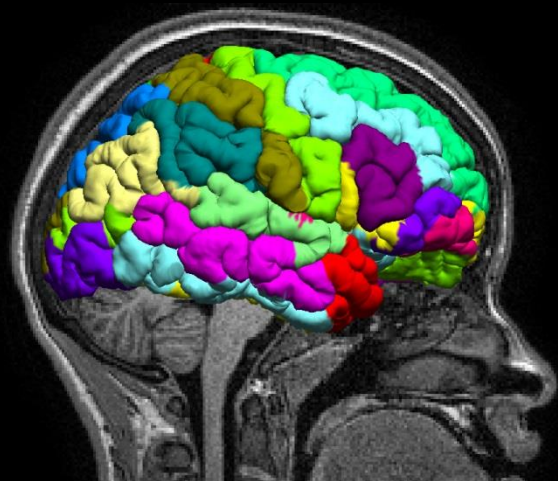
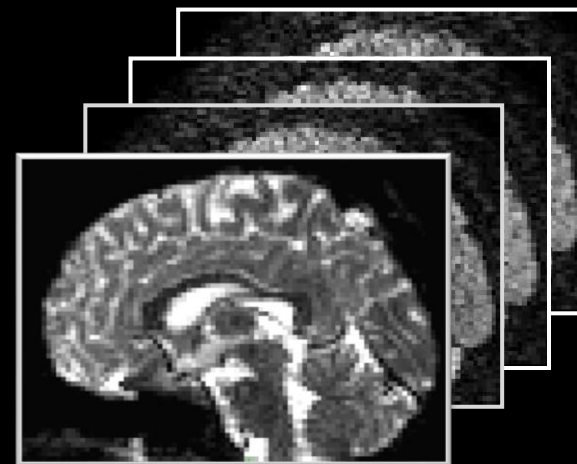
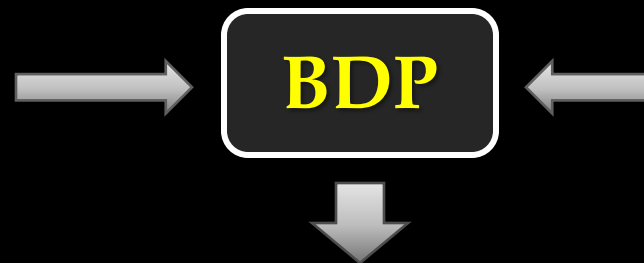


BDP: BrainSuite Diffusion Pipeline

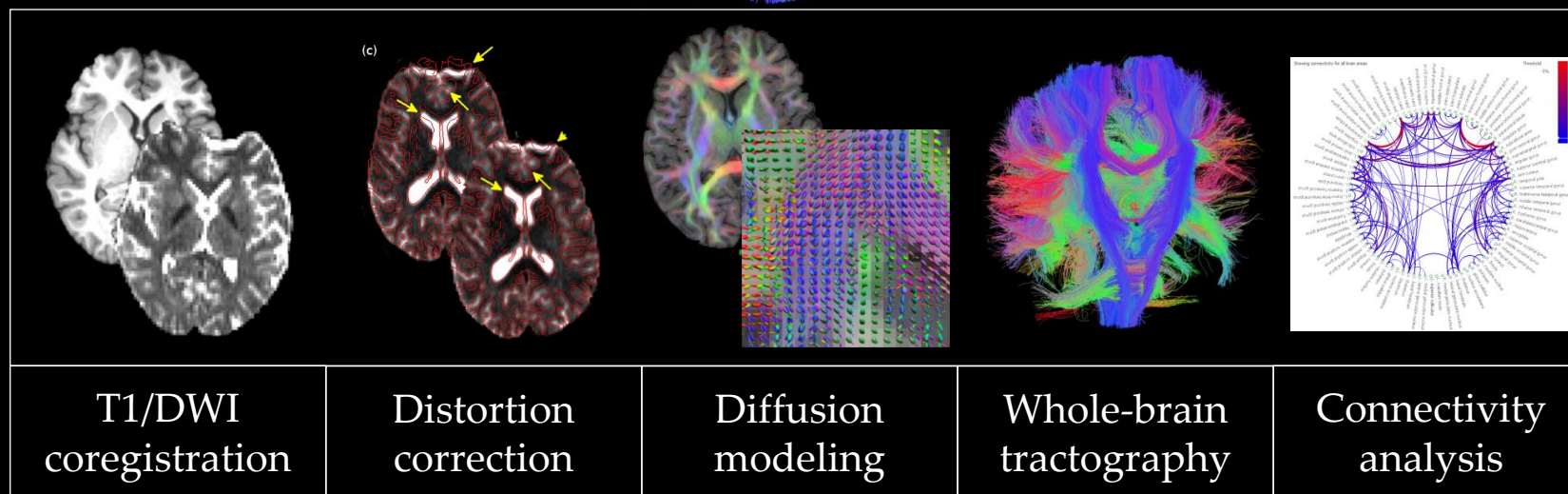
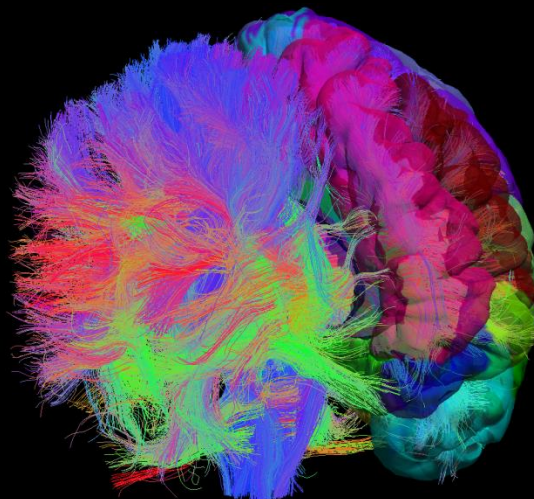
Chitresh Bhushan



