b460c3c02579648e43a4d1d4d320cb An OTU
e3eee0487f3f76c14297851288e45ff8 An OTU

X6f27a5bec829c92d571bc02def534097 An OTU
X3eeb3272aa9d718383e9edf6440e553a An OTU
bf986ff31d149672c9cbc82c6acd02af An OTU
b50b4a0d5a70ffbdce3e6bc5beff041d An OTU
X86604bec9cc7d5816f1364ddac7ab2c8 An OTU
a8e20a148e2996cf12774169db588e29 An OTU
b01e6ede36c34924033246455bcf1592 An OTU
X7118081b082b6be0aaa6138631e3dd71 An OTU
X36f38760917e51438033a22f8cd54c35 An OTU
X175f8e1bdeb057fd246004d733540ebf An OTU
X674d2d35d14f9dfab2d54559d258f523 An OTU
f9204432e6e4aad6410e2641ae9ea28f An OTU
ef7508e7fae79ae36d4987e9107bde8a An OTU
X56f38e3ae97739911a391dcbc300af6e An OTU
a9addb3c2d480ea59f8645d078c3a8e1 An OTU
X86e2c0621f63f15e551833709c6f3238 An OTU
c544ed46d118037e56fb14b964ddb15b An OTU
c8bfdc7805371a45d6574ab22022dc0a An OTU
X03f1ec4ae90bad4ae8dbcb6291c02832 An OTU
a20f9b25af4452ed6e5aa4f2373ea833 An OTU
X68723ede0e5794499b532482d2eb9047 An OTU
X64106b2886c94bb9f1db4680ce341f3a An OTU
b51893b75c7da8a70be1421b37f69a0d An OTU
X05d8c498c599d3493f9c16c844f2ef02 An OTU
X1ddf2b46003013435b8c423da5e77bc0 An OTU
X11d6f810f3e7c03347262cae43cd7956 An OTU
d30e63df830ef086a4f1ef6c9cb2512d An OTU
X4ba29f1550cac30a383f20698ead1daf An OTU
d0cc23f256b6c16cf9c96b87e82951bd An OTU
cee20ce431b3431f579f9155b565b6c0 An OTU
X6bd1aed189655ce4c06d04e707bcbbb0 An OTU
efe6d368dc9bc431d6aaaf795ab9df54 An OTU
X5fe90094af48b9637280b427ac1c0d17 An OTU
X1707c9eddfe5b08d42e04af7a129e384 An OTU
eae8bbb4274d5f1a66364e4a2cbffd65 An OTU
X4323afb9dbd103f9c1442bc0c7de592d An OTU
X394698d13484744273652027aee128d7 An OTU

e06c06e46dd546425eea522b7eb09446 An OTU
X9988e454747b882f6c1b4b20a2a5be96 An OTU
X8ecf612156fdc986a91e589981e5acf0 An OTU
b413dbb59eb0cf2930b79bc31420024b An OTU
f92f6b3fb0535e726742d37311011afd An OTU
X7d11b504d106a41e7c7af9476c1dafd3 An OTU
b025be5205f6394cdd7db14984060d17 An OTU
eccd7820f3e00427b8e5e20683b29262 An OTU
X890eb9242a407d4bf47d324d8de14335 An OTU
c3c0a41aebbfb475c8c89db2548f9711 An OTU
X14c1e2d52c5d7ca67e6b444a2c59bc0d An OTU
X7128a4db2d9f860a600485d996f7e091 An OTU
f0da9a14d3442c013740ee4bfdc1e1df An OTU
X561e055b53a466c7ef7f13e57b4cefe7 An OTU
c39ab2bf2f77dbebcc2ed113130ff161 An OTU
X984cc2f6f48a2dfe6854f1cd36ec9897 An OTU
f5a8c2e9f65368fffb1386dd410b6047 An OTU
a3200c9b00cd8c83942161f64ec94e2a An OTU
X38e75b4cc3e47f9e2699c07ed59c3738 An OTU
ca854d377b6980e189ae7f97fc61a361 An OTU
X70666ccf3855175ef75b494ea0e6fb13 An OTU
X6f408d1e7d525d41d317b1a0a60377fd An OTU
X6695ee3d28ee727511ad4f532b821aea An OTU
X001991eaea11679ef2e2e20ce57f6abf An OTU
X48e109900f0e31d78cafbaf446c2bc69 An OTU
c2416e5aec50e51d822ec6792ea046c1 An OTU
X1ca94cfd0e6730ebe455554f584126f7 An OTU
X31cc9a6f8e235ce3897c9b7656ce6675 An OTU
X535aaf6ecde31b9aff6f19d3144a2a9a An OTU
X822a8d6026709d2a5aa1ac5ed9e78e06 An OTU
X771ac41245b9a0e829d168e4f2149a37 An OTU
X51896e5e832a4f0a0d37a5a31daecb9e An OTU
X4cae948831490ef7b755754d5490f659 An OTU
X65de5781270d973a02de5546cad1816d An OTU
X9a5c9d8fe5b0b494e110ed36f4f18663 An OTU
e8fbd2e3e351ac72eb268cf194244fa3 An OTU
a9017d12751f8036d67d931670e4644a An OTU

X414f2cb1689b519b2c67c291aef3bc37 An OTU
a10e56c3a2715646a0795a4197434647 An OTU
X93ebb420f88060919967678b2dbfb861 An OTU
fc2182adb8629b6de4da26cc502ceb49 An OTU
e9109aeada92ed81df7161a39de0cdac An OTU
X102ae6c20b397f3475831c7ae06d1bcc An OTU
X4b714d3ff1ef339969dfc233445a6f9b An OTU
X5193a09b278af4704714a9a480b56335 An OTU
X338a8807a7f8af71fe69e74771ac9370 An OTU
X7db2b803a5fc6e44b3175e868ece4d70 An OTU
e83f0bcc89a16b318a24f8b583dbae61 An OTU
X8c8c73943b884eb4da467b6b3ebf8a37 An OTU
X3c2703ab6b4bdd1df1d9c8b847d10499 An OTU
b9dfc352c90555f9af606fb804751593 An OTU
X633bd196487c5df7955b650f9b468607 An OTU
X3c829cec651dcaf3f6ed40eef3e94b63 An OTU
b079e16fd0191b2108b12fa7e053c4a2 An OTU
bd03da586e7f6d3b3aa5e43997331c87 An OTU
f5a01ed61ae00406cd1a1f13f459e122 An OTU
X39672527826daf80f42599a8cf2f8ec5 An OTU
X17ef95311cadd1312356f7558b49509d An OTU
b143ef597ecf013c08c38e4532f4fec1 An OTU
X469eae57bcf261e2470f02d53a2e2d23 An OTU
X125f62fe5e01782e69598a5eee06e1ff An OTU
X87c73190cb6713a91b5de17d3ff4c3d4 An OTU
X91b8c829d70f0b3634edd2b27502d8b9 An OTU
ecab0bc4f5dfe38433c3f14a918a8cc2 An OTU
X578ef231a61142480dcf905560601ef2 An OTU
X8e49e0b1f2a5ee6c035903ecfe082db8 An OTU
b185e5ad6bc4f33d14c0202e18210eaf An OTU
X321b7fbd428e4173758005194963cb1e An OTU
e441364e78738a502c84d83851b4d116 An OTU
c1b8287c24e782535ad8af8c18fa69a1 An OTU
X5e51f0b907125eb79cf09219ca4139e9 An OTU
X54b8ca1a634942ca0ef6b3fb42614036 An OTU
b32b0a74453f46e3768db9df81a03843 An OTU
de212ac23114a54c17880b4f9d7bdd14 An OTU

X09a334b9bb574200ce529e595401a4b7 An OTU
X8db4287cbbf0ef950f0e0635d2c7c6d7 An OTU
X4be4c7b344fb58f97cd45e97a3587d15 An OTU
X2b30b4b302d1237401abbdb85df5e50c An OTU
X6843c27a57bd50b0a45229b64bade573 An OTU
c4f31dde562e60146331e40c1c3a9580 An OTU
X3191ee49322b43f3c382aee9d033e86e An OTU
X8da2f7a05c9a77c5f6c3e709da70e220 An OTU
deac06e79afc266dc6e789862598af3b An OTU
X3b0088d85f1a88dff1c998741d843a8f An OTU
f8f678546750241eaaca6b3d43093f76 An OTU
cb4273b1e51dbaf638ff50817d5cb15c An OTU
X21a999c6bb85fd58864ffe2ab7af784f An OTU
X47d4112df94f2e7be7b910a3e392dba8 An OTU
X144f3fe579e3d828dfa76b2b582d0475 An OTU
a2dd296c1d04c02ba87bc103cbbfc2ff An OTU
dcbb07d4ac073077efbf065219ac3022 An OTU
X43da0517031cac80fc29c033d54ccbd4 An OTU
X97146475b5820ed3e3d6073a305a9dca An OTU
X984302acd98b0ca248a53f4e3b21c5b2 An OTU
X1d383a0ef959cb8a7706318f80084e88 An OTU
X60ebd75b7ec61a0495b7f7eadc3b079b An OTU
X8b7586cb6f29d67836899929554c04f5 An OTU
X55ec3a0485ebdeb3eff14150e3a2cd5f An OTU
X22e282eb3e2548cc9ff3ce259cf27eed An OTU
a132940d90383ef772c2336bec637fa4 An OTU
X424480e9686c5c5f0c1c5d7bb52edd74 An OTU
X020696fcd53902d3adb483066ffbc012 An OTU
bcaa663b6ba40455634757464f104af0 An OTU
X16f91014308cd4d41e9d67cf39195007 An OTU
X810707640995fe11d72877696ee249e7 An OTU
X1dc75a42a0d99e0c427445352c065f5c An OTU
X3143202ddb42472de140f42c3432065b An OTU
c48ac472563fb3e66ec7903d1e353739 An OTU
X821c9b673170476940ca8034162b1ade An OTU
X7ab5f910e39200137d2075cfd638d013 An OTU
X0c9187b39760a8ef5970df64a924bf9b An OTU

X9aa7ffe46e2c83d9302c0cc11aaac625 An OTU
d45f6582d04c7de1e94adb8c9dfb379d An OTU
X27ad6633cf9e4fe7c8ca9b88903f41bf An OTU
b974e5df3978175efba8dc408b98947d An OTU
X1359438d9a2920b337001c093cba1708 An OTU
cd1559be35b143a397d07d319ce1de2d An OTU
X11f1055b6ff0ed6e72e45c0fda586bd9 An OTU
X661c67ff10271b7e4f981a0c54d42af2 An OTU
X4e4cacfe38dc0bec509e03003cf6560b An OTU
X27abcd507506c98b08c62839d4ef979e An OTU
X1ab2af8f9e57736e28d167ff3a1e95e2 An OTU
X4433e6582152cc09a3944258ca14902c An OTU
X4d1dd1ab6d69c263ce76517dcdfaf4a9 An OTU
X041212830fe82d644b63fa5f1b68800d An OTU
b88bc2180249c3b634729492897ea0a9 An OTU
X8ef991f762c9722ae8fb027b9db3a6e2 An OTU
a7442db0ef06805cf634cd1007e98fe7 An OTU
X747f2349a5e05816a56c75007ae79e3e An OTU
X71d55344bce95fd02e13ad8a14da3c54 An OTU
a8d8fdc873126c1ad734d17c837ab412 An OTU
X44ca263fa6484b41b133f81786a62beb An OTU
eff51cc1bae7fe9be4c6b5b6a6c3f880 An OTU
bba6b8bcb6f3d33017c4362d3a05d9ea An OTU
ae948c1581bfcd2c55fdb8774ec02b46 An OTU
X30ec390cea42736f7ed1941e24da8426 An OTU
eab66f522337339ae5003ad3b02f625b An OTU
X177266798b77e9b440807dd172718450 An OTU
ef263589d65c75c91bebf2811f05014e An OTU
X9b8742b29f12744758311ce50fbdf47f An OTU
e3ee23ef109f6f50db2005f9081f90ef An OTU
X17037fab6cdb6c999776d7e1140f6815 An OTU
X7e4748afbb125bddb3043d89eb06cd0c An OTU
afa948719de108054c53424f996b0a60 An OTU
X4ff4f5fa30a1f520e24bd9919a38daf1 An OTU
X07f38f8f2bbdfe7754f736722ed759ef An OTU
X20b3dc923671f11aedcf1d6b02745551 An OTU
e06d8a74dc8bc834a54cd3e672b0f02b An OTU

cfab49739630c4494e3aadbb326d04d7 An OTU
X6999f5a013d87c792581efee62cca718 An OTU
X4fbee3bd95dc9f157d4ade161ad29ea6 An OTU
ac2f26c2a42d9b6c48d895b5f32c7162 An OTU
X818364c9ce626da1c914ef3c60af22b4 An OTU
ebd25e1c46ace8037cf3da9dc02c650f An OTU
X100c7f197bc920ba7149b91f3eb4651b An OTU
X766762fdd09548b26b04d075d3a6e637 An OTU
X62dcafa08b4a0af11790809d1ce6bbe2 An OTU
f57ea9a365be154429c5076cf5d43ea1 An OTU
X372b6a48fbb97caf2ac839bc90becef5 An OTU
cd7d3f85be4a7b82067dac64eba71e38 An OTU
bb21337373e89471629209e302724a4b An OTU
X0e17f5306080adc8e64d61699f14d6a6 An OTU
X6ea8094823e61d135f28a6c74f5fc52c An OTU
X1262fa47f9dfd2344b0e3a112100f912 An OTU
X78db8eba2fc7c6d9ccd124f44eab253b An OTU
X82cbe976bf528612c8235bb762efa39c An OTU
X2d06711d1cbb3dd9d82996618f24c5b1 An OTU
X8705f31bdca195e028e12a75eb594576 An OTU
X03197e0a300476fc4a9393bcca66fa7e An OTU
X2fa024900c15a559fd420ceb6de7d93c An OTU
X5a2f127b35756159c6067ad886b357be An OTU
X4528f873cd7ae7b3fed35c0c22b3ce20 An OTU
X427ebc73d2cddfb257afc311f09f9394 An OTU
X714bff2266c6dd3f1520894f56fb3c12 An OTU
X9c31d4d1a721dcdfdf1ccb759e680804 An OTU
f976060612d6bdcf6abfad0b377edfe1 An OTU
a9a9c24a9842db6655c72e0b6547efc1 An OTU
f3518b235ca28eaaa51b50809c39f239 An OTU
X5842fb35cb0a50b6b15a8b6d267e2ba7 An OTU
X0242e9db67c7b7776f27ab2c1bcd1459 An OTU
X9b11034417c15c342b457db728b61d7e An OTU
f497e7d88882ee06ff9ff58c7760abe5 An OTU
e5a13e06a11e18f07160e9aa4d6d710b An OTU
X9d128c078a36cbb2af7e3945dcc6a84a An OTU
d4069f7b9185c74f9b55b38bebb19f4a An OTU

X07b58afb139686cbdfb507f56cad38f3 An OTU
X00aa9811bcd4d1dcf54ac7a0c55e9125 An OTU
X84bbdea56958171b2f68f4e1e201292a An OTU
cb80b54178ea1877ec0929b98f72ec69 An OTU
c67350663bef06314b549f087f3dbb77 An OTU
X3d9333ecdb2bf7887051dc7611893bd9 An OTU
X59648169551be2dde1a60c28cb9e49b4 An OTU
c1ba93f0b38f6f88a79174f6a0679e90 An OTU
a27e26d672292c841bdb6dc92f993f65 An OTU
b80867c5dd1edf560a4722b2d631241c An OTU
X02f0f8430d693d0269e37da262fa91ab An OTU
X1d626459ba50415c9ce97feb38fcd3ad An OTU
e6dbb64cc51f4d630313d17b97a69afd An OTU
X54ea2bae0600e5c4e03c18224a17667b An OTU
X9f6e11282f37d8666d3c88ea3e158c27 An OTU
X3d8098e1068fc9161d3e7cf9732a40d5 An OTU
X9bdc7fa688745d305853d8ebd82ebd0e An OTU
X7e20169b1b65357c324c1d7edd88d8d4 An OTU
X7344f4bc82e011eeb0c6599f7bf1201b An OTU
X4a58966418e71cdcee9392dba105d761 An OTU
X78b7dddc3e14ce1006dc00ba32aa79fc An OTU
X0315cd8d6636585e136765ef3f4d68ad An OTU
X27c461d0c6fa91ac51354e5b935bddfb An OTU
X177fa80cb9db0e4cb164479509d3f915 An OTU
cd6bbf7fca4dbdb73fd29ec55fb741ef An OTU
X99d8957a8613d5880d45b5154108ba71 An OTU
a5b039c6584d5dc9b9e67da95f526ef5 An OTU
X33f851141bb49eda64bc40c8d1157371 An OTU
X5a794d7960ae2ae7b1618b84860115e0 An OTU
X4265543e7ca9317e85b2cb238c7869ee An OTU
dd53bad490635d96f0cb42f4b6ede34e An OTU
X757afd9445bcf3de5a88039cb9369b2a An OTU
X6d76e4c64d5d4a69d1eb7ff81eafe6c0 An OTU
X73e57fc0e4d30d4ef4878d9730f734cb An OTU
X4f5906e818543f2033a592cd221fbb4b An OTU
X663666609241dd173df3c1f40f435965 An OTU
X3c97715eb85ba90450586ba3f3adf0fb An OTU

d6c13b97910d44b3f63eaae18984c3ae An OTU
afd99b9b2beadb00771b44a3eb34fdbc An OTU
e80a7dcbf631664e96db4db3bb52d2ac An OTU
X5e9c2f23c70be84f4ef4197004538cdd An OTU
X937aa8a875ac78ece285038d0524c4a9 An OTU
c12b2251e8bbc0f697f7f84d8365c8eb An OTU
X64878e118c3d70f362454ee1da720ce8 An OTU
abe029e18fc8b858853be5c9fe58abc7 An OTU
X3be426e56fb62ff1b11ef8ce00bd96e8 An OTU
X9a22fcaf2fae0ec7093522d751ed14ae An OTU
X78011135ad2219c654bafd921f6b6ec6 An OTU
ce37099d163f2509d25feb63af619b6a An OTU
X3f43cc235aec9178dd6b6fd80cf6bd44 An OTU
X17a3200e67f68c9e09ad0ee1005ecc5e An OTU
d32cbfb0119bdbaeb50990c3903dff49 An OTU
dfc45cb20ab8212b90fedc52382f5878 An OTU
e3b296fd7ecb33ba30e6c9fe4c4b93ba An OTU
X1670775667365283e8fdf5e38c605609 An OTU
bb79118c47413e226f0b1e34a5e27cea An OTU
e95f3aca590337f888d49f9a794042b6 An OTU
ff3a13a97b876f90fcd04c57da2b84ef An OTU
e96567bc4a22f3faee94d6ed86838f5d An OTU
c24ac1e3f7e1e61566b89e364b3531be An OTU
X83039cce1bca7a7c0eb3691e98dbe267 An OTU
X60d8e9c3819af16a1d7cdb4f25bfb654 An OTU
X32a0174bb2d68ba6c16999219ccc8843 An OTU
a80b6e250a6188d3753e3cc6dd6073fc An OTU
d50fa5fc739f5d8b6b271a229eb5be27 An OTU
b7b4e9967d61f55b8acf22c7e8541deb An OTU
ae830ebcf851b3d1e59668422658ebf2 An OTU
X67cefc79783fa12fd7bf9fbf4c4060f6 An OTU
d9711eb202673ad96f6deb82bf9f4ec3 An OTU
d3f7512ad096a5b79b34feaad79cb3ab An OTU
fd63cecd5bcce29c108fd98acd27dff4 An OTU
X72775ac91eec4871ba90291f712d5ed5 An OTU
X94f775072acc21d8a063629a85768d64 An OTU
X5f02d72fd9dc4b3d694140caa66e7611 An OTU

