# **CATNAP User Manual v1.0**

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Note:

• Items in green text are only sample value. Your values may be different.

### I. CreateParManifest -- Creates a spreadsheet to show all data files:

- 1) Open MATLAB.
- 2) Set path to where your data is stored.
- 3) If the function createParManifest is not in current directory, map its folder to a network drive and then type in **addpath(genpath('F**:\');
- 4) Use the createParManifest function.
- 5) Now, a text file has been created containing information about each of the data files.

### **II. Viewing Data Files:**

- 1) Open the parManifest text file in Excel.
- 2) To choose the appropriate files, concentrate on the first and third columns, the filename and the protocol:

⊠Microsoft Excel - parmanifest_2.txt										
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P50 =										
A	BC	D E	F	G	н	1	J	K	L	M N
1 Filename	Techr Protocol	ExamDNx	Ny	Nz	Nvol	ResX	ResY	ResZ	ScanRe	ScanResY
2 C:\\DATA\RDR1_s20051123y_3_1_sc1.par	DwiSIDTIHR2.2 SENSE	2005.1 2	56 256	§ 95	32	8.28E-01	8.28E-01	1.50E+00	96	96
3 C:\\DATA\wm_060426_10_1.par	DwiSIDTI15iso SENSE	2006.0 2	56 256	50	32	5.66E-01	5.66E-01	1.50E+00	96	96
4 C:\\DATA\wm_060426_11_1.par	DwiSIDTI15iso SENSE	2006.0 2	56 256	5 50	32	5.66E-01	5.66E-01	1.50E+00	96	96
5 C:\\DATA\wm_060426_12_1.par	DwiSIDTI15iso SENSE	2006.0 2	56 256	5 50	32	5.66E-01	5.66E-01	1.50E+00	96	96
6 C:\\DATA\wm_060426_13_1.par	DwiSIDTI15iso SENSE	2006.0 2	56 256	5 50	32	5.66E-01	5.66E-01	1.50E+00	96	96
7 C:\\DATA\wm_060426_14_1.par	TSE DE_TSE1.5iso SENSE	2006.0 2	56 256	95	2	8.28E-01	8.28E-01	1.50E+00	192	192
8 C:\\DATA\wm_060426_15_1.par	FEEFT1_151.5iso SENSE	2006.0 2	56 256	i 95	1	8.28E-01	8.28E-01	1.50E+00	256	252
9 C:\\DATA\wm_060426_16_1.par	FEEFT1_601.5iso CLEAR	2006.0 2	56 256	5 95	1	8.28E-01	8.28E-01	1.50E+00	256	252
10 C:\\DATA\wm_060426_17_1.par	FEEFMT1.5iso SENSE	2006.0 2	56 256	6 95	2	8.28E-01	8.28E-01	1.50E+00	144	140
11 C:\\DATA\wm_060426_18_1.par	FEEFMT1.5iso SENSE	2006.0 2	56 256	95	2	8.28E-01	8.28E-01	1.50E+00	144	140
12 C:\\DATA\wm_060426_19_1.par	FEEFMT1.5iso SENSE	2006.0 2	56 256	95	2	8.28E-01	8.28E-01	1.50E+00	144	140
13 C:\\DATA\wm_060426_3_1.par	TSE T2Wsag SENSE	2006.0 5	12 512	2 24	1	4.49E-01	2.32E-01	5	256	204
14 C:\\DATA\wm_060426_4_1.par	TSE T2Wcor SENSE	2006.0 5	12 512	2 24	1	2.32E-01	4.49E-01	5	256	204
15 C:\\DATA\wm_060426_5_1.par	DwiSIDTIHR2.2 SENSE	2006.0 2	56 256	66	32	8.28E-01	8.28E-01	2.20E+00	96	96
16 C:\\DATA\wm_060426_6_1.par	DwiSIDTIHR2.2 SENSE	2006.0 2	56 256	66	32	8.28E-01	8.28E-01	2.20E+00	96	96
17 C:\\DATA\wm_060426_7_1.par	T1TF MPRAGE SENSE	2006.0 2	56 256	5 130	1	8.28E-01	8.28E-01	1.10E+00	192	192
18 C:\\DATA\wm_060426_8_1.par	T1TF MPRage 0.8 SENSE	2006.0 5	12 512	2 150	1	3.98E-01	3.98E-01	8.00E-01	256	256
19 C:\\DATA\wm_060426_9_1.par	T1TF MPRage 0.8 SENSE	2006.0 5	12 512	2 150	1	3.98E-01	3.98E-01	8.00E-01	256	256
20										
22										
22										