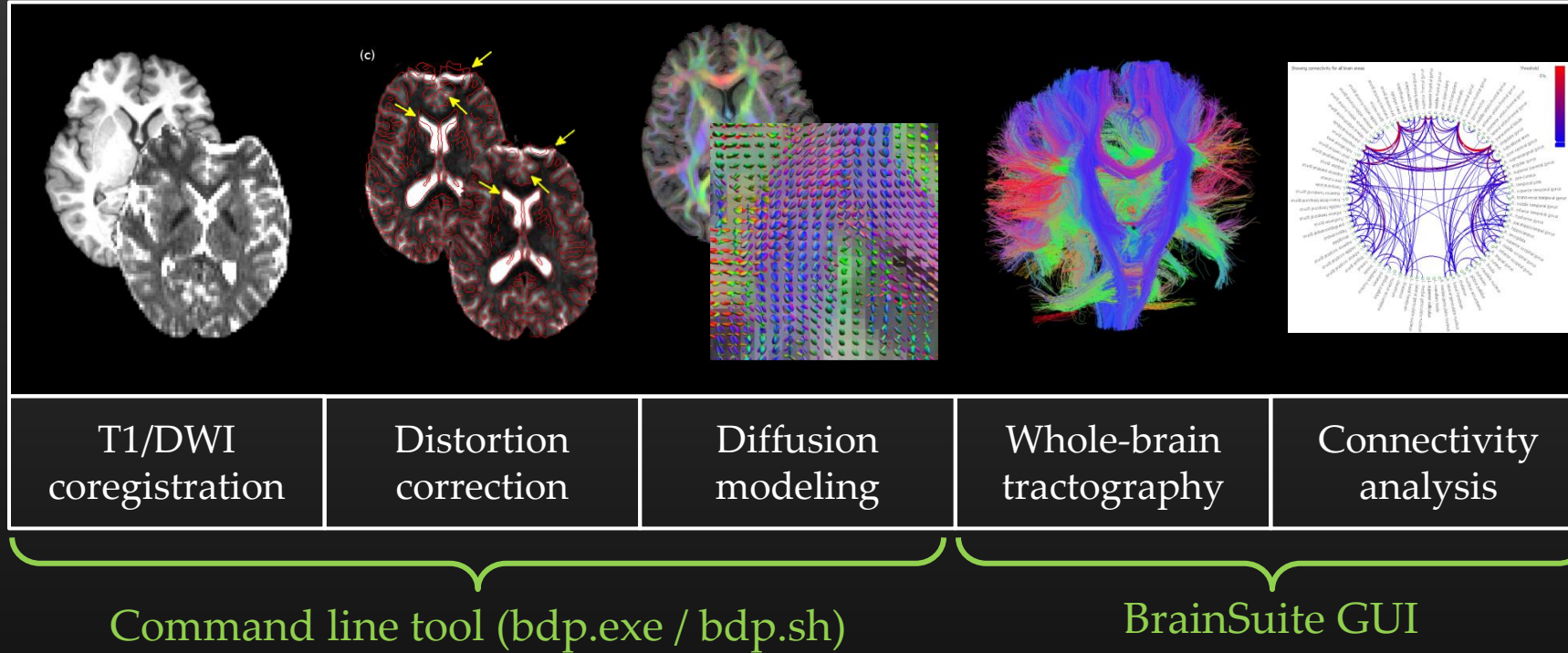
MPRAGE



Diffusion dataset

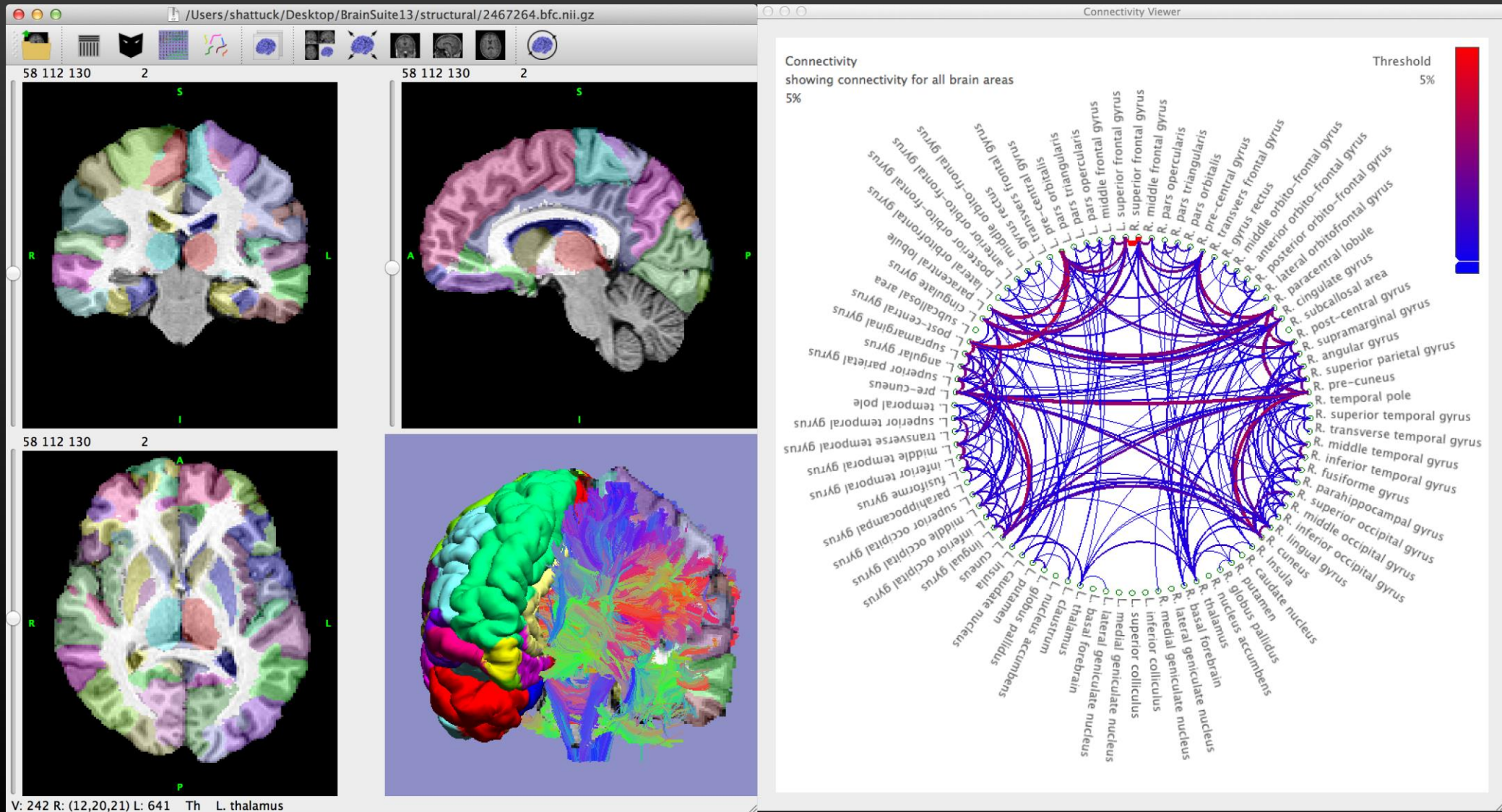


Diffusion Pipeline



- Allows user interaction
- Highly flexible

BrainSuite GUI



BDP command line

```
Administrator: Command Prompt - bdp.exe 2523412.bfc.nii.gz --tensor --odf --generate-stats --ni...
=====
                        Setting up dataset and inputs
=====

Reading input flags...

Checking input files...

BDP could not find any .mask.nii.gz file. BDP will use input bfc file itself as
brain mask for registration and statistics. All voxels with intensity>0 in bfc
will be treated as voxels in brain. You can specify a custom brain mask by using
flag --t1-mask <maskfile_name>. The custom mask must overlay correctly with
input BFC image in BrainSuite.

Processing data with fileprefix:
      2523412

=====
                        Co-registration and Distortion Correction
=====

Reading the input parameters for co-registration...

Total usable memory found:   5.98GB

Checking orientation information...Done
Extracting 0-diffusion (b=0) image from input DWIs...
DWI mask is not defined in input flags. BDP will generate (pseudo) mask from
0-diffusion (b=0) image. Automatic mask generation may not be accurate in some
situations and can affect overall quality of co-registration. In case
co-registration is not accurate, you can define a DWI mask by using flag
--dwi-mask <mask_filename>. The mask can be generated and hand edited in
BrainSuite interface. This mask would be used only for registration purposes
(and not for statistics computation).
Saved (pseudo) masks: C:\Users\niag9\Desktop\BDP\2523412.dwi.RAS.mask.nii.g
z

Starting Registration based distortion Correction...
Loading data...

Reading input data...
Setting/generating masks...
Matching centroids (approx. align)...
Matching resolution of the images...
Normalizing intensity of images...
Running affine registration with 6 degrees of freedom...
Search-based initialization...
Iteration 1 of 6 running...
Iteration 2 of 6 running...
```

EPI distortion in diffusion MRI

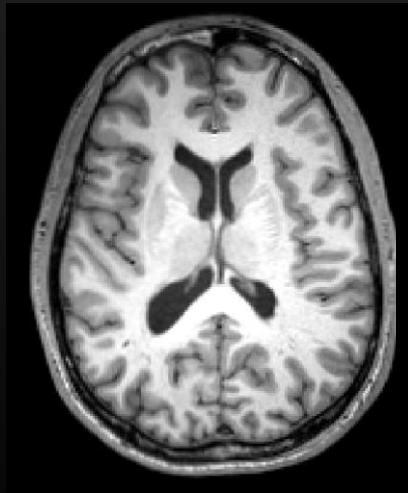
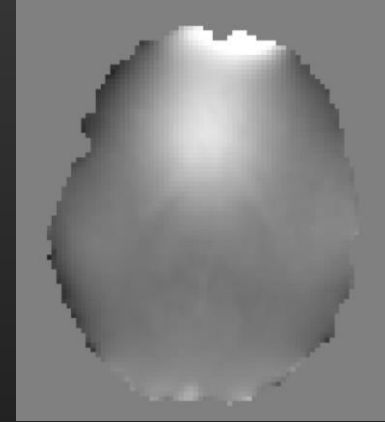
MPRAGE



b=0 image



Field inhomogeneity

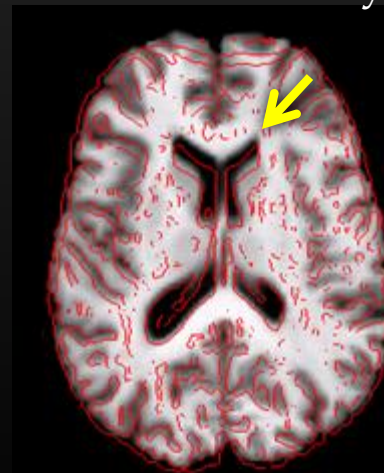


MPRAGE



b=0 image

Overlay with edges



MPRAGE

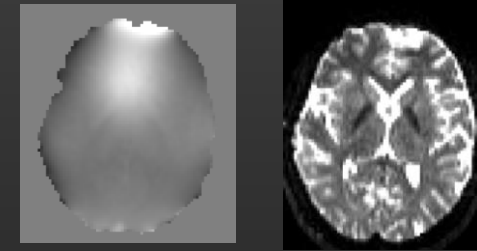


b=0 image

Distortion correction in BDP

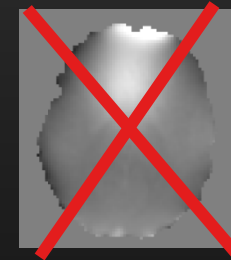
1. Fieldmap based

- `--fieldmap-correction <fname.nii.gz>`



2. Registration based (default)

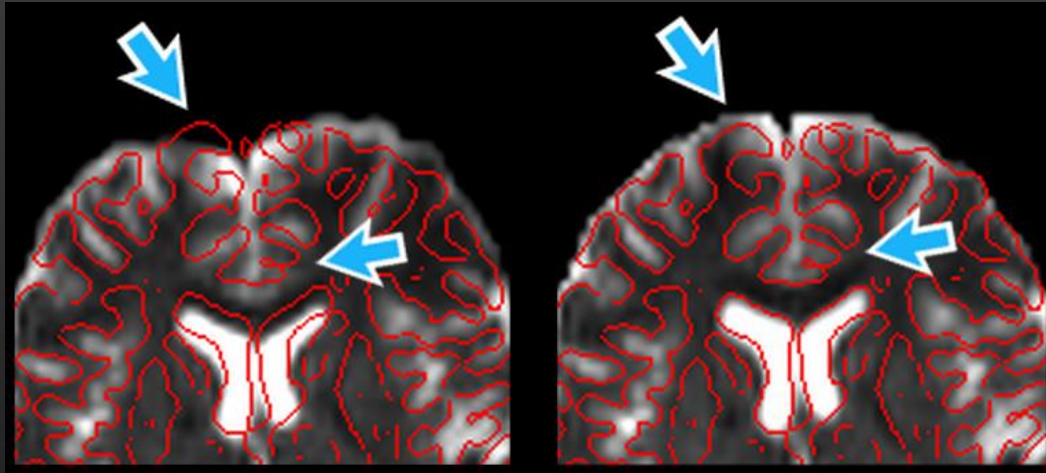
- Uses structural image to estimate distortion field
- Does not require a field inhomogeneity map



3. `--no-distortion-correction` (Only Rigid)

- Useful when some different technique is used for distortion correction, eg. IPED.