X2910c560710db4b5d8030e5effb0220f An OTU
X9877317d37487a8fff2051dfb8cd5d8e An OTU
X4cba486150b07248af974377c92be91f An OTU
bbc40f99cb13b3d78954394a1ae33af1 An OTU
fe56900011606fa655b3c81875505802 An OTU
X6c3478aab3e88a1e4ef169353f0dbc6a An OTU
bb87db5fb061699c87ef2715a40ee898 An OTU
b39fa215f3c8c7c75b2818ce4272721b An OTU
faae12034e4a1b8d48f4fdafd98a32a8 An OTU
f085a34dc04f14c9816f12845d2abff5 An OTU
e6d8ade4efbd5d47a6d2da96a9d77e65 An OTU
X84488e2f6c4561cb80bbb4ef987ec4a5 An OTU
a90ccc9d1cefb58cfc6513775c9ad1a0 An OTU
c970ac4fc75dca1e90fb20c2f865b04e An OTU
fc4769e9bbce26e42e9ef717cf4a4d48 An OTU
a162318b0b45848c48009326cca77be9 An OTU
X38b6a96e03ec65cf067877b841ba1675 An OTU
X2e60a2b63ef994fe9a9f8de5efe538c2 An OTU
X819c111aaae2dde58cf86db3c570e8ce An OTU
c73f026afaa4cfcd93699757a4544b18 An OTU
X046eb5df43f39d9cf7b2055eb14c41c5 An OTU
X44325cca76468695ee411c5e1b4e3fa8 An OTU
X6ad80c543709fe2bb6ce50f93f17c155 An OTU
e16502ed5f3e479caa7d69bec29ba2fb An OTU
X57c730f4ef66736bfdbd3e0e53533e0a An OTU
X0ceefaaa2d6d435647b72bd3e08a71df An OTU
e50c1af68f269e824165839ff33ecac3 An OTU
d655122e2adedde7e0c1540bda121beb An OTU
X59219e198dc658286639480c24fa5977 An OTU
X1747b66e0c5e0da9d87d9c6232c2da4f An OTU
X1111c3aac756f2dfb9e339f6a0c597dc An OTU
X446c66798967bfbce4a00ca96ec36401 An OTU
X901108409040f3bd324bf11e5bd5a0a1 An OTU
bfa04182497c5119e746a7d7c2d5c786 An OTU
f38f168678a5f98c4ae51e213256ed18 An OTU
d404a2856fdacf9b8e1418a4528478f7 An OTU
X67d4840e24bb6a9336daa65fcf6962e3 An OTU

X48ef29d42c31472cfb55623e2b323ead An OTU
X56479c40d26f26c5d5e7eb14498b90ab An OTU
eb8ea68222d9d84a72e3be781407f8e4 An OTU
X6a02e2e18aebeba59cfb364f4529dbe3 An OTU
X5bb3a12419960edcb206747aa15b427c An OTU
X93a796b76ffed4350adc2d9218be97f6 An OTU
X11e8a344ed471b8e76a386502cfcebeb An OTU
X75b2ba8a579f27a77d18d7cde20284eb An OTU
e3b0722cea397f25fb9af9c42d66451e An OTU
X77a2121ee67f9f23cbc8952e2277bb16 An OTU
X1cfeb763cb3db4a1053fa402507c3687 An OTU
ce91aa8c343414f4db91f652eb65e978 An OTU
f969a84b37793e984cad5eda37467202 An OTU
X306477b5535e2b2f44d75115c9204381 An OTU
db55d2368d79895a9f6968e6045ea6e5 An OTU
X3b8e408eb2754c099adfda1f9d77f361 An OTU
X40e63da7e86c656b19824c5e9c024f38 An OTU
cb2f5b5746b24460d27a951c720c0f69 An OTU
X32cd8494ac82b330b6412b7dcd739d3e An OTU
X171fb67b931bb70fc2d362daf0b72fee An OTU
e4330f6a6116cfa4344706f4b2f23d66 An OTU
c518f6c53c1467c7c926c0b670ce0df1 An OTU
b6c14c61acc23da7aeea3112d08ee010 An OTU
c4872f75a23abd1defc70509e06f6865 An OTU
f78409458d94ad79cb24899faddd5c76 An OTU
af24fa9005e6061f113d07acb2c41c73 An OTU
X76e01c2b60ca5d687f40188b4317b058 An OTU
c06d6a49f0bc54e7d7298ea85840766a An OTU
f11650c8b6202af5b21f83c61e2a5502 An OTU
b63015ade854e3788dc22e48aeb26a56 An OTU
afdbea7d94a37ee20f4cf27254633381 An OTU
X9f59d64e5cce3e49472cbb9514a663c8 An OTU
ad658abd798454ed5fabd4249f37307a An OTU
X4d86e0678785da3081e4b6f4fd3b9516 An OTU
X780bda985b3cc95e90e07b7640855c1f An OTU
X791ee828ec0f2608f5abdc8ab88a0d7e An OTU
X75ceccf62f1643749c8c4843e146c2b1 An OTU

X08b6fded6764ec4eb53cf7d136769534 An OTU
X855ea21a4571b5d7f6c876c16a8a9809 An OTU
X7740b633c2a17dbe940999b0c32cd4d4 An OTU
X85f1f8c1057464c991717241eb4d3de3 An OTU
f2251ff9fe085e3c4e0df6bd550e7c0c An OTU
X32a2ce2a3e258d04438eca317e6aad27 An OTU
X93e4f07e2920a24d489805d8ab15e192 An OTU
X3db7940fd3c86c554842c2a0c18c1472 An OTU
X9576a846b0c0dbffff0a325cab9262c9 An OTU
X96dc00b10aa92d3b4f421d8eeb6a6afd An OTU
X4edb6a8b9e2fa2b4a265822b53df5707 An OTU
X9d0e253614c81ee7f2bff5fa6dde9519 An OTU
X48cb339d669180a046ffe3c1eb5b2267 An OTU
eed61d7e7a435b7a0babed9a33910cb6 An OTU
X84576d790121099aed12fb730abd88a7 An OTU
X19f906bb68008c54ce8377c560bc3a33 An OTU
X98227232b95f8fe6697873d808e8f1ac An OTU
X32c0e4e99736193fa884acabfd5acdd3 An OTU
X88c867ec33f7741be5b39203d910b12d An OTU
X69e610056ab3a5d7fe9517c049e84156 An OTU
X54e5dfab8e4479ec57faff86b07245f0 An OTU
X7e497b0b70308a2b78641d4764a632c9 An OTU
X622beaa7966b62d874842bbe3b599f89 An OTU
ca2c9280e87571b44beab325f2767284 An OTU
f366845f82745e89f8c86420ba035a15 An OTU
X8eca924ce2655b9f1fc3e11530a48c2c An OTU
d919ce393fae6ec37b6ceac2954a007d An OTU
X709222b9eb1c4010002db4990ccdb106 An OTU
a8f7ed45809d3dc1c530f7ec7ac385ba An OTU
X98fdb37cf03da163148d78261b558ffa An OTU
e2b86e98618699502f6507eb266a70c6 An OTU
d71143cadedf5386f13221c70ad487ad An OTU
X892ab2b710b4152174700af33e46449c An OTU
X26cc2e6dd8680f7bc2b9913a200a25c9 An OTU
a7fa36c394b7bd0698476353552cdae8 An OTU
b0cdb2c6c892d404355ae9629fbd923b An OTU
d981f74500ce79d0ce7082e92a4035c7 An OTU

X8dd1cc8d259a523f63a1a691c44c6efd An OTU
X87b69fce7ed33f40f08257acd09beba9 An OTU
X3cbb023eb6260b51dc07721bac619f86 An OTU
X64892bbcdd7fb28beb16ec4eac54397d An OTU
X82f1c193f8605469f20cf46347a918bf An OTU
X7814e8162ab74d6e27a808363b515893 An OTU
e28916ae8ad9e0426a4ad71030e75bc8 An OTU
dbea4cdfdd043855cb82034d72ab839e An OTU
X908c397caa2005a4e2d999a6ef0ffb38 An OTU
X959e4f64be77ce53e0476a495d01834f An OTU
e416dd40fa17ddaba32eae69bb7f31b0 An OTU
X49ab1260e7215ffd2da917788e827c92 An OTU
X4c99ba16f4b96ba46930cfb606c5246e An OTU
X774a82515cb33f70f39f0a7b48d6a1e5 An OTU
acd5d7db8a1e1af5152d3dd21839f151 An OTU
X4b112c3a1c1b159a1ab74dd1992515af An OTU
cbf46908f2ba0e0dca368f0a4c211676 An OTU
X4a85caad82c56c1e22cb7bfe2b0b3b1d An OTU
X9dd5d5ac8d29d99ea509dc75f862148c An OTU
e393fa6c778caa32a7f99f686b4adc3b An OTU
fd3f38c776fdcb76e69e9a2c0a27d0cb An OTU
cf91035188049aecc8c72f88f75bbfa6 An OTU
e4f5d4c31dc096f7ad96c632548c8ee8 An OTU
X1b90b05e037cc7e487db68934f76b1ca An OTU
X8f553af23009225663b41d96535e983a An OTU
X7e7cf0131d581590b5993b8169f908c1 An OTU
X5fdc8b72d200bbf6254aad5455baf663 An OTU
X81cca8961043bab185c2cd1278661d6f An OTU
X68d24f3f3f0819ea357e73d550218ac5 An OTU
bf1d744c88ae1d3f4b57bf89bc6db77b An OTU
X7b62f2f666194476adc6bd5ee75ce6af An OTU
X625f6f0ffc62c55488dc41d1a13fa2ac An OTU
e4fa79443ca6f2b8fb79c56bfec6b12a An OTU
bf3633c07d2c3ab4a3eccb6a4eb052d9 An OTU
X38e265a9d21fe62f7220ae476822630a An OTU
X6f713672e41e26f5b2b077270f92d7f4 An OTU
X6d54d29d87fec389b9a6d33633c91481 An OTU

de11b1d7a848c838a851522e47dab8a9 An OTU
a020a5ee56b2a18a8eea5141b8c6ff02 An OTU
fa540a3fcdb0f473d9b3ab6e51982141 An OTU
X4a898005365119615 92f778cf78197d7 An OTU
X9b2166316a34f3ce02c78d3047b379de An OTU
ec6a0bff3fd0c81e2425c95af033b6f4 An OTU
X10c1a36e7182cd9b0c083097b4dabe88 An OTU
c983424ea2a1fa797c666d6da0be302b An OTU
X25c1cf1bf8717bde874614bff4db058b An OTU
X584961909f213ca5a58f55dcceab5e66 An OTU
f67cb0ab3e78d0a4297fafdec7895450 An OTU
X7f36a246b75bf432561bcfbf1aa7ca76 An OTU
f1b8a2bfd18ffc215ee80b7c328c0701 An OTU
X7eb30ea4bebdaf5e09ad54638d9c9c24 An OTU
X969887e586719c42f01841d96529c31c An OTU
cd73f6a7b0b272c049f0defdf328955c An OTU
a9e3c96a9415c39ffadda5fca920ad1f An OTU
c0b1ec8c7486703afc481f131ae79aa8 An OTU
X039ca597c40bb72dc3b0ea25c41a606e An OTU
d5e071a210e2c82aced557eec79feac4 An OTU
X80211bb291ec6218a9ea0adb77b91ed8 An OTU
d3af5761067e1c91188e887f239a53b7 An OTU
X49a3ad0d0094b5eb5dc0528dc69a6245 An OTU
X64b7fd01f9ccc6dcf9a8beefbd8078a9 An OTU
X4b54ca7238f26d9f9d98dc059bbf4ae1 An OTU
X69fbc1e168b7ec9eb612c33be9f398d0 An OTU
X6b23a17b18b06ffe80f527d35a073e7c An OTU
X1248c92f42b6aa5e762c55455651dd0e An OTU
b2193d7286bbacb3140573c15ee019d7 An OTU
X27c6b31be686bcbaff71823499c1610b An OTU
X1dda6910bf95123a6b20f0dbbd5a11fd An OTU
a0d120a8896cd2ac9f3db5548009aaa7 An OTU
X0667b1a15d100633599dbb01e9dbb54f An OTU
X5c2fb39ee9794f51e54b7253fb6fb57a An OTU
a9a99cfc1d86494000e2109e73c8fd84 An OTU
X786dc029bfb81e21730699279bf35719 An OTU
X837837ea314bb8fc79031707fd456dd9 An OTU

fa085a2c538bb4f3dc01fd508835d207 An OTU
X6f6f89cb4a5bc45a886aa8474109de53 An OTU
X17b318ab433bcd91d6ea9486988d2b78 An OTU
b6fbacf8058d7dc6075dc8535e170325 An OTU
X11915946b5c5354828c156c0385aa573 An OTU
X6f9ecd1cd09d1ad2caf5972d8906a4be An OTU
c16bc7dd76ad8f7d3644adfef52a7aeb An OTU
X0b11c588e7fa20725949d881db5fa63c An OTU
d39a2debabc1be76312d21f1ccc25574 An OTU
c68a4b9ae05579dd771bb1ba174521ad An OTU
X86aec277d7da6aaa671d651327888cdd An OTU
e16be6de6436803e3b84a5b5a648bb17 An OTU
b90cf553ae4bfc33715d61e40da820c4 An OTU
X72a779094bff76f74dc9b94bcb1065aa An OTU
c19d6177ce21227a61f389c2beef84c0 An OTU
b89e9d85959d8ddefa2ea68c59e275b5 An OTU
af5c71a6e2a23a907d24c8aec9f483e3 An OTU
e7d43d3d09f1785d89f327db50355305 An OTU
f49fe51e3b3784eae5a694f72db4c194 An OTU
X7dd07e7535285c2595a69538878226a6 An OTU
X01a63d3379635e941c8b0eef07136518 An OTU
X522f9ee146de80f56164f8674c37d758 An OTU
X62c703b91803c53f8668ff055695bdcf An OTU
X15f6863507cc0e975ce26582f76fd5df An OTU
a43ce6dd82ea8e8fcaff48e71316c5ad An OTU
X3c01ca7f1e4c5e686f38e78833d7780f An OTU
d8a418d6545d6bdf22f59d044a784e69 An OTU
X6dbd99563a5ed67618e0a171f9a8a87b An OTU
X20d49ed3bf5086467b743bc424e51686 An OTU
X9bd2d8df3568df456c798512cc4697bb An OTU
X7fadbd9462fe5e1df5f70c13119103db An OTU
X9572d9326268430e8816d32791a24b07 An OTU
X599e9b844f3d471b1a9339ae0f68b3d3 An OTU
X0d33e28f4c7c544bb8be8c0e6aca41a4 An OTU
X73aa37a9dc16834edb809f684fd59cdf An OTU
X52a29df9083ea673e0a1aa306e02a034 An OTU
X90e103998368dd88ea0d43558880e60d An OTU

X076b8959be336cbaf5716b82e9954440 An OTU
X5ce5fd28e4e11f1a1500ea33de61e0ff An OTU
X75cc20d7b9c5301e23eb92f3e6309585 An OTU
X8d496169e06d4ff85c337d95af9fcfdc An OTU
X6e5fbe2b90f9766807390c2863d8d9e9 An OTU
X51398e9dad5fce4dd2c577a8c6896f38 An OTU
X965b1c9d6d7d52e4d5c7ad64f58d63da An OTU
a65acb9daba377b8a547f105e0540c2b An OTU
X024ac9e8e2582fee0f792c77a7770d8e An OTU
a7d9c994f2d8177cab73da59317d7718 An OTU
d849a73a26c5cc4116194ecd5ec99128 An OTU
e5d4515bf3caf7245c71f3e1adab13e2 An OTU
a64893e53c54705ae152d0b3f41a19c0 An OTU
X5fecc5e2fd126666d02010e55c0b4f00 An OTU
X08a320ee465c066d7088e1c9f2f0e1e2 An OTU
X081a01a32a0ac328780d3562a8de1085 An OTU
X227e10a3f5ec147eb5585cb1b9ce462b An OTU
ad7891fab98fc6931d28fcc35256248e An OTU
X9af220cabcdaeb28a41e6ca88bdc7aec An OTU
X208aaa44ab0909a9ef8b3cbd432b67e6 An OTU
X7436a8924adf50e9f2e585730633b124 An OTU
X7f9e5c2f1afcb585098a73217387a041 An OTU
X829b3d40864dc58af126fc835b3af57a An OTU
a04a11b72b931e796ed97a673ee3b8f7 An OTU
X098bc04b008c447749194557af5dbd5a An OTU
X801a759b951725e76640d54b8181f643 An OTU
X4ba12fefb91f8219cc9e12f5790a5322 An OTU
X8636c0b964eb2e009b272d3f918ca9d0 An OTU
X022ba1c9319689ced8eb5291a9b0410a An OTU
d3f4f04507a95a2b62e234482d2bc129 An OTU
d86038214319c98ed9cbdbdfd8a7c6b1 An OTU
X68b64a173a511ca2bc4682a2e4582749 An OTU
X63dd3986b722a781191c5053e5b46443 An OTU
X399325c13d8f80dbc54fb35a30a80ef7 An OTU
X8e32b9964eb3ebe30c1e5c882696b0c6 An OTU
X0fd249cc2f3a8751979fd5d568fa4be3 An OTU
c27f7abd3abc4f5086d6019c9ef2e0d5 An OTU

X1a6d117cee0a60d9ece19d6bd6450973 An OTU
X8ed0b6f04b56cb466f24cb90a0ec94fd An OTU
X5bde187fd5ee18420a3ecea0af892f11 An OTU
X3f0334905fef33a9f6c961c4b2b78f3c An OTU
e21b14251c5f80f80b53526f56b99043 An OTU
f6797f57f6929a307ddfe44e52779247 An OTU
X55910270f6d8063c9855822f349320af An OTU
a5ba0866737d49ae3bca58ecd29c915f An OTU
ff879f5418ebe06779501b57b52cb944 An OTU
d3ad1d89be0ec080dee21dc5283fcbe9 An OTU
X18ae16b427936bb777a339ffd5e61cae An OTU
bd31e2fe0af5eeb7978ce3a57a2c4c40 An OTU
X9a4b1e1f5ff0a8ac53515148126a4c5d An OTU
X96d691e3b8aa0f48635775c0d190af78 An OTU
X08e5996d843b3203b06163edc542cdef An OTU
aa019bd414579ea0a1c3fa3f2c79c181 An OTU
e0549d52e6e8e2d6d7466a515b85492d An OTU
X0565b303816978de5e68f0994a5cab6d An OTU
X8eed4be1ba61fd8a39deeaa12e428525 An OTU
X0eff9b01e1ce29840fca8be279b2d6f6 An OTU
X2632f7553bede0d09b17ab5c96341ebc An OTU
X6ffed603109d2d169a33bdce03fa3c99 An OTU
X653c2825e035955016fcd0cc0aa4e3b5 An OTU
X49fa302e5104195f2542e814166d369d An OTU
a2f10386c444a35f98ed662aa17cd3da An OTU
eae0738ba858df2d22433de0913bc58c An OTU
X69d4eb11e07babbb05de8a5c8dac31fb An OTU
c2d41dc0a7b8eaedcf4697512aee4427 An OTU
d7ec23ebad7e4698083e474a5c27fa63 An OTU
X3017db2b707d240270c8118853a694ab An OTU
X27a8730105c30276c2f1ca8ba1ba9a61 An OTU
X5e68ac3644e04032b57a2f0473fa3037 An OTU
X3ad6ff4c64ef0252158cdd71c3cbc39d An OTU
df5f8e6f57731f52381392871de418d1 An OTU
addd981a28a17fc0a3b923aa0721c959 An OTU
X8622987ddfa6f1a7d9909f49018cb1f1 An OTU
d2c74cd566befe9fae18a34e90aa758a An OTU

X9f59e865f69a2ca93cbdda982e552569 An OTU
b2a61052fb2c0aa8e165a0e890d8d0eb An OTU
X5d837609c077c9e263ac0a6ce823cdf1 An OTU
X45bc25871a89a78a99f06dcab7cd4f5c An OTU
ac6acd3dfdac8c59f09d28b6a174fe88 An OTU
X8db50bb83e10b373dda3f1751bb16341 An OTU
X4bdd0f5cced923b99403ad52e919c732 An OTU
X452476421843831555547b63a111ff31 An OTU
X9730cc3d47181da5a79f43bd0592f4e6 An OTU
b58cf837b9db14a03300a69a420152b7 An OTU
X16c7cc0b0a00be092420e17b4ab2533c An OTU
X9bc0b5e10b8f7b9b3afa4d374f6f7500 An OTU
X8cbeee4c9a8ba9034e69df01872cc82a An OTU
bdc0c8cf7ceb9be895e82881adfb7ad2 An OTU
X0209d05b9fc1df7ba1ebe46212a2ce5a An OTU
X7c76c4592199ce1c62209e422b9207da An OTU
X47fb8ffc50d26f7f3a341fb0728594b6 An OTU
X140031c5f01bd6b43ad3197fe1eb5c98 An OTU
X3a971660ac01ac23c9796271ff4461fb An OTU
b167ad9fdf6c2158e6e90d7756049242 An OTU
X22a4e6b40286d3ed0a3a46a8cbe08d95 An OTU
X0bbf87852ed648b187c1335890284295 An OTU
X1c96c20a340b1e53ae41c3c96f016cdf An OTU
a27159eea2d8772718038dac5f8ca486 An OTU
c7d23ce34cf34581f76728edee1810e0 An OTU
X42bf0230501446f0ac41a1cfa733a019 An OTU
X3c1ea9842554ffd2b2da9885a8b72999 An OTU
e0c08294f18d3fe6a6bf471b5fc7c695 An OTU
X602b16201d2198ffec3acf40a0f62f28 An OTU
X8dd0420d11ab9084b0e6cde08dfa83a7 An OTU
e8754eb291b5a325c26b69261c063ad8 An OTU
ca344e0c09ed83afd9798f6e0febcc31 An OTU
cad64b04adc7c31c1837282822f51469 An OTU
X4868ee4205231936793c29f13cd8fe82 An OTU
fe4c45af45a1ced6777398479ca5025b An OTU
a8950ea716619e3682e2a34473e5adc7 An OTU
X65eb5f66ec11cb6fcb1bb3d469c9152b An OTU