Automatically, we have the type of file with its corresponding name, which makes it possible to distinguish the files for selection in CATNAP.

3) The following is a table of the various protocol types

Protocol		Diffusion
Туре	Meaning	Diffusion
DTI1.5	diffusion with resolution 1.5	
DTIHR2.2	diffusion with resolution 2.2	
DE_TSE1.5	dual scan echo	
T1_151	Absolute T1 with flip angle 15	
T1_601	Absolute T1 with flip angle 60	l Stanotymol Eilag
MPRAGE	MPRAGE scan with 1mm res	Structural Files
MPRage 0.8	MPRAGE scan with 0.8mm res	
T2Wsag	Scout pulses	
T2Wcor	Scout pulses	
MT	Magnetic Transfer	

<u>III-IV. Generating CATNAP Processing Script and Running</u>
1) In the MATLAB command window, start CATNAP by typing in CATNAP, and the following window appears:

				Diffusi	ion File
					ist
	CATNAP : Coregistr	ation, Adjustment, and	d Tensor-solving	🛛 - a Nicely Auto 💶 🕽	×
	Select PAR/REC Files				
	Add DWI File	Selected Files and File Info			Structural File
		Selected files are motion correct	ied.		
	Add Structural File	Selected Files and File Info			
	Remove Selected File			•	
	Select Output Path				
			A	About Clear Files	
Alignment File	Motion Correction (Co-Regis	tration)		1	
ĩ 🔪	Registration Method Default: F	RADAR		Perform Motion Correction	
	Registration Target Custom	Volume 💌 Quanti:	ation Factor 10	×	
	DTI Image Adjustment				
	Diffusion Weighting Table (Gradi	ent Table) Jones 30	¥	Adjust Gradient Table	
	Select custom target				
	Required Parameters (Par Versi	ion 4) Additional P	arameters (Par Version 3)		
	1.5	Detient Ori	Anterior-Poster	rior	
	Fat Shift Anterior	Patient On	Supine		
		Patient Po	sition Head First	<u>•</u>	
	Tensor Estimation			Olderin Transa Madeira	
	Method Default	<b>*</b>		Uptain Tensor Metrics	
0.1	Fractional Anisotropy		Principal Eigenve	ector	
Select .m		t	l✓ Eigenvalues I✓ Tensor		
	Delayed Data Processing (S	(orinto)			
	Select m File	ichproj	(	Generate Processing Script	