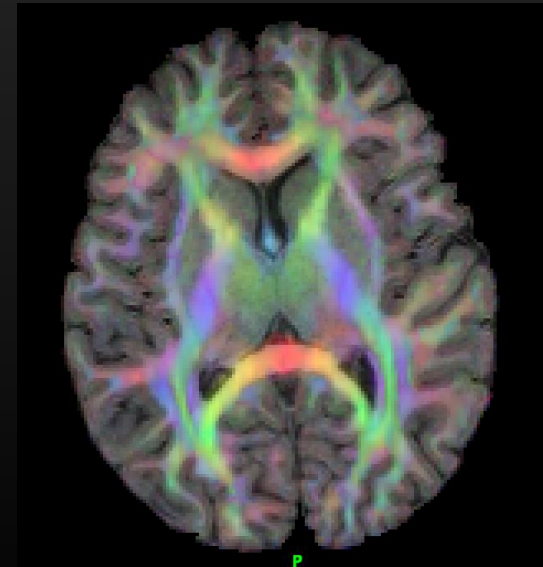
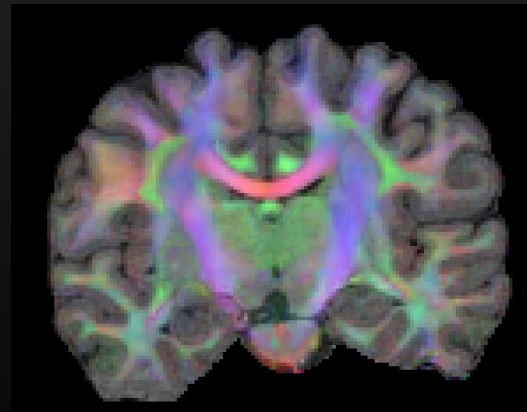
Distortion correction in BDP



Distorted

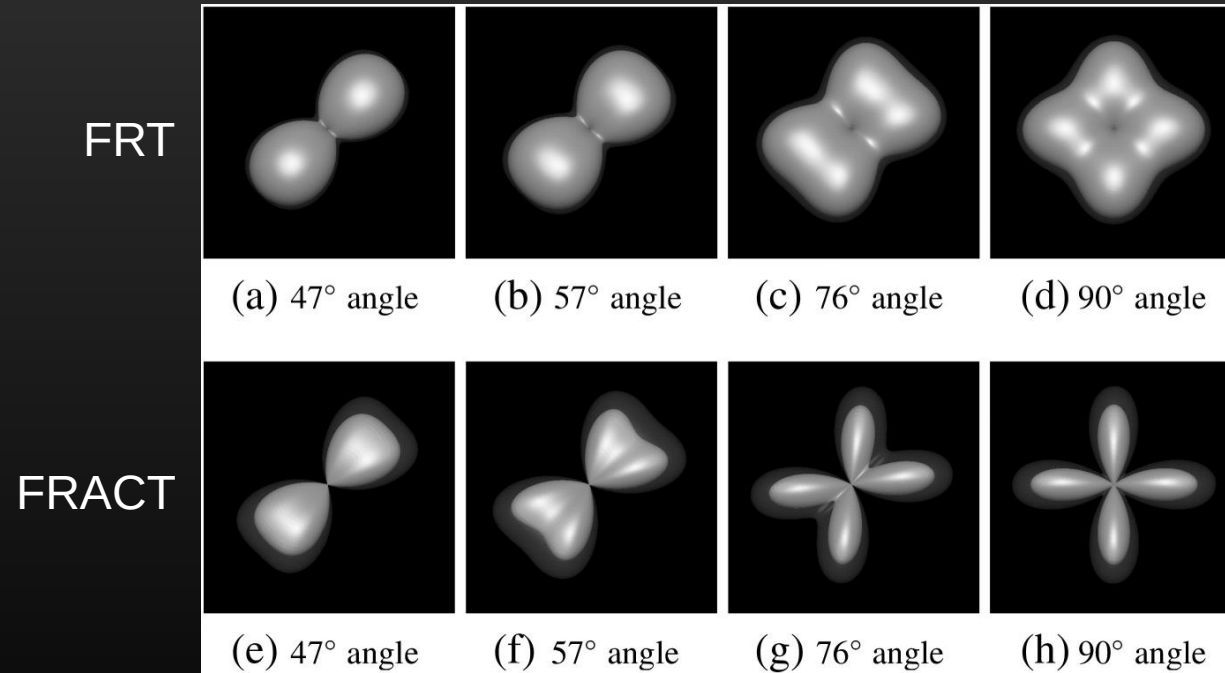
After correction

Color FA
overlaid on
MPRAGE image
after correction

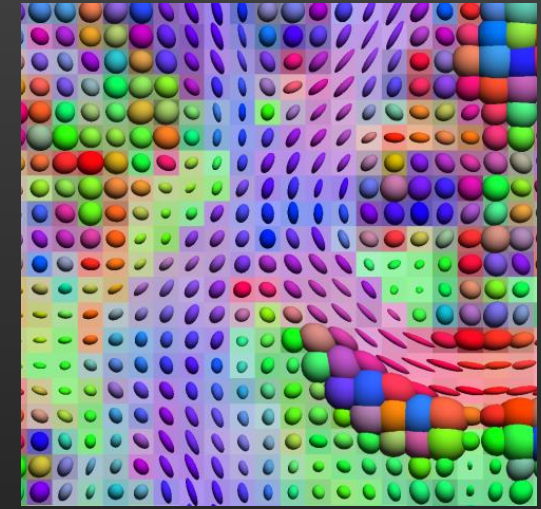


Diffusion modeling

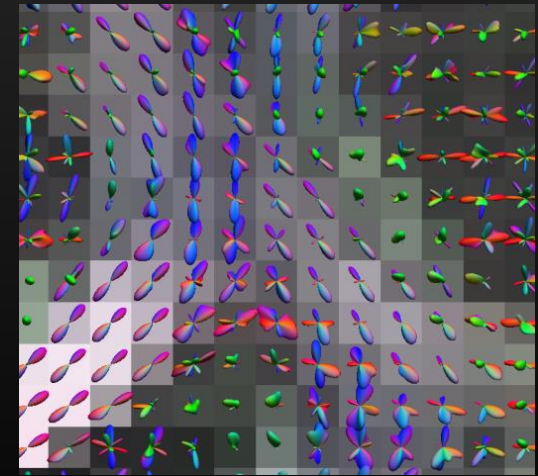
- Diffusion tensor
- ODFs – FRT & FRACT



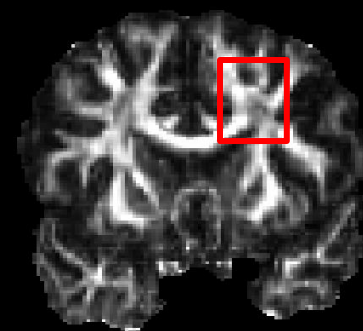
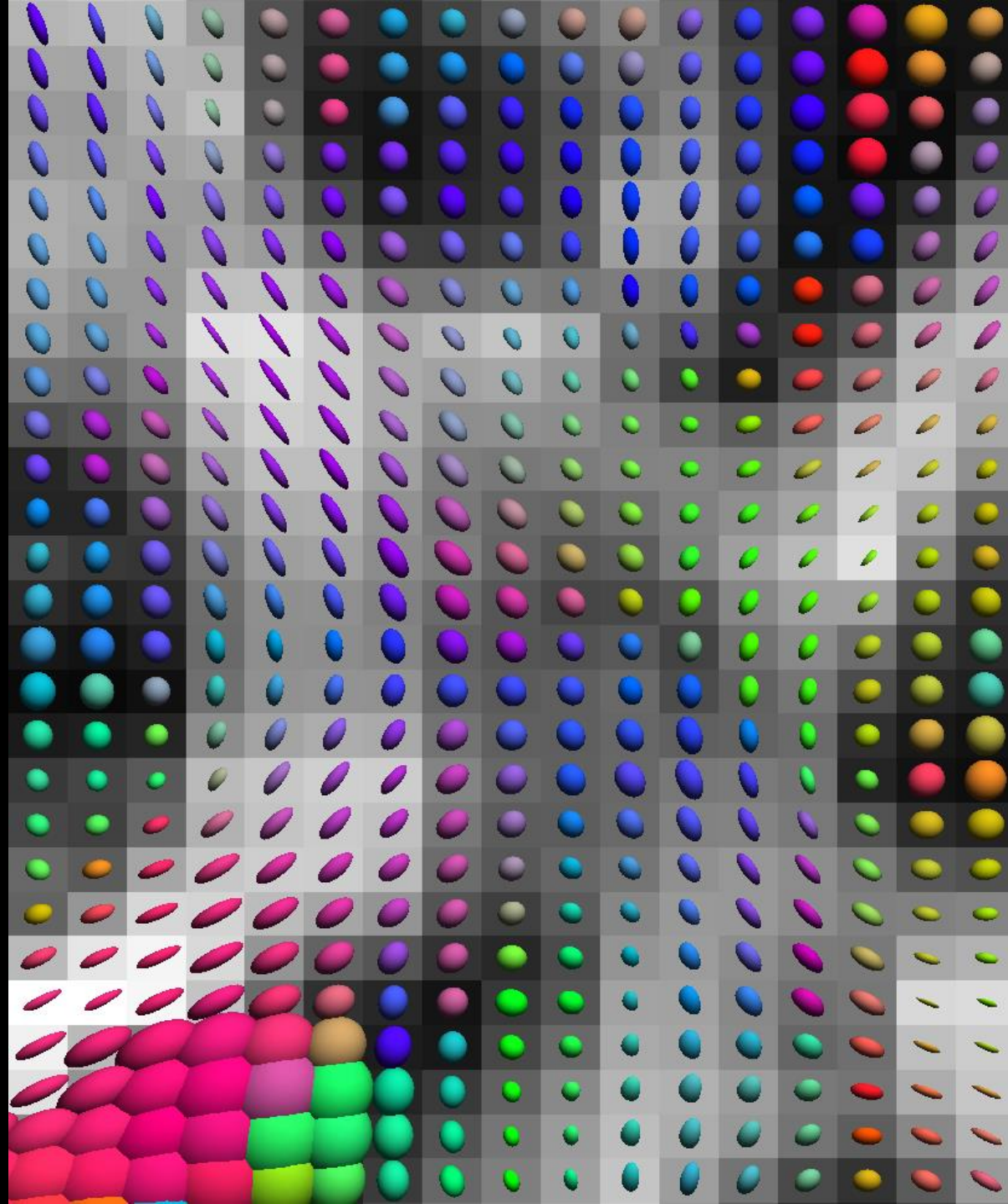
Two crossing tensor simulation