X2471c5547851c1cf32dffe0b1a9755b3 An OTU
X8a82820cc1075421faf42ec4285f23b3 An OTU
X94b4d8567e54ea38d3e62d0c51542ff9 An OTU
X6e44ead3f2ba90c2d92aa0865aa62d2c An OTU
X32333ba154fa6c0ec9089b120cefd32a An OTU
X469374ea6b01861d3ac52cf23609dfdc An OTU
X98a1a70c544224df5b52510e39a0fabf An OTU
X8d29a4b0e2aa4632d98d3b302ea9ef31 An OTU
X402adb7dbed3d6812803e4872afeb794 An OTU
e1cf3c2355c776e353ff955e7d657463 An OTU
fa0a2d1ec3044a5c1a67b8dc286a58f3 An OTU
a55f3f9b0e4f47ba982aaf6b59b172e1 An OTU
X678f46c6792382e3f42d82acd705b678 An OTU
X159f4bd43719f4226ae35e9f3a257ba5 An OTU
X07d0062e63a21a31a692129f8fe16ac6 An OTU
a1bd3320fd5d8eebb25c87ea19cb0f4f An OTU
a96669d311fe04b1aa7359c674f4a854 An OTU
X36faca38e62a8e280ac588a2bd4c1eaf An OTU
X98234758c3ff7a6a9ea61162afa84ba4 An OTU
X05410d4440d9213b00d8d245742d5449 An OTU
X7cba9e83d232831d6c3826cf7d32cdc4 An OTU
X5c4c361695cb59f119cdf583d315aee9 An OTU
X11b6e085e506436abb45e998147d138a An OTU
X26f415ae1057685553cdaab56a496ef0 An OTU
X30dc7e7c7ccb548cd9cadbff7baa0e35 An OTU
X1eb32926d01a2310727bae5b447a9fd4 An OTU
X1d3c676d5555d4b2aa01154ec1d44206 An OTU
X45abfd208c33b91301bf868ddc2492c0 An OTU
a046007bb4a0ce2b32bb1c4dd6ee867b An OTU
f01167cfcdeab9665a07bcb664e714e9 An OTU
X5b110bff15d5501fd0e216117bc93393 An OTU
X6570e98f6d39bacffe712be49da85a72 An OTU
X7306fb0ee46de8b9d258a86c7143a670 An OTU
d8d889a018ba3bc3f9e109d45abf7d57 An OTU
X1de8a8bc685293bc92fccfd080dd1a64 An OTU
cfd150d0420410fcf782b1028e225539 An OTU
X42b2c8922e615af317c681084b97e119 An OTU

X620edd2956ede81b09704c3f3f5657fa An OTU
X4ab684e2c9d14049f0d3e89e53a87027 An OTU
X845b50c6597e2321953c2d661757c56a An OTU
X427f75edb9daf181b502228f599ec95f An OTU
a027233f3723427e572c7e088fba3582 An OTU
X50935370327b2c7621fb3bf842aff307 An OTU
f19f4001aed2b27296977db4c0313e25 An OTU
X07a3896620d1ba67233e06704a768fb2 An OTU
ee6d7c42c1ac71d6449153488e84905f An OTU
X52a44013a743c006ae6b79c1c4a7082e An OTU
X11014aa63c805e049f9a41486caebd72 An OTU
b2f71935b9de77abbd9d17f7f0e96cb2 An OTU
X4a8cbd4289458340c478f5d323fe155c An OTU
c5c368fa5d36912d8a01dbdf80cf9aea An OTU
X45673282739bae2ea95d0598ead55a55 An OTU
X3b20ca5ec488029489427f0d79d410a6 An OTU
X05131eda47202ff9fac2775b1cd653e8 An OTU
c867dafcb463143a2e0d618e71de363e An OTU
X8b7cd55d5449f3c0aa282f514ca5995b An OTU
X5e9ede61c135ee9fd679392e0d875585 An OTU
e2db0a9769f76c82420f9af99a2507f7 An OTU
X34f596506fec311944e2ffcd6c1dcaba An OTU
b1634dae47cf3c3cae033fb1bc5dc966 An OTU
X5bb62555c5017440b2dce60ab510cd12 An OTU
ae3ae4cd1ba0f60f3298fdb16c0acba4 An OTU
X62f3e14ad8ef78dc6d329c3b9a1df8d5 An OTU
c79bb71e3ab20f2a01f73133e17c1a80 An OTU
X3c2d2c81a136df6b70b223ebf634aeda An OTU
X4533ef1226a6eb5fccc756bbd6933d0d An OTU
ee14a1fd608ba5156b7b14bec81432cb An OTU
X13862f192552f2fad61e3c092e9876c1 An OTU
X93003d66be8076ffb8592b3d746c5e36 An OTU
ed8e1240eb554ecf417abfbb4dd0b542 An OTU
f37755fc97383fee86f6ed7a79a67e43 An OTU
X6ae320dbad330a17a55b7a07fdc1e2fb An OTU
X684d81a0e36795565a9bb1adf812a469 An OTU
X1f58973efd01649ffb49ba0c75277d1c An OTU

b924f3989d89a1c3bcfd1fce628840a5 An OTU
X4eb6ae4fa55666ca716c32af0881e3b8 An OTU
X149abfd325deefc6cca348e2271868ec An OTU
d9306b96e6cb2b2eda38978b54800e22 An OTU
aa197e5dd4e5546f3892c6bff3130b90 An OTU
ee75a1b4d13d57baaee3da9e5e87ff0c An OTU
X9e0cf2990d3c1b967f22b595403e1578 An OTU
d01f4ae01fbbf473f40263cbc7aca946 An OTU
X101c00a240afc542f187a9d53a9b76cc An OTU
e42b733682b1b9a43ea6c53425efbd4e An OTU
a55c76a00f38acb391d3ec56b134a7c4 An OTU
X512c38bb2b7b6b6da50ae532d4147618 An OTU
d3d16f870dfadf956370c3aba43e4098 An OTU
X4bccbdb96fb331b5bd8aec33cbb8a34e An OTU
b6f72229417dd8d1ad18e8f641b451e4 An OTU
X2f3eff2ddd6d3dde07c227659d063739 An OTU
a74055d47c89f9211f4cf680dfff73fb An OTU
e0b12a002f66a631d7db3322d42f4d6a An OTU
f2f02533a0d8a9b9101ef881bb7ac701 An OTU
a738c9a055f296196004e0aca36c6d8b An OTU
a7c4cfe7da4c4e9119e2a94130461eac An OTU
X449c7ce0de6d943882321da7c4d797cc An OTU
X8b8df003d1373d54d632249f9a446a30 An OTU
X5b95c8aee32012ea3c842e4fdbd4d137 An OTU
X83dfb42c05836dc221d1d65470e76534 An OTU
ca7528867af8b346b3d0f1584c82a71b An OTU
X17c53ad32e52716c30e309ddaa50eaf7 An OTU
cc627dec60d9ad853d5759a3669f4525 An OTU
X6c91b03edc155703d03eca97c5a2597b An OTU
X4062336e57d489e42ab58f8760bbf568 An OTU
X5fffd523bffc0267d71407398c9de374 An OTU
X78f1d5541d7593f50007dc4414c0212c An OTU
X687863d2f7f5e75e906be095d48fad5f An OTU
X2897f7c0c302e175164c6412f262d5b4 An OTU
a5bb957484459b57f83358235b7033e7 An OTU
X0f91d01b350a3d13871fd8c43c89264a An OTU
X710a1177e53fdeebbadb046144731234 An OTU

X8bda3773e7494186d3b5ff903871d5a5 An OTU
X8f49152e89280e6857f9087f142b62ff An OTU
X4e95330310b5c1c03b93e266efbd8485 An OTU
eb4fa5f4ae2e1a1302c1f0b25fceb96c An OTU
bb023fa57fd1964b6ebb7eb0fbd38213 An OTU
X284e5c12fdb03624f570ffa31b079120 An OTU
X2692b314a6957f064c07bb997d3be483 An OTU
X7bd4bc34bd08a30131f3099667101c1d An OTU
f06df35b407fa60615aa158c7e8dc8bc An OTU
X307ab489c240ad69541d6f7efbc55d5f An OTU
X01445ab5098c198dace056c2c84becf4 An OTU
X4f44782d2e9483b14e4b8b3edc66c612 An OTU
X8d413be978190e9b43e9608e29135d91 An OTU
e23903e5145e80c7a00ee956a1d66ef7 An OTU
ac93e4cf0b5f1396cd3dbd8d9af334fa An OTU
X96904d0cb61e292f4a004fd6d68a42bc An OTU
d36b885d9031a3850af4244df297a76e An OTU
fc9eb1f00856480534aa837ca362656e An OTU
f2b99a001673871809b58e7c9c61856a An OTU
X5aa60d3b3f0ce15d4097877f938bd5a8 An OTU
bd90f2088bf715476396f730eb05f991 An OTU
X7f8536f3f177b38a28d4a8f27a139864 An OTU
c9ba8a08f5c9edb9adbeb9997dddee90 An OTU
X7ad98dcbd5acc33fdc6333c025573769 An OTU
X57273e0d47cf3ed1c2679c0a9ce830dc An OTU
X4c995d3db33afbd45fe542f173979dc5 An OTU
X285d150b582f8dbe761d222a28db506e An OTU
e6e736770ba0182e08607e5032536759 An OTU
c764da1e61f465f755f13ec573720380 An OTU
X5f3216e3a6b303b1ea911e594096866b An OTU
X7729531465de13a88aec35c5ba57da6b An OTU
X35628f5d2a603897fd01467831f59057 An OTU
X882c8043617aa3844e1e1743c7e6bc81 An OTU
X8ba742f68eac37fe13c4b1904dbecfc1 An OTU
X611f22c4148835b3347e113a625e4b3f An OTU
af4873094a76eba58d33d1a162ec9135 An OTU
cf076b386220f4f42d799846f4f06fab An OTU

X9e2506f56aa4711df181c6a4753e9ce6 An OTU
ebdca0e907dad4d368004527dd95ddbb An OTU
X21762b238cd28471c5f2d79d24152ace An OTU
X1e7873f23ed1eee090abf3264fa97fdc An OTU
dd400cbb44950e5745d42062c1174eea An OTU
fda3f8be3cbb25ffb216c5cfb50c61ea An OTU
X5cf70ce47afa2a3b82feeb0054b079f8 An OTU
X1bfd479ebbf50451353399fd5eb183a9 An OTU
X1c5e0fa9bbb74d957ca8acd893978cef An OTU
fffe4ce3a6adbc2ed106b172e16379cf An OTU
f2a3a88e8e19de94bb33b39a6b1a4480 An OTU
X765937f3505346990a25d4d6b2a16a9f An OTU
X158efe14c7664067f7505fc303101186 An OTU
X659917b4f59c160ee502becdf6f20fce An OTU
X3b331720ec8c05a64bcbc0975acf511a An OTU
f2f37f1b3aaf4c5550c2c45dc8d5c197 An OTU
X5623a8884dbd72363b09eb05af7f61f5 An OTU
b5bb128a05472b26e6a8dc99028a1812 An OTU
X3579ebace3c49b8a810aba67a3ef4de9 An OTU
X878cc308f7004cc5abe4aa5f53d74284 An OTU
X9afea79d8bff63ab5766f154a005a350 An OTU
X522bd9efd6db63416a2b6c185818c244 An OTU
X96a1b65d0bed7d541682c95071975c58 An OTU
X83b0bde4963afa2035706cc3fac899e7 An OTU
c7fbd561062023ced0db0e8b8d9e2fb8 An OTU
X15bc2ba4f6aee903bee624882015521b An OTU
X6a3da1d1f915705126429e9abeb49e4b An OTU
f75c9c95d859604b092eb4905f9944b7 An OTU
b88d43d352c3129a3a229e93367df837 An OTU
X71a0b3f9cbf0ecb32640a3dc2ca60cf1 An OTU
X822c0ae8058e522c3f72db9a064b43fa An OTU
X177932b7e453bcfbf9202fb3d0d4f769 An OTU
cb9603c6db4034750ebaf21ad8416ac9 An OTU
ed62866c025c0679ec1c1b76e0f0e37a An OTU
f6ca11c000f8522fac792886a183c0da An OTU
a6df70c7cb43bbcffb1a63d2d66a1778 An OTU
d9265d1e972696045dd62fd91cea8c3d An OTU

X8f14cc14d4b2e760751e72b9504662a1 An OTU
X53435ceffb58bb6b2bf75b003398fd8d An OTU
X6ec997735af6c65ddcc886de5d35aef8 An OTU
X592b19b91910c7d13ead34e0a6e2c194 An OTU
X4f6d3d640a4f02f6f51f5357b9e2d812 An OTU
b50963276da84e8e5d5dfb0392e0e022 An OTU
X42ac8bbbb949f735dd0a56acff484a33 An OTU
X0961a354fac72e4a6dc9e4388a2c4255 An OTU
X52e3cb0935a827c84c1e61f13bbf45d5 An OTU
f3b178d47f09d2c2fc4e2d211747bfe8 An OTU
X7ab852abc7ba398afc26e41e9005ad45 An OTU
X2e9fc32c01c63b02ecb07d1eff996653 An OTU
d779a3b2fa3b175317dfe3591225354a An OTU
X25e66412d5d3929fdd2e88b4a4affff2 An OTU
X711184f525c4b04e87cba4c907ee73d9 An OTU
ef366129b50b5ea424db24e708a75ba3 An OTU
X11d0e59d1718ab8d3020827d05271572 An OTU
X0c443b081fb69d6f88d60364eac4d5d3 An OTU
X4993ff38b89d1174b9181637362d6953 An OTU
f93717934e7a9ebcda06f19a96e68198 An OTU
f221f8076616963818a94ba26d64e786 An OTU
X2e2d877ea8c08d1e6dfd5627d92bcebd An OTU
X0db5d53458bf68ab4f3ca669bff9b5f3 An OTU
e5c182a72ab6968853f3675e8c66677e An OTU
X663c77acb5417302790850802189efec An OTU
f9c46affb13111584d76ec1a5cf7808d An OTU
a5eb8fccbee4d2a74bdcd76a620ec022 An OTU
X45fb7a54746d7162371434aad6e33dc5 An OTU
X4edae113b038a07308110f3a5373f28d An OTU
X5292d2590a7746eaf425c5459bdc8712 An OTU
c7a3c75d90688e68200e663a0c81ddb6 An OTU
fbe30e0d303692fa2d82425edee48698 An OTU
X7b938afa7f402a14986706d5838aea10 An OTU
X5fcac78818038613697cac44728586f2 An OTU
X258dc9d1ba00f180e9611eac3379932e An OTU
X050be40748ba138bed5f68e86a1ee4b8 An OTU
eea1f73cd10064cc0fd952c08f744051 An OTU

c3c8173d7d89d03bd617ccd342e34658 An OTU
e2f8c8653c91c3c0f70419260356c073 An OTU
b4d87a1397168272049915b47f1d4250 An OTU
X0a9194770ab6df585329f46157d6da9f An OTU
af71bac0e2ea79741611fa7fd0472fb3 An OTU
be30ca59be5ec716edf3bb30d57f4c52 An OTU
X765b45d30efc61942b331c7c1894ab0c An OTU
X1c5953242d41775d9cba956998182cf3 An OTU
X96c5877f7b4fef0d30c952909b51543a An OTU
X9a584a90d465aa30df37e49573ef5e7f An OTU
e8dd282ce4b6d033b648f8d2d44c24db An OTU
X1daba54f31eff204f19918e130108c04 An OTU
c9a37732d9bcedc950ebcb20ef3c9ab6 An OTU
X41f01415fa3f60f330b74b2d873cbe68 An OTU
X4143eaecd281f3ae5e2af3ed07b897c4 An OTU
b29c649894abae06ead5b4b5997fc789 An OTU
X13c264d999fbc57f47c84f889b991b8c An OTU
X9b119c3c0fa910deca32fd7571866de7 An OTU
X17723bf553471de1966fdf9e90515467 An OTU
X411f369a1725655b42dc243f2d071ea1 An OTU
X21ae8ee3bdb8753881816ea6d50dc168 An OTU
X4b52f40578eb5176391be5751625ccd8 An OTU
X4020c811435b3cb702fdf7e04e8eca42 An OTU
c4f514328c37f2744b9134f76bd7d337 An OTU
X1275642660b8952aa4fc3d27e28b3092 An OTU
c189c0eef8090a70be2c930da9d1a68c An OTU
X7a788fd4ad85a44927663c33ca823af9 An OTU
X2767d4a7a901f282028a4285918789f1 An OTU
afebcdcb872070829998df126e1cdc85 An OTU
X0cfc6dc25d50f8a1c1c45fd89a66d3f4 An OTU
X2ffb1f44027d1186d2dbbf1462e8a5ae An OTU
X2be93cb6fdbb7cb2f7c4e7e5c48c91b1 An OTU
X415065579d71bba9a02667ab6791a272 An OTU
X2a0ddbffef225e7072fd4957b19a9e90 An OTU
X6f493123644cb71ab9880ad4e164bd05 An OTU
X5a5ba5c3b2c4d99052ea479a734bc934 An OTU
a2e521c0c4cf25a6cb3408fad8a4198b An OTU

d51c3a4f0e71f8a68e929f8566e7b6e1 An OTU
X2e382fd24dd4ad2a9848a8b1f2e52344 An OTU
X1debdc43e4f1524673ccf4b5d6de30ad An OTU
af940754025fd4c17fd2d973bb21ad1a An OTU
f95cc672ecb949d7301e424dbf4c59d3 An OTU
X659b2ff6ecde127b9c437864b7c8a9f5 An OTU
X7b46a3d2ffd5941d13ba4132509059fa An OTU
bf8d6f43faf6f4cf4adaee3643d37ab7 An OTU
X3c6004d404160d543df16b18994bcfd1 An OTU
d0b840a248534ce65e2937e4caa2af39 An OTU
X12d67f05d30007a9cf179267abce35c9 An OTU
f4f376bbf89bb5f5c656f54308cb4d45 An OTU
X61ed332f517752f13f15c328fee5c5d3 An OTU
a8556f75bfdaadf8ef317448965d4d7c An OTU
X81d5b8af463c9c67fdb0101a25a44046 An OTU
X3654ef379e1b313dcbcc4e0e7e48c3ee An OTU
f3082c1b4ec0c8c3911202c9cc235ea4 An OTU
X2a2cb8b3caf5bca6f201cee6a795c2a5 An OTU
c609555b4c1288abaf34c3d6c6fc69ba An OTU
X9c5e717430d1dd57e8fad8d086463805 An OTU
cae9456157ea8f321807fb620ebab259 An OTU
X0c0d7be5fb446c35af4c8908f08e8a42 An OTU
f084a458876259ba9452d382d1f2e172 An OTU
X7c5c099ae477c1e45683d943eba5df41 An OTU
ce29fe8dd673e9aafdc4a2a6887a6ed5 An OTU
e0c584704eef8f15458a4e08db215fac An OTU
X088eb09b6b8d6f1c98cd01ebea58c2e6 An OTU
X6307d963b71bce0f62fc6d9c560ee30a An OTU
X7c7bbe70b28f5cf27b67f603970725e2 An OTU
e25af967229506cdd118af13a3fa18ad An OTU
X04bb565690893e54ba147a858e9c57da An OTU
X030d0dfa992345e388f3e3f2b833a3af An OTU
X488cd2a4c45814c26fd730bbd26c320b An OTU
X5a6d985ea02b0b780e503c8f6599e6b7 An OTU
X8d490b2dec6cf6447a84e20089dddc79 An OTU
X1dfad3e87026bec25ad21b02370ba6ff An OTU
X40601bb335e898d24650af8d1221c7cc An OTU

