

aiRec

aiRec performs tomographic reconstruction using either SART or WBP.

aiRec needs a configuration file provided by the **-u** argument. Some options can be overwritten using command line arguments.

Options are:

CudaDeviceIDs

The deviceIDs of the GPUs to use.

Argument for command line: **-d** or **--CudaDeviceIDs**

Type: **List<int>**, a list of integer values

Option is mandatory: **true**

Input

The file to process.

Argument for command line: **-i** or **--Input**

Type: **string**

Option is mandatory: **true**

OutVolumeFile

Filename of the output volume.

Argument for command line: **-o** or **--OutVolumeFile**

Type: **string**

Option is mandatory: **true**

LP

Low pass filter value.

Argument for command line: **-lp** or **--LP**

Type: **float**

Option is mandatory: **true**

LPS

Low pass filter sigma value.

Argument for command line: **-lps** or **--LPS**

Type: **float**

Option is mandatory: **true**

HP

High pass filter value.

Argument for command line: **-hp** or **--HP**

Type: **float**

Option is mandatory: **false**

Default value if not set: **0**

HPS

High pass filter sigma value.

Argument for command line: **-hps** or **--HPS**

Type: **float**
Option is mandatory: **false**
Default value if not set: **0**

DeadPixelRemoval

Enables removal of dead pixels based on thresholding. If set to 'relative', the threshold is X times the STD + MEAN of the image.

Argument for command line: **-deadPixel** or **--DeadPixelRemoval**

Type: one of [**ABSOLUTE**, **NONE**, **RELATIVE**]

Option is mandatory: **false**

Default value if not set: **NONE**

Possible notations:

- **ABSOLUTE**: ABSOLUTE, Absolute, absolute
- **NONE**: NONE, None, none
- **RELATIVE**: RELATIVE, Relative, relative

DeadPixelThreshold

Threshold above which a pixel is considered invalid.

Argument for command line: **-threshold** or **--DeadPixelThreshold**

Type: **float**

Option is mandatory: **true**

Only applicable if

- **DeadPixelRemoval** = ABSOLUTE or
- **DeadPixelRemoval** = RELATIVE

ReconstructionSettings

The file name for the file with reconstruction settings.

Argument for command line: **-rec** or **--ReconstructionSettings**

Type: **string**

Option is mandatory: **true**

ReconstructionMethod

The reconstruction method to use: SART or WBP.

Argument for command line: **-m** or **--ReconstructionMethod**

Type: one of [**SART**, **WBP**]

Option is mandatory: **true**

Possible notations:

- **SART**: SART, SART, sart
- **WBP**: WBP, WBP, wbp

Lambda

Relaxation factor used for SART back projection, usually = 1.

Type: **float**

Option is mandatory: **false**

Default value if not set: **1**

Only applicable if **ReconstructionMethod** = SART.

LongObjectCompensation

The method to use for compensating the long object effect.

Type: one of [**COMPENSATED**, **CONSTANT**, **MEASURED**, **MIXTURE**]

Option is mandatory: **true**

Possible notations:

- **COMPENSATED**: COMPENSATED, Compensated, compensated
- **CONSTANT**: CONSTANT, Constant, constant
- **MEASURED**: MEASURED, Measured, measured
- **MIXTURE**: MIXTURE, Mixture, mixture

Only applicable if **ReconstructionMethod** = SART.

LongObjectCompensationRatio

The mixture ratio that combines ‘ratio * COMPENSATED + (1-ratio) * MEASURED’.

Type: **float**

Option is mandatory: **true**

Only applicable if **LongObjectCompensation** = MIXTURE.

DimLength

Dim the image borders over X pixels along the projected volume borders, for volume x and y axis.

Type: **float2**, two float values

Option is mandatory: **false**

Default value if not set: **(50, 50)**

CutLength

Crop the projected image along the projected volume borders, for volume x and y axis.

Type: **float2**, two float values

Option is mandatory: **false**

Default value if not set: **(10, 10)**

Iterations

The number of SART iterations to perform.

Type: **int**

Option is mandatory: **true**

Only applicable if **ReconstructionMethod** = SART.

OverSampling

The amount of over-sampling used for back-projection (relative to binned tilt series).

Type: **int**

Option is mandatory: **true**

VolumeBinning

Binning ratio of the reconstruction volume (relative to unbinned tilt series).

Type: **float** or **float3**, one or three float values

Option is mandatory: **true**

DoFourierFilter

Perform fourier space filtering on the tilt series before reconstruction.

Type: **bool**

Option is mandatory: **true**

SIRTCount

Size of the ordered subsets for contrast enhancement.

Type: **int**

Option is mandatory: **true**

Only applicable if **ReconstructionMethod** = SART.

CtfCorrectionType

The type of CTF correction to perform.

Type: one of [NONE, PHASE_FLIP, WIENER_FILTER]

Option is mandatory: **true**

Possible notations:

- **NONE**: NONE, None, none, FALSE, false, False, NO, No, no
- **PHASE_FLIP**: PHASEFLIP, PhaseFlip, phaseflip, PHASE_FLIP, Phase_Flip, phase_flip
- **WIENER_FILTER**: WIENERFILTER, WienerFilter, wienerfilter, WIENER_FILTER, Wiener_Filter, wiener_filter

CTFSliceThickness

The thickness of a CTF slice for 3D-CTF-Correction in nanometer.