Diffusion tensor

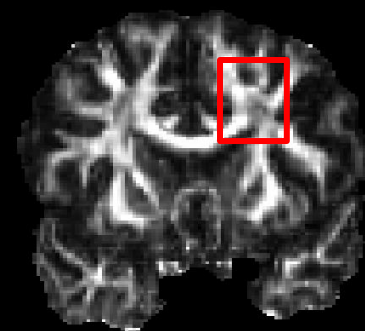
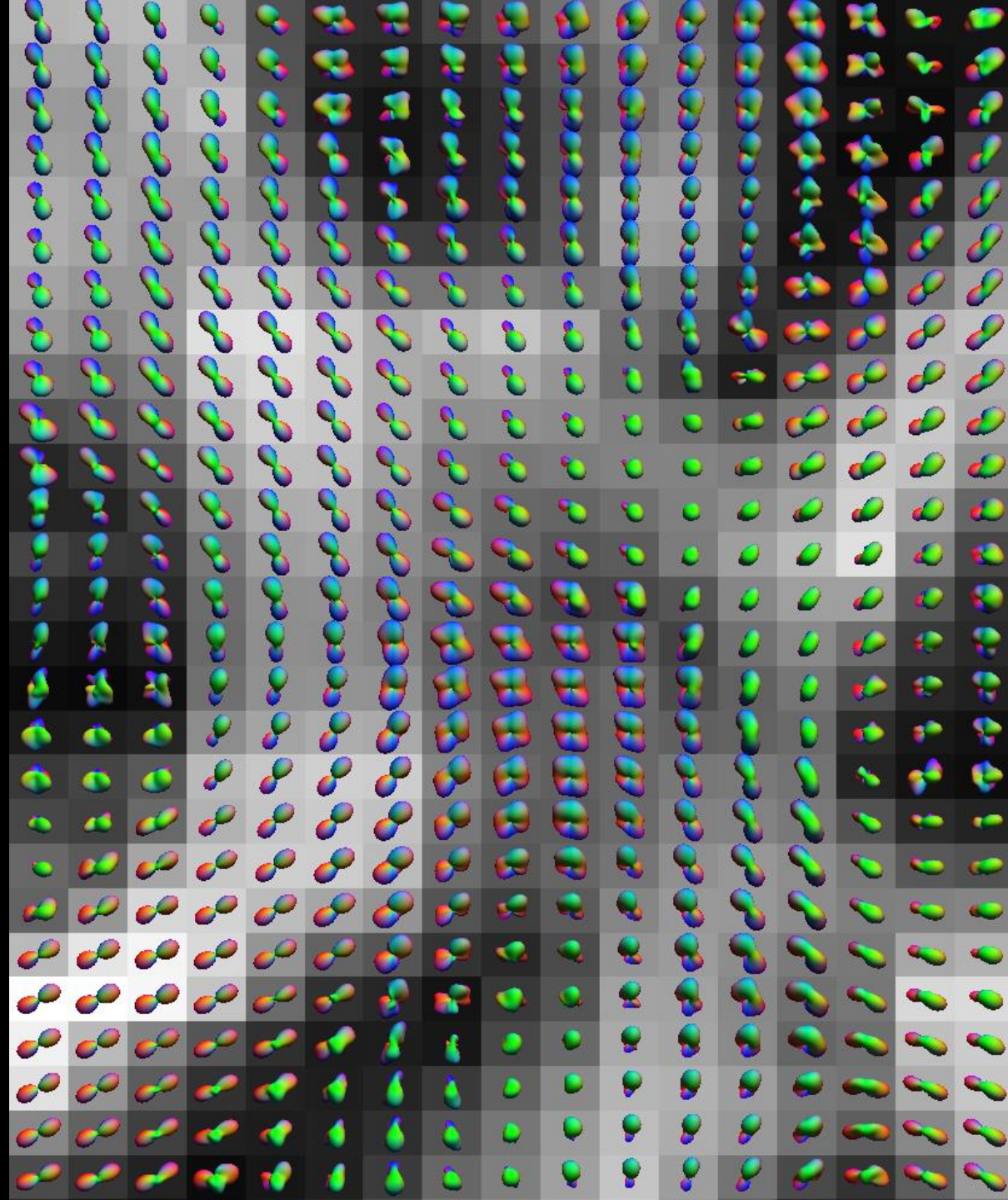


FRACT ODFs



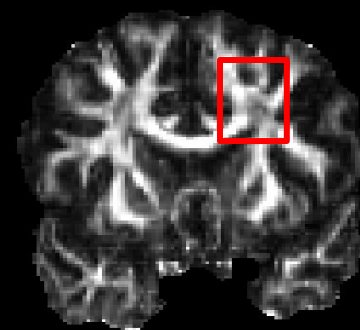
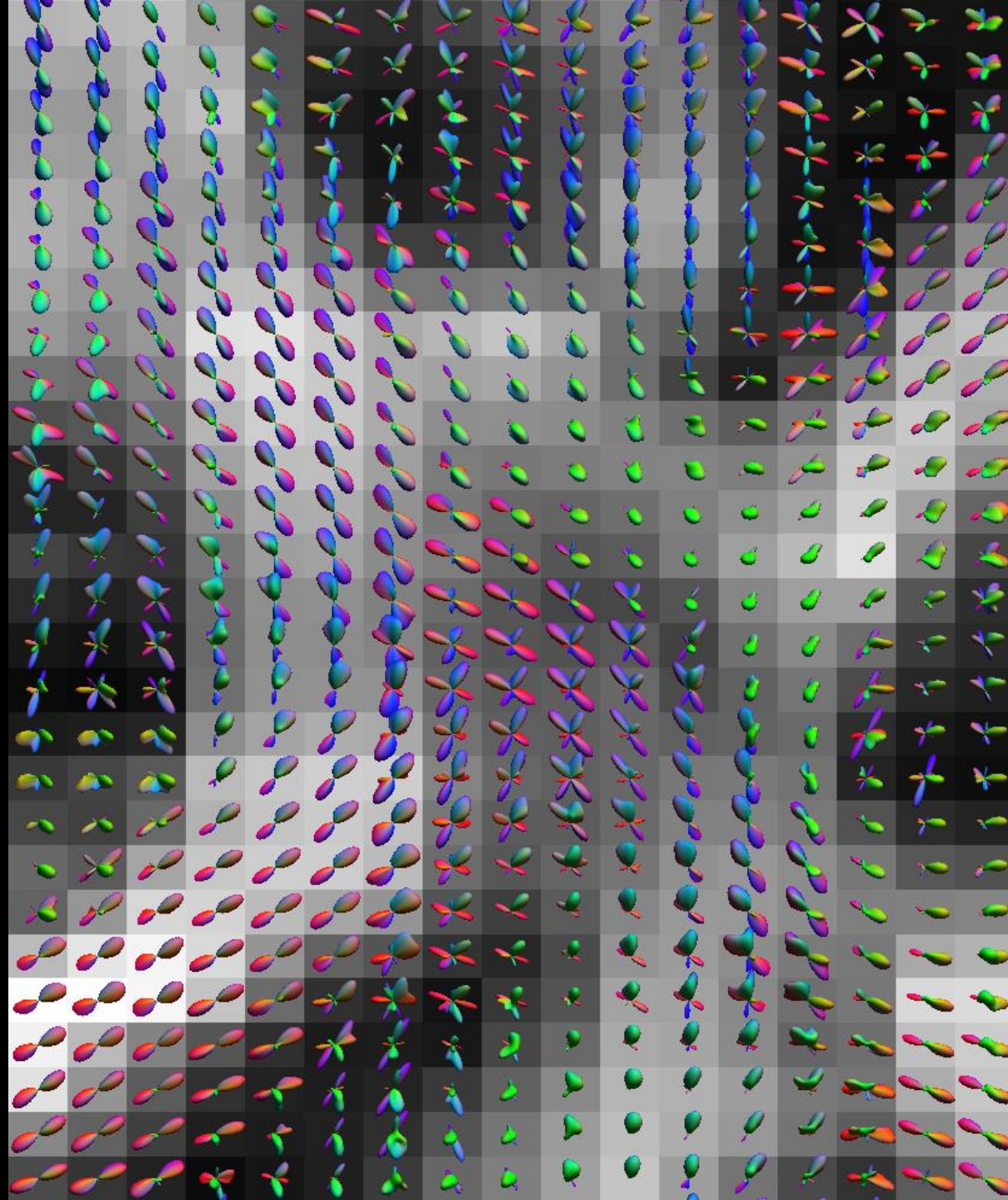
FA image

