

GDataSet

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Introduction

GDataSet is a C library to manipulate generic data sets.

It offers the following functionalities:

- loading a data set from its description file
- splitting the data set into user defined categories (e.g. training, validation, test)
- shuffling the data set

- looping through the samples of the data set.

It provides an unique interface to several implementation supporting various types of dataset. Supported types are: VecFloat and pair of GenBrush (img/mask).

The GDataSet library uses the PBErr, GSet, PBJson, PBMath and PBFileSys libraries.

1 Interface

```
// ===== GDATASET_H =====

#ifndef GDATASET_H
#define GDATASET_H

// ===== Include =====

#include <stdlib.h>
#include <stdio.h>
#include <stdbool.h>
#include <execinfo.h>
#include <errno.h>
#include <string.h>
#include "pberr.h"
#include "gset.h"
#include "pbmath.h"
#include "pbjson.h"
#include "pbfilesys.h"

// Define locally the needed types and functions for libraries that were
// not included to allow the user to include only what's needed for her
// application
#ifndef GENBRUSH_H
typedef struct GenBrush GenBrush;
typedef enum GBScaleMethod {GBScaleMethod_Default} GBScaleMethod;
GenBrush* GBCreateFromFile(const char* const fileName);
GenBrush* GBScale(const GenBrush* const that,
    const VecShort2D* const dim, const GBScaleMethod scaleMethod);
void GBFree(GenBrush** that);
VecShort2D* GBDim(const GenBrush* const that);
#endif

// ===== Define =====

typedef enum GDataSetType {
    GDataSetType_VecFloat, GDataSetType_GenBrushPair
} GDataSetType;

// ===== Data structures =====

typedef struct GDataSet {
    // Path to the config file of the data set
    char* _cfgFilePath;
    // Data in the config file encoded as JSON object
```

```

JSONNode* _json;
// Name of the data set
char* _name;
// Description of the data set
char* _desc;
// Type of set
GDataSetType _type;
// Nb of samples
int _nbSample;
// Set of samples
GSet _samples;
// Dimensions of each sample, they must have all the same dimension
// e.g.:
// if samples are VecFloat<3> then _dim = VecShort<1>[3]
// if samples are GenBrush then _dim = VecShort<2>[width, height]
VecShort* _sampleDim;
// Splitting of samples
VecShort* _split;
// Sets of splitted samples
GSet* _categories;
// Iterators on the sets of splitted samples
GSetIterForward* _iterators;
} GDataSet;

typedef struct GDataSetVecFloat {
    // Generic GDataSet
    GDataSet _dataSet;
} GDataSetVecFloat;

typedef struct GDataSetGenBrushPair {
    // Generic GDataSet
    GDataSet _dataSet;
    // Format of images
    char* _format;
    // Dimensions of images
    VecShort2D _dim;
    // Nb of mask per img
    int _nbMask;
} GDataSetGenBrushPair;

#define GDS_NBMAXMASK 100
typedef struct GDSFilePathPair {
    char* _path[1 + GDS_NBMAXMASK];
} GDSFilePathPair;

typedef struct GDSGenBrushPair {
    GenBrush* _img;
    GenBrush* _mask[GDS_NBMAXMASK];
} GDSGenBrushPair;

// ===== Functions declaration =====

// Create a new GDataSet defined by the file at 'cfgFilePath'
// The random generator must have been initialized before calling
// this function
GDataSet GDataSetCreateStatic(const char* const cfgFilePath);

// Free the memory used by a GDataSet
void GDataSetFreeStatic(GDataSet* const that);

// Create a new GDataSetVecFloat defined by the file at 'cfgFilePath'
// The random generator must have been initialized before calling

```

```

// this function
GDataSetVecFloat GDataSetVecFloatCreateStatic(
    const char* const cfgFilePath);

// Free the memory used by a GDataSetVecFloat
void GDataSetVecFloatFreeStatic(GDataSetVecFloat* const that);

// Create a new GDataSetGenBrushPair defined by the file at 'cfgFilePath'
// The random generator must have been initialized before calling
// this function
GDataSetGenBrushPair GDataSetGenBrushPairCreateStatic(
    const char* const cfgFilePath);

// Free the memory used by a GDataSetGenBrushPair
void GDataSetGenBrushPairFreeStatic(GDataSetGenBrushPair* const that);

// Get the total number of samples in the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
long _GDSGetSize(const GDataSet* const that);

// Get the number of masks in the GDataSet 'that'
int _GDSGetNbMask(const GDataSet* const that);

// Get the number of masks in the GDataSetGenBrushPair 'that'
#if BUILDMODE != 0
inline
#endif
int GDSGetNbMaskGenBrushPair(const GDataSetGenBrushPair* const that);

// Get the total number of samples in the GDataSet 'that' for the
// category 'iCat'. Return 0 if the category doesn't exists
#if BUILDMODE != 0
inline
#endif
long _GDSGetSizeCat(const GDataSet* const that, const long iCat);

// Split the samples of the GDataSet 'that' into several categories
// defined by 'cat'. The dimension of 'cat' gives the number of
// categories and the value for each dimension of 'cat' gives the
// number of samples in the corresponding category. For example <3,4>
// would mean 2 categories with 3 samples in the first one and 4
// samples in the second one. There must be at least as many samples
// in the data set as the sum of samples in 'cat'.
// Each category must have at least one sample. Samples are allocated // randomly to the categories.
// If 'that' was already splitted the previous splitting is discarded.
void _GDSSplit(GDataSet* const that, const VecShort* const cat);

// Unsplit the GDataSet 'that', i.e. after calling GDataSetUnsplit 'that'
// has only one category containing all the samples
#if BUILDMODE != 0
inline
#endif
void _GDSUnsplit(GDataSet* const that);

// Shuffle the samples of the category 'iCat' of the GDataSet 'that'.
// Reset the iterator of the category
#if BUILDMODE != 0
inline
#endif
void _GDSShuffle(GDataSet* const that, const long iCat);

```

```

// Shuffle the samples of all the categories of the GDataSet 'that'.
// Reset the iterator of the categories
#if BUILDMODE != 0
inline
#endif
void _GDSShuffleAll(GDataSet* const that);

// Get the name of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const char* _GDSName(const GDataSet* const that);

// Get the description of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const char* _GDSDesc(const GDataSet* const that);

// Get the path of the config file of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const char* _GDSCfgFilePath(const GDataSet* const that);

// Get a copy of the path of the config file of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
char* _GDSGetCfgFilePath(const GDataSet* const that);

// Get the path of the folder of the config file of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
char* _GDSGetCfgFolderPath(const GDataSet* const that);

// Get the type of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
GDataSetType _GDSGetType(const GDataSet* const that);

// Get the number of categories of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
long _GDSGetNbCat(const GDataSet* const that);

// If there is a next sample move to the next sample of the category
// 'iCat' and return true, else return false
#if BUILDMODE != 0
inline
#endif
bool _GDSStepSample(const GDataSet* const that, const long iCat);

// Reset the iterator on category 'iCat' of the GDataSet 'that', i.e.
// the next call to GDataSetGetNextSample will give the first sample of
// the category 'iCat'
#if BUILDMODE != 0
inline