X336b1bee751829fbd801833b2b2756c9 An OTU
cbd86ac3302db37258c537628f6a501f An OTU
f0d3ad42c3754a9af2c18ab6f102bb28 An OTU
f7e6ac4b7e459fc46da41075be1486d0 An OTU
X27d2cfa19722ac7195be245ab5a8700e An OTU
X1bd60b051136b8e719d9772f121b4a4f An OTU
X07bff612a919cb7ddb70c28265671e7e An OTU
X6fbf110b706fde58dbfc599c82441bcf An OTU
e513e73d3fea3067b53c79d48d9422bd An OTU
X00b4199ed841317e072aa975a5bbf602 An OTU
X07d2fa68a6e56569c4e2c352642efad3 An OTU
X8c68d6d9daf29663a22e3c86179ab9a0 An OTU
X5e0dde227ae392d39f2a56c020ed30c1 An OTU
X544d40245e7eec51c160bb3a26566049 An OTU
a57c20b781e5c505172759494af0888b An OTU
X36009a1a784a332284124f870270d589 An OTU
X7053132878bd07c7dac8ac3a3484919b An OTU
a5ce2056aae16f7a199621656603bfe1 An OTU
X8bd8a20601c0703a841ecd04fc98a423 An OTU
X99d327135746bef7062ca9186097c7b1 An OTU
dd93bc698bdb8d4a9caa83e404af4bb5 An OTU
X7c94e45a8ec3bc86748be7c67aaed428 An OTU
a60b52a6c65cdd80f0157c7fed9e6b42 An OTU
X588706b0ddbcf67a0b82af2c39ec6f41 An OTU
X77bd2db7428844831895e99fa808f258 An OTU
dcb35ab82e9d00117ba2539acc4d7ae2 An OTU
X67e7e35ebb179c13be86f64e1ad7ab07 An OTU
afe8bf0bb557de192a16773be10bc368 An OTU
X42e69e7f4d99ca9ce0c212f0d96233e8 An OTU
c6cacc4ba6c7234fefa80eb1897adf0a An OTU
X946ae3fe7ad380317d57ee6283a8bcb3 An OTU
X08be7ee7e2c933c064e9d7586f7c00aa An OTU
e3642debdfb5f9aeea92807531e4af42 An OTU
d5b625e2f6c4e1d0dc02237baeda0946 An OTU
e3fa90c670b3e7c3588c760c08c991b7 An OTU
b3c7b308dacecac806e12d68a525ded3 An OTU
X4936297b9dbb9e35091f03154d7a6812 An OTU

X1108901e83996a68e4758af26725b002 An OTU
X8978f88b79080486aec0a477c8f443b3 An OTU
X53cddc49fabbdf696366a78df2558656 An OTU
b72cb0e55b8f54de17874ae165854f26 An OTU
X80d06c7567f7252c4754c7f50415ef7d An OTU
X67472f850438a6aee75616cf98888027 An OTU
X3953976ab7481d4ade65542b929a0264 An OTU
X29c912c62f0f9e67ce029fda636dd4f9 An OTU
f1900a9f854949f9d73fc6201ac3dfb6 An OTU
X5a6289b8068d8b7722dafb10cc3d0b76 An OTU
X5c5b85daf7e1b56e4e0d8d6da1294893 An OTU
X5a511d747ecaf42b3bb2dc6682bfece3 An OTU
b57d203e00ddb432898b380e258d34c6 An OTU
X326f8ffd9445143be18d784baf4930b1 An OTU
ea052139a16a1ef0b7cdc98011d93b09 An OTU
e3def4aa99104ba6a21bb5aba2128d15 An OTU
X6948424bec9a4555dd906877105d732e An OTU
X87a497c3378e265e862190af9b4bc72f An OTU
X9645bc2f2320140d8b1192ebd779ebb5 An OTU
f955984606b9f3e07041824e6679fa6b An OTU
X009c0490f447bd0906ccd1112dfc0e41 An OTU
f94aef96aba749c08664723d1c2d9567 An OTU
X991ef268d4516d2caa7951239f072065 An OTU
fac6fdea489e35c065e4c9837b1e2143 An OTU
X6cd5c4f3ce9a412d8080e300b56991c4 An OTU
X74905f98f0ae4c6d5e5ce76cf1ac1f2e An OTU
eaf00f18164e3c4307167def1b16be03 An OTU
X4b8340adf7cc241f3b66ed191e5c0d6c An OTU
X524008b7dde30a14326f6ff991210b18 An OTU
X9a6270752372d8d5e0d6cdd11284ab89 An OTU
X4f1a1ff7e73ea253372d60fd6ddc5453 An OTU
X24a243c38014e2daa1fadd8c23ec578f An OTU
X7c40e219f3280548f7dab707abb97c6f An OTU
X273b2166874c7fb2a29c7685a202cd07 An OTU
X56000d16ead1c4ce2498ed0fded71468 An OTU
X888b71b006596db27ff1ec809a26ccd9 An OTU
ecc4a1e70215a95a08cd7744746df3a5 An OTU

X695ea2927110c54ad0cef59d8c21ac9e An OTU
X5a3b2c0eb77242c6e69bc853049c08a8 An OTU
fdc6df54450717ade47d61ac0775cf4f An OTU
X684bec00c8a3a76e05c5f8ac74c25dad An OTU
X24258fc3cf645edf9addfc36abac00a4 An OTU
a8ac7e3c1c1d86484dd56c1fe015abd4 An OTU
X24f4bbe975b8b4d646577570f923b182 An OTU
X6af10ea5c29e3cb23de0f460c78a2163 An OTU
X78dc28fa7efba149e50a0b886672b744 An OTU
X50e5099ef757a1e94c17700d577ee4c3 An OTU
ab1d62b9f65aa20a7ed086effeb3b1af An OTU
X5cffc4f803484d5d7d1c76ea6a0bf546 An OTU
X2d98692d68e9d9ee5061a9d73be01784 An OTU
X6b780e361cfc5f06def718518324bdcb An OTU
X8178240d6c79b498c48045a79a70ff86 An OTU
X4b591e4cd6d09697a756379251cb530c An OTU
X76eb6161ed6ab77b5e0edd5c80f91074 An OTU
X84c6142f909127bf6791b6a9bbbfc667 An OTU
X700f10680d0befda165341ba5eba362a An OTU
d173e3eb5ae43069f02e699f35d72238 An OTU
X4cd66da15ae97fd8bfed8c361806862e An OTU
X7600fe2fde3bdeba05b87199f8950ec1 An OTU
X370b5c0a328639369e399235bac477a5 An OTU
cd3939a464748ccfdec298f0d40e4559 An OTU
X906291cf0e69a402c3d45908877b95d8 An OTU
X2b11230c96914ae5295ff1578aca448b An OTU
X58fca053c4fdaa06d81606ddb7744302 An OTU
e9c5a8261acf27d564ef8229b08f83f3 An OTU
e8be3ae3348a61049d3be8a00a136da9 An OTU
X221dceb40c3fc51695fe9272c7b9e441 An OTU
X0c595041c360903268044ad36e05558c An OTU
e24ee91cf484ec5c5350b9704e5dcd2a An OTU
X014c5d760d7ea42963a7f33704b25c2c An OTU
X6e821a7c4f7dcb828c893fa547ab7101 An OTU
X7f61916981c29cf0e2fdfdaf02cb0b03 An OTU
e52589fa367aaead4635817ad6de24ec An OTU
X64b44ecf8d5b413da986fa8f3268c612 An OTU

d26ebc53fcb8af46205564976427c48f An OTU
X9f5a04a999df8cfac7a47200d7f01768 An OTU
X42920e29ceedebd361934ca6c9b8e5f5 An OTU
X6eb1e7dfb6623e74dc38202d40073652 An OTU
X88ec98acf9dbeabc30cb6acb1eb660c6 An OTU
X6962bcf167c433b8898109cec2b6fce1 An OTU
c83b53741ebbd168de03ec82c3bd0bb0 An OTU
X1e8b57ff6732a8fa5faf9a1a068ed3ce An OTU
c3df1302067f7d3891bfe7abc37d631c An OTU
c603c41211179d07626d63686f901656 An OTU
X115a195a25fe81bd6488ea34e2f7df4c An OTU
X28bc3f437fcff607adab01879f006f58 An OTU
e6c8bad6f09d8ee85d932d37c6181b05 An OTU
cea7de91478c33386974060a329a529c An OTU
X837cceac5c8436910085a933f505db51 An OTU
c07cea36a63941415649ed1cee64b6c5 An OTU
d93f915e03cd7abd7802f45e641cdb29 An OTU
X21b967d1d8b72e89b56e14a01ab7c124 An OTU
f174e0b8a3433ee1dd6ceb7e904a7a30 An OTU
X6367b76d7549c934fd3c44d41b32197e An OTU
X60d2e9b24ed15f5232c0d304fbe9cf98 An OTU
a2aa6eea008962f99902a7c7630af1e7 An OTU
c669721362bf3b680ca4e6b7fc0d6560 An OTU
X214b0c0e741f63a50c14e177f26b06f3 An OTU
e0ead0c415755aefcf8a3232aff15f73 An OTU
d6ee61191490e6fdf0a0250e4604e3bc An OTU
X225c214be44851578ee9fbe5f47a2c6f An OTU
dc38fd08f72cbaf769bf4976e1b2b492 An OTU
X2edef51e10e6c0407ce1d0b7c094c768 An OTU
X4bec907c5c52d95f0cdd7b27574551e6 An OTU
X3e3cafd4a91279d415f289cb042cb7be An OTU
cbd2e69752af33b075b18f68720b54ca An OTU
X2bf15d726ba26c22badcd0fefa4983f8 An OTU
X5eb3417ab564edc1f8954241c7ce7f5a An OTU
e8a298b93336ef301eb941cb5de4364a An OTU
X0ef44eaa38633505158a3dab1466cbf7 An OTU
X3c7b46492ed3022e056f11a8121e2622 An OTU

f0ddfa604ece8861fc50d8ea13b28819 An OTU
X92c08900f50d527df58f623ab21324c8 An OTU
c0b238663093b4daaa131ee94462683b An OTU
X0b2cfae607c37bc20fc4b724e80500c9 An OTU
df1ce85ab323b711ebe3aaee27b258ae An OTU
bf8a4fa88eaca0a763cc5f48e12f220d An OTU
e48315b0d7ae74fa1b5cd8bd998e084d An OTU
X38cc099fe8bdfd23698a0ebdd24e5c2b An OTU
X8a592bc2f58c5ec7a32da48d51fa11ad An OTU
X6c65456f667c815215a85cf83b50d2cb An OTU
X05f891ea42696c56c580de5ac73a7c8f An OTU
X664bc9d736d690de3f9814b709b6de86 An OTU
X0b9503de1e51ec5428f6d25acfbaf9b8 An OTU
fc97e85d516643e2e4afceb9184f307d An OTU
ecf73c2b032a8decf369b397af55c731 An OTU
aa472166c0979b5e16f5f9ae4cb1372d An OTU
X9fe936f55c7d1ce3a4c7387ba09d596a An OTU
a543ccf315c299997c60d450225f7906 An OTU
X70dce0674f6a001db5c98320040aa541 An OTU
b545cc3d37ab011cd7db18f0254f9edf An OTU
cacebda10719cb67864b21bb343a9d98 An OTU
b9b66c1c7b885d78a3b80354af38bd81 An OTU
d96791d5688ccb64e4936d64456313f6 An OTU
a546612ad2ef4cb75bae50ab6688169e An OTU
X8be8d3d7f62a470bf825ee907e852e0a An OTU
X386086a9f7aae8493b944303335cf179 An OTU
X191922ac14808694d8b610202c9fa6e9 An OTU
X033384d3017e07e13fbd04929ec4f50e An OTU
X70d129a7c53dc2b018439dbab2c3c2ae An OTU
b93b3fcbbe27766c308fc9a1163f06b8 An OTU
X06b3bb8ed7acbe37b0f360b260dacc6c An OTU
c942bd368b77a42e97b94447b558e275 An OTU
b84f6f2bcaf6d87a5eea66ca5dd3b9fb An OTU
X4ca504a78711ac0f30ea43c189741ad0 An OTU
X4f42027663b8c2bad9ef2cb9f3bd0c15 An OTU
X23bde50cc07eb360128571c652540d1d An OTU
X04a79736420e423d4cd6043253521d58 An OTU

X5d02450d6d135a42a76b9cebd8aeca1b An OTU
da4e8019b15ff215580dd710708d9e6c An OTU
d07b969106a90785efa6b1ea5ce3845b An OTU
X1aeab092b7afb5601be0d99de76930b6 An OTU
X0d5d50d0965127496c62e44512a1c53f An OTU
X18bf7196b211a3632023a8abce0bee0a An OTU
c64c524e157e37a840ae40e60d5f47d7 An OTU
X4ea954266247d7ccc4aefe3402216861 An OTU
X7aa6043582ff282614b0be6540f0b43d An OTU
X71790bd527451f2f2e0cc8b0d2247c61 An OTU
X09dbca088f051d4acfeba5d2576bd1fc An OTU
X0528f537c382781ad08f7c73cd605f88 An OTU
X63db6bb4e0702ce062c8844f66199c0e An OTU
X5e1edeb7fe85914a0fca00dd690a001b An OTU
c89e6fe2f701de9d420a34bd07d4e902 An OTU
X9890adaa3d76b84a8d3a1153819e72fe An OTU
X30707493990671052c0cbb5e0520309d An OTU
X7b7717e9831f8d590811dada05956310 An OTU
a5256e41e63464aaf8c2c44d65d223f0 An OTU
X32a88ce5e1cf54950c24c061c564233b An OTU
f90f7eae39f7677d971b3e3bf07cd93c An OTU
X1727b095c4f1ea6bba8a6b348d27ac92 An OTU
e539cfe7a9bd0a7de696f876451d5d26 An OTU
X9a711c13e1de2700273f8804ff5d53b9 An OTU
fb72d003ee79b8aa53863660614bac8a An OTU
a5eb479386684654f8234db727516ab7 An OTU
X259e12fa1a3b1302b0109e9ea64c2856 An OTU
c2d971d86ed29c9c4c71757f5e486c96 An OTU
X508ad793881f60d3fd2940c1a6d7aba4 An OTU
efe5fb4b93d78a5474f713fc8e064dd3 An OTU
X0f8384dcf85b5fcebda26c700d3cd951 An OTU
b828ed83b97996a0b5b4ff29d04ad362 An OTU
bf24c7072c5183bef94b6e5a1522c6fa An OTU
a44370bb4d6911302345714eddaf4c8e An OTU
e4113a641a8ea13c8b3ce2d1ece8bc7a An OTU
X89a275b13d53296729f9757d6301e758 An OTU
X8f7a7546f8cc74b46acb72a16cee4017 An OTU

b39dc12abaa429a11516a0fa884023c7 An OTU
X82a05ac3f7c0998b34ed8e38bf4539e8 An OTU
X2c2d3e24af4c98a18b5d7d810604827c An OTU
X04a75f1199d1bc6b58d19dd8aeb24520 An OTU
b4b5167ab2caf32b198e8cf6852e5595 An OTU
X739add851e0ee881627d20c7280ba81e An OTU
X0b594ce9c44ccbd87f9d324440fcc48f An OTU
b1711465594abb77d942f8b3033968e3 An OTU
X5bffafce04b621940042dd8ed4eff1e5 An OTU
X52de03b34ffed38920216b004f047a75 An OTU
X3397eff4588b0468fddb93ebac9db31c An OTU
f4d1bbd72fe716fadc6cfc578f61c9a9 An OTU
X718b0155861cc442fc1968c068fa58d3 An OTU
X78c1a7765d0809f9ac190ff80284e9d1 An OTU
X0ae844eaba7edeafb1ab21a210c1f97a An OTU
X356da47bb9a0b3208ca1de595b1f0a2f An OTU
X8c07036bfe95a6744fdfb9c50c1adc91 An OTU
c31722de8d4900b879993addcbebbb5a An OTU
cdda832a389aa62026d0871444e4e346 An OTU
ae92027db22dbe2b0acea9777c22eda3 An OTU
a576ccb9ce1d5ba59065ecaf9f0d98d0 An OTU
X7852e23119b5776cb1c336423a1b6b3b An OTU
a60d1fa2c940866447228afbfd2f6b26 An OTU
X8f700b51f88e4516ced7c753fbf6224b An OTU
X5864cf6d2ea5d5af7d37d77c3fff7095 An OTU
X2955fbdfa0391067b35c29b746a97c88 An OTU
X2a49d41b3a77c458bfe8a66ee499e3eb An OTU
c0eb7e39e2cc6d5dc6b3b05eb40c5737 An OTU
X855978a88f882100971ef7e9d0c756cd An OTU
X0dac0a45b50c3203da6cbbe47897de02 An OTU
X82468ba0306700f252957ee433175f3f An OTU
d1fed5555111418a35a422c27f0c1d4a An OTU
X165c9b43cb91070fc8ef688faae38586 An OTU
d4445fd581a695fad6e9cb89abcb9e56 An OTU
X34b32933f7ccf504f3d591952229610c An OTU
e355f6c75d287a024da0d6f924edcc44 An OTU
X444c7b7baa39bc6128e8d0bfa2d2436e An OTU

bd65f88a190e2cb0ec7ff4517f96d2bf An OTU
X1694c96c3549b697a57564457898e296 An OTU
X5accad0753035b3ba947447e1ac97b32 An OTU
c5c0f9d877c2875d6c473249b1091869 An OTU
X6b8c46f02cc8ed67a34d36803099e797 An OTU
X460ca7637203d1eb742a745771f60efc An OTU
fa1f5436cd26ac4723c7df58bc932486 An OTU
X5b9a6dbfc952e746732fc2d8d850487d An OTU
e37b94dcbf34c0c2fbc2d0da08b33edc An OTU
X61fe883ce30105268d5434f16b92e1cb An OTU
X2def8ebbed4c74f7417bfe7ed24d5ef6 An OTU
X05e5b08e1faba46438269d2a5909578a An OTU
e783488708509f26ddc8c0f8bc697020 An OTU
e2038cfe77c7a345cbee82ad137d45f2 An OTU
X88063b95478eb21189f84dbeeb12c4ce An OTU
e0dde3cd20c6d4ae9130150ed2222c13 An OTU
e02059f612328009b39b7ad0ca83b81b An OTU
X23dca444baf5cc36e6e41b110fe0b2f3 An OTU
X194e18a5ba11c42ec7d2d54ed9242ab0 An OTU
b9f7ac9946f43a854cb9fc386e126e71 An OTU
cd5d1d3420705be2a2cee5305236322e An OTU
d780edecd14c1e3fe41bd5b6dcda4ebd An OTU
a2a18fb831f3fe6d690cf3c26918034f An OTU
X30c3b9a0069212aa0010b38d04cfc90a An OTU
X43a60dcb46615aef3348bcc184856760 An OTU
fc73be2941dbca3f9fe0cfb1a0e80500 An OTU
X7b4a81d58716bb2330b95a2654f01360 An OTU
X6e7bfd8302488122ab735f8b1638aac3 An OTU
X8e004fb785401e8d9bc5a9ec014a8151 An OTU
ea8cbd0a64dc3047348843278f30c5d3 An OTU
X5cfb115fe183d9aa7151598401bb65bc An OTU
dcc00e6d8498da96a64f6bd41d033f3e An OTU
b4f99c59e822e47eb23e1d5529ebbdfa An OTU
X3127611a15782c1b2aeaa6833e11b183 An OTU
X8f133ef3b861a149c6ff1ba8601fe033 An OTU
f044dfe8b33862169e1f34f1a58fed41 An OTU
X9c9a17fa34797daa052d861d52d65b51 An OTU

