NAME

disc − pixelwise and contextual classification

SYNOPSIS

disc [**−l**]
[**−ew**]
[**−e**]
[**−wsh** | **−ohm** | **−fastohm** | **−switzer** | **−hier** | **−xhier**]
[**−T** *trainfile*]
[**−V** *testfile*]
[**−Cnames** *classnamesfile*]
[**−Bnames** *variablenamesfile*]
[**−C** *covfile*]
[**−loss** *lossfile*]
[**−v** [*proportion* [*seed*]]
[**−saveC** *savecovfile*]
[**−Jeps** *Jeps*]
[**−auto** *rho theta*]
[**−pqr** *p q r*]
[**−ap** *ap1 ap1 ... apk*]
[**−rq** *quantile*]
[**−rc** *rclassvalue*]
[**−mdist** *mdistfile*]
[**−Mdist** *Mdistfile*]
[**−pprob** *pprobfile*]
[**−Pprob** *Pprobfile*]
[**−prior** *priorfile*]
[**−cum** *cumfile*]
[**−re**]
[**−cmmah**]
[**−ps** *pagesize*]
[**−ls** *linesize*]
[**−nopc**]
[**−nodate**]

DESCRIPTION

disc performs a classification of the input image into a number of classes each of which is described by its prior probability, mean value and dispersion matrix.

By default *disc* performs quadratic discrimination (class dependent dispersion matrices) with equal prior probabilities.

The parameters can be estimated from a training sample or represented in a parameterfile.

The input sequence must be in HIPS-format and the format must be either byte, short, int or float.

The output is the classification result.

Statistical data are sent to a file whose name defaults to 'log(pid)'.

The Mahalanobis distance to the classified class and the posterior probability of the classified class can be requested by options.

OPTIONS

−l Use a common dispersion matrix for all classes. This results in linear classification if **−wsh** or **−ohm** or **−fastohm** or **−switzer** is not specified. The covariance matrices for all classes are pooled

weighted by the number of observations in the training set of each class.

−ew The common covariance matrix is estimated by pooling the covariance matrices of all classes using equal weights. Alternatively the class dependent covariance matrices are pooled weighted by the number of observations in each class in the training set.

−e Set all off-diagonal elements in the dispersion mtarices to zero. This results in minimum distance classification of the standardized dataset if **−wsh** or **−ohm** is not specified.

−ohm Use the contextual Owen-Hjort-Mohn classification scheme.

−fastohm
Use the contextual Owen-Hjort-Mohn classification scheme with p=1, q=r=0.

−wsh Use the contextual Welch-Salter-Haslett classification scheme.

−switzer
Use the contextual Switzer classification scheme.

−hier Use the Jia and Richards hierarchical classifier. A reject class may be introduced by specifying **-mdist**.

−xhier Use the Rasmus Larsen and Allan Aasbjerg Nielsen extended Jia and Richards hierarchical classifier. In this case a classification including a Jeffries-Matusita feature selection scheme is performed for each pair of input classes in the training set. This results in (nclass-1)*nclass/2 classifiers. A majority voting scheme is subsequently applied in order to find the final classification result for each pixel.

−Jeps *Jeps*
Jeps is the relative change in the Jeffries-Matusita distance used for stopping criterion in the feature selection scheme.

−auto [*rho* [*theta*]]
Use a model that allows for autocorrelated noise. This may be combined with an OHM model as well as a WSH model. *rho* is the correlation between first order neighbouring pixels. *theta* is the proportion of the total variation due to the noise. Both parameters default to 0.5 .

−pqr *p q r*
These are parameters for the OHM model. *p* , *q* , and *r* are the prior probabilities of observing a X, a L, or a T pattern in the classified image within a cross consisting of a pixel and its four nearest neighbour. *p* , *q* , and *r* default to 0.8, 0.0828, and 0.117 respectively.

−T *trainfile*
Read a training set from *trainfile.* The training set should be a HIPS byte image. The classes may be numbered arbitrarily. The same numbers will be used in the output image. Pixels that are not part of the training set should have the value 0.

−V *testfile*
Evaluate the classification results using the test data set in *testfile*

−v *proportion seed*
Partition the training set into a training set and a test set. A training pixel is sent to the test set with probability *proportion seed* is a seed for the random number generator used to partition the set. The classification results are evaulated on the test set.

−saveC *saveCfile*
Save the prior probabilities, means and dispersion matrices in *saveCfile.*

−C *covfile*
Read the dispersion matrix of the input data from *covfile*. The dispersion matrix must be loaded in HIPS-format and the format must be double. The first line in each frame (class) must contain the image mean, and the second line the prior probability for the class.

−loss *lossfile*
Read the loss function for the classification from *lossfile*. The loss matrix must be loaded in HIPS-format and the format must be double. In the cth column and the rth row the HIPS file must conatin the loss of classifying a pixel of class r as belonging to class c. This is only implemented for the classical classification algorithms.

−ap *ap1 ap2 ... apk*
Set the prior probability for each class to *api*.

−rq *quantile*
Set the reject class Mahalanobis distance to the distance given by *quantile* in the chi aquare distribution.

−rc *rclassvalue*
Set the reject class pixels in th eoutput image to *rclassvalue*. *rclassvalue* defaults to 0.

−mdist *mdistfile*
Output the Mahanalobis distance of a pixel to the posterior class in a HIPS image to *mdistfile*.

−Mdist *Mdistfile*
Output the Mahanalobis distance of a pixel to all classes in a HIPS (bil) image to *Mdistfile*.

−pprob *pprobfile*
Print the posterior probability for each pixel in a HIPS image to *pprobfile*.

−Pprob *Pprobfile*
Print the posterior probability for all classes for each pixel in a HIPS (bil) image to *Pprobfile*.

−prior *priorfile*
Read the prior probabilities for all classes for each pixel from the HIPS (bil) image *priorfile*.

−cum *cumfile*
Print the cumulator arrays for the majority voting scheme used in the IMM modified Jia classifier in a HIPS image to *cumfile*. Beware that space is allocated for number of classes bytes for each pixel in the input image, which is a potentially large number.

−re Reestimate contextual parameters for OHM and WSH based on the classification result.

−cmmah
Calculate Mahalanobis distances between class means.

−nodate
Do not print date and time in log file.

−nopc Do not print means and covariance matrices in log file.

−ps *pagesize*
Use at maximum *pagesize* lines on each page in log file.

−ls *linesize*
Use at maximum *linesize* characters in each line in log file.

−Bnames *variablenamesfile*
Read variable names from *variablenamesfile*. Each line should hold first a variable number and second a string. variables are numbered consequtively starting with 0.

−Cnames *classnamesfile*
Read class names from *classnamesfile*. Each line should hold first a class number and second a string. Class 0 is reserved for the reject class. Class numbers must be positive and smaller than 256.

IMAGE FORMATS HANDLED DIRECTLY
byte, float

SEE ALSO

disc3D(1), seed(1), maf(1), jefmat(1), roprc(1), bil(1), lintrans(1), musecc(1)

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