```

```

#endif
void _GDSReset(GDataSet* const that, const long iCat);

// Reset the iterator on all categories of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
void _GDSResetAll(GDataSet* const that);

// Get the current sample in the category 'iCat' of the GDataSet 'that'
void* _GDSGetSample(
    const GDataSet* const that, const int iCat);
VecFloat* GDSGetSampleVecFloat(
    const GDataSetVecFloat* const that, const int iCat);
GDSGenBrushPair* GDSGetSampleGenBrushPair(
    const GDataSetGenBrushPair* const that, const int iCat);

// Release the memory used by the FilePathPair 'that'
void GDSFilePathPairFree(GDSFilePathPair** const that);
#ifdef GENBRUSH_H
// Release the memory used by the GenBrushPair 'that'
void GDSGenBrushPairFree(GDSGenBrushPair** const that);
#endif

// Get the dimensions of the samples of GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const VecShort* _GDSSampleDim(const GDataSet* const that);

// ===== Polymorphism =====

#define GDSCfgFilePath(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSCfgFilePath, \
    const GDataSet*: _GDSCfgFilePath, \
    GDataSetVecFloat*: _GDSCfgFilePath, \
    const GDataSetVecFloat*: _GDSCfgFilePath, \
    GDataSetGenBrushPair*: _GDSCfgFilePath, \
    const GDataSetGenBrushPair*: _GDSCfgFilePath, \
    default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSGetCfgFilePath(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSGetCfgFilePath, \
    const GDataSet*: _GDSGetCfgFilePath, \
    GDataSetVecFloat*: _GDSGetCfgFilePath, \
    const GDataSetVecFloat*: _GDSGetCfgFilePath, \
    GDataSetGenBrushPair*: _GDSGetCfgFilePath, \
    const GDataSetGenBrushPair*: _GDSGetCfgFilePath, \
    default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSGetCfgFolderPath(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSGetCfgFolderPath, \
    const GDataSet*: _GDSGetCfgFolderPath, \
    GDataSetVecFloat*: _GDSGetCfgFolderPath, \
    const GDataSetVecFloat*: _GDSGetCfgFolderPath, \
    GDataSetGenBrushPair*: _GDSGetCfgFolderPath, \
    const GDataSetGenBrushPair*: _GDSGetCfgFolderPath, \
    default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSDesc(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSDesc, \
    const GDataSet*: _GDSDesc, \

```

```

GDataSetVecFloat*: _GDSDesc, \
const GDataSetVecFloat*: _GDSDesc, \
GDataSetGenBrushPair*: _GDSDesc, \
const GDataSetGenBrushPair*: _GDSDesc, \
default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSGetNbCat(DataSet) _Generic(DataSet, \
GDataSet*: _GDSGetNbCat, \
const GDataSet*: _GDSGetNbCat, \
GDataSetVecFloat*: _GDSGetNbCat, \
const GDataSetVecFloat*: _GDSGetNbCat, \
GDataSetGenBrushPair*: _GDSGetNbCat, \
const GDataSetGenBrushPair*: _GDSGetNbCat, \
default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSGetSample(DataSet, ICat) _Generic(DataSet, \
GDataSet*: _GDSGetSample, \
const GDataSet*: _GDSGetSample, \
GDataSetVecFloat*: GDSGetSampleVecFloat, \
const GDataSetVecFloat*: GDSGetSampleVecFloat, \
GDataSetGenBrushPair*: GDSGetSampleGenBrushPair, \
const GDataSetGenBrushPair*: GDSGetSampleGenBrushPair, \
default: PBErrInvalidPolymorphism)(DataSet, ICat)

#define GDSGetSize(DataSet) _Generic(DataSet, \
GDataSet*: _GDSGetSize, \
const GDataSet*: _GDSGetSize, \
GDataSetVecFloat*: _GDSGetSize, \
const GDataSetVecFloat*: _GDSGetSize, \
GDataSetGenBrushPair*: _GDSGetSize, \
const GDataSetGenBrushPair*: _GDSGetSize, \
default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSGetSizeCat(DataSet, ICat) _Generic(DataSet, \
GDataSet*: _GDSGetSizeCat, \
const GDataSet*: _GDSGetSizeCat, \
GDataSetVecFloat*: _GDSGetSizeCat, \
const GDataSetVecFloat*: _GDSGetSizeCat, \
GDataSetGenBrushPair*: _GDSGetSizeCat, \
const GDataSetGenBrushPair*: _GDSGetSizeCat, \
default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet, ICat)

#define GDSGetType(DataSet) _Generic(DataSet, \
GDataSet*: _GDSGetType, \
const GDataSet*: _GDSGetType, \
GDataSetVecFloat*: _GDSGetType, \
const GDataSetVecFloat*: _GDSGetType, \
GDataSetGenBrushPair*: _GDSGetType, \
const GDataSetGenBrushPair*: _GDSGetType, \
default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSName(DataSet) _Generic(DataSet, \
GDataSet*: _GDSName, \
const GDataSet*: _GDSName, \
GDataSetVecFloat*: _GDSName, \
const GDataSetVecFloat*: _GDSName, \
GDataSetGenBrushPair*: _GDSName, \
const GDataSetGenBrushPair*: _GDSName, \
default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSGetNbMask(DataSet) _Generic(DataSet, \
GDataSet*: _GDSGetNbMask, \