Diffusion
tensor



FA image

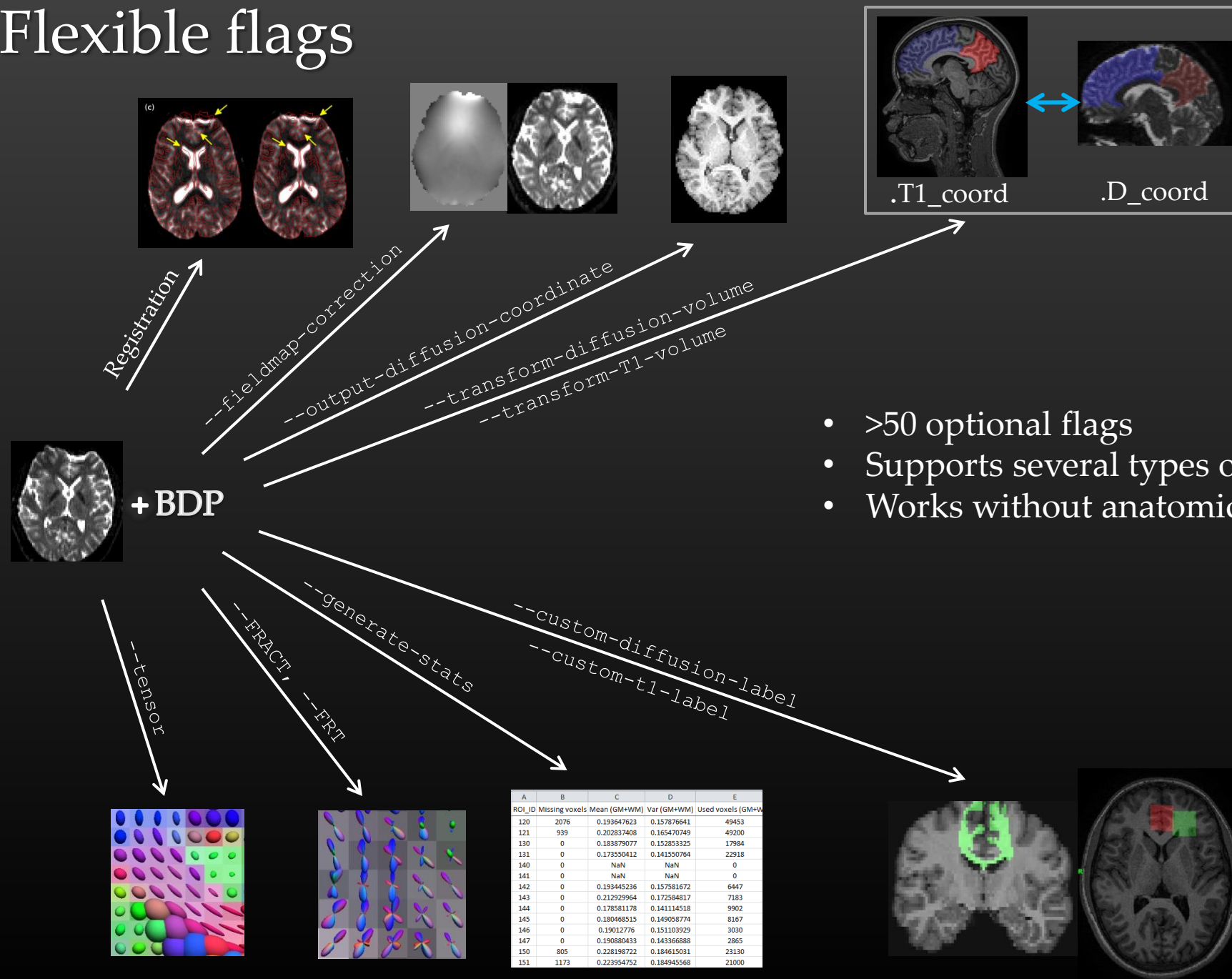
FRT ODF
(min-max norm.)



FA image

FRACT ODF
(min-max norm.)

BDP: Flexible flags



Running BDP

- BDP executable location

- Mac: /Applications/BrainSuite15cb10/bdp/bdp.sh
- Windows: C:\Program Files\BrainSuite15cb10\bdp\bdp.exe

- Typical syntax

```
bdp.sh <BFC File> [Optional Flags] --nii <4D DWI NIfTI> \  
--bvec <Gradient file> --bval <b-value file>
```

- Example

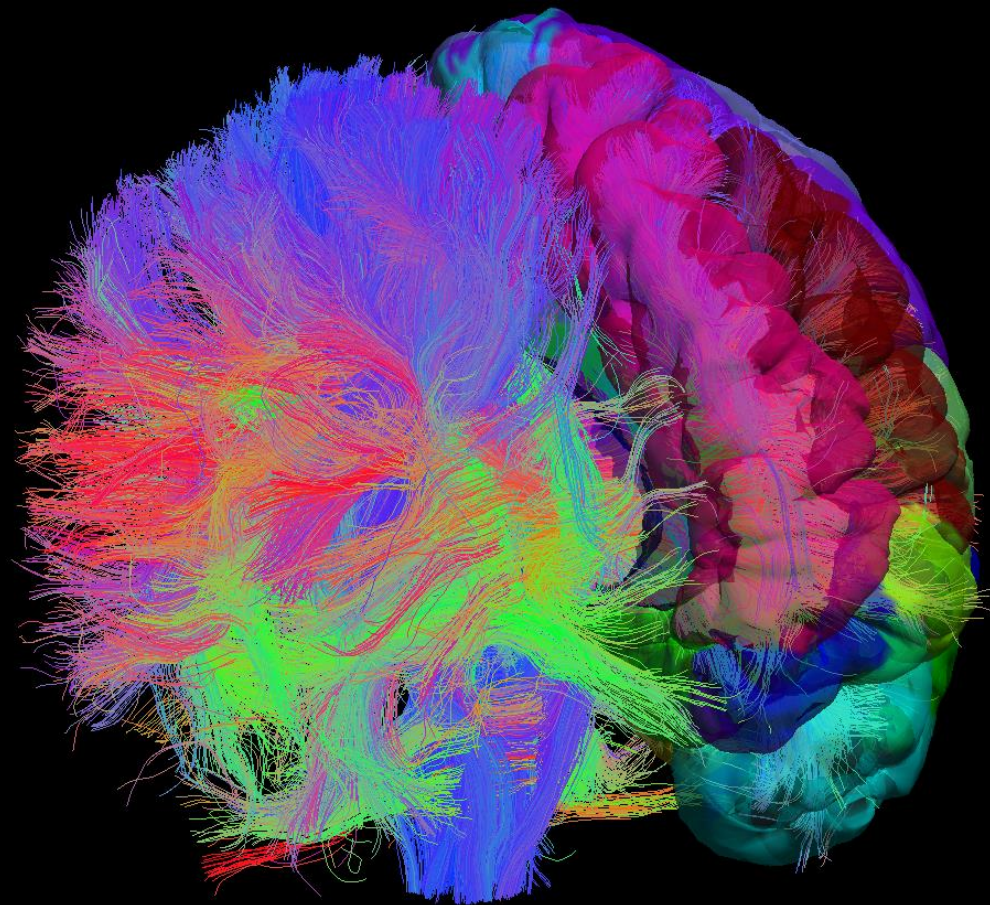
```
bdp.sh 2467264.bfc.nii.gz --tensor --odf \  
--nii 2467264.dwi.nii.gz --bvec 2467264.dwi.bvec \  
--bval 2467264.dwi.bval
```

(See next section and website for more details)
<http://brainsuite.org/processing/diffusion/pipeline/>

BDP outputs

Diffusion Tensor Estimation	
Filename	Description
<i>fileprefix.dwi.RAS.correct.FA.T1_coord.nii.gz</i>	Fractional anisotropy (FA) image in sMRI space
<i>fileprefix.dwi.RAS.correct.FA.color.T1_coord.nii.gz</i>	Color fractional anisotropy image in sMRI space
<i>fileprefix.dwi.RAS.correct.MD.T1_coord.nii.gz</i>	Mean diffusivity (MD) image in sMRI space
<i>fileprefix.dwi.RAS.correct.mADC.T1_coord.nii.gz</i>	Mean apparent diffusivity coefficient image in sMRI space (Model free)
<i>fileprefix.dwi.RAS.correct.axial.T1_coord.nii.gz</i>	Axial diffusivity image in sMRI space
<i>fileprefix.dwi.RAS.correct.radial.T1_coord.nii.gz</i>	Radial diffusivity image in sMRI space
<i>fileprefix.dwi.RAS.correct.L2.T1_coord.nii.gz</i>	Second eigenvalue image in sMRI space
<i>fileprefix.dwi.RAS.correct.L3.T1_coord.nii.gz</i>	Third eigenvalue image in sMRI space
<i>fileprefix.dwi.RAS.correct.T1_coord.eig.nii.gz</i>	BrainSuite eigen file of eigenvalues and eigenvectors
<i>fileprefix.tensor.T1_coord.bst</i>	This BST file can be opened in BrainSuite to easily load all the data required for tractography and connectivity analysis using diffusion tensors.
Orientation distribution function (ODF) estimation	
Filename	Description
<i>fileprefix.dwi.RAS.correct.FRT_GFA.nii.gz</i>	Generalized fractional anisotropy for ODFs estimated by Funk-Radon Transform (FRT) in sMRI space.
<i>fileprefix.dwi.RAS.correct.SH.FRT.<001...045>.T1_coord.nii.gz</i>	Spherical harmonic coefficients of ODFs estimated by Funk-Radon Transform (FRT) in sMRI space. These files are located in the FRT folder.
<i>fileprefix.dwi.RAS.correct.SH.FRT.T1_coord.odf</i>	Plaintext list of FRT files for loading into BrainSuite for ODF visualization and analysis. This file is located in the FRT folder.
<i>fileprefix.dwi.RAS.correct.SH.FRACT.<001...045>.T1_coord.nii.gz</i>	Spherical harmonic coefficients of ODFs estimated by Funk-Radon and Cosine Transform (FRACT) in sMRI space. These files are located in the FRACT folder.
<i>fileprefix.dwi.RAS.correct.SH.FRACT.T1_coord.odf</i>	Plaintext list of FRACT files for loading into BrainSuite for ODF visualization and analysis. This folder is located in the FRACT folder.
	This BST file can be opened in BrainSuite to easily load all the data

<http://brainsuite.org/processing/diffusion/output-files/>



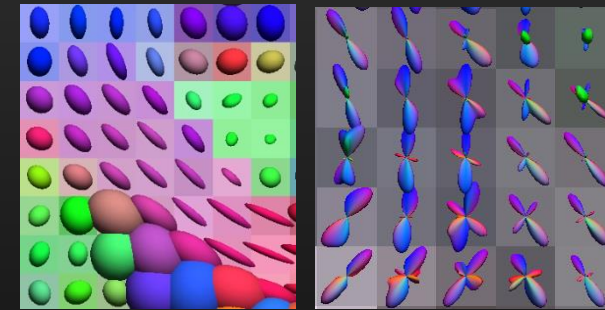
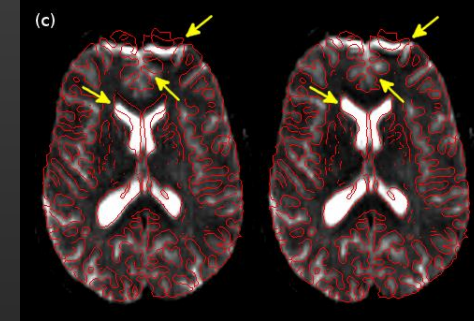
<http://brainsuite.org/>