Type: **float**

Option is mandatory: **true**

Only applicable if

- **CtfCorrectionType** = PHASE_FLIP **or**
- **CtfCorrectionType** = WIENER_FILTER

SwitchCTFDirection

Inverses the defocus offset value (experimental, do not use).

Type: **bool**

Option is mandatory: **false**

Default value if not set: **false**

Only applicable if

- **CtfCorrectionType** = PHASE_FLIP **or**
- **CtfCorrectionType** = WIENER_FILTER

IgnoreZShiftForCTF

Ignore possible Z-Shift of the reconstruction volume for defocus offset.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **true**

Only applicable if

- **CtfCorrectionType** = PHASE_FLIP **or**
- **CtfCorrectionType** = WIENER_FILTER

FP16Volume

Use float16 as internal volume storage format.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **false**

ProjectionScaleFactor

Scale values in case of float16 as internal volume storage format to compensate for accuracy loss.

Type: **float**

Option is mandatory: **true**

Only applicable if **FP16Volume** = true.

ProjectionNormalization

Projection normalization method to use before reconstruction.

Type: one of [MEAN, NONE, STANDARD_DEV]

Option is mandatory: **true**

Possible notations:

- **MEAN**: MEAN, Mean, mean
- **NONE**: NONE, none, None
- **STANDARD_DEV**: STD, std, StandardDeviation, STANDARD_DEV

WBPFilter

WBP filter to use.

Type: one of [EXACT, NONE, RAMP]

Option is mandatory: **true**

Possible notations:

- **EXACT**: Exact, EXACT, exact
- **NONE**: None, NONE, none
- **RAMP**: Ramp, RAMP, ramp

Only applicable if **ReconstructionMethod** = WBP.

DebugImages

Save temporary images to disk for debugging.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **false**

CosineWeighting

Apply cosine weighting to tilted projections.

Type: **bool**

Option is mandatory: **true**

Only applicable if **ReconstructionMethod** = WBP.

DoseWeighting

Apply dose weighting to tilts before reconstruction.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **false**

Only applicable if **ReconstructionMethod** = WBP.

MissingFrameWeighting

If set to 'true' and when frames from a dose fractionation stack were excluded, the projection is downweighted accordingly. If set to 'false' no additional weighting occurs.

Type: **bool**

Option is mandatory: **true**

LimitToNyquist

Fourier filter the result of forward projection to limit the signal to nyquist limit of the volume.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **true**

ProjectionOrder

The order in which the tilt series is reconstructed.

Type: one of [**AS_FILE**, **AS_RECORDED**, **INVERSE_AS_RECORDED**, **RANDOM**, **RANDOM_ZERO_TILT_FIRST**, **RANDOM_ZERO_TILT_LAST**]

Option is mandatory: **true**

Possible notations:

- **AS_FILE**: **AS_FILE**, **As_File**, **as_file**, **ASFILE**, **AsFile**, **asfile**
- **AS_RECORDED**: **AS_RECORDED**, **As_Recorded**, **as_recorded**, **ASRECORDED**, **AsRecorded**, **asrecorded**
- **INVERSE_AS_RECORDED**: **INVERSE_AS_RECORDED**, **Inverse_As_Recorded**, **inverse_as_recorded**, **INVERSEASRECORDED**, **InverseAsRecorded**, **inverseasrecorded**
- **RANDOM**: **RANDOM**, **Random**, **random**
- **RANDOM_ZERO_TILT_FIRST**: **RANDOM_ZERO_TILT_FIRST**, **Random_Zero_Tilt_First**, **random_zero_tilt_first**, **RANDOMZEROTILTFIRST**, **RandomZeroTiltFirst**, **randomzerotiltfirst**
- **RANDOM_ZERO_TILT_LAST**: **RANDOM_ZERO_TILT_LAST**, **Random_Zero_Tilt_Last**, **random_zero_tilt_last**, **RANDOMZEROTILTLAST**, **RandomZeroTiltLast**, **randomzerotiltlast**

Only applicable if **ReconstructionMethod** = SART.

Binning

Bin the tilt series images prior to reconstruction.

Type: **float**

Option is mandatory: **false**

Default value if not set: **1**

CompensateImageRotation

Rotate the image before applying the WBP filter so that the WBP is not interpolated.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **false**

SampleThickness

Overrides the sample thickness value in the reconstruction settings to allow the reconstruction with improved contrast.

Argument for command line: **-thickness** or **--SampleThickness**

Type: **int**

Option is mandatory: **false**

Default value if not set: **-1**

ReduceGoldBeadArtifacts

Reduces artifacts due to the high contrast of gold beads in the tomogram.

Type: **bool**

Option is mandatory: **false**

Default value if not set: **false**

ReduceGoldBeadArtifactStrength

The strength factor for gold bead artifact reduction. The value has to be in range [0..1] and is usually > 0.5 .

Type: **float**

Option is mandatory: **true**

Only applicable if **ReduceGoldBeadArtifacts** = true.

GoldBeadSize

The size of the goldbeads used in the tilt series in nm. (With a small additional margin of 1 to 2 nm and if multiple sizes are used, the larger one.)

Type: **float**

Option is mandatory: **true**

Only applicable if **ReduceGoldBeadArtifacts** = true.