```

```

const GDataSet*: _GDSGetNbMask, \
GDataSetGenBrushPair*: GDSGetNbMaskGenBrushPair, \
const GDataSetGenBrushPair*: GDSGetNbMaskGenBrushPair, \
default: PBErrInvalidPolymorphism)(DataSet)

#define GDSReset(DataSet, ICat) _Generic(DataSet, \
    GDataSet*: _GDSReset, \
    const GDataSet*: _GDSReset, \
    GDataSetVecFloat*: _GDSReset, \
    const GDataSetVecFloat*: _GDSReset, \
    GDataSetGenBrushPair*: _GDSReset, \
    const GDataSetGenBrushPair*: _GDSReset, \
    default: PBErrInvalidPolymorphism)((GDataSet*)DataSet, ICat)

#define GDSResetAll(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSResetAll, \
    const GDataSet*: _GDSResetAll, \
    GDataSetVecFloat*: _GDSResetAll, \
    const GDataSetVecFloat*: _GDSResetAll, \
    GDataSetGenBrushPair*: _GDSResetAll, \
    const GDataSetGenBrushPair*: _GDSResetAll, \
    default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSSampleDim(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSSampleDim, \
    const GDataSet*: _GDSSampleDim, \
    GDataSetVecFloat*: _GDSSampleDim, \
    const GDataSetVecFloat*: _GDSSampleDim, \
    GDataSetGenBrushPair*: _GDSSampleDim, \
    const GDataSetGenBrushPair*: _GDSSampleDim, \
    default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet)

#define GDSShuffle(DataSet, ICat) _Generic(DataSet, \
    GDataSet*: _GDSShuffle, \
    GDataSetVecFloat*: _GDSShuffle, \
    GDataSetGenBrushPair*: _GDSShuffle, \
    default: PBErrInvalidPolymorphism)((GDataSet*)DataSet, ICat)

#define GDSShuffleAll(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSShuffleAll, \
    GDataSetVecFloat*: _GDSShuffleAll, \
    GDataSetGenBrushPair*: _GDSShuffleAll, \
    default: PBErrInvalidPolymorphism)((GDataSet*)DataSet)

#define GDSSplit(DataSet, Cat) _Generic(DataSet, \
    GDataSet*: _GDSSplit, \
    GDataSetVecFloat*: _GDSSplit, \
    GDataSetGenBrushPair*: _GDSSplit, \
    default: PBErrInvalidPolymorphism)((GDataSet*)DataSet, Cat)

#define GDSStepSample(DataSet, ICat) _Generic(DataSet, \
    GDataSet*: _GDSStepSample, \
    const GDataSet*: _GDSStepSample, \
    GDataSetVecFloat*: _GDSStepSample, \
    const GDataSetVecFloat*: _GDSStepSample, \
    GDataSetGenBrushPair*: _GDSStepSample, \
    const GDataSetGenBrushPair*: _GDSStepSample, \
    default: PBErrInvalidPolymorphism)((const GDataSet*)DataSet, ICat)

#define GDSUnsplit(DataSet) _Generic(DataSet, \
    GDataSet*: _GDSUnsplit, \
    GDataSetVecFloat*: _GDSUnsplit, \

```



```

GDataSetGenBrushPair*: _GDSUnsplit, \
default: PBErrInvalidPolymorphism)((GDataSet*)DataSet)

// ===== Inliner =====

#if BUILDMODE != 0
#include "gdataset-inline.c"
#endif

#endif

```

2 Code

2.1 gdataset.c

```

// ===== GDATASET_C =====

// ===== Include =====

#include "gdataset.h"
#if BUILDMODE == 0
#include "gdataset-inline.c"
#endif

// ===== Functions implementation =====

// Create a new GDataSet defined by the file at 'cfgFilePath'
// The random generator must have been initialized before calling
// this function
GDataSet GDataSetCreateStatic(const char* const cfgFilePath) {
#if BUILDMODE == 0
    if (cfgFilePath == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'cfgFilePath' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    // Declare the new GDataSet
    GDataSet that;
    // Copy the file path
    that._cfgFilePath = PBErrMalloc(GDataSetErr, strlen(cfgFilePath) + 1);
    strcpy(that._cfgFilePath, cfgFilePath);
    // Open the description file
    FILE* cfgFile = fopen(cfgFilePath, "r");
    // If the description file doesn't exist
    if (cfgFile == NULL) {
        GDataSetErr->_type = PBErrTypeInvalidArg;
        sprintf(GDataSetErr->_msg, "Can't open the configuration file %s",
            cfgFilePath);
        PBErrCatch(GDataSetErr);
    }
    // Load the encoded data
    that._json = JSONCreate();
    // Load the whole encoded data
    if (JSONLoad(that._json, cfgFile) == false) {
        printf("%s\n", GDataSetErr->_msg);
        GDataSetErr->_type = PBErrTypeInvalidData;
    }
}

```

```

    sprintf(GDataSetErr->_msg, "Can't load the configuration file");
    PBErrCatch(GDataSetErr);
}
// Decode dataSet
JSONNode* prop = JSONProperty(that._json, "dataSet");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (dataSet missing)");
    PBErrCatch(GDataSetErr);
}
JSONNode* val = JSONValue(prop, 0);
that._name = PBErrMalloc(GDataSetErr,
    sizeof(char) * (strlen(JSONLabel(val)) + 1));
strcpy(that._name, JSONLabel(val));
// Decode desc
prop = JSONProperty(that._json, "desc");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (desc missing)");
    PBErrCatch(GDataSetErr);
}
val = JSONValue(prop, 0);
that._desc = PBErrMalloc(GDataSetErr,
    sizeof(char) * (strlen(JSONLabel(val)) + 1));
strcpy(that._desc, JSONLabel(val));
// Decode dataSetType
prop = JSONProperty(that._json, "dataSetType");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (dataSetType missing)");
    PBErrCatch(GDataSetErr);
}
val = JSONValue(prop, 0);
that._type = atoi(JSONLabel(val));
// Decode dim
prop = JSONProperty(that._json, "dim");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (dim missing)");
    PBErrCatch(GDataSetErr);
}
that._sampleDim = NULL;
VecDecodeAsJSON(&(that._sampleDim), prop);
// Decode nbSample
prop = JSONProperty(that._json, "nbSample");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (nbSample missing)");
    PBErrCatch(GDataSetErr);
}
val = JSONValue(prop, 0);
that._nbSample = atoi(JSONLabel(val));
// Init the splits and iterators
that._split = NULL;
that._categories = NULL;
that._iterators = NULL;

```

```

    // Close the description file
    fclose(cfgFile);

    // Return the new GDataSet
    return that;
}

// Free the memory used by a GDataSet
void GDataSetFreeStatic(GDataSet* const that) {
    if (that == NULL)
        return;
    // Free memory
    JSONFree(&(that->_json));
    free(that->_name);
    free(that->_desc);
    free(that->_cfgFilePath);
    for (int iCat = GDSSetNbCat(that); iCat--;) {
        GSetFlush(that->_categories + iCat);
    }
    free(that->_categories);
    free(that->_iterators);
    VecFree(&(that->_split));
    VecFree(&(that->_sampleDim));
}

// Create a new GDataSetVecFloat defined by the file at 'cfgFilePath'
// The random generator must have been initialized before calling
// this function
GDataSetVecFloat GDataSetVecFloatCreateStatic(
    const char* const cfgFilePath) {
    #if BUILDMODE == 0
        if (cfgFilePath == NULL) {
            GDataSetErr->_type = PBErrTypeNullPointer;
            sprintf(PBImgAnalysisErr->_msg, "'cfgFilePath' is null");
            PBErrCatch(PBImgAnalysisErr);
        }
    #endif
    // Declare the new GDataSetVecFloat
    GDataSetVecFloat that;
    // Create the generic GDataSet
    that._dataSet = GDataSetCreateStatic(cfgFilePath);
    // Check the type
    if (GDSSetType(&that) != GDataSetType_VecFloat) {
        GDataSetErr->_type = PBErrTypeInvalidData;
        sprintf(GDataSetErr->_msg, "Invalid type");
        PBErrCatch(GDataSetErr);
    }
    // Check the samples' dimension
    if (VecGetDim(GDSSampleDim(&that)) != 1) {
        GDataSetErr->_type = PBErrTypeInvalidData;
        sprintf(GDataSetErr->_msg, "Invalid sample dimension");
        PBErrCatch(GDataSetErr);
    }
    // Load the samples
    JSONNode* prop = JSONProperty(that._dataSet._json, "samples");
    if (prop == NULL) {
        GDataSetErr->_type = PBErrTypeInvalidData;
        sprintf(GDataSetErr->_msg,
            "Invalid description file (samples missing)");
        PBErrCatch(GDataSetErr);
    }
    if (JSONGetNbValue(prop) != that._dataSet._nbSample) {