Running BDP

{ Flags and options

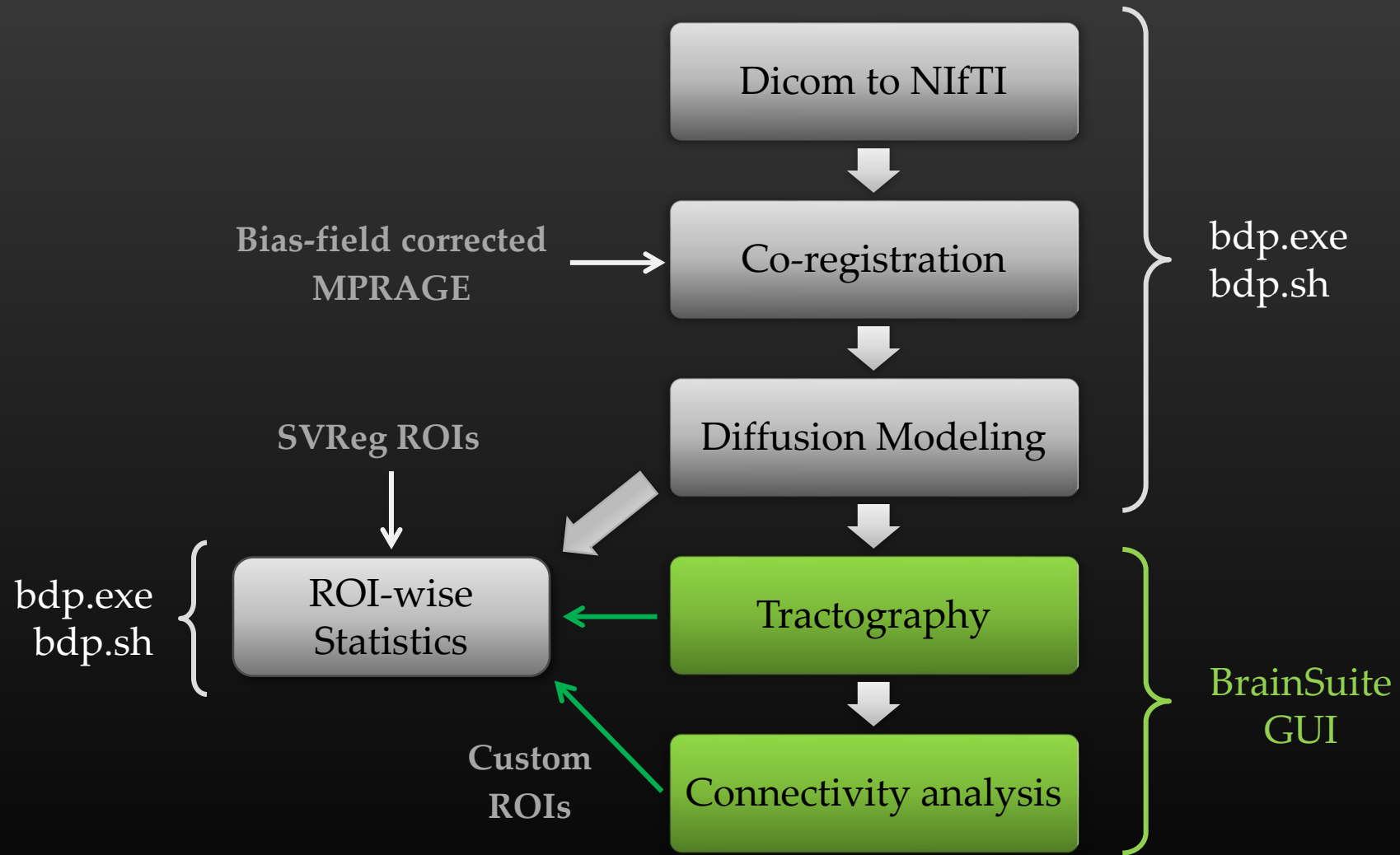
bdp.exe – overview

- Co-register diffusion and MPRAGE scan
 - Distortion correction – multiple methods
- Fit diffusion model
 - Multiple models – Tensor, ODFs
- Compute *basic* ROI-wise statistics
 - Custom ROIs, track based ROIs etc.



A	B	C	D	E	F	G
ROI_ID	Missing voxels	Mean (GM+WM)	Var (GM+WM)	Used voxels (GM+WM)	Mean (WM)	Var (WM)
120	2076	0.193647623	0.157876641	49453	0.367816687	0.158458
121	939	0.202837408	0.165470749	49200	0.384492725	0.163745
130	0	0.183879077	0.152853325	17984	0.371818811	0.152749
131	0	0.173550412	0.141550764	22918	0.347554863	0.142177
140	0	NaN	NaN	0	NaN	NaN
141	0	NaN	NaN	0	NaN	NaN
142	0	0.193445236	0.157581672	6447	0.394196153	0.124804
143	0	0.212929964	0.172584817	7183	0.414764017	0.14748
144	0	0.178581178	0.141114518	9902	0.345779568	0.12801
145	0	0.180468515	0.149058774	8167	0.353723109	0.141367
146	0	0.19012776	0.151103929	3030	0.36529085	0.157643
147	0	0.190880433	0.143366888	2865	0.348852992	0.136231
150	805	0.228198722	0.184615031	23130	0.397928327	0.16902
151	1173	0.223954752	0.184945568	21000	0.423291534	0.159717

Diffusion Pipeline



bdp.exe / bdp.sh

- Command line tool
 - Highly extensible using your batch/shell scripts
- Requires
 - Matlab 2012a MCR
 - Visual C++ runtime package (windows only)
- Documentation

<http://brainsuite.org/processing/diffusion/>
- Detailed flag description

<http://brainsuite.org/processing/diffusion/flags/>

Syntax

DICOM

```
bdp.exe <BFC File> [Optional Flags] -d <DICOM path> [DICOM path ...]
```

- Limited support
- BDP extracts (most) relevant diffusion scan parameters

NIfTI (.nii or .nii.gz)

```
bdp.exe <BFC File> [Optional Flags] --nii <4D DWI NIfTI> --bvec <Gradient  
file> --bval <b-value file>
```

- BDP expects diffusion gradient direction in voxel coordinates
- BDP uses NIfTI header matrix extensively for registration

Linux and Macintosh

Replace `bdp.exe` by `bdp.sh`

BDP - example

Mac (similar for Linux):

```
/Applications/BrainSuite15b/bdp/bdp.sh 2523412.bfc.nii.gz --tensor --odf --nii \  
2523412.dwi.nii.gz -g 2523412.dwi.bvec -b 2523412.dwi.bval
```

Windows:

```
"C:\Program Files\BrainSuite15b\bdp\bdp.exe" 2523412.bfc.nii.gz --tensor --odf --nii ^  
2523412.dwi.nii.gz -g 2523412.dwi.bvec -b 2523412.dwi.bval
```

Note: \ and ^ are line continuation characters for Mac/Linux and Windows, respectively.

- Approximate run time on a 3.5GHz i7-3770k is **22 minutes**.
- Flags are separated by space.
- If required file are not in current working directory, then specify full path to files.
- Any number of flags can be added.
- Output files:
 - Many many files.... (see documentation for all details)
 - <fileprefix>.BDPSummary.txt
 - Summary of all the processing with references.
 - The command used by BDP, for future reference.

<fileprefix>.BDPSummary.txt

BrainSuite Diffusion Pipeline: Processing Summary

BDP Version: 13p17

Processing finished: 19-Sep-2013 12:03:26

Scan: D:\BrainReg_Git\data\BDP_test_data\6067JH\5934JH

Diffusion MRI data was co-registered to the anatomical T1-weighted image and corrected for susceptibility-induced distortions using an acquired B0 fieldmap [Bhushan 2012].

Diffusion tensors were estimated using a weighted linear least squares method, and scalar diffusion parameters such as fractional anisotropy (FA), mean diffusivity (MD), radial diffusivity, and axial diffusivity were computed based on an eigendecomposition of the tensors as described in [Kim 2009].

Orientation distribution functions (ODFs) were computed using the Funk-Radon Transform and the Funk-Radon [Halдар 2013].

