

Undersampling Pipeline

Soumick Chatterjee Mario Breilkopf
`soumick.chatterjee@ovgu.de` `mario.breilkopf@ovgu.de`

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Chapter 1

Basic Operations

The pipeline execution starts from `main.py`

All the parameters have to be configured in this module.

The input images can be either DICOM or NIFTI. They can be in different folders, or all in same folder. The root folder has to be specified. All the files inside that folder (even inside its sub-folders, recursively) will be considered for undersampling. A single folder containing multiple scans can also be used with this program.

Same folder structure as the input images, will be created for the output.

Chapter 2

Configurable Parameters

General Parameters

useExistingMATs : [True/False] If an existing MAT file containing the sampling pattern (mask or om) is to be used.

fullySampledPath : Root path containing fully sampled images (NIFTIs: .img, .nii, .nii.gz or DICOMs: .ima, .dcm)

min_scan_no : Will be only used for DICOMs. If a single folder contains DICOMs from multiple scans, then using this parameter the starting scan number can be mentioned. If set to None, then will start from the very beginning.

max_scan_no : Will be only used for DICOMs. Similar to the last one, it denotes the last scan that to be considered. If set to None, then scans will be considered till the very last.

underSampledOutPath : Root path to store the undersampled output

outFolder : Inside the underSampledOutPath, this folder will be created. Inside which the undersampled results will be stored. It is advisable to write the undersampling type that is been performed

keepOriginalFormat : [True/False] Will be only used for NIFTIs. Specifies whether to keep the original NIFTI extension (e.g. .img) or different file extension to be used while saving

saveFileFormat : File extension to be used while saving the undersampled output. For NIFTIs, if keepOriginalFormat=True, then this will be ignored.

Parameters for using Existing MATs (useExistingMATs=True)

isRadial : [True/False] Whether the sampling pattern is Radial or not (Cartesian)

mask_or_om_path : Specifies the path of the sampling pattern

Parameters for generating new sampling pattern (useExistingMATs=False)

recalculateUndersampling4Each : [True/False] Whether to calculate separate sampling patterns for each volume. This is useful when different volume has different width and height. Also, this can be used when it is intended to generate different variable density patterns to be generated for each volume. Sampling patterns will be stored in respective folders along with the undersampled output.

inputShape : [(width,height)] This has to be defined when not recalculating sampling patterns for each volume separately. If recalculateUndersam-

pling4Each set to True, then this is ignored

staticSamplingFileName : Only will be used if recalculateUndersampling4Each=False. This specifies the filename of the MAT file where the generated sampling pattern will be stored.

undersamplingType:- Numerical value from the given list below

Cartesian Sampling Patterns:

0 : Variable Density in One Dimension

1 : Variable Density in both Dimensions

2 : Uniform Sampling (Grappa like)

3 : Center of K-Space Mask (Ignore same no of lines both sides, based on given percentage)

4 : Center of K-Space Mask (Ignores specified number of of lines both sides)

5 : Center of K-Space Mask (Ignores lines based on given percentage, preserving the aspect ratio)

6 : Center of K-Space Square Mask (Ignores lines based on given percentage, end mask will have same height and width)

7 : High-frequency K-Space Mask

Radial Sampling Patterns:

10 : Golden Angle Sampling

11 : Equi-distance Sampling

Table 2.1: Undersampling Parameters

			Cartesian									Radial	
Parameter	Description	Values	0	1	2	3	4	5	6	7	10	11	
percentOfKSpace	Percentage of k-Space values to sample	0 to 1	✓	✓	✗	✓	✗	✓	✓	✓	✗	✗	
stepsize	Interval of k-Space lines to sample	int	✗	✗	✓	✗	✗	✗	✗	✗	✗	✗	
lines2ignore	No of lines to ignore each side	int	✗	✗	✗	✗	✓	✗	✗	✗	✗	✗	
maxAmplitude4PDF	Maximum amplitude of the Probability Density Function	0 to 1	✓	✗	✗	✗	✗	✗	✗	✓	✗	✗	
ROdir	Read-out direction	[0,1,2]	✓	✗	✓	✗	✗	✗	✗	✓	✗	✗	
noOfSpokes	No of Spokes	int	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	
fullresSpokesMulFactor	No of spokes in Full resolution equals how many times of baseresolution	[2,3]	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	
interpolationSize4NUFFT	Interpolation size for NUFFT	int	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	