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Introduction

mlpack is an intuitive, fast, scalable C++ machine learning library, meant to be a machine learning analog to LAPACK. It aims to implement a wide array of machine learning methods and function as a "swiss army knife" for machine learning researchers. The mlpack development website can be found at http://mlpack.org.

mlpack uses the Armadillo C++ matrix library (http://arma.sourceforge.net) for general matrix, vector, and linear algebra support. mlpack also uses the program_options, math_c99, and unit_test_framework components of the Boost library, and optionally uses libbfd and libdl to give backtraces when compiled with debugging symbols on some platforms.

How To Use This Documentation

This documentation is API documentation similar to Javadoc. It isn't necessarily a tutorial, but it does provide detailed documentation on every namespace, method, and class.

Each mlpack namespace generally refers to one machine learning method, so browsing the list of namespaces provides some insight as to the breadth of the methods contained in the library.

To generate this documentation in your own local copy of mlpack, you can simply use Doxygen, from the root directory of the project:

```
$ doxygen
```

Executables

mlpack provides several executables so that mlpack methods can be used without any need for knowledge of C++. These executables are all self-documented, and that documentation can be accessed by running the executables with the '-h' or '–help' flag.

A full list of executables is given below:

- mlpack_adaboost
- mlpack_approx_kfn
- mlpack_cf
- mlpack_decision_stump
- mlpack_decision_tree
- mlpack_det
- mlpack_emst
- mlpack_fastmks
- mlpack_gmm_train
- mlpack_gmm_generate
- mlpack_gmm_probability
- mlpack_hmm_train
- mlpack_hmm_loglik

- mlpack_hmm_viterbi
- mlpack_hmm_generate
- mlpack_hoeffding_tree
- mlpack_kernel_pca
- mlpack_kfn
- mlpack_kmeans
- mlpack_knn
- mlpack_krann
- mlpack_lars
- mlpack_linear_regression
- mlpack_local_coordinate_coding
- mlpack_logistic_regression
- mlpack_lsh
- mlpack_mean_shift
- mlpack_nbc
- mlpack_nca
- mlpack_pca
- mlpack_perceptron
- mlpack_radical
- mlpack_range_search
- mlpack_softmax_regression
- mlpack_sparse_coding

Tutorials

A few short tutorials on how to use mlpack are given below.

- Building mlpack
- Matrices in mlpack
- mlpack Input and Output

- mlpack Timers
- Simple Sample mlpack Programs
- mlpack version information

Tutorials on specific methods are also available.

- NeighborSearch tutorial (k-nearest-neighbors)
- Linear/ridge regression tutorial (mlpack_linear_regression)
- RangeSearch tutorial (mlpack_range_search)
- Density Estimation Tree (DET) tutorial
- EMST Tutorial
- K-Means tutorial (kmeans)
- Fast max-kernel search tutorial (fastmks)
- Alternating Matrix Factorization tutorial.

Methods in mlpack

The following methods are included in mlpack:

- Density Estimation Trees - mlpack::det::DTree
- Euclidean Minimum Spanning Trees - mlpack::emst::DualTreeBoruvka
- Gaussian Mixture Models (GMMs) - mlpack::gmm::GMM
- Hidden Markov Models (HMMs) - mlpack::hmm::HMM
- Kernel PCA - mlpack::kpca::KernelPCA
- K-Means Clustering - mlpack::kmeans::KMeans
- Least-Angle Regression (LARS/LASSO) - mlpack::regression::LARS
- Local Coordinate Coding - mlpack::lcc::LocalCoordinateCoding
- Locality-Sensitive Hashing - mlpack::neighbor::LSHSearch
- Naive Bayes Classifier - mlpack::naive_bayes::NaiveBayesClassifier
- Neighborhood Components Analysis (NCA) - mlpack::nca::NCA
- Principal Components Analysis (PCA) - mlpack::pca::PCA

- RADICAL (ICA) - mlpack::radical::Radical
- Simple Least-Squares Linear Regression - mlpack::regression::LinearRegression
- Sparse Coding - mlpack::sparse_coding::SparseCoding
- Tree-based neighbor search (KNN, KFN) - mlpack::neighbor::NeighborSearch
- Tree-based range search - mlpack::range::RangeSearch

Final Remarks

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