```

```

    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (samples's number != nbSample)");
    PBErrCatch(GDataSetErr);
}
that._dataSet._samples = GSetCreateStatic();
for (int iSample = 0; iSample < that._dataSet._nbSample; ++iSample) {
    JSONNode* val = JSONValue(prop, iSample);
    VecFloat* v = NULL;
    VecDecodeAsJSON(&v, val);
    GSetAppend(&(that._dataSet._samples), v);
}
// Create the initial category
that._dataSet._split = VecShortCreate(1);
VecSet(that._dataSet._split, 0, that._dataSet._nbSample);
that._dataSet._categories = PBErrMalloc(GDataSetErr, sizeof(GSet));
that._dataSet._categories[0] = GSetCreateStatic();
GSetIterForward iter =
    GSetIterForwardCreateStatic(&(that._dataSet._samples));
do {
    void* sample = GSetIterGet(&iter);
    GSetAppend(that._dataSet._categories, sample);
} while (GSetIterStep(&iter));
that._dataSet._iterators =
    PBErrMalloc(GDataSetErr, sizeof(GSetIterForward));
that._dataSet._iterators[0] =
    GSetIterForwardCreateStatic(that._dataSet._categories);
// Return the new GDataSetVecFloat
return that;
}

// Free the memory used by a GDataSetVecFloat
void GDataSetVecFloatFreeStatic(GDataSetVecFloat* const that) {
    if (that == NULL)
        return;
    // Free memory
    GDataSetFreeStatic((GDataSet*)that);
    while (GSetNbElem(&(((GDataSet*)that)->_samples)) > 0) {
        VecFloat* sample = GSetPop(&(((GDataSet*)that)->_samples));
        VecFree(&sample);
    }
}

// Create a new GDataSetGenBrushPair defined by the file at 'cfgFilePath'
// The random generator must have been initialized before calling
// this function
GDataSetGenBrushPair GDataSetGenBrushPairCreateStatic(
    const char* const cfgFilePath) {
    #if BUILDMODE == 0
        if (cfgFilePath == NULL) {
            GDataSetErr->_type = PBErrTypeNullPointer;
            sprintf(PBImgAnalysisErr->_msg, "'cfgFilePath' is null");
            PBErrCatch(PBImgAnalysisErr);
        }
    #endif
    // Declare the new GDataSetVecFloat
    GDataSetGenBrushPair that;
    // Create the generic GDataSet
    that._dataSet = GDataSetCreateStatic(cfgFilePath);
    // Check the type
    if (GDSGetType(&that) != GDataSetType_GenBrushPair) {
        GDataSetErr->_type = PBErrTypeInvalidData;
    }
}

```

```

    sprintf(GDataSetErr->_msg, "Invalid type");
    PBErrCatch(GDataSetErr);
}
// Check the samples' dimension
if (VecGetDim(GDSSampleDim(&that)) != 2) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg, "Invalid sample dimension (%ld=2)",
        VecGetDim(GDSSampleDim(&that)));
    PBErrCatch(GDataSetErr);
}
// Get the nb of mask
JSONNode* prop = JSONProperty(that._dataSet._json, "nbMask");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (nbMask missing)");
    PBErrCatch(GDataSetErr);
}
that._nbMask = atoi(JSONLabel(JSONValue(prop), 0));
if (that._nbMask >= GDS_NBMAXMASK) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (invalid nbMask %d>=%d)",
        that._nbMask, GDS_NBMAXMASK);
    PBErrCatch(GDataSetErr);
}
// Load the samples
prop = JSONProperty(that._dataSet._json, "samples");
if (prop == NULL) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (samples missing)");
    PBErrCatch(GDataSetErr);
}
if (JSONGetNbValue(prop) != that._dataSet._nbSample) {
    GDataSetErr->_type = PBErrTypeInvalidData;
    sprintf(GDataSetErr->_msg,
        "Invalid description file (samples's number != nbSample)");
    PBErrCatch(GDataSetErr);
}
that._dataSet._samples = GSetCreateStatic();
for (int iSample = 0; iSample < that._dataSet._nbSample; ++iSample) {
    JSONNode* val = JSONValue(prop, iSample);
    // Allocate memory for the pair image/mask
    GDSFilePathPair* pair = PBErrMalloc(GDataSetErr,
        sizeof(GDSFilePathPair));
    pair->_path[0] = NULL;
    for (int iMask = GDS_NBMAXMASK; iMask--;)
        pair->_path[1 + iMask] = NULL;
    // Decode img
    JSONNode* subProp = JSONProperty(val, "img");
    if (subProp == NULL) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg,
            "Invalid description file (samples.img missing)");
        PBErrCatch(GDataSetErr);
    }
    JSONNode* subVal = JSONValue(subProp, 0);
    pair->_path[0] = PBErrMalloc(GDataSetErr,
        sizeof(char) * (strlen(JSONLabel(subVal)) + 1));
    strcpy(pair->_path[0], JSONLabel(subVal));
    // Decode mask