- First add diffusion files with the <u>higher resolution</u> to the Diffusion File List and add all structural files (excluding the scout pulses) to the Structural File List. Be patient, as loading files takes a little while.
- 3) The following parameters record how the subject was scanned. Choosing them correctly allows CATNAP to adjust and register the images correctly: Registration Method: 'Default: RADAR' Registration Target: 'Custom Volume' Quantization Factor: 1.0 Gradient Table: 'Jones 3D' Scanner: '3.0' Fat Shift: Posterior Foldover: Anterior-Posterior Patient Orientation: Supine Patient Position: Head First Method: Default Tensor Estimation check boxes: All Checked
  4) Click the celest butter to celest the Alignment file, and chapter the file that hed
- Click the select button to select the Alignment file, and choose the file that had the DE-TSE protocol.
- 5) Click the Select Output Path... button to choose the location of where data will be stored after it gets processed.
- 6) Click the Select.m File button and type in a name for the processing script as an .m file i.e. myfilestoprocess.m.
- 7) Finally, click the Generate Processing Script button, and the .m file will appear where specified.
- 8) Now, the next resolution set of diffusion files need to be added to the processing script, so on the CATNAP window, click the Clear Files button.
- 9) Add the next highest resolution files to the Diffusion Files List.
- 10)Leave the same parameters set.
- 11)Click the Generate Processing Script button, and the remaining diffusion files will be appended to the processing script.
- 12)To process the files, simply open the processing script in MATLAB and run it. Note that data processing is a very time-consuming operation, so it is best to first generate the processing script and then run it overnight.
- 13) The processed files will appear in the folder that was specified in step 8, and within this folder, CATNAP will create the subfolders 'dti', 'xfm' and 'scaled' to further organize the data.

## V.To Process Structural Files

- 1) Set path to the path where structural files are stored.
- 2) Open the parManifest file created earlier.
- 3) Structural files are processed with the following commands:

Protocol	Command
T1	ComputeAbsoluteT1
DE-TSE	ComputeAbsoluteT2
MPRAGE	ComputeMean
MT	ComputeMTR

# VI. Masking: float and argb data

Colormap(.cmap) images are argb, while all the rest are floats.

## Creating Mask

- 1) Open MATLAB and set the current directory to the subfolder 'scaled' that contains the processed data.
- 2) At command prompt, type in dir \*.rec to generate the list of .rec files.
- 3) Look for the .rec file corresponding to the first 2.2 resolution diffusion file listed in the ParManifest text:

At the prompt load this file with the **loadPARREC** function with the first argument containing the filename corresponding to the 2.2 resolution file (do not include the file extension) and the second argument being 1, indicating that the image mask will be produced with the first b0 volume. The command will resemble the following:

b0vol=loadPARREC('wm\_061605\_5\_1\_sc1', 1);

- 4) To check what type of data is stored in b0vol, type in fields(b0vol).
- 5) We see that bovol stores several fields, including the one of interest, scans.
- Run a movie of this volume with the floatSliceMovie function, with the only argument being the variable the scan was stored into, and the scan number, 1: floatSliceMovie(b0vol.scans{1});
- 7) Now, view the image and determine the threshold at which the outside of the matter becomes distinguishable from the actual brain image. Be sure to note the order of magnitude of this threshold (encircled in yellow below).



- 8) Now view the video again with the floatSliceMovie command, adding the resolution and 'bone' to the arguments.
- Observe the video, looking for uniformity in the cerebellum no holes. The following are examples to better illustrate the point. They are images of slice 40.







High Threshold

Correct Threshold

Low Threshold

If you observe holes, the threshold was too high. If you cannot identify structures in the brain, the threshold was too low. Repeat steps 6-9 until the ideal threshold is chosen.

10)Now, create the mask by using the voxels of higher threshold:

mask= b0vol.scans{1}>0.5e6;

Float Images

- To load the float images, use the **loadFloat** function.
- To mask loat images and write them to a file, use the **MaskWrite** function. <u>ARGB Images</u>
- Load the cmap images with the **loadCmap** function
   \*Note there are strict memory requirements to run this function –if memory error occurs, quit MATLAB and restart. Do not use unnecessary java applications within MATLAB.
- Use the **maskcmap** function to mask the image and write data to a file.

Viewing images, use the **imagesc** function with the following parameters:

Protocol	
AbsT1	imagesc(absT1(:,:,50), [0 4000]);
AbsT2	imagesc(absT2(:,:,50), [0 200]);
MPRAGE	imagesc(mprage(:,:,50));
MT	imagesc(mt(:,:,50), [0 .55]);
fa	imagesc(fa(:,:,50));
cmap	imagesc(cmap(:,:,1,50));