X04fea3baafeada7167a2824595057c41 An OTU
X3ebb36173256d3515a632e3713d5b4fa An OTU
X9ec5343d87acd9f95acd78b13a6a7a15 An OTU
db01408269e8e793b5ad1681ed7cd156 An OTU
X91cdb5431458d16dec6b01ab37e0c7a3 An OTU
b47a3fe2ad6062051ed405d37b017316 An OTU
X6dcff71b1dc3de89544a22149e95176a An OTU
X37adb0004026708fe731cc190f6352de An OTU
X6a4e821b1e85964071034e0221b56bf9 An OTU
X8471cb34ba6c86452fc3a1762248412a An OTU
X28678fece3f35365c49d854acda6535d An OTU
d8e34506edfa6af6eb4b14d43d7afc54 An OTU
X2cbd6e01151621ae19f347f2b2e6fbed An OTU
X454aa1bcc28a1964b5c5fdef5f1ed77f An OTU
d6fc8a93dc0306dd14317673b1141f9f An OTU
X579208af46feea5112bfbdb11a15e600 An OTU
cf7fc0845d1124a18d8136f06283581b An OTU
X59e29af751f3fc9a466fb6fb8569b0d2 An OTU
X9b3a21626dcd600eb154b1e7ac3e29ff An OTU
X43331b833cbf9dd98539b21acb7db000 An OTU
d3c2e719446c4e424beb594e0bb59bc5 An OTU
X7fa92e462e129b0e5b59663f90acfa4f An OTU
X360f850e0666da638a48d60a2ee50825 An OTU
X9d71ef8bed32e9364e8ebfda87b1b5f3 An OTU
X5d237debebb9182a1d1f0291fa657dae An OTU
X9a6946e5da7d81952c86a6e4524be5a5 An OTU
X693d10622e13e49d5df16b9cfc61ad28 An OTU
X692a5d635b049f2c1ea96ad2af16b7af An OTU
X9e25d1fd097db02ff421becd6fea0dea An OTU
X55ba47f30bee6f3137284645293c9dda An OTU
X2673f63a20ed81729be455f835e21c7d An OTU
X0098eef1236c55a841d3ee9ca198a31b An OTU
c35bcffa6fd85f7fd1006d0e26bc2bb9 An OTU
X04ded369e0f047051ba8fd98c1b40fb0 An OTU
e4eb2be10157386ad4eadacb55596541 An OTU
X45bc4d703ef1f96d65d3ef274e0e5c6a An OTU
X1b29e5fc894be91666a7eb4d7a4fa9f2 An OTU

X06a92c101ae1ebdb6c22a992cff6579d An OTU
X29891d920a84d6363bbc13678193c13e An OTU
d897e821df898583baa7e832da459cfa An OTU
X09fedad436c73f3b0ec4343416d2b96a An OTU
X77ad84c3d43811be40a95432fd07223f An OTU
X32dce301d368229fa3cc086ca5b8a531 An OTU
X830fa17391939a14a0b57f3c2eaa5654 An OTU
X16279a445501561827705a7c0a780ee3 An OTU
e66c52710f0038e0b31bdd44038ed7b3 An OTU
X80efca5ca2684b026e592a0e1858fd0a An OTU
X9060faf8b14f0e9ec7a6f15a8318196f An OTU
X65f242aa12e23735229f7f6e7bd9044a An OTU
d6f143ec4f754489904413148f69ef6b An OTU
X427d5adae0edcbcf971184314dcd7029 An OTU
X1a1a7a5f0ee78237dd3cbd605b5063cf An OTU
X5c0b43a1ab1e62e3373713d9e7c53c3e An OTU
f3a4334211547f1a9c8094c529fc38c1 An OTU
X75f7ea62bf20d408b4d5b7d5eb5be90d An OTU
a41088fa5ee6f24230acc8e5d2acbbde An OTU
X66c42ff7a335e134894429f5eb9a6ed7 An OTU
X36221089831ab1f9525eb7bbe6c5edd4 An OTU
d8c93b6c1b94c7ce5b63297abb3645c3 An OTU
a060f81fa6bdb5e7327b77fc8acbf46d An OTU
X45054b4dc81dc122a1c762f9de3e8395 An OTU
X81dad46dd4de2a722fb9114817fff931 An OTU
f2cf8091ff9ca5ada32056c49ccb25e0 An OTU
ca37439049ec63b4c976457d478b688f An OTU
b633c40cdce6a361350b0d8338e9612c An OTU
X982229bd3ad240a8120a7c8d22b82b8d An OTU
X8d77aca8b99e5aa1af189c3e82f0599e An OTU
cc47d13382fe7f06f4e8753b72376aa9 An OTU
X6b927f02ee4bf89fc6d4baa46a5a3e5b An OTU
X2453367aacf13257faf3489aef391938 An OTU
b0bc1e2c61b1baed3229bf8437f3a6aa An OTU
X8d35b756634b4588349a78a0866b8b94 An OTU
c68727fd75b1537c2d4009808d43e323 An OTU
e4395c104ddb3a4f0d7740351ed0e84d An OTU

X9b116e288fa11edcd627b856a9349e5d An OTU
c60c8de122dcae6a2f46dcd627880dc8 An OTU
X2126e67c76df835defee93b9ccee3857 An OTU
X7850ad40fa1d8d7810ac3d2163c25756 An OTU
a55da83adba41844e47ac723f68bdabb An OTU
cf8b21ab877a04c683c7150d503cbdc6 An OTU
e2b4a3633f7bb862903d1afbd8f70d2e An OTU
d8e475d0f8113298435d3fe988390ccb An OTU
X499c26dbde4691c9dd12aa4400bce7be An OTU
c1d1f678c6124e6a56af92626dbd67a4 An OTU
X180f7080a26467f4287ef202237a077c An OTU
c5260614404220261264de55899a049e An OTU
X5ed5856ba44263106dd3789681eec780 An OTU
dc641a85e7c6b6f2fbf967522de3ead5 An OTU
a7112623dc041b3a70518d9462877c4f An OTU
X67396e92acfd5989cfd672b36dd6ecba An OTU
X85a00e41d5fea623818b99cffb1e8a71 An OTU
X1cd3b4fcbc9fac60e9ff82bc510ac9d0 An OTU
X0ee10d9534465c6b0093f796b2aaf5a4 An OTU
affeb72c556909c09e127e52e7075d8c An OTU
b10f9e742ac7abed431f99313a36f6a6 An OTU
a84d89531d7b8be14c8193ba398232c9 An OTU
X6ee8069e2fd2c432917cb437ee26cd81 An OTU
X5322886a2bc091233ff3b3265ea2fbfa An OTU
c9afe65363a088e23000de1679d98ca9 An OTU
b8987fba80f23af0cc51866873ecb386 An OTU
X8b628e5adeb670a667856f3da3f029c9 An OTU
X0f019d919f52c8500125befaf649affb An OTU
X385f853b1cb02a98b9d886f7dd5237e1 An OTU
f1dcf715f1afd58605bad7858e52654b An OTU
f9a77ee2c9b50a7d4fd4855718e0b4f2 An OTU
X17307cc3e2f28b23d839b0a5464f4c46 An OTU
X8b3c7f12533d4a42a1207507f89cbe78 An OTU
c38345cab94ecc6466b0176f865accb8 An OTU
X7a3da5b7373b2d290851827292ee6b4e An OTU
X7e033cde0c81890db3bb7a32dde0e6fe An OTU
X46f8853af5cce7f058617c6300a4edb5 An OTU

X26e673d5d7347144d0a69f5b17705691 An OTU
X4bf55de613a92dd896c0595335c2d0b2 An OTU
a9ccd5069bb4432cfc4c8b638d84265d An OTU
X9e62c5f21a3d3823b03f063b9322e8c9 An OTU
X5c198af7453aa0993f23a349525d7bd2 An OTU
X1be3a3951111e62b3bbd7e0dd52b6da0 An OTU
X5195df328a1ac23ea730af565fa45781 An OTU
X70919666681937ca046c7e73a1675052 An OTU
cdb90fda7490fcc0de1804c53f9c13c6 An OTU
X6c0a0cfa86598c9465e56574800dc79d An OTU
X646d7521f8be1c16b7c44478d97c2648 An OTU
bacd54a305a29f7dd4f42f069cdbff8c An OTU
X879f9c49d427337be10018e9ac34856c An OTU
f0d01b34f57b41db1aef3aecfdb3e61b An OTU
bf56b87bdd4f45531ba1d880bf5973e5 An OTU
X0164b7c8258eeffcf49bb137abe38a7e An OTU
X2deed443120a8c68c6fec5424309882a An OTU
X914b6bde6aae58d7d2e334c2ce96d716 An OTU
X197186d11f9da9af5548a00dd53d5020 An OTU
X306c8e51853a104e44d917f945f9bd67 An OTU
dd5652ce7ea1cee6c03deb3b631b4542 An OTU
X38024578d7517da306c25c5b4ffc4ef6 An OTU
X34aa9b17bb999c6c9102c4f103bcc363 An OTU
f134b1453f63ba290aac1001a1552dee An OTU
X6318941ff2953bd076e38558c9f4d131 An OTU
X0460cb999dca2691523673d0d92cacfe An OTU
X8e2e4a136a9c88493273398ce4b9ab28 An OTU
X8d811f2a7cc6fbde797d99e0a3959f66 An OTU
X95793f022b7774c9d759f68f1013114c An OTU
X5e8621218fc19b4531ac5bdd838775d1 An OTU
X7237b789f9415bdbc92dcf3012b8f308 An OTU
a44761b145aab3bc3348d397d84702fc An OTU
X139886a131dcd0af914a8e9b8750a847 An OTU
a0716b71d9a50ef9f349740850a00c98 An OTU
X42acb7b800a02f9debb1fa8a726bebd9 An OTU
X4a49a065ad35b333e1bcee378388e3bd An OTU
X49f80fb7e07f54f67c41b107b5d4f9e7 An OTU

X052ab6dd0fadcee704538661db3bd42c An OTU
X3756ab1e64ca0050a972de12160c7abc An OTU
X8c559a9c840b22b2eaa0b06a85a66244 An OTU
c35a1b8473680f7347558b9c044a1919 An OTU
X126b6d163ecd33a0f36504b81bde68c3 An OTU
da0a3beb62aac59e507e87ae2f865eb5 An OTU
ee342b0bf6610201cb0686165484d911 An OTU
e45f3b3d2a78751948b0d26008104dcb An OTU
X8d4825424163b1b4a62b259b2cc7c9b6 An OTU
cbe8695f546ebb64df861863ab592c69 An OTU
ff39472593e8e3c94605af65ef0c912d An OTU
X3d1db1694bbceca139b4dfe398b5b5ab An OTU
fa0dc30d56bdac2cd0c4c93bf589a3af An OTU
X5fb37276ae56bf04b5b13a0086cd34d2 An OTU
X0e6188d9c5abd7e38c8e9fd5cfb1b18d An OTU
aed3d53cb5e9079605e8a6e2c5491ea7 An OTU
abd008bffc4623b27305beb0e57d7f1d An OTU
X99c51f1424edec5dabd3a7c1109bdfdb An OTU
X2cf2593332af0496fabcec6a3aa91b14 An OTU
X122a5c76e32717bb759d87c59146ebb5 An OTU
X0e5658d041cb75626285dd4064046b00 An OTU
a50c6b89fa0d4726b773964b616e38c4 An OTU
X5dc1648412f0f7b18a6d394e9f838554 An OTU
X9b0999a9dcf2d64ad2d30d2da503c520 An OTU
X7ebc7983a48161236b67540d19396ca0 An OTU
X1c3837b95d478045e3881ea2233a0d1c An OTU
X695b38fc0cd247e0bd8955c9a1039920 An OTU
X4c1881ff5acb7c9f31175883859939cc An OTU
X8a2ff984f4cc1e725668394b38f905a4 An OTU
X4b5550c72ab0337dba46f857d0188a52 An OTU
f7dd314d07f0b7e4c3c09b43d30319a1 An OTU
X350d794911b6d2861884c02e354814a0 An OTU
da3d3685b42fd71a548b22619c3f791d An OTU
X2dc2c73ee7c0ca060a0b0adcc0a15d09 An OTU
X743ffed86a8ab0481f793783308604d9 An OTU
X6eb106cae291871e4e44a13bd3d03908 An OTU
X8b52ee63e03b8d84e360955a51ebdbc4 An OTU

X3b61ca559d62f6a9361cab41e95d7b5a An OTU
bacd152147294dec5e5e1de5cfb6cc53 An OTU
a4546f79ebf09835b8d436dbcee45a5d An OTU
df5de7ab5d0dd4d50f5f7cc7cfceb9db An OTU
X7be7b0bd7f4fa5dc9d48adc7b4a7d52e An OTU
X5d8cf64cc89c04c26cfcb50e5aabfeb2 An OTU
f021cd5a65706083872cd85fd0cad30a An OTU
X022f11d35e50a348056a6a4b396a3bf8 An OTU
a6906a25b69b13a2ef775ac4ae7a3730 An OTU
b76ccad2585c03fcf9cb3842ba5261c7 An OTU
X94af7d88c26ebec2db6320b0d46ee934 An OTU
X914145af89c61fcbcae2cd0c7a4b3b41 An OTU
ccc6d0ab6483b069d52bc030a445bf79 An OTU
X047b2147bc417ecb710b34a6ce353881 An OTU
c6f0970ac11f4d3b35ea34c69748bb79 An OTU
e541e1ce40f8e4f877bc5bde3cfde409 An OTU
fdcc45db0bd8706d1bf3468d9e1b1daa An OTU
X624ad27cc5892a3abd14bf091727abfe An OTU
X4b3160ea0bab9aa3fae08602a7f63df5 An OTU
X572ab97364a41d89216cad8aea97d4cd An OTU
X120ef8daafff895f2ae2e73b2c5a05cf An OTU
X46a5b556e592a60ccee59639003926ee An OTU
X5d75eaee557e4c12cedba70a89ba4641 An OTU
cf735a4dfd69f05335fb173642cd8cab An OTU
X1c854703a37c655fa0a1c45836525f16 An OTU
e27d6ec6ae05804a3be0eabbd877ab10 An OTU
X2dae34b3ad009ace13375460ff483779 An OTU
f6906294d905c54d459b09c5a8aa27f7 An OTU
X970b7148d5eca49abb5bf401ef5a9d12 An OTU
X685b99fce7c9e0259461c0ab7c697b22 An OTU
X78fedfe4b867f45e8195249e0bf04f29 An OTU
edbe269c0a3e44e26a18ce4512c3faf7 An OTU
c70f78515643169c3d22e72f1f385811 An OTU
X97e434379b833ceaa7fe155eee82a372 An OTU
X0495ee5a976b4e675a8f08bc17428218 An OTU
X4d728686954217dab770e832cf5aefb3 An OTU
e6b592548481362823669038 9a36d175 An OTU

X08d85759fad21c603f29b797fcbec08a An OTU
X752f3899c061d5b1f728278b65cb5faf An OTU
X9adda51aa51ac32ffaf6a76ce3bf0446 An OTU
d9fccd64ea897a18bb7afe5211a346c8 An OTU
d58efe27ef5ebd2314422bc567d3a0f9 An OTU
X29a9aad667398c46822290d2f9a4bed6 An OTU
ff8faf7f36ec079229f54705ae2f67ca An OTU
X4916d155abbf584942fcce2919a84952 An OTU
X711518485f631cc6e92802728a033788 An OTU
e5d1ec0688d57c73a314cedc874289ab An OTU
cb3c099c511d626190524b757778c92b An OTU
b1f510e750c860ab6ba50cdc478b8e2f An OTU
X6c990a0114d9cd0fb21a14cf77f40313 An OTU
ba8805bfc4cb53e83d5b1f1d62edce58 An OTU
X3f976a710837a20ab918e6aa037dd334 An OTU
X0a23d1ebf8e8629e348a6d35daaac14f An OTU
b578c696e3ada2f38e4be688981398d4 An OTU
X054222944fa9bb88afe88eb24739ba4f An OTU
X746d19f028877d35f6f60e509fe40349 An OTU
a47065b5d6a6be4e80985da4e188cbd8 An OTU
X03a76051d9c1585f5ea540b760f2dc36 An OTU
d48ee80127cba72961382cf80121bf0b An OTU
da8e46e8dad3ff33c45b32fba79d944b An OTU
eacda76e63ba0dc4a7436faf4afedaa9 An OTU
X2638acaa5c61b16b4ca1fd36eab18b50 An OTU
X604d367c0db10435714b6aeb2a2fc74b An OTU
X79586e35ca4c2b91f547068968da53f5 An OTU
X0c04f37ef00371f3b50e7eecc46be419 An OTU
X9427670267a1aa77fe2c94280ba8d397 An OTU
d502f5d91459deb14817064c3ea10d1a An OTU
X71890e1e9c9aea9c54dbfe4e0c269bf6 An OTU
X872b0c831f91aa7461379a955792bfa2 An OTU
X61f8a758e8c00e26f10fec09d772d32e An OTU
ad993e7240fddae772477d582b8013b6 An OTU
X89b0987178ff04e6bf78836baf978709 An OTU
X01ff53849643d183ee73e64ca1dc4fcd An OTU
cb772301bac5168f91af9ba02232a3a6 An OTU

ab47bf1a72c920af495b72f281c7db36 An OTU
e71441573987dc065081998a4947fec4 An OTU
X5e25e6329241c395103a85ac3ba5e335 An OTU
X74208c45c7f848a5971a15210e72714e An OTU
X2ac2dc534c6577ecd963a873aa8b5801 An OTU
ca210cd955df846b9c1f400c4bb150c5 An OTU
f8892c3269d2aa0862638a907e3eacf3 An OTU
X9076f3ee866e4447df921c0bbccd4b74 An OTU
a5cc4d13bc591f582bfeb75ef88cbe57 An OTU
X2f5169985b44d6c6ff7ce2faca5e61dc An OTU
X0cdc494e103e197fed70821cac23deed An OTU
bf14ae04b65409ba6cd0acbb3a339bd4 An OTU
X89cb667096a167bb7d6518192f1a40a2 An OTU
X323a90d3633412129c2a9ec29083d2cf An OTU
X13f6d1c733ca5654f9bcdb86c5a8c208 An OTU
X18d144e05d2c2f98b77a30674c7073c0 An OTU
X6370185b1d61cb5a4e86695572f98d01 An OTU
X36b49edf90f51af6a6b18451225a37ec An OTU
e35f81a65c67c94cf3a234f29df23548 An OTU
X33740759d3b0555287a8dddbd41d07de An OTU
c60b3b237064a8bb9ac7725093bf6d5c An OTU
a4fde8ba0e7beaf3595b739ef8f33d21 An OTU
X87395d7d82ceb2b8b19a3bb07d89125e An OTU
X5d6eb339c047b4f7f93eb82b34e025f5 An OTU
d1585015aae81c136d87efe837462b45 An OTU
X4afead6c5551d5514ce48ffc0985bfcc An OTU
X7c720868ca59f9e7b372aee62e8ca525 An OTU
f831ad3ec38f22a92d8bd20b407dbc1e An OTU
X1e1762a2fe8fd16aa75d841858138d78 An OTU
fd86f41d457a496d8b6ff8f276091e0a An OTU
e807d3990596c8da43c778bba56dbff2 An OTU
fb3776fbe0b3be104a6d5476cc55264d An OTU
X4f3622ba47b96d615b59edafafde3fdd An OTU
X3fadbe3a352b50c0d90c5735c10efc32 An OTU
X32d6c74d5dc1824876e29bdfa74d1ea8 An OTU
X04452c83340ecb71a3c1bea0251bbd75 An OTU
X48e237315dbd2df1f405e7b3f958642c An OTU

