

Parameter space all

```
displacement=4 8
gaussian_range_one_sided=5
brain_coverage_fraction=1
intensity_decay_fraction=0 0.75
num_vecs=64
angle_thr=7
num_splits=4
spline_order=1
smoothing_std=4
perlin_noise_res=0.05 0.08 0.1
perlin_noise_abs_max=0 0.6
```

New suggestions from meeting 2

<https://github.com/ivartz/cancer-sim/commits/master>
f8236b3

Parameter space all

```
displacement=4 8  
gaussian_range_one_sided=5  
intensity_decay_fraction=0 0.75  
num_vecs=64  
angle_thr=7  
spline_order=1  
smoothing_std=4  
perlin_noise_res=0.01 0.04 0.07  
perlin_noise_abs_max=0 0.6
```

16 models/patient

$16 \times 27 = 432$ models

Parameter space

```
displacement=8  
gaussian_range_one_sided=5  
intensity_decay_fraction=0.75  
num_vecs=64  
angle_thr=7  
spline_order=1  
smoothing_std=4  
perlin_noise_res=0.04  
perlin_noise_abs_max=0.6
```

Local

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 116 59

Intensity under cursor:

Layer	intensity
2-T1c	19...
warped	24...
3-T1c	21.7
directional-bin...	0
neg-field-8	1.1...
interp-neg-fiel...	3.7...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