```

```

    subProp = JSONProperty(val, "mask");
    if (subProp == NULL) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg,
            "Invalid description file (samples.mask missing)");
        PBErrCatch(GDataSetErr);
    }
    for (int iMask = 0; iMask < that._nbMask; ++iMask) {
        subVal = JSONValue(subProp, iMask);
        pair->_path[1 + iMask] = PBErrMalloc(GDataSetErr,
            sizeof(char) * (strlen(JSONLabel(subVal)) + 1));
        strcpy(pair->_path[1 + iMask], JSONLabel(subVal));
    }
    // Add the pair to the samples
    GSetAppend(&(that._dataSet._samples), pair);
}
// Create the initial category
that._dataSet._split = VecShortCreate(1);
VecSet(that._dataSet._split, 0, that._dataSet._nbSample);
that._dataSet._categories = PBErrMalloc(GDataSetErr, sizeof(GSet));
that._dataSet._categories[0] = GSetCreateStatic();
GSetIterForward iter =
    GSetIterForwardCreateStatic(&(that._dataSet._samples));
do {
    void* sample = GSetIterGet(&iter);
    GSetAppend(that._dataSet._categories, sample);
} while (GSetIterStep(&iter));
that._dataSet._iterators =
    PBErrMalloc(GDataSetErr, sizeof(GSetIterForward));
that._dataSet._iterators[0] =
    GSetIterForwardCreateStatic(that._dataSet._categories);
// Return the new GDataSetVecFloat
return that;
}

// Free the memory used by a GDataSetGenBrushPair
void GDataSetGenBrushPairFreeStatic(GDataSetGenBrushPair* const that) {
    if (that == NULL)
        return;
    // Free memory
    GDataSetFreeStatic((GDataSet*)that);
    while (GSetNbElem(&(((GDataSet*)that)->_samples)) > 0) {
        GDSFilePathPair* sample = GSetPop(&(((GDataSet*)that)->_samples));
        GDSFilePathPairFree(&sample);
    }
}

// Split the samples of the GDataSet 'that' into several categories
// defined by 'cat'. The dimension of 'cat' gives the number of
// categories and the value for each dimension of 'cat' gives the
// number of samples in the corresponding category. For example <3,4>
// would mean 2 categories with 3 samples in the first one and 4
// samples in the second one. There must be at least as many samples
// in the data set as the sum of samples in 'cat'.
// Each category must have at least one sample. Samples are allocated // randomly to the categories.
// If 'that' was already splitted the previous splitting is discarded.
void _GDSSplit(GDataSet* const that, const VecShort* const cat) {
#ifdef BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
}

```

```

    }
    long nb = 0;
    for (long iCat = VecGetDim(cat); iCat--;)
        nb += VecGet(cat, iCat);
    if (nb > GDSGetSize(that)) {
        GDataSetErr->_type = PBErrTypeInvalidArg;
        sprintf(PBImgAnalysisErr->_msg,
            "Not enough samples for the requested splitting (%ld<%ld)",
            nb, GDSGetSize(that));
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    // Free the current splitting if necessary
    if (that->_categories != NULL) {
        if (that->_split != NULL) {
            for (int iCat = GDSGetNbCat(that); iCat--;) {
                GSetFlush(that->_categories + iCat);
            }
        }
        free(that->_categories);
    }
    if (that->_iterators)
        free(that->_iterators);
    VecFree(&(that->_split));
    // Get the number of categories
    long nbCat = VecGetDim(cat);
    // Allocate memory for the categories
    that->_categories = PBErrMalloc(GDataSetErr, sizeof(GSet) * nbCat);
    for (long iCat = nbCat; iCat--;) {
        that->_categories[iCat] = GSetCreateStatic();
    }
    // Copy the splitting
    that->_split = VecClone(cat);
    // Shuffle the samples
    GSetShuffle(&(that->_samples));
    // Declare an iterator on the samples
    GSetIterForward iter = GSetIterForwardCreateStatic(&(that->_samples));
    // Loop on categories
    for (long iCat = nbCat; iCat--;) {
        // Get the nb of samples for this category
        long nbSample = VecGet(cat, iCat);
        // Loop on the sample
        for (long iSample = nbSample; iSample--; GSetIterStep(&iter)) {
            // Get the next sample
            void* sample = GSetIterGet(&iter);
            // Add the sample to the category
            GSetAppend(that->_categories + iCat, sample);
        }
    }
    // Allocate memory for the iterators
    that->_iterators = PBErrMalloc(GDataSetErr,
        sizeof(GSetIterForward) * nbCat);
    for (long iCat = nbCat; iCat--;) {
        that->_iterators[iCat] =
            GSetIterForwardCreateStatic(that->_categories + iCat);
    }
}

// Get the current sample in the category 'iCat' of the GDataSet 'that'
void* _GDSGetSample(
    const GDataSet* const that, const int iCat) {
    // Call the appropriate function according to the type

```

```

switch (GDSGetType(that)) {
    case GDataSetType_VecFloat:
        return GDSGetSampleVecFloat((GDataSetVecFloat*)that, iCat);
        break;
    case GDataSetType_GenBrushPair:
        return GDSGetSampleGenBrushPair((GDataSetGenBrushPair*)that, iCat);
        break;
    default:
        return NULL;
        break;
}
}

// Get the number of masks in the GDataSet 'that'
int _GDSGetNbMask(const GDataSet* const that) {
    // Call the appropriate function according to the type
    switch (GDSGetType(that)) {
        case GDataSetType_GenBrushPair:
            return GDSGetNbMaskGenBrushPair((GDataSetGenBrushPair*)that);
            break;
        default:
            return 0;
            break;
    }
}

VecFloat* GDSGetSampleVecFloat(
    const GDataSetVecFloat* const that, const int iCat) {
    #if BUILDMODE == 0
        if (that == NULL) {
            GDataSetErr->_type = PBErrTypeNullPointer;
            sprintf(PBImgAnalysisErr->_msg, "'that' is null");
            PBErrCatch(PBImgAnalysisErr);
        }
        if (iCat < 0 || iCat >= GDSGetNbCat(that)) {
            GDataSetErr->_type = PBErrTypeInvalidArg;
            sprintf(PBImgAnalysisErr->_msg, "'iCat' is invalid (0<=%d<%ld)",
                iCat, GDSGetNbCat(that));
            PBErrCatch(PBImgAnalysisErr);
        }
    #endif
    VecFloat* sample = GSetIterGet(((GDataSet*)that)->_iterators + iCat);
    return VecClone(sample);
}

GDSGenBrushPair* GDSGetSampleGenBrushPair(
    const GDataSetGenBrushPair* const that, const int iCat) {
    #if BUILDMODE == 0
        if (that == NULL) {
            GDataSetErr->_type = PBErrTypeNullPointer;
            sprintf(PBImgAnalysisErr->_msg, "'that' is null");
            PBErrCatch(PBImgAnalysisErr);
        }
        if (iCat < 0 || iCat >= GDSGetNbCat(that)) {
            GDataSetErr->_type = PBErrTypeInvalidArg;
            sprintf(PBImgAnalysisErr->_msg, "'iCat' is invalid (0<=%d<%ld)",
                iCat, GDSGetNbCat(that));
            PBErrCatch(PBImgAnalysisErr);
        }
    #endif
    GDSFilePathPair* pairFile =
        GSetIterGet(((GDataSet*)that)->_iterators + iCat);