X44fc2bd3986a6167e95a8f2068bc81ec An OTU
bb10bfde3e8464d25f648aa7c5c35b02 An OTU
X4aa645da4f222902b44affa3548f51c1 An OTU
cfa930b826fd6eaf451c05845d17e3bf An OTU
X242e6a9379a0e9d11eb88d3f93f5b896 An OTU
b2e7c7b6f31534ebfb3bba5ffb10e3f8 An OTU
b3cca5edc045a2dca8728e33873e589f An OTU
X7b33ddf289ac7d4e054141eb249ffba9 An OTU
X739da00e85e476c4f89261a7fed20643 An OTU
X00221f3c2c9c38253e9c870382592c78 An OTU
d0bdae14b85a0fc3a416e6046fa6ccac An OTU
X6ae4218732ad162b6db78462ef6db315 An OTU
f31705b92463785533d89c55303117ff An OTU
X771dc5b5c9c1200e2eca09f93c6b504d An OTU
X3455a2ee43a84d6ec885fc3bdf69abfb An OTU
X6788f043e76f38e714133ce9e7e9ae5a An OTU
X9d64ad1cf3f9fdf592877dc436706d78 An OTU
X1d973a235f472003fe8fc7d2c89d3b56 An OTU
X12d74cf4397618486147c2db83d5823d An OTU
X940bd703330511595c2e5519c021ce36 An OTU
X61e00f826d3090cf2de337065a5f5492 An OTU
af5628d38bb82b74806d9ac95acb39d4 An OTU
X953e212c82e63ad729e8dc94555f4591 An OTU
e29711aa4f6fd56bf2214fbf722aaa79 An OTU
X1f882853e8c6d8dfb4aca37f2705b95a An OTU
X875912656f8aa4d319cb58dd7b155fd6 An OTU
X15cb726dca51e84e9aac181f1941c7c1 An OTU
X7991c0841b2308052bf063e2f17c4a92 An OTU
X20fbf9c30f9aa6e4276379330964d80b An OTU
X10c608fae2519b49110373edb1d1f924 An OTU
X2469139489d2a398e28f19191cb5a31c An OTU
X91406f16c4d97acfbc43072dd56b9fd9 An OTU
f90ad75004743e8470376778c7d52ff9 An OTU
c537dbade3c1ee38f02fbc97ee21fdf9 An OTU
a7319f67d512ee74ffef79458c31cd46 An OTU
X9e71ea50ed6df9a57f8af4ef5715afa7 An OTU
X732debfc0ea9cf538ad820233db83226 An OTU

X62bc54f906bad7ed17ee920ac48fcc7c An OTU
X4eb82c49dbcfd98bcd709a8109b42aa3 An OTU
X5fd525ffc913dafbee2b3e72c40157d3 An OTU
X61eb613076ac0318bf01ab04a351de63 An OTU
X59bbbfd73e87813a5dc6d7091caa28fd An OTU
cc2a6a9bd87811a2d8013c66bdf25028 An OTU
X60189b4a7e191e59bb6445d06d0f8c5b An OTU
X946f3b0b4bfba6ed39332c18a99757eb An OTU
X55bfb2bcd8927eb6606df96d2643c987 An OTU
X9f6714942d172bfc6ffda3a01bc9d837 An OTU
X044792e303d9eaf9265092428a4b6fa1 An OTU
X479c608d112661c4a5030944c33532fd An OTU
X3d894721d3795d403a072a4c2ad60e3b An OTU
c1eff21be4c71313e6ef94a98586f115 An OTU
X22103f5fba906087116fc964336a61b5 An OTU
X8d82dbae4a6c0826a1f56671452a942d An OTU
X5594da9691830aec15acc165b87ea2ae An OTU
b09686ae1711183b29fc18d8fed4d54d An OTU
ff780810e6fa06363f5767a07603f5c6 An OTU
X673131772d57255d86ba11c90bf5bae1 An OTU
ce2d6a999d15c1d2095d709e91821786 An OTU
X80b9c03bb98eb553d2f64615f6507444 An OTU
X492b9bc04fd49b01b974787c6f07903b An OTU
X90d939ebdfcadce8711bcc8e11c642c0 An OTU
X7c2b01400fc7df1fd5dae314f9d4e216 An OTU
f7e46fefd2dd2f8f8b8db7550f1e4b66 An OTU
X7061bd1ffc1ec3acac99f93893546c9f An OTU
X9bc10fe2c3bbbbce75a927925cfbd0bb An OTU
ab095112b23792d6fc08345aabfd0f75 An OTU
e24875ca0fe6681549fcc8da9e453ca0 An OTU
f6d7c7a6e899ce0085d4201ac63c5a9a An OTU
dc44aa7b9dedfcdeeea86aa045ee8f65 An OTU
d37c4ccbd270e2406e37b5304102d9de An OTU
f170928799c1d0a687ede47947f755cc An OTU
b9df4fe36ec4d1ea81bfb8361a65dcad An OTU
X45b990253e88a47eb45c3abebabdb7fc An OTU
X3e3678a909a58aac4d1b6cf1d75f9dcf An OTU

X37c6ea63b5eeea12268287dc0ab13368 An OTU
b63be3874dcbf9555332390568fd18df An OTU
X9056973683010de56c6d2f1118582a2f An OTU
ad0f0c92ae804a65fae48f92d78e5acd An OTU
b855acadfae8c1ad5e8dda294ad51db3 An OTU
X2a1c7501cc15f30dc117ce9cb567dfd6 An OTU
X7c607be6e11ca596eaced42565b85a9d An OTU
ab4529a9e6d67373a6c2489d5e60b1f8 An OTU
X915e0f9a5129d0cc74811f6d1224bda7 An OTU
b2e537a1eeea9e3c6c5317c9bfcc4cf1 An OTU
cc7be00a41379bf2c9527c053d57272a An OTU
X6a80991bba95bf8d5fe6d57fcda2dac9 An OTU
X7747231d2c971a531617b415bb973b1e An OTU
a2a4fdb739650bc22dc3a3083c41720a An OTU
bcccb7b7780261a2465392b86d524872 An OTU
X7876628b4615d0263413539c5d7c99d9 An OTU
X8dc4520cb0b6df47a8b7d0832a252cb0 An OTU
X3ea3436b887a17aced7707531ab82874 An OTU
X6e1ee4ac952c619b04c1871f5497b94f An OTU
dc2d0af17e09a5644c069e4ef69405be An OTU
X22bfe07da9adcc401838d2c33c77894a An OTU
df83aa0fa8968a42bc8e0856e4828d2e An OTU
X1f30de6bf4eb9ab20848e3b7530ae639 An OTU
ef8af36d9f7d679f05537e7b345b353d An OTU
f996ad2ed14db766574b064d81025a96 An OTU
f3f763551f110cc8fa00ea6388cd9c32 An OTU
X2f65631b5082f6550109d0111c8867e8 An OTU
X8a572a163221fb780a0ed3c347a7f960 An OTU
X75c0da4b3067a485248373306c7f6aa7 An OTU
f5358e9584805cd32e182e29c1531c81 An OTU
X91bea96817bfdb5380f68fe715b2eabb An OTU
X5dbc8e800877cf12a1b265b61b0afcf8 An OTU
X090408666a499ea5839d75cc4cbd1e02 An OTU
b0978d6e07019a79f3d6d9be170802c7 An OTU
X32db669cdf5162ce34242ff085c70370 An OTU
d63d19e8f59834c113ac320fbe1a34ff An OTU
X8be5d98f013c3fbc7999a794f8373c6e An OTU

X07c0c2b99dcd28beddc9d2c58f381202 An OTU
c098c6cfb432520ac76b08e93499a587 An OTU
e87c949057829492793d1153d63cd6c5 An OTU
b0e1558487377fa9e853f4d4aa88fc90 An OTU
dd47a875f3d045fa8a669392db03b29a An OTU
c84eacfc3071beabc1f2fc597619f968 An OTU
X2482c981d56bcc33f5b554921fcb58ba An OTU
X40ab3550097bbaf33475d82c48554bf8 An OTU
e031c83d0e0e162e87b8ca92c5954746 An OTU
X78a5b220c399011a5a72ce2755fc54ac An OTU
X6485cbaced0ceac09800f0eb32ca6706 An OTU
X61c2ae6c1ea8ff91b08ae219ca4480d1 An OTU
X8458e05f3a8397de598bdd0ee55b0351 An OTU
X851696f092645bd2d355d23ee1e81bad An OTU
X20c7915226d6814d16f6b9b587a726b8 An OTU
X7a0554723ef91e9e9d34f600d5f32174 An OTU
X954cef42cfa0c109704ff7e8c22defc7 An OTU
e5f06e90beb87977e2ba1b281736b1e7 An OTU
e59014d574f0910a4a4f8f7c0f788bc3 An OTU
fc845f4037a993eff341541b323e68d7 An OTU
d4adb0fb561f02f8e2de6c9ce51a2c60 An OTU
X893a9ca1e7e33773bb80ecd5a59e18b2 An OTU
X2d5db26fb916f96531623e8c1ab646aa An OTU
X0dc5e12ca236f832cb19c0216efec505 An OTU
X8c657bc37ee146de3197b0aaa1cd9a12 An OTU
aa300b36a5d3bf57f565ffb1edceaa68 An OTU
e054323b5bfdee554aa1e9caa9b8f123 An OTU
X90634ca7b0ac498c2d0a00a7640bf416 An OTU
X2692a65dde1922e63b4c413b7efd0757 An OTU
c0a7ffc4c97236915ca5b3441066d448 An OTU
ac56eaf7905410c3ad0200a74cf59026 An OTU
X3726213f2408093b5ed4c8b233f1efa5 An OTU
b4930ad86a3636c7f49742dbc1029426 An OTU
f6039ed13129e92c90cfbcc279328938 An OTU
a1e812315cc2995addecbe6a51bf7d9c An OTU
eb7176dbda53db07c5bcd55baebd6889 An OTU
X5454b34d3dddac03c2c4deebe74670ab An OTU

X5196d8865dba02ea0d5d0a94038611d7 An OTU
X071fcba63ae4c37549ad8adf260a6f59 An OTU
X31916b1caf6581ea6a7fd8f0640f3e10 An OTU
X1654a992949d567428f2c07230daa4d5 An OTU
b90195284dfdfeb3c091b159a86f32f2 An OTU
X9c1e4af03786652849b09875f6809ecb An OTU
X5d8d83dd2eefaa21382685dc23812bd0 An OTU
X889553cfd5c5dd13ca1f3de6be4ffa90 An OTU
X4903ed3b697eaded86357bdbdb7ca031 An OTU
X66161bd07d5296269caf61601f1c29bd An OTU
X8931c006203b2217e5801ceb77b58ea5 An OTU
X60e7d2946f202d960ab14e5ba4c1e6ae An OTU
f9841bbca3f0f09586af04f9c74bf55c An OTU
X1eefd5fade56f9e090d4d7023eeed285 An OTU
X8faeafe620778d9444ab9b46b028d32f An OTU
X9dae88a5c83442aa3020a29ef366a053 An OTU
X9d559fa2039e96f9db8b5362dd798b39 An OTU
b0442b5b62c8ddaa78572e52493ed2f4 An OTU
X5c676971808f0efb54f9136a889fdc19 An OTU
X849b912d78eaeb07ae3f4cf6338e12df An OTU
X7e8c14efeac0fa180194bb481c42a437 An OTU
c4aaacb0dfb37f8edbffe553093483a3 An OTU
bd3be4fe7da044a8df3c5277728838f8 An OTU
X71f9666dcefc94f1a49e246e4569f708 An OTU
X7356c63d131d5e973ca35ffb4746d441 An OTU
X151cd31ee6eb5ae7d1e62b84ab5b5869 An OTU
cc026bbf3539f0a35b2a6af5a10f4bcf An OTU
X9b58b90a6de8d702d3ac8c20db936af3 An OTU
badb25c77bf32046905e330bd1113d72 An OTU
X30017431f4f9744acfc76b66c2afe3c9 An OTU
X871fcc3c84b0af8daad8418bebe9534c An OTU
cadb2ef8fcaf4dd75e82813181472a29 An OTU
X288aec77a72087a768007a07d4029112 An OTU
X7b67c5a74bac335a33ae9af0956f3f7c An OTU
X5cd83c5713c80e75cb912d55a8ead844 An OTU
X844c5a38c178172866949de23cfb5767 An OTU
ac9d55f38b44a0175676704c1ac34d9c An OTU

X97b8a1fd5b64f0eb0d389739bda27284 An OTU
X404703933b3eec39814167f64768e28a An OTU
X48f8c549a5bc8888a040827a5e12e291 An OTU
X7941f60a4a55efcfc5266598d6999b33 An OTU
e5fc8e674ccc7c92c9ed48ba0cb4ac00 An OTU
X1bb91200e6930377c9c93150e1ebde2a An OTU
c097de103926df5150eba87ad800905a An OTU
fac72cfe64dfa2b46d87cca96ea3d2c9 An OTU
a3efca3e02d4ce408629b2ccf237b2bd An OTU
X3bc08d2574f4be4a0ce246960d0802d1 An OTU
X08d22b2dc7a67c8bc8c873c2b91a32a1 An OTU
f4adcb701a1d5e2dd8b919083632d3b3 An OTU
X199bc036586b1c23e6bf85d17153b141 An OTU
X65f13600a11cbd2495224f98ee0c5a50 An OTU
d90c9812e0799882ee560b59ef11cdeb An OTU
X9d82f03a8e5a05d2a1c1934971efc859 An OTU
X49c39bf6cf97a5aecd8edc0b67edd37f An OTU
b86b826f60de4195e67c34611f2b2dc2 An OTU
X470d586445e144f28995ec80be2b72da An OTU
aea7cc7e04322780fe6e01afc1096014 An OTU
c11985a6bcc2ae63e71922494f360321 An OTU
c683b4419446fd558b0e7891d6c1dbf8 An OTU
X93f8f42a5dc282e20d8841181601ec4d An OTU
d57905448f06b6633d8cad4c243a27e8 An OTU
X4f1d71f46b560956635734e46f609192 An OTU
X9ca8f231c86ffb4583eb19f204605933 An OTU
e41bc5267c369caf5cea8a5d7f1776eb An OTU
X813f91b42a394821027a96b1416dd6fc An OTU
X286a76584ad683aa4161f250a7ddf95e An OTU
X1a19037ffa981a409649b2b1f3efd2d1 An OTU
X6ec3d1341060c604aa18ec2805b282d0 An OTU
X307573dc7a2f1c49591ce7b2525871dd An OTU
a57ef5032587ebf5c1cfd6037aca29c6 An OTU
X75478ab3a63d15460648b52c9516086b An OTU
X0b356428e76f99225e1907ddd8706c07 An OTU
c3582c6cd06b715b796a575e180cc02d An OTU
X1562c5fb57c87eabf6929dd91e64072f An OTU

X68d8add0bfe7337c3c38a27639aa79a8 An OTU
e953ceb6ac1405771ab000ea3dab0430 An OTU
X3a4d7209fc338bb33a95c26e19f71cd8 An OTU
X9124b59a179bb31e518b55417d687c5a An OTU
X377909c55c6a5ea2d7f01a00911372ea An OTU
X9f28c9fce68c9a915e1a0b766676c803 An OTU
X0c4b08bb7b07296e0ea1650bf04a60f6 An OTU
ab8481a7753ec9bcd4dba3fcffcf5901 An OTU
X8b5e3a265eef42c3f27e71d0850e69c1 An OTU
aa8806c2d57281db3a1c0022ee9b34d2 An OTU
bc2a07db5309e4124c599a5f4879ea0e An OTU
cdacece7ec21ee62d806efdb10c10d30 An OTU
d524a8c9488bd647fe73f452ced5adc4 An OTU
X3f3f97c91aaededc82d16ff5618ce280 An OTU
c9a9f386073a662bd5f727a24e9c3db6 An OTU
b2e913fd197104e1dca4dbfa68edd0c6 An OTU
X9df320ba2f970b567cedd6a579640867 An OTU
X14a8bf7359bcd7af890d9c8877fb3e17 An OTU
c18214423782fcd3162c5eed8312bcd1 An OTU
d61646892628150861faae20d3ac2490 An OTU
c8d137b978dd7129c92ae5b315cabe98 An OTU
X1ea88b12d5ba10972d51f6d93b142b48 An OTU
X1b4a681250b8a906cd6c2383492b9cff An OTU
X26ab356483c70316f00378d859b25814 An OTU
c4b0278be555a3341a4eb7002839ca58 An OTU
X48e893206a6bab13c051f6f9693d8150 An OTU
bb5e29836700021a9863346cb615983f An OTU
f719bded38a1ae0f3ed4b17e588e1be3 An OTU
X41c1dbf8b1487bedad6fedd9a7630314 An OTU
X23095e5a398fcf6133fe20990249008c An OTU
e310f5b8d6b2224e027db03853ddd5c9 An OTU
X3b87477be5150b4a02c9f01871df1a48 An OTU
f32f7bac4edba106dde8d21dce05fefd An OTU
X5848aff5a9b69e9e5a5d743f9843c05f An OTU
X66abd1febeaefc9caaab9da0d9eda9e3 An OTU
afd9bf8abfaf5934f17b2dcae7b79258 An OTU
fea2d11dba0b804504b4de9daa1df678 An OTU

X8ecfa9b13b7ef2342b474d5f1a4ee93b An OTU
X9e1a29e8ded169c251d4051258fb572f An OTU
X9a4b8bf97aeaa9eb2a3933b4c17197a5 An OTU
X290307de6fc35932de04388458f8d401 An OTU
X807e3e24fa35c4d2d9146a15979a0bbe An OTU
X4ccda27d9c32a24f0cccbfccef0157e5 An OTU
X136209c70179507f2d402a6c49f0ba8e An OTU
X1f7f7ef821253cb51b35e5307cd39633 An OTU
f68c45e9480dabe25512880485cbc02c An OTU
X4624bc2355d1da4fc85b25591ce03fbd An OTU
dde3e89bf257c7bf1438d396669a14f7 An OTU
c5a3139581e6ad4b06734b2c62396d9b An OTU
X191a69529c91c6bc3f1f0e8c560424a9 An OTU
f5c9babe8df5865ae1f01b7a76946acd An OTU
X204ab1499d781c1af5b80c511ab4b5b8 An OTU
f648748515663060a64e8ab63b647c37 An OTU
cfea82ffbdf767001adf02ec7f45a8f1 An OTU
X7b629f604ae26f45e149865d79ba3fe8 An OTU
d59de3f1ae358d3561e61bf1d425a42d An OTU
X8f1ad6af2da45e3d98f96787466a597c An OTU
dfbe37e6bdcf4e526724131a502cfa86 An OTU
c3ef3bccfcccec181f1eded696534de0 An OTU
X533db2299957bdb0692f455901f882f8 An OTU
X960c5653f0121e5bdc7322ad14694070 An OTU
X1d0139b037c60010d6a0ed979f7541f5 An OTU
X2a872b1cc9fc3ca14d1c455da708f62a An OTU
e374191fa71ac03ba0dad0654a9f20f9 An OTU
c88f442ae3a858618d0a4ff15f6a001f An OTU
cbffaae41da2035f8a3647c382b3c878 An OTU
X205aa62d648b1aeb8ed072d008955775 An OTU
ebd9579d4a390fbc0b7192a7504d30c9 An OTU
ad0dc00a74d7eb24275ad65da0429241 An OTU
X8e231157c5d80f6c8f8b0bc8c5cc8061 An OTU
X0944d1c97574c64ebfc3c2d3dfcb6923 An OTU
X96a7f3bf86a25670a5157edb7c5fb2c3 An OTU
X6501a5683c3719c77af60bcc8f6bb9e6 An OTU
cac69ed20820f2730a26550b0bd33f1b An OTU