REFERENCES:

[Bhushan 2012] C. Bhushan, J. susceptibility-induced distortion nonrigid registration", Asia-Pacific Annual Summit and Conference

[Halдар 2013] J. P. Halдар, R the sphere: Application to high NeuroImage, Volume 71, Pages

[Kim 2009] J. H. Kim, J. Halдар imaging of mouse brain stem and Methods, Volume 176, Issue 2,

COMMAND USED:

```
bdp13.exe D:\BrainReg_Git\data\BDP_test_data\6067JH\5934JH.bfc.nii.gz
--threads=4
--dir=y-
--odf
--tensor
--output-subdir windows_complied_v13p17_fieldmap
--output-diffusion-coordinate
--nii D:\BrainReg_Git\data\BDP_test_data\6067JH\6067JH.DWI.00.nii.gz
--bvec D:\BrainReg_Git\data\BDP_test_data\6067JH\6067JH.DWI.00.bvec
--bval D:\BrainReg_Git\data\BDP_test_data\6067JH\6067JH.DWI.00.bval
--fieldmap-correction D:\BrainReg_Git\data\BDP_test_data\6067JH\6067JH.fieldmap.rad
--echo-spacing=0.00036
```

Approximate processing time: 18.07 minutes

Command line output

```
Reading input flags...

Output sub-directory already exists:
D:\BrainReg_Git\data\BDP_test_data\6067JH\windows_complied_v13p17_fieldmap
The files in the output folder can be overwritten.
Checking input files...
Successfully generated b-matrices file.

BDP could not find any .mask.nii.gz file. BDP will use input bfc file itself as
brain mask. You can specify a custom head mask by using flag --t1-mask
<maskfile_name>. The custom mask must overlay correctly with input BFC image in
BrainSuite.

Reading the input parameters for co-registration...
Checking orientation information...Done
Extracting 0-diffusion (b=0) image from input DWIs...Done

DWI mask is not defined in input flags. BDP will generate (pseudo) mask from
0-diffusion (b=0) image. Automatic mask generation may not be accurate in some
situations and can affect overall quality of co-registration. In case
co-registration is not accurate, you can define a DWI mask by using flag
--dwi-mask <mask_filename>. The mask can be generated and hand edited in
BrainSuite interface. This mask would be used only for registration purposes
(and not for statistics computation).
Saved (pseudo) mask: D:\BrainReg_Git\data\BDP_test_data\6067JH\windows_complied_v13p17_fieldmap\5934JH.dwi.RAS.mask.nii.gz

Distortion correction using fieldmap started...
Field of view (FOV) of Fieldmap and EPI (diffusion) scan seems to be different.
PNG images showing overlay will be generated with name:
D:\BrainReg_Git\data\BDP_test_data\6067JH\windows_complied_v13p17_fieldmap\5934JH.dwi.RAS.correct.fielmap_overlay

WARNING: Fieldmap and EPI (diffusion) data do not share same field of view
(FOV), but it seems that EPI data is totally included in fieldmap FOV. BDP will
only use information from overlapping FOV. It is *highly* recommended to check
the overlay images to make sure fieldmap and EPI data overlap correctly.
Fieldmaps should be pre-registered to EPI image in order to work correctly.

[=====>] 21/21 volumes done

Saving file...Done
Correcting DWI mask...
Field of view (FOV) of Fieldmap and EPI (diffusion) scan seems to be different.
PNG images showing overlay will be generated with name:
D:\BrainReg_Git\data\BDP_test_data\6067JH\windows_complied_v13p17_fieldmap\5934JH.dwi.RAS.correct.mask.fielmap_overlay
```

Command line
output – Always
verbose with
relevant important
information

Default flags

When no optional flag is defined:

- `--tensor`
- `--dir=y`
- Registration based distortion correction
- Only T1-coordinate outputs
- Outputs are saved in same directory as bfc file
- `--threads=4`

```
bdp.exe C:\5934\5934.bfc.nii.gz --nii C:\5934\5934.dwi.nii.gz --bvec  
C:\5934\5934.dwi.bvec --bval C:\5934\5934.dwi.bval
```

Help!

`--help` or `-h`

- Prints out description of all BDP flags
- Also reports the version of BDP executable being run

`--check-for-updates`

- Connects to BrainSuite server to check if a new version of BDP is available

All other flags and options are ignored and BDP terminates after printing help or checking for updates.

Of course online documentation:

<http://brainsuite.org/processing/diffusion/>

Diffusion models

Multiple 'model' flags can be used at once:

➤ Diffusion Tensor

- `--tensor`
- `<name>.eig.nii.gz` – saves all eigen value/vectors
- FA, colorFA, axial, radial, L2, L3, MD

➤ ODFs

- `--FRT`
- `--FRACT`
- `<name>.odf` – Load saved Spherical harmonic coefficients

➤ Coordinate filename suffix

- `.T1_coord` : In T1/MPRAGE coordinates
- `.D_coord` : In diffusion coordinates

Distortion direction

`--dir=<direction>`

Define phase encoding direction

`x` : increases along the Right side of the subject

`x-` : increases along the left side of the subject.

`y` : increases along the Anterior direction of the subject

`y-` : increases along the posterior direction of the subject

`z` : increases along the Superior direction

`z-` : increases along the inferior direction

Example

`--dir=y-`

➤ -ve sign is important only for fieldmap based correction

Fieldmap based correction

Required

```
--fieldmap-correction <fname.nii.gz> (in rad/sec)  
--echo-spacing=<t> (in sec)
```

Example

```
--fieldmap-correction fieldmap.radians.nii.gz  
--echo-spacing=0.00036
```

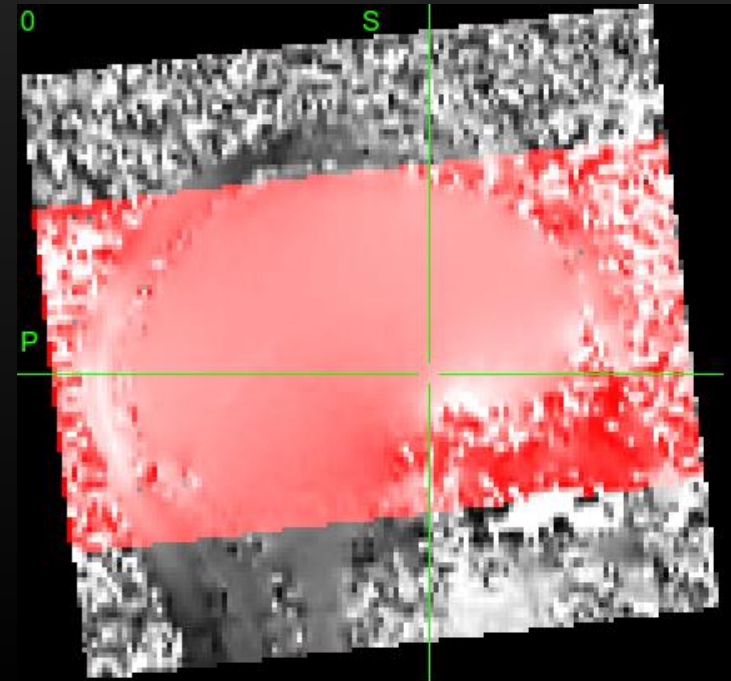
Optional

```
--fieldmap-smooth3=<S> (in mm)  
--ignore-fieldmap-fov
```

- BDP checks for overlap of field of view (FOV) of diffusion scan and fieldmap scan
- Overrides FOV check

Example:

```
--fieldmap-smooth3=0.75
```



Some (more) useful flags

`--output-subdir <directory_name>`

- allows to specify a sub-directory name in which output files would be written
- Example:

`--output-subdir BDPv15b`

`--output-diffusion-coordinate`

- Enables estimation of diffusion tensors and/or ODFs in the native diffusion coordinate
- All native diffusion coordinate files are saved in a separate folder named “diffusion_coord_outputs”
- Outputs in MPRAGE coordinates are always saved

Statistics flags

--generate-stats

- Requires extraction (& SVReg) output files
- Writes statistics for white matter(WM), grey matter(GM), and both WM and GM combined
- Outputs in .csv format

A	B	C	D	E	F	G	H	I	J	K
ROI_ID	Missing voxels	Mean (GM+WM)	Var (GM+WM)	Used voxels (GM+WM)	Mean (WM)	Var (WM)	Used Voxels (WM)	Mean (GM)	Var (GM)	Used voxels (GM)
120	2076	0.193647623	0.157876641	49453	0.367816687	0.158458	13550	0.12791613	0.095325	35903
121	939	0.202837408	0.165470749	49200	0.384492725	0.163745	14200	0.12913822	0.093767	35000
130	0	0.183879077	0.152853325	17984	0.371818811	0.152749	4789	0.11566798	0.076836	13195
131	0	0.173550412	0.141550764	22918	0.347554863	0.142177	5907	0.1131282	0.076227	17011
140	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0
141	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0
142	0	0.193445236	0.157581672	6447	0.394196153	0.124804	1873	0.11123998	0.073218	4574
143	0	0.212929964	0.172584817	7183	0.414764017	0.14748	2233	0.12188043	0.082116	4950
144	0	0.178581178	0.141114518	9902	0.345779568	0.12801	2914	0.1088594	0.069754	6988
145	0	0.180468515	0.149058774	8167	0.353723109	0.141367	2412	0.10785522	0.072814	5755
146	0	0.19012776	0.151103929	3030	0.36529085	0.157643	764	0.13106996	0.091235	2266
147	0	0.190880433	0.143366888	2865	0.348852992	0.136231	768	0.13302445	0.093814	2097
150	805	0.228198722	0.184615031	23130	0.397928327	0.16902	8681	0.12622583	0.098437	14449
151	1173	0.223954752	0.184945568	21000	0.423291534	0.159717	7044	0.12334342	0.091737	13956
160	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0
161	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0

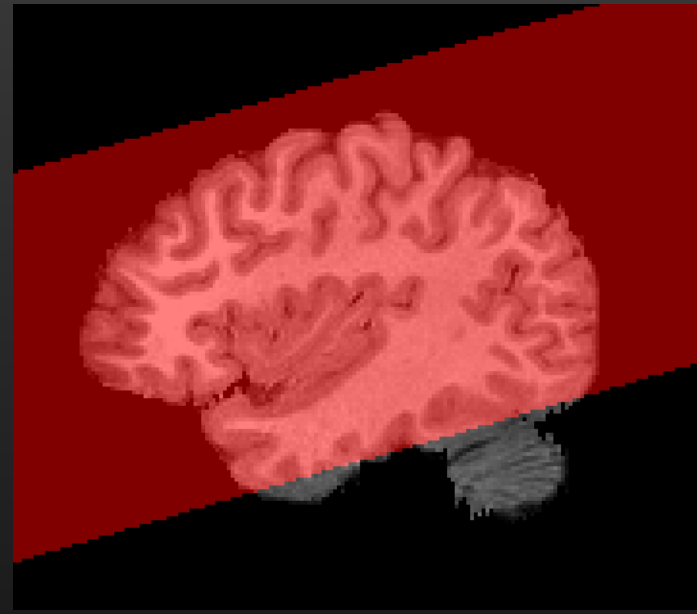
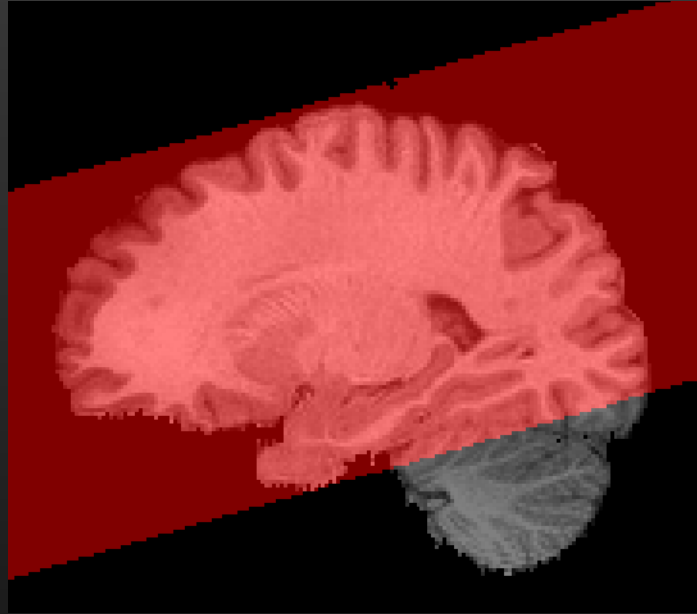
Statistics flags