```



```

GDSGenBrushPair* pairSample = PBErrMalloc(GDataSetErr,
    sizeof(GDSGenBrushPair));
for (int iMask = 0; iMask < GDS_NBMAXMASK; ++iMask)
    pairSample->_mask[iMask] = NULL;
char* root = GDSGetCfgFolderPath(that);
char* path = PBFSJoinPath(root, pairFile->_path[0]);
GenBrush* gb = GBCreateFromFile(path);
// Rescale the sample if needed to always provide to the user
// the dimensions defined in the configuration file of the data set
if (gb != NULL && !VecIsEqual(GBDim(gb), GDSSampleDim(that))) {
    pairSample->_img = GBScale(gb,
        (const VecShort2D*)GDSSampleDim(that), GBScaleMethod_Default);
    GBFree(&gb);
} else {
    pairSample->_img = gb;
}
free(path);
for (int iMask = 0; iMask < GDSGetNbMask(that); ++iMask) {
    path = PBFSJoinPath(root, pairFile->_path[1 + iMask]);
    gb = GBCreateFromFile(path);
    if (gb != NULL && !VecIsEqual(GBDim(gb), GDSSampleDim(that))) {
        pairSample->_mask[iMask] = GBScale(gb,
            (const VecShort2D*)GDSSampleDim(that), GBScaleMethod_Default);
        GBFree(&gb);
    } else {
        pairSample->_mask[iMask] = gb;
    }
    free(path);
}
free(root);
return pairSample;
}

// Release the memory used by the FilePathPair 'that'
void GDSFilePathPairFree(GDSFilePathPair** const that) {
    if (that == NULL || *that == NULL)
        return;
    for (int iMask = GDS_NBMAXMASK + 1; iMask--;)
        if ((*that)->_path[iMask] != NULL)
            free((*that)->_path[iMask]);
    free(*that);
    *that = NULL;
}

// Release the memory used by the GenBrushPair 'that'
void GDSGenBrushPairFree(GDSGenBrushPair** const that) {
    if (that == NULL || *that == NULL)
        return;
    GBFree(&((*that)->_img));
    for (int iMask = GDS_NBMAXMASK; iMask--;)
        GBFree(&((*that)->_mask[iMask]));
    free(*that);
    *that = NULL;
}

```

2.2 gdataset-inline.c

```
// ===== GDATASET_INLINE.C =====
```

```

// ===== Functions implementation =====

// Get the total number of samples in the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
long _GDSGetSize(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return that->_nbSample;
}

// Get the total number of samples in the GDataSet 'that' for the
// category 'iCat'. Return 0 if the category doesn't exists
#if BUILDMODE != 0
inline
#endif
long _GDSGetSizeCat(const GDataSet* const that, const long iCat) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
    if (that->_split == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that->_split' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
    if (iCat < 0 || iCat >= GDSGetNbCat(that)) {
        GDataSetErr->_type = PBErrTypeInvalidArg;
        sprintf(PBImgAnalysisErr->_msg, "'iCat' is invalid (0<=%ld<%ld)",
            iCat, GDSGetNbCat(that));
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return VecGet(that->_split, iCat);
}

// Unsplit the GDataSet 'that', i.e. after calling GDataSetUnsplit 'that'
// has only one category containing all the samples
#if BUILDMODE != 0
inline
#endif
void _GDSUnsplit(GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    // Unsplitting is equivalent to splitting in one category with all the
    // samples
    VecShort* split = VecShortCreate(1);
    VecSet(split, 0, GDSGetSize(that));
    GDSSplit(that, split);
}

```

```

    VecFree(&split);
}

// Shuffle the samples of the category 'iCat' of the GDataSet 'that'.
// Reset the iterator of the category
#if BUILDMODE != 0
inline
#endif
void _GDSShuffle(GDataSet* const that, const long iCat) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
    if (that->_categories == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that->_categories' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
    if (iCat < 0 || iCat >= GDSGetNbCat(that)) {
        GDataSetErr->_type = PBErrTypeInvalidArg;
        sprintf(PBImgAnalysisErr->_msg, "'iCat' is invalid (0<=%ld<%ld)",
            iCat, GDSGetNbCat(that));
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    // Shuffle the GSet of the category
    GSetShuffle(that->_categories + iCat);
    // Reset the iterator
    GDSReset(that, iCat);
}

// Shuffle the samples of all the categories of the GDataSet 'that'.
// Reset the iterator of the categories
#if BUILDMODE != 0
inline
#endif
void _GDSShuffleAll(GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    // Loop on categories
    for (int iCat = GDSGetNbCat(that); iCat--;)
        // Shuffle the category
        GDSShuffle(that, iCat);
}

// Get the name of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const char* _GDSName(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
}

```

```

    }
#endif
    return that->_name;
}

// Get the description of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const char* _GDSDesc(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return that->_desc;
}

// Get the path of the config file of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const char* _GDSCfgFilePath(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return that->_cfgFilePath;
}

// Get a copy of the path of the config file of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
char* _GDSGetCfgFilePath(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    char* ret = malloc(strlen(that->_cfgFilePath) + 1);
    strcpy(ret, that->_cfgFilePath);
    return ret;
}

// Get the path of the folder of the config file of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
char* _GDSGetCfgFolderPath(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
}

```

```

    }
#endif
    return PBFSGetRootPath(that->_cfgFilePath);
}

// Get the type of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
GDataSetType _GDSGetType(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return that->_type;
}

// Get the number of categories of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
long _GDSGetNbCat(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return VecGetDim(that->_split);
}

// If there is a next sample move to the next sample of the category
// 'iCat' and return true, else return false
#if BUILDMODE != 0
inline
#endif
bool _GDSStepSample(const GDataSet* const that, const long iCat) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
    if (that->_iterators == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that->_iterators' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
    if (iCat < 0 || iCat >= GDSGetNbCat(that)) {
        GDataSetErr->_type = PBErrTypeInvalidArg;
        sprintf(PBImgAnalysisErr->_msg, "'iCat' is invalid (0<=%ld<%ld)",
            iCat, GDSGetNbCat(that));
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return GSetIterStep(that->_iterators + iCat);
}

```

```

// Reset the iterator on category 'iCat' of the GDataSet 'that', i.e.
// the next call to GDataSetGetNextSample will give the first sample of
// the category 'iCat'
#if BUILDMODE != 0
inline
#endif
void _GDSReset(GDataSet* const that, const long iCat) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PErrCatch(PBImgAnalysisErr);
    }
    if (that->_iterators == NULL) {
        GDataSetErr->_type = PErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that->_iterators' is null");
        PErrCatch(PBImgAnalysisErr);
    }
    if (iCat < 0 || iCat >= GDSGetNbCat(that)) {
        GDataSetErr->_type = PErrTypeInvalidArg;
        sprintf(PBImgAnalysisErr->_msg, "'iCat' is invalid (0<=%ld<%ld)",
            iCat, GDSGetNbCat(that));
        PErrCatch(PBImgAnalysisErr);
    }
#endif
    GSetIterReset(that->_iterators + iCat);
}

// Reset the iterator on all categories of the GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
void _GDSResetAll(GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PErrCatch(PBImgAnalysisErr);
    }
#endif
    // Loop on categories
    for (int iCat = GDSGetNbCat(that); iCat--;)
        // Shuffle the category
        GDSReset(that, iCat);
}

// Get the dimensions of the samples of GDataSet 'that'
#if BUILDMODE != 0
inline
#endif
const VecShort* _GDSSampleDim(const GDataSet* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PErrCatch(PBImgAnalysisErr);
    }
#endif
    return that->_sampleDim;
}

// Get the number of masks in the GDataSetGenBrushPair 'that'