X90f2c3c8a12ee65f7d52490212ee85fd An OTU
X19b2ade8140ec05f929cd3c6d5da342b An OTU
X698f3731aceaba2f73b76dba2b967a8c An OTU
X7b8fb2e24da45401839cf3a4d4c93d08 An OTU
ea931c705aa5ae6af75880f38795d324 An OTU
X43b06fb4fc50546526eb524f012282a6 An OTU
X93777d634b005a419b123cabde567ad0 An OTU
X5ff095a07a5082808a578938082e8fb6 An OTU
bdc57626fe14835451db8a6ca43ff2c7 An OTU
X28a3474b3467fe1b128d8350df514eac An OTU
X7e3aa586b6bb2b8c3e064dab1fb0a414 An OTU
X6c907536f6d353ad54dc53657358bc3e An OTU
X8406cc47aff1cbd12ffa0f955cf48fa3 An OTU
X1561f54a1436a300d808c60019a5a4d8 An OTU
dd313fb77ed8b3e8d7ea223f5333e829 An OTU
cb8ad134b4949578eff927bf4e6bcb1d An OTU
X817fd36b2fbfadb5a7b4773f79484bba An OTU
a7c6a2dcdd0e92db2fb60edcd7a6321b An OTU
X65211cb1d164c500850cf1cedf01f5c3 An OTU
X197952126533a2db13a0d78515e98def An OTU
aa6147309bc17b08978a0a5c65d4a1e0 An OTU
c6c2fdffb63742f3ccdb47ac91336f4a An OTU
X62ed8f3d79b15c5648ae962d2f1a8846 An OTU
X82a635372d188c44e5d33eddc21734cd An OTU
e3e054135ab9c4068370193e0205ae4c An OTU
X94a7835a95be2a0c67528979a24784fe An OTU
f012889e1a5ccd2c2c44fe190f74342f An OTU
bbfc342b94dbf76b2437e07d20c3a0b1 An OTU
e348f4bd542d098f265782f232a3f682 An OTU
e1491a19e3718f7671de76c61cc9a68f An OTU
d789beb6e71019a486083f1c7bfdeb3e An OTU
c936cf29d6ff8369eef067b525453f84 An OTU
efdd4d1dc969805f6d34b3de6021b909 An OTU
X01736d321ee9129113729baa3506213a An OTU
d2bf9bf72ab0895655297669b0b48c14 An OTU
X71516275dd4964c5587087fee5b2eead An OTU
X5d098252b16922ccee029e37430a755c An OTU

cc5735e5c770abaec59f20adecaa8202 An OTU
X4d6eb4f4fc61d5c115ee07a6d8aa69fa An OTU
X788609e2259d3a233acc0aa696dc507c An OTU
X4df809abf3b705fd001bd802c8d80e54 An OTU
X2f31d0c4d63c3101b95c986f41733058 An OTU
X080892b20b7553b4f70f22a03f9ada2a An OTU
X581cba661e2ea1e735eb65f9bc0858bf An OTU
X7355af232541826b6429715498d452ed An OTU
X3af4996069b57ace8353e64d0c52dd86 An OTU
X96e3c83a6ccbc094c9a646de747635a7 An OTU
cb0e6fffe365b1d928c2a12caee4af8c An OTU
X61d94f79f5ea4fd2d050094646cb311c An OTU
f8aff23af7986c2ad605af81c568fc02 An OTU
X57bf6871b5baa4dc06362ae93cc31120 An OTU
a4aa82e4810c9d0c0afebc492cb35ec1 An OTU
X8764270ca1b3fc3caa0ba1088f6fbf95 An OTU
f77299c5feb5c31dd7137436c97cb4b0 An OTU
d323d3c30950fd89c35a5ff24427863f An OTU
X9a3bc3851037cb9b0cb021374adab8de An OTU
f70ad1cebfe5541d59502845e9730ae1 An OTU
X23adf4f572101e2d90b25ce986a137bb An OTU
X89c6a92cef1300b141d7456fc8c3ec9b An OTU
X71a832b23a26d81408a356224918a8f8 An OTU
X439c1f767db2e7c464ee73cf9bc1db9c An OTU
X343af697bad1edfaea514e1bd5ea64a3 An OTU
X6a1093d702f80a5f76f4553130674f0a An OTU
a624f26f281b4297a38fe2a1c271df62 An OTU
X15a597b5cfe2bed66f1c1ae29557777f An OTU
c7a2d918674a08bf50eafa5bd118e293 An OTU
X3ed7a33e39a7f5cb9881390cea5f53be An OTU
c64b278341b88bfd17ca64a4fd7febe1 An OTU
cdd65894a471bfa0eaf3cd308730eda1 An OTU
c04f0d1ccfd2245a4d84f777050a1829 An OTU
X1c7c8c8b5d860c2f7fd28166c328127b An OTU
b94e81a877481b754fa72f0040fb2335 An OTU
c79b6aee7b648e49c71f56a470d976e5 An OTU
X9a9c97bd2277d832e2b17c6b6f891f09 An OTU

f46e0d93401cc7b1c6c1413b619bbf7d An OTU
X5c3d14b6715dd3060b60af0b9c30f9cd An OTU
X9053d63199a5c6ff349270b2ca37ffac An OTU
e532c61996d325c41fcd3bbe79dcc704 An OTU
e7407516d1777dc8216043e447ba789b An OTU
X9a8b2fb09741c9883c66e24a7df083b6 An OTU
X96f81c2f8c365f3e994ead1b389bf099 An OTU
X3dccf5745dd200ae9e81586ff1e59c79 An OTU
X22fbf277570a52a7cdba64e6826ab303 An OTU
X9a00e9c255d3e3187669f93e6fdbe7f9 An OTU
X8ff6c51014cec1a9da9d41136955c978 An OTU
b467bbf7f9d84b55f768d9100667bb5c An OTU
X08e2378a397b0abc279ca880a5fd8454 An OTU
fc2e338a20116214fe52945f1b056c6a An OTU
X4ffc8bbf6de70b7fc5741e676e5dc159 An OTU
X3bccc71ec85ebb6fe344c763ad65c76a An OTU
cf14ec1af664e1808276438e38a7c664 An OTU
X8c0d39c70b65e6c197834a5a6d42ecc4 An OTU
X87633660e49a3c58c858529a5135ba9e An OTU
X365473f5776f4fabb5bc2e44adfda5b0 An OTU
X341af14f00265fc5b89f0e9397c29c46 An OTU
X618cdf643373b4aa1d47f979105040bd An OTU
X65e594b5d8a96e3934fe20a3c38deaae An OTU
b7b8fe426d9946895c98aa98c1282e00 An OTU
X5cd79e533c46e90d166b46a02cb6f6d1 An OTU
X839f6cf19e3e6f0275f426332fee2193 An OTU
f695840d4c0ae4c96be77c74fd49fa30 An OTU
X2e9e86f2c6108216297ceba5f7b5fff2 An OTU
adce91614fa53c033646d05a7756a083 An OTU
X42cb2f2d9b340bfa805e265090d889ed An OTU
a1f4fcaddfcc7d95b2cdb1700c2ed847 An OTU
X283252c01cf4b083b404b03f977937f4 An OTU
X249ebbc9565095d7be49ac2d5962d390 An OTU
X43db40f8410f883e6ec6af913960e88c An OTU
X0618a66a00e21d39e8314105dafbc53e An OTU
X1d4527808d6929adbb4b08812c9a5929 An OTU
dcff4ae328e49e4b6a8a5fcdc69c9580 An OTU

X6a25bd2fdb0b3bfb2c74af499acb73d7 An OTU
X1635671ebab79c06385a4739ade75f20 An OTU
X79220e094f013310e39000c9ddc699a9 An OTU
X00bd468e455f14151ade5f9e1f448db3 An OTU
X85344e899bbbadc3a7bad0bbef5baad8 An OTU
X2ae8aac61eb85f6dcc10eb03fdf86e00 An OTU
X711ec8e81e9ff0566375914d9ebd9865 An OTU
X934d11ffcd7951b28be4f41490556592 An OTU
X24a1daf63508821a3b58e03e4f274418 An OTU
X6c9c7b97b5e95affc58f5ee8c5e83803 An OTU
X102adec1a05d8f2be15e62ed6902edb7 An OTU
X6a74b0fe9b8d7b3458f3e32d82188d3c An OTU
a6a57b1f64a1aae1f5dde939f5fc8d6f An OTU
X26fb459969f0712e9c68bbeaec050778 An OTU
X8eb510cfb544887f4399a16b5b378b24 An OTU
X5972d64ad7404bddc5955704b4d9e959 An OTU
X8fb0a282de7900d27f2fa982c5395b62 An OTU
fad7959733a200344fe5a2a9f6252f81 An OTU
X47886d497d1890ba0b74039f77cf2cd4 An OTU
d5554f8b926fba25f7287d8eb05eddea An OTU
e96e0294d9b622f5a56393e164299ffe An OTU
e20c5343cc96e2911526dffcfe1b0041 An OTU
b3d7c388757c5ec716547169d790df96 An OTU
e77d49ec876916cca0ec6ab530e563c5 An OTU
X8e2118fd48ed26ab392474c1b6654df4 An OTU
X474feb592f0f4f3498bc37e10dedcca5 An OTU
X65c2af5f8f103fa8351a8322c00ebe30 An OTU
X00f28b93cdd7bf15fb402c0a8e194d42 An OTU
X97b54f546e16cc51a1c9abcfed646a1b An OTU
X2b721e4e5336061ced14983bfbf69366 An OTU
ebb2437805bf6ce57f79c1daa09eed7f An OTU
X27976cc54cab587e7b9ccc042bd4abd4 An OTU
c6918ec974f69567a31127eb3f674dc6 An OTU
fbc07f77a9024d30c86a9a5876ff0616 An OTU
X8de03717fa609f49b857801491a5b172 An OTU
c80f11e443169af9570fec243eef4e28 An OTU
X3e5e1b88b6fde860312843492b7a11bc An OTU

X52c08af84d123f2dde2bb2677e30346f An OTU
e2acaceaf90420aae741971ab21c4f74 An OTU
X3952bc678794f8430cfc60c84b07878f An OTU
X03b85478a93c9da8008e81190d74ff9e An OTU
X0a1f5a851a6d4948bef4423eeb267c6f An OTU
X848ebc971f1376b38c5b54f7cacb6976 An OTU
ff363bebf2dd08c7259bea87b082328b An OTU
X12cb475cafd75bc00db6f18bbd0fa985 An OTU
X35320ef074ae4463b6c08851df3930cd An OTU
X21885106f55cce0e4e6565fdebc32fa2 An OTU
X677d8b45c3187dde591539f61b6065d4 An OTU
b8fc5b01a5e939bb02f5635faa6179ce An OTU
X000f505e95f04bedb717d6cf8a204ea6 An OTU
X11164d92e7ce0a6afa389c1c2e49af0c An OTU
X2be2b98a86afc2adfac6e0d7d9abe61e An OTU
X192a788fa21b8ee6ee9405bdf08bb4e0 An OTU
X44ab7a1bf3899fbdaaef9e48ed8e99d7 An OTU
X9244fbfa551902ca60239ff5d67a6db4 An OTU
X8de5dcd53c525052fbda64b435c20975 An OTU
X72c34e34f172c00ee73287307f8f3bfa An OTU
X12bd9a723ac7a13c05ba80d8d828fabc An OTU
X4e4cb4b7b01e5cad814e0c78c54bd4d4 An OTU
X9915f8a0b01534305a1e03eb71408abd An OTU
d9cf0041e4a3d680a5e72f0db241bd49 An OTU
X0493dbd3904617d5add4eb6e56b3aaaa An OTU
X9f8793564a18c244542d3b52c6af920e An OTU
X1bbab11996003e08550cd2ec2182b097 An OTU
X381c489f292dddca99862543b843d897 An OTU
X63cbf3c3753c0a9a1dae840242f117ff An OTU
X5a8add637bd4698a522f593e2dfa0c19 An OTU
X8aada0a3398d6b96325559d7716ca10a An OTU
d6d503eb4ac08d55e889283d573a0050 An OTU
X44a520f16101e1010105e70ea052699d An OTU
X65d4cd4ed0789778433d0b4b235c65dd An OTU
X52487f847e56ea685a52711f85e9f663 An OTU
e74262bc485728de40a986ee08ade740 An OTU
X606206f863d40647d70f823e043e271b An OTU

X0e2bb0faab453b7ea84061304d0cf9b6 An OTU
X570ebf54eef0494338ab80255cbb8fd0 An OTU
X59af5feb45f45d797883be1c67a67249 An OTU
X47346df4a5957c02940a85ff3e41e48d An OTU
X9aadbb4af1f934ac46ebe6eb01600bb1 An OTU
da8dbb9356ed5e68256a9c9ec39bdbdc An OTU
X98c4e2f18722c28a7f9de0f90ceb4e9f An OTU
X826df015a227f31db6ca0f6d9a974ded An OTU
d11826d9844184c925bc18cfc59ce8fa An OTU
X9b86760f1d24e78119093f5f08f45f71 An OTU
c560196fe13fddf1d7de0783c7792ea5 An OTU
X6409ff356135068d957e799ee74ad541 An OTU
c1869b84a4aaff872df592c08381dc52 An OTU
cc9e4a6cd1499edefd0b896f7bf95f00 An OTU
X66625bdd9aa70c128e5d8aed9ef16fd6 An OTU
X64b947bbba8defe9493d3117420b4022 An OTU
X18cdcf8edaec6304144b9c65319bde87 An OTU
X38ba3ec95fe8b21df45b679283d92034 An OTU
X35dacdf6c69365bcdd3d2392fdced7b3 An OTU
X552c0ac97153fbd09dc1ec7a13de2df7 An OTU
X4780520594b3c359ad272f976d15b036 An OTU
ec0cceda18c167d89ab91a8f034626b5 An OTU
X73cfe54f3690ad1f617a65166bb83c9f An OTU
edcb83fd877a17ccd7ff7ad10a089a10 An OTU
X97df94ae30edb34b210282ac77e7405d An OTU
f54585da3f57e40b54d06273989b4c27 An OTU
X5b3eccee29294748b1dafa6fe2ae2f73 An OTU
X9c6e2a4d55efc64cc5467823ae32e1a1 An OTU
X19b6434b4e10197d24bda91924905960 An OTU
dc8a2f47b3d1dc2e1f5f805891976b29 An OTU
X987ae25eb8219222cc0c1be0aa006309 An OTU
b1cb18850eb4103c545ae2e2b4db6490 An OTU
X5c78314ff92e6fec9aa07acc1fa0dc24 An OTU
X9a4ab89e88dee668f878444d90b060b1 An OTU
X1f2e0961931bcb783b40c957fac03aae An OTU
e1e4e79362469f2b83cb275c1f237566 An OTU
bcc8f2f37b14c180b9878e798c390eba An OTU

X22449fa090e6cf11dad648ba8318841b An OTU
X5fddbf4df835ebc706ce66fee2f1d0c2 An OTU
X014c5eac7817574c27a328f980d1f676 An OTU
f1b60abefd8ee5ff48fa1ff62e3b23a9 An OTU
X91834717994e0c63fcbeb5224cefc3c4 An OTU
X6449ffc94d73ac38e021402f11594391 An OTU
X18848802f034db497900841dcf0ac617 An OTU
bafb2fb48eda0858225ae443b78fae9b An OTU
X73684f56a44db9457fc3efd7ae147d3b An OTU
X5a10fbf1995eec0c6edb29bb471797c0 An OTU
c87b53bf7cfba0eb69f6645375c7f3bc An OTU
X4cc432d3cf68ebd1181aa00ef09e07b0 An OTU
X921e3f1690e3a0c619de9d9495d2bb3c An OTU
X72fcf159ecd6ab426af86b009f888505 An OTU
d81f6677d4def916b40df041822bad97 An OTU
X41cbe6c259771cba99a76662d1fbf8b6 An OTU
bee2ed9b645b34b265975e4a71ddbf57 An OTU
d8b05411520e19fc6b4e94278ac6b2a2 An OTU
X618d4532e991c64ae1d5b7fe78cb6e46 An OTU
X036eab8506c6ade39b269dbeab870ca6 An OTU
cff4471536b6ec9380e11b7d30606667 An OTU
f9a1cdc7bb83b617bad01a9b77fb4eec An OTU
X28c71f22029d7e1d951b3ea3e1ac0f08 An OTU
X3584e6153a4e3f3b3f5cfcb5f720c39c An OTU
X89d860ba7a37eb370a82f0f9787ae8a2 An OTU
X564641f288ea5f495d66712041300b44 An OTU
X32fcbcf8a30d55bcb9adad85e8c2d187 An OTU
X2f05b8218ad5d8a86959e53efce3bd2e An OTU
X2666dc866eface066f3e65d4bc095965 An OTU
d2da768d9e9e5df5f520ac9bd8c4488e An OTU
X9a211c35559dd28eec350701b8e69ca7 An OTU
d32e69d3cd0ab56c1d9b2582c173ea09 An OTU
X42e5b736b17981056ce9f6c4105b6772 An OTU
feec76e765730a3800f6200ba696c93a An OTU
X5cafa7f776ffc9e8fe9041460ad0211b An OTU
X319c86f817c8b25013fbb341abf0a554 An OTU
a64edbedefe21608575a557e77314771 An OTU

X42d8ec900866f9ba1348abf0ada4089d An OTU
X85df5a40b065a859bd0a39fd66d341ab An OTU
fefcc4f9dbd6e1504fd05b242910abae An OTU
X577e286672fb94fc8cbabc67cc18bf2f An OTU
d4ce42c8c70995498ab39c7d2c786384 An OTU
f802ae84792400b01375437451435a1f An OTU
X9426b9e3d7d73abad9ef88a3b0965c10 An OTU
a6fbb3b4ec721557339911b9acdc9221 An OTU
X41b6a2dc0608ee950d01fe535357d19f An OTU
b92b6415850e7f15021c9384716f76d1 An OTU
X58f0c92008c9ce502c9a598d417d7c8d An OTU
a2fe88fcaa20b7c0c14a31a1e319e49d An OTU
X4064441b887bca313a9a017e0e841a40 An OTU
X503d40014ee4e3b2c041fdb4521d4fd8 An OTU
X0a26bd15d7d8ef486eb71d62c11874ef An OTU
X4fa9336955fb159120b7cc21c7fb59b3 An OTU
X8ff08d154f7dfc93b7ae48c3e3f85221 An OTU
X7ace71efdd51ab87964d4e74b2c46123 An OTU
X8292c792c3d223b0b8a4bd170c73a0c1 An OTU
ea5cf4717f7bf1692db734ab86cecd27 An OTU
X0afcbf5373074e1168597ba9b273983b An OTU
X082b1f871d9e4437a2336368d5f29002 An OTU
X01f2d743d1ebd0f2583d06d87a2a3d0f An OTU
X6973405c27f129fe4f801c6f8bd8f68a An OTU
daf8858e6f235f939098123efb387947 An OTU
X0a6571ae5b8f5a0e32a5393588da1fcb An OTU
X65064bc9fd21dabaf513dc68973d6189 An OTU
X74d1206853e839271e089bd51ace9043 An OTU
X290b7beb6d401cda23c4b4f1b554d69d An OTU
X23a34510b569076382cb04b6e9779556 An OTU
X095309e2ab466c98629e6011f0edd877 An OTU
X325183d99d7f83828d29b1a6bb353fc5 An OTU
X047fa6fa7b3caa75f79a2716962b8f2d An OTU
X547bcb1243b37f02745c31f0eb197e2b An OTU
b9e5bdc83003572369cabb3ea006ef7a An OTU
X33160dc296404c413b79d151bc9c433d An OTU
X0e8ab50d87123c6e20ca724eff1375c5 An OTU

X32780cfd0437bcec6dd27ff9af889934 An OTU
X8cdfddaad46b246c0f27135eee1e4fe7 An OTU
X88b510e260fc16d6f55015a77fc905c3 An OTU
X972e77a8e91c18cd99fe5b33bde8bbe2 An OTU
d755fcbe30a1d068cdb39c2a68a7d83d An OTU
X2713e4467a39443014347eb203c1dc8f An OTU
de5425be545b836744042f3b4cc718ba An OTU
X2628dc4fd7cf9b504603c1e0e7038d17 An OTU
b567a89798ed734c80dfdd557dd53b6d An OTU
X980d525ac81e0787764eca4365c80095 An OTU
fd38419f56219daaba630d8b139b0a03 An OTU
b83a5d6bdbcda90d9727c23d95aec804 An OTU
X52335cd5ba68401f2e339191306976e0 An OTU
X4553a78d1225e5cee4643aeca109cb55 An OTU
X9c5ee43932327f8ca0eb304352dc3d32 An OTU
X28127c4a89a17630274c8daf62b85d51 An OTU
X86bdd508682c4e9bc5db1fc4e432b14f An OTU
X7d77bbcada712b813d97edd5c376793e An OTU
eb1a986c470ac55c3a3986893cebb884 An OTU
d59f57c1b59254737a7fc9ae65dce526 An OTU
X5d2510d4c29ccad7ab5ce50833d81c15 An OTU
X630f305e5662ad3360e7123da0e06e93 An OTU
X17f730ac860d5490842dcf3cf6f897b8 An OTU
X8bd062ff26896a7bb96cc38cdbf672f7 An OTU
e888aad716718c488184c77e0274605e An OTU
X88aeab6e14578627bcfcacf4736c4de2 An OTU
X86f77ab70eb43c56b49f674ea8b5f089 An OTU
X3d53dad59c3cbac9b873745c4cee2519 An OTU
X5ac3b03df98e30c8b0a5be3dcb95c8c8 An OTU
X0673c01e9e6593415b6420a50b3647fd An OTU
d90a3590610e52dd3eee28f55d3d81d8 An OTU
X31f22d9549fc5c3aac71af906ca6dc3a An OTU
be1c5620cae0c0506f71e3112711c6ce An OTU
X6378db552257f0488bc1301be809daf4 An OTU
ee63811572f132515effef307fad2a73 An OTU
X7235a86dd8a78f3121eef89fcaaf1084 An OTU
X5fc916648b0c095932e5f95b3b48e277 An OTU