A	B	C	D	E	F	G	H	I	J	K
ROI_ID	Missing voxels	Mean (GM+WM)	Var (GM+WM)	Used voxels (GM+WM)	Mean (WM)	Var (WM)	Used Voxels (WM)	Mean (GM)	Var (GM)	Used voxels (GM)
120	2076	0.193647623	0.157876641	49453	0.367816687	0.158458	13550	0.12791613	0.095325	35903
121	939	0.202837408	0.165470749	49200	0.384492725	0.163745	14200	0.12913822	0.093767	35000
130	0	0.183879077	0.152853325	17984	0.371818811	0.152749	4789	0.11566798	0.076836	13195
131	0	0.173550412	0.141550764	22918	0.347554863	0.142177	5907	0.1131282	0.076227	17011
140	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0
141	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0
142	0	0.193445236	0.157581672	6447	0.394196153	0.124804	1873	0.11123998	0.073218	4574
143	0	0.212929964	0.172584817	7183	0.414764017	0.14748	2233	0.12188043	0.082116	4950
144	0	0.178581178	0.141114518	9902	0.345779568	0.12801	2914	0.1088594	0.069754	6988
145	0	0.180468515	0.149058774	8167	0.353723109	0.141367	2412	0.10785522	0.072814	5755
146	0	0.19012776	0.151103929	3030	0.36529085	0.157643	764	0.13106996	0.091235	2266
147	0	0.190880433	0.143366888	2865	0.348852992	0.136231	768	0.13302445	0.093814	2097
150	805	0.228198722	0.184615031	23130	0.397928327	0.16902	8681	0.12622583	0.098437	14449
151	1173	0.223954752	0.184945568	21000	0.423291534	0.159717	7044	0.12334342	0.091737	13956
160	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0
161	0	NaN	NaN	0	NaN	NaN	0	NaN	NaN	0

Default information:

- WM/GM from <name>.cortex.dewisp.mask.nii.gz
- SVReg labels from <name>.svreg.corr.label.nii.gz
- ROI_ID from brainsuite_labeldescription.xml
 - --custom-label-xml <filename.xml>

Statistics – FOV issues



- BDP detects overlap of field of view (FOV) of MPRAGE and diffusion scan
- Computes missing voxels in each ROI
- By default does *not* compute stats for ROI missing *any* voxel
- `--force-partial-roi-stats`
 - Force stats computation in all ROIs

Custom labels

```
--custom-diffusion-label <name>
```

```
--custom-t1-label <name>
```

- Define custom labels in either coordinates
- <name> can be either NIfTI filename or directory name
- Custom labels can be painted in BrainSuite13

```
--custom-label-xml <filename.xml>
```

- Example:

```
--custom-diffusion-label ROI26.nii.gz
```

```
--custom-t1-label T1_labels
```

- When `--custom-label-xml` is not used:
 - BDP generates 5-digit ROI IDs for each label found
 - Saves ROI ID maps (to labels found) in an .xml file
`<fileprefix>.BDP_ROI_MAP.xml`

Re-compute statistics

`--only-generate-stats`

`--generate-stats-only`

- Refined/manually corrected labels – re-run BDP to only compute statistics
- Skip all of the processing (co-registration, distortion correction and tensor/ODF estimation)
- All of the other flags **MUST** be used in the same way as they were in the initial BDP run (`<fileprefix>.BDPSummary.txt`)

Transform image volumes

`--transform-diffusion-volume <name>`

`--transform-t1-volume <name>`

- To-and-fro from diffusion and T1-coordinates
- `<name>` can be either NIfTI filename or directory name
- This does *not* perform any distortion correction

`--transform-interpolation <method>`

- Define interpolation method
- `linear`, `nearest`, `cubic` or `spline`

`--transform-data-only`

- Skip all of the processing (co-registration, distortion correction and tensor/ODF estimation)
- All of the other flags **MUST** be used in the same way as they were in the initial BDP run (`<fileprefix>.BDPSummary.txt`)

Error!

```
C:\Windows\System32>D:\bdp13p17_win64\bdp13.exe zxdfasd.nii.gz
```

```
Reading input flags...
```

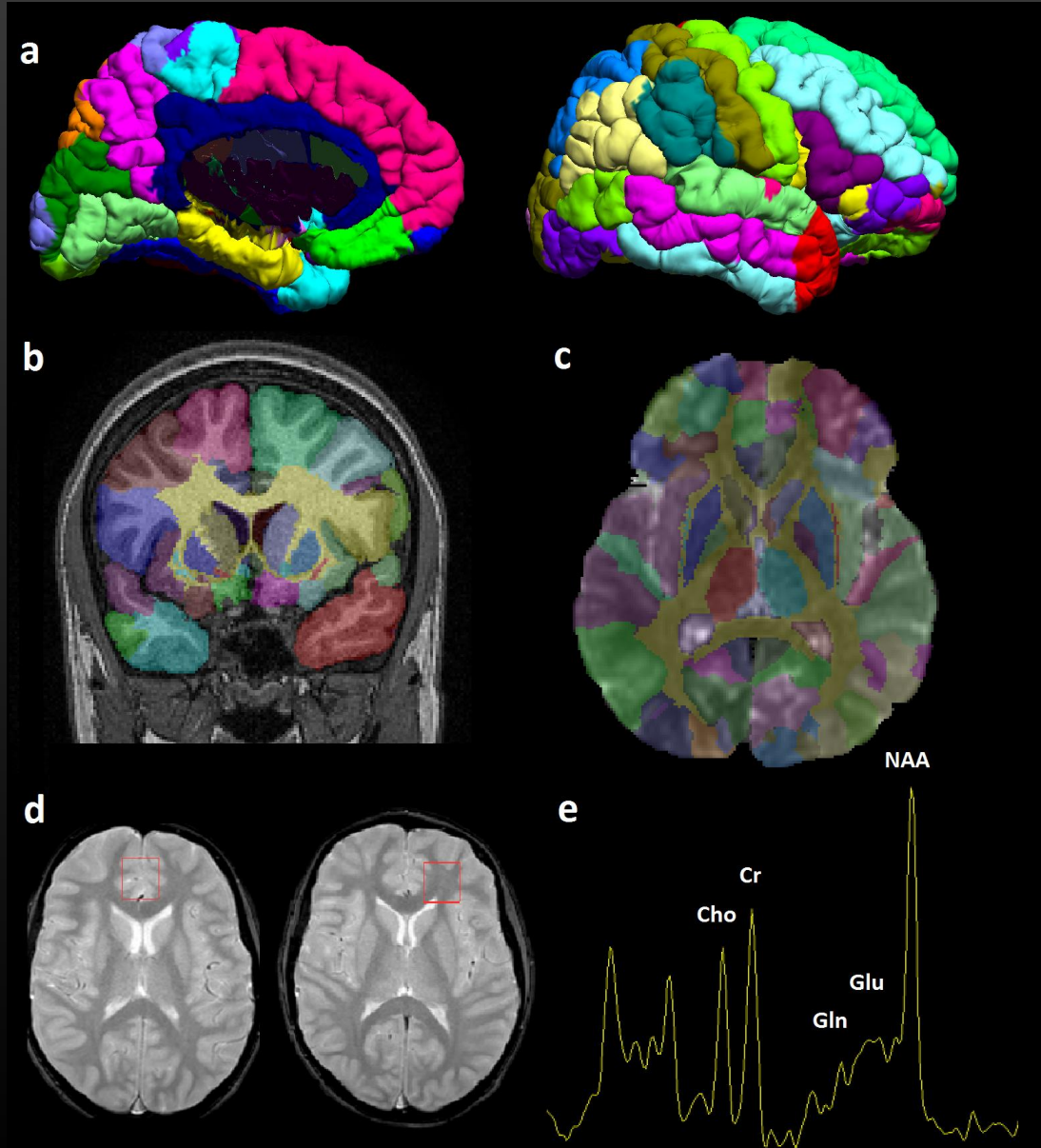
```
*****
*                                     *
*           Error running BDP       *
*                                     *
*           FILE DOES NOT EXIST     *
*                                     *
*****
```

```
BDP could not find the file:
zxdfasd.nii.gz
```

```
Check to make sure that the file exists and that you spelled
its filename and path correctly
```

```
*****
```

Example multimodal study



Choi et al., "A Multimodal Investigation of Neuronal/Axonal Integrity Using Structural T1-weighted Imaging, Diffusion Tensor Imaging, and H1 MR Spectroscopy", ISMRM 2013, Salt Lake City, p. 1951



BDP Documentation:

<http://brainsuite.org/processing/diffusion/>

Detailed flag description:

<http://brainsuite.org/processing/diffusion/flags/>