# Wistar NMD Rat Template Set

The **NMD rat template** **set** is, to our knowledge, the only set rat atlases and tools that allow for several neuroimaging processing:

1. Unbiased normalization to a Minimum Deformation (MD) Space, allowing:
   1. Unbiased voxel-based
   2. Unbiased deformation-based Morphometry
2. Labeling individual rats cortices in 96 Region of Interests (ROI), furnishing:
   1. ROI-based morphometry
   2. ROI-based fMRI interpretation
   3. ROI-based cortico-cortical DTI tractography
3. Normalization to the stereotaxic Paxinos & Watson (PW) Space, making possible:
   1. Straightforward interpretation of any analysis in coordinates of the PW space
   2. Stereotaxic guidance for surgery and intracranial recordings
4. Unbiased EEG source imaging and localization
   1. Superficial source reconstruction
   2. Volumetric source reconstruction
   3. Straightforward compatibility with Brainstorm

The NMD Template Set contains the files listed in the following Table:

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| **File** | **Description** | **Possible Applications** |
| head-nmdrat30.nii  brain-nmdrat30.nii | T2-weigthed average head and skull-stripped brain in the MD space | Visualization and standard unbiased normalization to MD Space |
| mask-nmdrat30.nii | Binary brain segmentation in the MD space | Masking in Morphometry, fMRI and DTI analysis and Visualization |
| atlas-nmdrat30.nii  atlas-nmdrat30.txt | Segmentation and labels of 96 (48 each hemispheres) cortical structures of the Paxinos & Watson atlas in the MD space | Individual cortical ROI segmentation (labeling) via inverse warping, useful |
| gray-nmdrat30.nii  white-nmdrat30.nii  csf-nmdrat30.nii | Probabilistic gray matter, white matter and cerebrospinal fluid segmentations in the MD space | Morphometry and normalization to the MD space, e.g. via “unified segmentation” |
| head-nmdrat30-P&W.nii  brain-nmdrat30-P&W.nii | T2-weigthed average head and skull-stripped brain in the PW space | Visualization and standard (biased) normalization to PW Space |
| mask-nmdrat30-P&W.nii | Binary brain segmentation in the PW space | Masking in fMRI and Visualization |
| atlas-nmdrat30-P&W.nii | Segmentation of 96 (48 each hemispheres) cortical structures of the Paxinos & Watson atlas in the PW space | ROI-based identification of cortical structures in normalized results, such as fMRI |
| gray-nmdrat30-P&W.nii  white-nmdrat30-P&W.nii  csf-nmdrat30-P&W.nii | Probabilistic gray matter, white matter and cerebrospinal fluid segmentations in the PW space | Normalization (biased) to the PW space, e.g. via “unified segmentation |
| convertPW\_MD.m  MD2PW.mat  PW2MD.mat | MATLAB code and transformations to convert coordinates and warp images using SPM12 between the MD and PW spaces (type ‘help convertPW\_MD’ for more) | Transform any analyses, such as unbiased morphometric results, fMRI, among others to be interpreted in the PW space. This can aid coregistering individual MRI measurements (such as fMRI or EEG) to stereotaxic coordinates to better locate sites of surgical and intracranial recordings in the stereotaxic devices. |
| MIP-rat.mat | SPM12-compatible glass brain | Visualization of fMRI activations and inverse solutions using SPM12. |
| elecs\_nmdrat30.mat/.xlsx  gm\_grid-nmdrat30.mat  sources-nmdrat30.mat  inskull-nmdrat30.mat  outskull-nmdrat30.mat  scalp-nmdrat30.mat | EEG head model in MD space. Superficial and volumetric source spaces are provided | EEG source imaging and localization. |
| Brainstorm folder | Brainstorm compatible folder with head model and MRI template in MD space | EEG source imaging and localization using Brainstorm  To import to Brainstorm, see diagram below. |