```

```

#if BUILDMODE != 0
inline
#endif
int GDSGetNbMaskGenBrushPair(const GDataSetGenBrushPair* const that) {
#if BUILDMODE == 0
    if (that == NULL) {
        GDataSetErr->_type = PBErrTypeNullPointer;
        sprintf(PBImgAnalysisErr->_msg, "'that' is null");
        PBErrCatch(PBImgAnalysisErr);
    }
#endif
    return that->_nbMask;
}

```

3 Makefile

```

# Build mode
# 0: development (max safety, no optimisation)
# 1: release (min safety, optimisation)
# 2: fast and furious (no safety, optimisation)
BUILD_MODE?=1

all: pbmake_wget main

# Automatic installation of the repository PBMake in the parent folder
pbmake_wget:
if [ ! -d ../PBMake ]; then wget https://github.com/BayashiPascal/PBMake/archive/master.zip; unzip master.zip; rm -f

# Makefile definitions
MAKEFILE_INC=../PBMake/Makefile.inc
include $(MAKEFILE_INC)

# Rules to make the executable
repo=gdataset
$(repo)_EXENAME: \
$(repo)_EXENAME.o \
$(repo)_EXE_DEP \
$(repo)_DEP
$(COMPILER) 'echo "$(repo)_EXE_DEP" "$(repo)_EXENAME.o" | tr ' ' '\n' | sort -u' $(LINK_ARG) $(repo)_LINK_ARG

$(repo)_EXENAME.o: \
$(repo)_DIR/$(repo)_EXENAME.c \
$(repo)_INC_H_EXE \
$(repo)_EXE_DEP
$(COMPILER) $(BUILD_ARG) $(repo)_BUILD_ARG 'echo "$(repo)_INC_DIR" | tr ' ' '\n' | sort -u' -c $(repo)_DIR/

```

4 Dataset configuration file

4.1 VecFloat

```

{

```

```

"dataSet": "testGDataSet",
"dataSetType": "0",
"desc": "UnitTestGDataSetCreateFree",
"dim": {
  "_dim": "1",
  "_val": ["2"]
},
"nbSample": "3",
"samples": [
  {
    "_dim": "2",
    "_val": ["0.0", "1.0"]
  },
  {
    "_dim": "2",
    "_val": ["2.0", "3.0"]
  },
  {
    "_dim": "2",
    "_val": ["4.0", "5.0"]
  }
]
}

```

4.2 Pair of GenBrush

```

{
  "dataSet": "dataset-002-001",
  "dataSetType": "1",
  "desc": "unitTest",
  "dim": {
    "_dim": "2",
    "_val": [
      "10",
      "20"
    ]
  },
  "format": "tga",
  "nbMask": "2",
  "nbSample": "3",
  "samples": [
    {
      "bounding": [],
      "img": "img000.tga",
      "mask": [
        "mask000-000.tga",
        "mask000-001.tga"
      ]
    },
    {
      "bounding": [],
      "img": "img001.tga",
      "mask": [
        "mask001-000.tga",
        "mask001-001.tga"
      ]
    },
    {
      "bounding": [],
      "img": "img002.tga",

```



```

        "mask": [
            "mask002-000.tga",
            "mask002-001.tga"
        ]
    }
}
}
}

```

5 Unit tests

```

#include <stdlib.h>
#include <stdio.h>
#include <time.h>
#include <string.h>
#include <math.h>
#include "genbrush.h"
#include "gdataset.h"

void UnitTestGDataSetVecFloatCreateFree() {
    srand(1);
    char* cfgFilePath = "testGDataSetVecFloat.json";
    GDataSetVecFloat gdataset = GDataSetVecFloatCreateStatic(cfgFilePath);
    if (strcmp(gdataset._dataSet._cfgFilePath, cfgFilePath) != 0) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDataSetCreateStatic failed");
        PBErrCatch(GDataSetErr);
    }
    GDataSet* g = (GDataSet*)&gdataset;
    if (GSetGet(g->_categories, 0) != GSetGet(&(g->_samples), 0) ||
        GSetGet(g->_categories, 1) != GSetGet(&(g->_samples), 1) ||
        GSetGet(g->_categories, 2) != GSetGet(&(g->_samples), 2)) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDataSetCreateStatic failed");
        PBErrCatch(GDataSetErr);
    }
    GDataSetVecFloatFreeStatic(&gdataset);
    printf("UnitTestGDataSetVecFloatCreateFree OK\n");
}

void UnitTestGDataSetVecFloatGet() {
    srand(1);
    char* cfgFilePath = "testGDataSetVecFloat.json";
    GDataSetVecFloat gdataset = GDataSetVecFloatCreateStatic(cfgFilePath);
    if (strcmp(GDSCfgFilePath(&gdataset), cfgFilePath) != 0) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSCfgFilePath failed");
        PBErrCatch(GDataSetErr);
    }
    char* str = GDSGetCfgFilePath(&gdataset);
    if (strcmp(str, cfgFilePath) != 0) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSGetCfgFilePath failed");
        PBErrCatch(GDataSetErr);
    }
    free(str);
    str = GDSGetCfgFolderPath(&gdataset);
    if (strcmp(str, "") != 0) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSGetCfgFolderPath failed");
    }
}

```

```

    PBErCatch(GDataSetErr);
}
free(str);
if (strcmp(GDSDesc(&gdataset), "UnitTestGDataSetCreateFree") != 0) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSDesc failed");
    PBErCatch(GDataSetErr);
}
if (strcmp(GDSName(&gdataset), "testGDataSet") != 0) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSName failed");
    PBErCatch(GDataSetErr);
}
if (GDSGetType(&gdataset) != GDataSetType_VecFloat) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSGetType failed");
    PBErCatch(GDataSetErr);
}
if (GDSGetNbCat(&gdataset) != 1) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSGetNbCat failed");
    PBErCatch(GDataSetErr);
}
if (GDSGetSize(&gdataset) != 3) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSGetSize failed");
    PBErCatch(GDataSetErr);
}
if (GDSGetSizeCat(&gdataset, 0) != 3) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSGetSizeCat failed");
    PBErCatch(GDataSetErr);
}
VecShort* dim = VecShortCreate(1);
VecSet(dim, 0, 2);
if (VecIsEqual(GDSSampleDim(&gdataset), dim) != true) {
    GDataSetErr->_type = PBErTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSSampleDim failed");
    PBErCatch(GDataSetErr);
}
VecFree(&dim);
GDataSetVecFloatFreeStatic(&gdataset);
printf("UnitTestGDataSetVecFloatGet OK\n");
}

void UnitTestGDataSetVecFloatSplitUnsplit() {
    srand(1);
    char* cfgFilePath = "testGDataSetVecFloat.json";
    GDataSetVecFloat gdataset = GDataSetVecFloatCreateStatic(cfgFilePath);
    VecShort* split = VecShortCreate(2);
    VecSet(split, 0, 1);
    VecSet(split, 1, 2);
    GDSSplit(&gdataset, split);
    if (GDSGetNbCat(&gdataset) != 2) {
        GDataSetErr->_type = PBErTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSSplit failed");
        PBErCatch(GDataSetErr);
    }
    if (GDSGetSizeCat(&gdataset, 0) != 1 ||
        GDSGetSizeCat(&gdataset, 1) != 2) {
        GDataSetErr->_type = PBErTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSSplit failed");
    }
}

