**Tools for NIfTI and ANALYZE image in MATLAB**

(Click [**LINK HERE**](http://www.rotman-baycrest.on.ca/~jimmy/NIFTI/#update) for the latest update)

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**Description:**

Frequently Asked Questions:  <http://www.rotman-baycrest.on.ca/~jimmy/NIfTI/FAQ.htm>

* If you are confused by the Left side / Right side of an ANALYZE image, the following link may help you:  
  <http://www.rotman-baycrest.on.ca/~jimmy/UseANALYZE.htm>

* Feature of **load\_untouch\_header\_only**:  It will load exactly whatever stored in the header section of NIfTI or ANALYZE data, and automatically detected the input file format. NIfTI structure will be returned for NIfTI file, and ANALYZE structure will be returned for ANALYZE file.

* Feature of **load\_nii**:  It not only loads the file, but also transforms the affine matrix to a diagonal matrix with positive entries and re-orients the image matrix in the loaded structure correspondingly. This feature makes it different from other software, and it is proven to be a convenient way to tell the orientation immediately, especially in the Left / Right confusion. For NIfTI data with both non-zero sform\_code and qform\_code, load\_nii even allows you to pick your preferred form, also sform\_code is picked by default.

* Feature of **view\_nii**:  It can display & edit the background image, as well as the overlay activation map and ROI etc. If you use this function in your application, the display can be embedded into your existing figure window. If you use it as an individual program, it can also edit the orientation and voxel value of the image, and save the modified image. See detail at:  
  <http://www.rotman-baycrest.on.ca/~jimmy/NIfTI/examples.txt>.

* Feature of **reslice\_nii**:  It can interpolate any oblique images with non-orthogonal rotation or shearing and save them into orthogonal orientations that can be loaded with load\_nii.

* Feature of **save\_nii**:  It can save any NIfTI data into ANALIZE compatible file extension (.img/.hdr), and can be used by other software that does not support NIfTI file format.

Basic Programs:

1. **load\_untouch\_header\_only.m**:  Load only the header section of NIfTI or ANALYZE data. The input file will be automatically detected. NIfTI structure will be returned for NIfTI file, and ANALYZE structure will be returned for ANALYZE file.  For usage, type:  help load\_untouch\_header\_only

1. **load\_nii.m**:  Load N-Dimensional NIfTI data (where N can be from 3 to 7)or ANALYZE data (where N can be from 3 to 4), and apply header info (e.g. affine geometric transform, voxel intensity scaling, etc.) to the data. If your data has more than 3-Dimension (e.g. time series etc.), you can also specify a range to extract only 1 or several volumes.  For usage, type:  help load\_nii

1. **save\_nii.m**:  Save N-Dimensional NIfTI data (where N can be from 3 to 7) that is loaded by "load\_nii.m" or made by "make\_nii.m".  For usage, type:  help save\_nii

1. **make\_nii.m**:  Make N-Dimensional NIfTI data (where N can be from 3 to 7) based on the N-Dimensional matrix and other optional parameters (e.g. voxel\_size, origin, etc.). Using "save\_nii" command, the NIfTI data that is made by "make\_nii" can be saved into a NIfTI file.  For usage, type:  help make\_nii

1. **make\_ana.m**:  Make 3D ANALYZE data based on the 3D matrix and other optional parameters (e.g. voxel\_size, origin, etc.). Using "save\_untouch\_nii" command, the ANALYZE data that is made by "make\_ana" can be saved into an ANALYZE file in order to be compatible with some ANALYZE only programs.  For usage, type:  help make\_ana

1. **reslice\_nii.m**:

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| [Example View_nii window](http://www.rotman-baycrest.on.ca/~jimmy/NIfTI/NIFTI.jpg) |
| [**View fullsize image**](http://www.rotman-baycrest.on.ca/~jimmy/NIfTI/NIFTI.jpg) |
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1. Reslice 3D (or 4D) NIfTI data or ANALYZE data with affine matrix M in .mat file. The program will base on the affine matrix, which is especially useful for oblique images with non-orthogonal rotation or shearing that cannot be loaded with "load\_nii.m". You can also specify voxel\_size, etc. It will not cause negative effect, as long as you remember not to do slice time correction after using "reslice\_nii.m".  For usage, type:  help reslice\_nii