X6c5146394df4651693bc644c446fd171 An OTU
e3f262862aad2ec66627638e8fb72ed7 An OTU
fdbf2d657afd15e9c47943ffa345a318 An OTU
X8b9fa4a8c48582bbc378a395afbc5af7 An OTU
fcadf967c4e26608a7c3b75b2be0b2a7 An OTU
X52e28db0da9cb2605acacd2beab9a442 An OTU
X85c05f10d08efcd03834e6f9f9dc8a18 An OTU
ef2e316faec342b89132e892a6355945 An OTU
X927b918da0e608c22445cc50ebf92063 An OTU
fcf7636db3a1be38a11fe254aba13912 An OTU
a6cf8e4d6c237f442f4a122f1e8a99e4 An OTU
ee3d71c4895f9c295ec76e8b47965810 An OTU
X42df8b1ef95af065766469117929e018 An OTU
X83f2af7b8683f86804716dd48e676349 An OTU
c7b0b427a7d1b8eb6ac63f57ba007241 An OTU
X77bf6221e84b2f18835a0f9411782ef2 An OTU
X2d5ce190308c31c6415f54ce9aaab014 An OTU
X5d268e477b3cda650c7683ec17df240e An OTU
eed7c9ac5b7e4110dc28404eab6fafdc An OTU
a871b418889555d7e766ef85376f2481 An OTU
a39ee699285bf19c1554d9f543510845 An OTU
X98ccd43c1c7c07b6900af65c4cee01e8 An OTU
ef706845df5711a720f5130be1b4cc69 An OTU
X33899690580de9a60df6194a7db393f1 An OTU
fd5fedd489121a57f34fa171ac341906 An OTU
ff529053ca1e54c06f65b5287b9f1a99 An OTU
X7156c1305654deb182105f1b55cfccb1 An OTU
X19520bfa42ea96ccf021ac989c094254 An OTU
X724ee42a77eab889d59d5eee80afad3a An OTU
X0553d6830de1a828d8175b9255380893 An OTU
X1152bfae8f11485372b52315ed335ee7 An OTU
X355c3240c6a55a96ef70dd3701c96392 An OTU
X23b8cd86ed215e7966bb44feaaa43919 An OTU
X753ba0c21cca279d60a88abe583b66d0 An OTU
X10e543819d0af78ef7d4b5693b00691c An OTU
X0986ca545e388c912faec3048119ff8f An OTU
X43ecf3f5a5d2f93186351a94be3118e7 An OTU

b906d523019f1dde51cf8b4a19074cdf An OTU
X965d6cc72e78ee9f80dc18e7829b961e An OTU
dbef0e2d9b57bc50ff490b1c53715370 An OTU
X2f39a4d8505177aae740cc9d6e9784bc An OTU
X87beef8a5e76103a8be4b934d67ac420 An OTU
X7e6d4c09f15263dd8d81fee61a0b7bf5 An OTU
X61364e5dc6571bce6bb75392749d8a8e An OTU
c8207b4043f2307a8f039a99f1a38c73 An OTU
b9bc0b9b8bf35a9a44a3e2f84a7b60d9 An OTU
X9c04b4f9294defd38b871d14f852f5c2 An OTU
X5554774949e909ef2a1b9ab405e6b314 An OTU
ed511ecec3dea98450faa236b2508ba1 An OTU
X43fe945c4b94723bb8b48d9bce8f2217 An OTU
a5850e8165ced5491f8618818dc185ff An OTU
X725e791679cc704c54872641619b2da4 An OTU
cbc3b4e70385c892b31f9c7e3303232a An OTU
d1104189e6e74c5a61b72881b7aafb8c An OTU
ab5776a9704139bb7bada9a986f24a00 An OTU
ab0f93d054148426215a961e9a21c67d An OTU
X4bb96d7ec191f9f114463f425bca5f72 An OTU
c98c3e21376439101a3c612ac0f31cae An OTU
X01965ec55d499ecaee0cf9583b5718a7 An OTU
X4783e4af2048d3e7ae65932d1c096499 An OTU
X8b2b9c19bfc9ba554b1736d133597ffc An OTU
c36d3de2084f414880dde721106c23ed An OTU
X71169f6558dc93f19d26bed953cfddf4 An OTU
a627575a990cb49210481ce847c06965 An OTU
X4f3f4e7fe9692e43d7c7ce8cf60b14f1 An OTU
c066109efb9ebb2fdfdd0c37ab426f89 An OTU
X3f338e5839651d86d3dda9de242c60d5 An OTU
ffa0946e695b5e6ceb093dad6efe9ff0 An OTU
f4e74ca923beb2284df64374ab540cbc An OTU
X726fd60af4d71b3796242c5e4eb8f747 An OTU
X0d4f31238c0dc868f1937f847ef3fe69 An OTU
X51cec441a60e6960087eb37e2a354b61 An OTU
X08abbc7736ca0c69bcc304f290769e6d An OTU
bd707f9c5e15af21391cd02c1ce784c7 An OTU

X7ca8fd2a731ddc94e0f53e940957b111 An OTU
X9084a3bb86621ad27e5343ba1c587295 An OTU
X2ae0b98af5d353de3a06ea5a3cc6c7d0 An OTU
X11d7660e8d9775e470fb6025e5e4de70 An OTU
X4188d3f3a563ed83c5f576310a2cadb8 An OTU
e265fb9fdb3bca3b90caab437588c6a5 An OTU
X6ef03ee9d8d8552891f3d9667da82a66 An OTU
X69eea89a1e9b03cc7527cc7df05d9717 An OTU
ed8d6b2f54c45bbc654a94906533d6f2 An OTU
X40316fcce7d17a283fa1e80b76fa9816 An OTU
aac2fbd0137f9ff3451e52105d76a467 An OTU
X9079e982f890f1684eaa546cbdb500e5 An OTU
e111db81c2a90ba40ef54ddc735d4b94 An OTU
X04971809052481b1866deb12bf5aebad An OTU
X70fb6f6b18601dfde5a057b694a345c8 An OTU
X69f3b6da55ec1b28e7c7bfe401c15177 An OTU
X381811c011c99b6d895c389fa48b006f An OTU
d3e4ecdbab32ff6146f84eb68f7f5854 An OTU
X971495a7120b0f0bfaaa32568fd9c3f4 An OTU
dadec627e95a61e7d7bd0c863e4c44c9 An OTU
X7bbd8e9a8b7691aa5817479811901239 An OTU
X949f13d2961f9389d656f3754d6ba49d An OTU
X4ed52398918c3276815f4fb4e9b52c01 An OTU
X6a28cb440f0a6fc9100e38e1ec45e5e3 An OTU
d0fb0d2934e8f82b6c9f67903039691f An OTU
X0f8604c7929451ac44e747f050aa715c An OTU
X9c1454b23d7b9e86ad391e0b238ee420 An OTU
X7978facd10d73caf9d38eaabc3734d72 An OTU
c510576b7da7aa00272c73e42a3fca16 An OTU
X2a9d786d5c070cb6588844aea6209709 An OTU
X471ec038f818367e831b0b858510334c An OTU
X0ab95c6059ac35c603cc4ee440072cca An OTU
X28577d6d18c544a64dc300c67756df82 An OTU
X9c49f55243bd1f220450503334bc5a9e An OTU
d46628e502024dc68f6ddb09cd16b7b6 An OTU
f07c5c09cf606d5bb90f7e9a2babb203 An OTU
ae797ae7949c70d1ab33b8f214191a18 An OTU

X461785173d52cea7498a51d11039a6cb An OTU
X79bfd0f007a0c18bbab60be5a6000335 An OTU
X34ee5b9130ad1e33d8c9b44334984327 An OTU
X52d3527b15fb72c4a3ec6545c41eb64e An OTU
X48509b60b02aafbf04621b3b38aaf13d An OTU
c8427312a34c42bf7e8fd55250f8877d An OTU
b4e11c7bc998c25ab94fb5042f061ac1 An OTU
d43ed378a846746647619025dcb17b10 An OTU
dc1f44c145de143aad36156e3c112062 An OTU
X1a37face0a22c54f87c8710233a42784 An OTU
X21af6c12d3a71822b65d7a667ce73643 An OTU
f5d031dfa39b7478776b36cc2623d12d An OTU
b248c8237cbfc6a17357b926a1c88225 An OTU
X58de20a5c30157a40e4ed693769f9c38 An OTU
X052040f040eed5aabe28e27b4acd3cbf An OTU
X815e3202678b49e7f0b351a5be11dd85 An OTU
X7b364f5ef3684f92c4f2631cb4ed17d5 An OTU
fdf62551368b413734444e14a3422162 An OTU
X39a1e33291f171b2f41073ac44025f8c An OTU
X643336dac981889cfd0b469afa912b87 An OTU
X909722ec171a68c45c56a2c8d2e6efa8 An OTU
f919b82fdad02143e98d7c7095ff37a3 An OTU
a75310b050a0188f84c5db17e82e0745 An OTU
X2fc3a470029f7213361373e8b963844a An OTU
d9dfa9ecc7f2db57e3b5461194754b58 An OTU
X63935a753e87c1c008ebbf32e2781db7 An OTU
a0a14712e4cf136df6d0b771d8cfe49b An OTU
ef25f7c91a40da3f4c5620cc51e0d535 An OTU
X7c4ef49f58cf0699b44fbc4ccede08c8 An OTU
X54d9ceb6a24489bd276b726ac824cc55 An OTU
X23c30557799aa71a03c5667425657571 An OTU
X765442afe5f3b10442181438de3ad428 An OTU
X709dbb529c0d8eab107f03624501db96 An OTU
fff75440a8a18a9c0493d7541503f7cd An OTU
X929d82246fe6e1d3bc25ee0ba753f996 An OTU
a0d3a31c4341a20aa205c57de6611405 An OTU
X9aa3fd974b7442f74bab23ac3a5178a9 An OTU

X12421c48d6a0746f63ad6bc9b8b9d798 An OTU
X9fc5c72a0a49831d25abbab6d52febe1 An OTU
b75aa4110b6d7c21ad0b616c0d2c78cd An OTU
c12e2d448713410a1ca26451f8f98476 An OTU
d26287185f1151b3c5363a2371b816e7 An OTU
X43f82b9bdf46fbad8c4cea22763f1519 An OTU
ef34e6696ded41823d3f66c0f73e6b46 An OTU
X13ef39327a9a40ce5f44f8b27db52c7c An OTU
X6898520892f36d2f9597b1c708e294f0 An OTU
fc99a6b10bf5533b1766dde2b06534bd An OTU
e2aca5d26aba9ffda7dad4517b2058c7 An OTU
X1ff00aa01fb7d4bb5c6756e6bc8e222d An OTU
X5beb04dd443a70676c7abcb1fa9ed669 An OTU
X5e4f920bf1ca33bd8e4ef68815365008 An OTU
X55684b5fb20eda4d1af5181250880b34 An OTU
X12e578b9763a29387fce1cabd3a23e11 An OTU
X1b5bc0c0f492ec5adee306aa26ba83d6 An OTU
X238bbd12889818a77baebc684a6a04e0 An OTU
X5efc7802cc6b72d959f635a006d482c5 An OTU
X0e4131e2df0be953b6ddbaa6bd96ab54 An OTU
X86527342512661bc5472ee8db6552c0e An OTU
X19b04f2babf6af613eed71cdf6527fdc An OTU
d2e99643ec43827ffe30c7f56e06c4d0 An OTU
X470dc35fdbdfad49fb03c09837960eb3 An OTU
X596af7e0c83b8b132d24f48fa1bf2419 An OTU
X89acee9d02c73e5e2b28d8111b0dc901 An OTU
c841ce8a17914e4564ac2e9a887be81c An OTU
d99949a035ba7530cb5835b1ea1faabe An OTU
b27135e8d73b632586ff212edbc1e3f3 An OTU
X1ce151cd15ac444204519f4f8260c503 An OTU
X6eb3f747505b027607654373c88891d2 An OTU
X1631aa5ee4035702cdf7eb97497e345c An OTU
X4435ef9ba4e2670d855c347e06a6b57d An OTU
e94a38476919dfcd71856c9dba1acb31 An OTU
a3de2fae9925edf23be9bf5ee6887024 An OTU
X20c0b9d9104aebe21e5d3583d89d0429 An OTU
ee5d1db9d7b0e7fcc9f595b31c449612 An OTU

X1f4d160ff6c0bb9c34d1c20f783d314e An OTU

X7a88ef8a99cd1665ef2bd6878d17023d An OTU

a05317bb54e232983273fa650022bffd An OTU

X4eae78dc4f76a0b76e888032f2430302 An OTU

aec38a93f51d499c121d6f8ac2ce0451 An OTU

X42d179a562749edf5ce0d1fac96140a0 An OTU

X7e44537094e22909f2e40cec0094c25a An OTU

X4da7382e35b2b29310798825e4ce8cba An OTU

X74d7fc3b65abcc9669e228d9e7c4c1e8 An OTU

fcecaab3c88d40802d5b14b57271a88f An OTU

X1f087d6ca500a9eef7b8096b9dbbe12e An OTU

X8102da3078854a27778e59b659dc313b An OTU

d5bc23d5f22f5803ff531326cdcc11d2 An OTU

d55c6efcff87c52c7f0a52b59197d2d2 An OTU

X6f8b091f6346823e6839051b854083af An OTU

bc300ab72dfe8bb9a460795a21905863 An OTU

X2effb4dd191a848e976bc6bf0ed88346 An OTU

X8f8a67fce2c9dd9f1c1837511819af1b An OTU

X8e704a0e1277e37ab801823ee1ee9ea7 An OTU

e765d7f34ca916aef3f5fbe67cce0aeb An OTU

X005d3193f381b0793f0c928bde66dd21 An OTU

SampleID ID of the subject

Treatment Treatment variable

T1Dweek Time to develop T1D in week

T1D Censored indicator

Source

https://elifesciences.org/articles/37816

`Week3_response` *Response datase.*

Description

A dataset containing the information of subjects.

Usage

```
data(Week3_response)
```

Format

A data frame with 81 rows and 30 variables:

SampleID ID of the subject

Treatment Treatment variable

T1Dweek Time to develop T1D in week

T1D Censored indicator

Treatment_new Treatment indicator obtained from treatment variable

Source

https://elifesciences.org/articles/37816

`ZerosPerGroup` *This function returns a matrix with rows are Micros and 9 columns containing number and the proportion of zeros per groups of treatments and in total.*

Description

This function returns a matrix with rows are Micros and 9 columns containing number and the proportion of zeros per groups of treatments and in total.

Usage

```
ZerosPerGroup(
  Micro.mat,
  groups,
  week = 0,
  n.obs = n.obs,
  n.control = n.control,
  n.treated = n.treated,
  n.mi = n.mi,
  plot = FALSE
)
```

Arguments

Micro.mat	Micro matrix (rows are Micros, columns are subjects)
groups	Treatment groups or groups of any binary variables
week	A specific time point. To use when having different time points in the dataset.
n.obs	Number of patients.
n.control	Number of patients in control group or in the first group.
n.treated	Number of patients in treated group or in the second group.
n.mi	Number of taxa.
plot	A boolean parameter indicating if the plot should be shown. Default is FALSE.

Value

A matrix with information of number and the proportion of zeros per groups.

zero.per.group	A matrix with rows are Micros and 9 columns containing number and the proportion of zeros per groups of treatments and in total.
plot	Plot percentage of zeros per group

Author(s)

Thi Huyen Nguyen, <thihuyen.nguyen@uhasselt.be>

Olajumoke Evangelina Owokotomo, <olajumoke.x.owokotomo@gsk.com>

Ziv Shkedy

See Also

ZerosPerGroup

Examples

```
# Preparing data for analysis at OTU level
data(Week3_otu)
data(Week3_response)
Week3_otu = data.frame(Week3_otu)
otu_mat_w3 = t(data.matrix(Week3_otu[ , 1:2720]))
n_obs = dim(otu_mat_w3)[2]
n_control = table(Week3_response$Treatment_new)[1]
n_treated = table(Week3_response$Treatment_new)[2]
n_otu = dim(otu_mat_w3)[1]
# Calculate zeros per groups
zero_per_group_otu_w3 = ZerosPerGroup(Micro.mat = otu_mat_w3,
                                      groups = Week3_response$Treatment_new,
                                      week = 3,
                                      n.obs = n_obs,
                                      n.control = n_control,
                                      n.treated = n_treated,
```

```
n.mi = n_otu,
plot = TRUE)
```

Index

∗ **datasets**
data_zero_per_group_otu_w3, 21
fam_info_w3, 26
fam_shan_trim_w3, 27
metadata_taxonomy, 33
Week3_otu, 52
Week3_response, 127

coxph, *6*, *13*, *24*, *26*, *31*, *33*, *35*, *38*, *41*, *44*, *48*, *50*
CoxPHUni, *3*, 3
CVLasoelascox, 4, *7*, *34, 35*
cvle, *5*, *34*
cvle *(*cvle-class*)*, 7
cvle-class, 7
cvle-method *(*cvle-class*)*, 7
CVMajorityvotes, 8, *14*
cvmm, *13*, *20*, *35*
cvmm *(*cvmm-class*)*, 10
cvmm-class, 10
cvmm-method *(*cvmm-class*)*, 10
CVMSpecificCoxPh, *10, 11*, 11
cvmv, *9*
cvmv *(*cvmv-class*)*, 14
cvmv-class, 14
cvmv-method *(*cvmv-class*)*, 14
CVPcaPls, *15*, 15, *17–19*
cvpp, *16*
cvpp *(*cvpp-class*)*, 17
cvpp-class, 17
cvpp-method *(*cvpp-class*)*, 17
cvsit, *18*, *20*
cvsit *(*cvsit-class*)*, 18
cvsit-class, 18
cvsit-method *(*cvsit-class*)*, 18
CVSITaxa, 19

data_zero_per_group_otu_w3, 21
DistHR, 22, *39*

EstimateHR, *6*, *8*, *13*, *24*, 24, *31*, *33*, *35*, *38, 39*, *41*, *44*, *48*, *50*

fam_info_w3, 26
fam_shan_trim_w3, 27
FirstFilter, 27, *28*

GetRA, 28, *29*
glmnet, *5, 6*, *8*, *30, 31*, *40*

Lasoelascox, *6*, *8*, *22*, *24–26*, 29, *39–41*

Majorityvotes, *8, 9*, *15*, *22*, *24*, 32, *39*
metadata_taxonomy, 33
MiFreq, 34
ms, *38*
ms *(*ms-class*)*, 35
ms,ANY *(*ms-class*)*, 35
ms-class, 35
ms-method *(*ms-class*)*, 35
MSpecificCoxPh, *13*, *20*, *32, 33*, *35, 36*, 37, *44*

perm, *23*
perm *(*perm-class*)*, 39
perm-class, 39
perm-method *(*perm-class*)*, 39
plot, *7*, *11*, *14*, *17, 18*, *36*, *39*
plot,cvle,missing-method *(*cvle-class*)*, 7
plot,cvmm,ANY-method *(*cvmm-class*)*, 10
plot,cvmv,ANY-method *(*cvmv-class*)*, 14
plot,cvpp,missing-method *(*cvpp-class*)*, 17
plot,cvsit,missing-method *(*cvsit-class*)*, 18
plot,ms,ANY-method *(*ms-class*)*, 35
plot,perm,ANY-method *(*perm-class*)*, 39
plot.default, *7*, *11*, *14*, *17, 18*, *36*, *39*
plsr, *50*
princomp, *48*

QuantileAnalysis, 40

SecondFilter, *42*, 42
show,cvle-method *(*cvle-class*)*, 7
show,cvmm-method *(*cvmm-class*)*, 10
show,cvmv-method *(*cvmv-class*)*, 14
show,cvpp-method *(*cvpp-class*)*, 17
show,cvsit-method *(*cvsit-class*)*, 18
show,ms-method *(*ms-class*)*, 35
show,perm-method *(*perm-class*)*, 39
SITaxa, *20*, 43
summary,cvle-method *(*cvle-class*)*, 7
summary,cvmm-method *(*cvmm-class*)*, 10
summary,cvmv-method *(*cvmv-class*)*, 14
summary,cvpp-method *(*cvpp-class*)*, 17
summary,cvsit-method *(*cvsit-class*)*, 18
summary,ms-method *(*ms-class*)*, 35
summary,perm-method *(*perm-class*)*, 39
SummaryData, 45, *46*
SurvPcaClass, *15, 16*, *18, 19*, *22*, *24*, *39–41*, *44*, 46, *50*
SurvPlsClass, *15, 16*, *18, 19*, *22*, *24*, *39–41*, *44*, *48*, 48

Top1Uni, 51, *52*

Week3_otu, 52
Week3_response, 127

ZerosPerGroup, 127, *128*