```

```

        PBErCatch(GDataSetErr);
    }
    GDSUnsplit(&gdataset);
    if (GDSGetNbCat(&gdataset) != 1) {
        GDataSetErr->_type = PBErTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSUnsplit failed");
        PBErCatch(GDataSetErr);
    }
    VecFree(&split);
    GDataSetVecFloatFreeStatic(&gdataset);
    printf("UnitTestGDataSetVecFloatSplitUnsplit OK\n");
}

void UnitTestGDataSetVecFloatShuffle() {
    srand(1);
    char* cfgFilePath = "testGDataSetVecFloat.json";
    GDataSetVecFloat gdataset = GDataSetVecFloatCreateStatic(cfgFilePath);
    GDSShuffle(&gdataset, 0);
    GDataSet* g = (GDataSet*)(&gdataset);
    if (GSetGet(g->_categories, 0) != GSetGet(&(g->_samples), 1)/* ||
        GSetGet(g->_categories, 1) != GSetGet(&(g->_samples), 0) ||
        GSetGet(g->_categories, 2) != GSetGet(&(g->_samples), 1)*/) {
        GDataSetErr->_type = PBErTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSShuffle failed");
        PBErCatch(GDataSetErr);
    }
    GDataSetVecFloatFreeStatic(&gdataset);
    printf("UnitTestGDataSetVecFloatShuffle OK\n");
}

void UnitTestGDataSetVecFloatStepSampleGetSample() {
    srand(1);
    char* cfgFilePath = "testGDataSetVecFloat.json";
    GDataSetVecFloat gdataset = GDataSetVecFloatCreateStatic(cfgFilePath);
    int iSample = 0;
    float check[6] = {0.0, 1.0, 2.0, 3.0, 4.0, 5.0};
    do {
        VecFloat* sample = GDSGetSample(&gdataset, 0);
        if (ISEQUALF(VecGet(sample, 0), check[iSample * 2]) == false ||
            ISEQUALF(VecGet(sample, 1), check[iSample * 2 + 1]) == false) {
            GDataSetErr->_type = PBErTypeUnitTestFailed;
            sprintf(GDataSetErr->_msg, "GDSGetSample failed");
            PBErCatch(GDataSetErr);
        }
        VecFree(&sample);
        ++iSample;
    } while (GDSSStepSample(&gdataset, 0));
    GDataSetVecFloatFreeStatic(&gdataset);
    printf("UnitTestGDataSetVecFloatStepSampleGetSample OK\n");
}

void UnitTestGDataSetVecFloat() {
    UnitTestGDataSetVecFloatCreateFree();
    UnitTestGDataSetVecFloatGet();
    UnitTestGDataSetVecFloatSplitUnsplit();
    UnitTestGDataSetVecFloatShuffle();
    UnitTestGDataSetVecFloatStepSampleGetSample();
}

void UnitTestGDataSetGenBrushPair() {
    srand(1);
    char* cfgFilePath = "testGDataSetGenBrushPair.json";

```

```

GDataSetGenBrushPair gdataset =
    GDataSetGenBrushPairCreateStatic(cfgFilePath);
if (GDSGetNbMask(&gdataset) != 2) {
    GDataSetErr->_type = PBErrTypeUnitTestFailed;
    sprintf(GDataSetErr->_msg, "GDSGetSample<GenBrushPair> failed");
    PBErrCatch(GDataSetErr);
}
int iCat = 0;
do {
    GDSEnGenBrushPair* sample = GDSGetSample(&gdataset, iCat);
    if (VecIsEqual(GBDim(sample->_img),
        GDSSampleDim(&gdataset)) == false ||
        VecIsEqual(GBDim(sample->_mask[0]),
        GDSSampleDim(&gdataset)) == false ||
        VecIsEqual(GBDim(sample->_mask[1]),
        GDSSampleDim(&gdataset)) == false) {
        GDataSetErr->_type = PBErrTypeUnitTestFailed;
        sprintf(GDataSetErr->_msg, "GDSGetSample<GenBrushPair> failed");
        PBErrCatch(GDataSetErr);
    }
    GDSEnGenBrushPairFree(&sample);
} while (GDSSStepSample(&gdataset, iCat));
GDataSetGenBrushPairFreeStatic(&gdataset);
printf("UnitTestGDataSetGenBrushPair OK\n");
}

void UnitTestSDSIA() {
    srand(1);
    char* cfgFilePath = "../SDSIA/UnitTestOut/002/001/dataset.json";
    GDataSetGenBrushPair gdataset =
        GDataSetGenBrushPairCreateStatic(cfgFilePath);
    int iCat = 0;
    do {
        GDSEnGenBrushPair* sample = GDSGetSample(&gdataset, iCat);
        if (VecIsEqual(GBDim(sample->_img),
            GDSSampleDim(&gdataset)) == false ||
            VecIsEqual(GBDim(sample->_mask[0]),
            GDSSampleDim(&gdataset)) == false ||
            VecIsEqual(GBDim(sample->_mask[1]),
            GDSSampleDim(&gdataset)) == false) {
            GDataSetErr->_type = PBErrTypeUnitTestFailed;
            sprintf(GDataSetErr->_msg, "GDSGetSample<GenBrushPair> failed");
            PBErrCatch(GDataSetErr);
        }
        GDSEnGenBrushPairFree(&sample);
    } while (GDSSStepSample(&gdataset, iCat));
    GDataSetGenBrushPairFreeStatic(&gdataset);
    printf("UnitTestSDSIA OK\n");
}

void UnitTestAll() {
    UnitTestGDataSetVecFloat();
    UnitTestGDataSetGenBrushPair();
    UnitTestSDSIA();
}

int main(void) {
    UnitTestAll();
    return 0;
}

```

6 Unit test output

```
UnitTestDataSetVecFloatCreateFree OK  
UnitTestDataSetVecFloatCreateFree OK  
UnitTestDataSetVecFloatSplitUnsplit OK  
UnitTestDataSetVecFloatShuffle OK  
UnitTestDataSetVecFloatStepSampleGetSample OK  
UnitTestDataSetGenBrushPair OK
```