1. **view\_nii.m**:  View & Edit 3D (or 4D) NIfTI data or ANALYZE data that is loaded by "load\_nii.m" or made by "make\_nii.m". Activation map, ROI, etc. can be overlaid on top of a background image (see above picture). Plotted view can be embedded into your existing figure window. If you use it as an individual program, it can also edit the orientation and voxel value of the image, and save the modified image. See detail at <http://www.rotman-baycrest.on.ca/~jimmy/NIfTI/examples.txt>.  For usage, type:  help view\_nii

1. **load\_untouch\_nii.m**:  Load N-Dimensional NIfTI data (where N can be from 3 to 7)or ANALYZE data (where N can be from 3 to 4), but do not apply any changes indicated in the header. WARNING: Do not use "view\_nii.m" to view the dataset that is loaded by "load\_untouch\_nii.m".  For usage, type:  help load\_untouch\_nii

1. **save\_untouch\_nii.m**:  Save N-Dimensional NIfTI data (where N can be from 3 to 7)or ANALYZE data (where N can be from 3 to 4) that is loaded by "load\_untouch\_nii.m" or made by "make\_ana.m". If you do not modify the loaded dataset, the header and data in the new saved file should be the same as those in the original file.  For usage, type:  help save\_untouch\_nii

Other Programs:

1. **collapse\_nii\_scan.m**:  Integrate multiple single-scan NIfTI or ANALYZE files into a multiple-scan NIfTI file.  For usage, type:  help collapse\_nii\_scan

1. **expand\_nii\_scan.m**:  Break a multiple-scan NIfTI file into multiple single-scan NIfTI files.  For usage, type:  help expand\_nii\_scan

1. **save\_untouch\_slice.m**:  Save back the portion of processed data that was loaded by load\_untouch\_nii. Although you can also use save\_untouch\_nii to save back the entire data, this works better when your data is huge.  For usage, type:  help save\_untouch\_slice

1. **get\_nii\_frame.m**:  Return the number of time frames of a NIfTI dataset.  For usage, type:  help get\_nii\_frame

1. **flip\_lr.m**:  Flip ANALYZE or NIfTI image left to right (and right to left). The L-R flipped image will always be saved in NIfTI format. WARNING: Please use this program with caution, although you can always flip it back.  For usage, type:  help flip\_lr

1. **load\_nii\_ext.m**:  Load NIfTI header extension.  For usage, type:  help load\_nii\_ext

1. **mat\_into\_hdr.m**:  Integrate affine matrix in old SPM .mat file into its .hdr header file to be a NIfTI file.  For usage, type:  help mat\_into\_hdr

For NIfTI image, "load\_nii.m" will take the affine matrix in its header and make appropriate space transformation. The affine matrix will be transformed to a diagonal matrix with positive entries and the image matrix in the loaded structure will be correspondingly re-oriented, which is actually in neurological convention or RAS. i.e. X axis from Left to Right, Y axis from Posterior to Anterior, and Z axis from Inferior to Superior.

For ANALYZE image, "load\_nii.m" will load the image as is. Since an ANALYZE image could be in RAS or LAS depending on your assumption, many people are confused by its laterality, especially when an ANALYZE image is processed by different software. If you are still using ANALYZE image, I strongly suggest that you take a look at the table that I summarized:

<http://www.rotman-baycrest.on.ca/~jimmy/UseANALYZE.htm>

Because "load\_nii.m" can only handle a subset of affine transform (flipping and orthogonal rotation with a total of 48 orientations), you should use "reslice\_nii.m" to handle the rest of the space transformation (e.g. NIfTI files with non-orthogonal rotation, shearing etc.). It will not cause negative effect, as long as you remember not to do slice time correction after using "reslice\_nii.m".

If you prefer the loaded dataset untouched, you have to use "load\_untouch\_nii.m" and " save\_untouch\_nii.m" program pair. In this case, the affine matrix in NIfTI header will not be applied to the loaded dataset, and the loaded dataset should not be used for other programs, like "view\_nii.m" etc.

Two example datasets, "avg152T1\_LR\_nifti.nii" and "avg152T1\_RL\_nifti.nii", are provided under NIfTI web site <http://nifti.nimh.nih.gov/nifti-1/data>. As is indicated on NIfTI web site, "*The first image (LR) is stored in radiological convention (LAS). The second image (RL) is stored in neurological convention (RAS). Any NIfTI compliant viewing software should display these images identically*". When you load them with "load\_nii.m", and display them with "view\_nii.m", you can expect the same result.