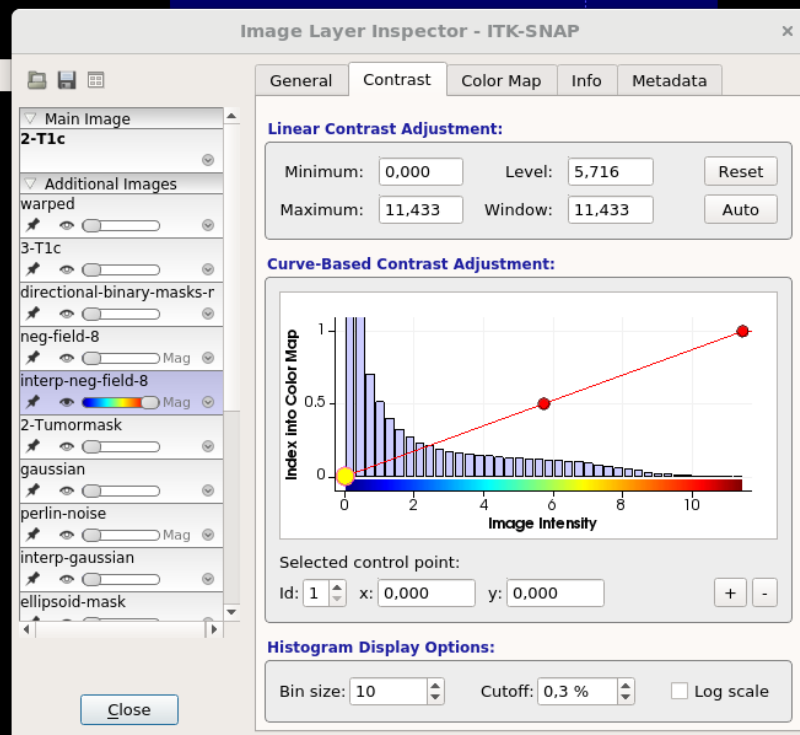
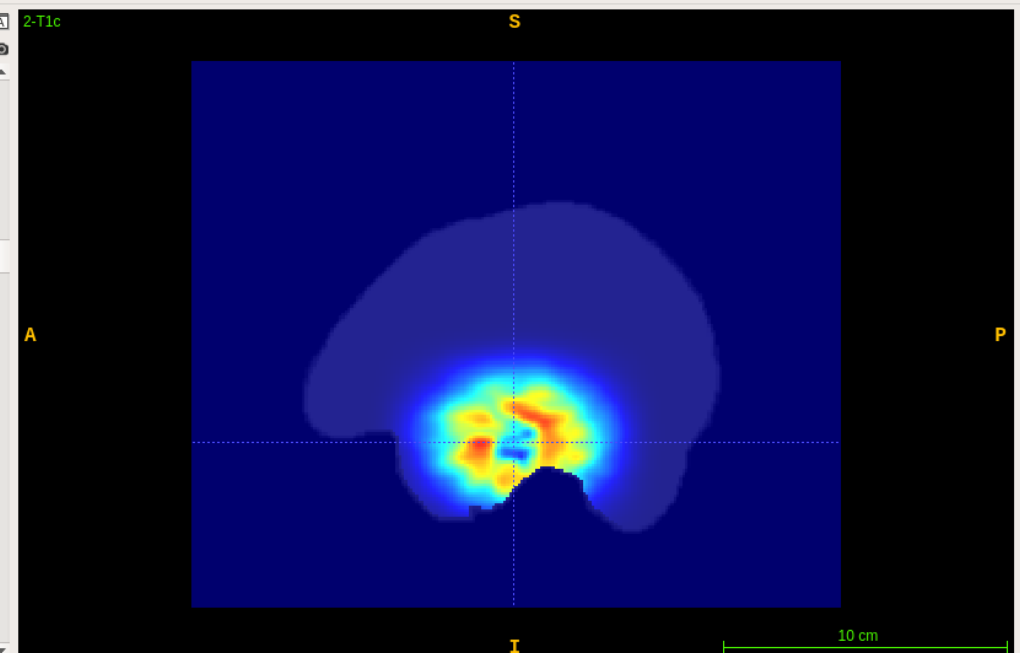
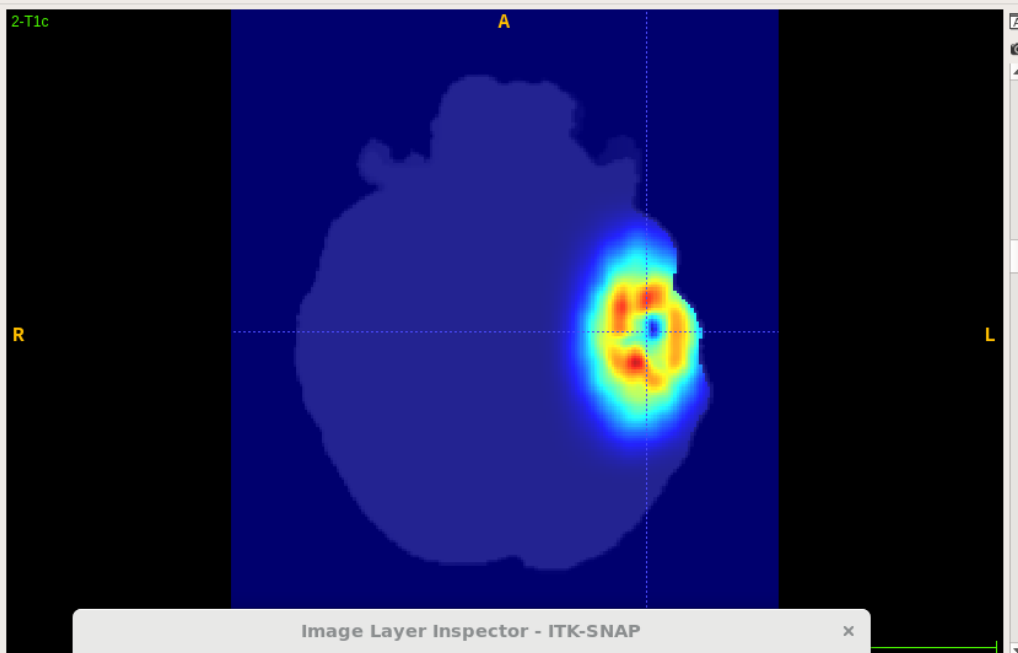
Paint over:

All labels

Overall label opacity:

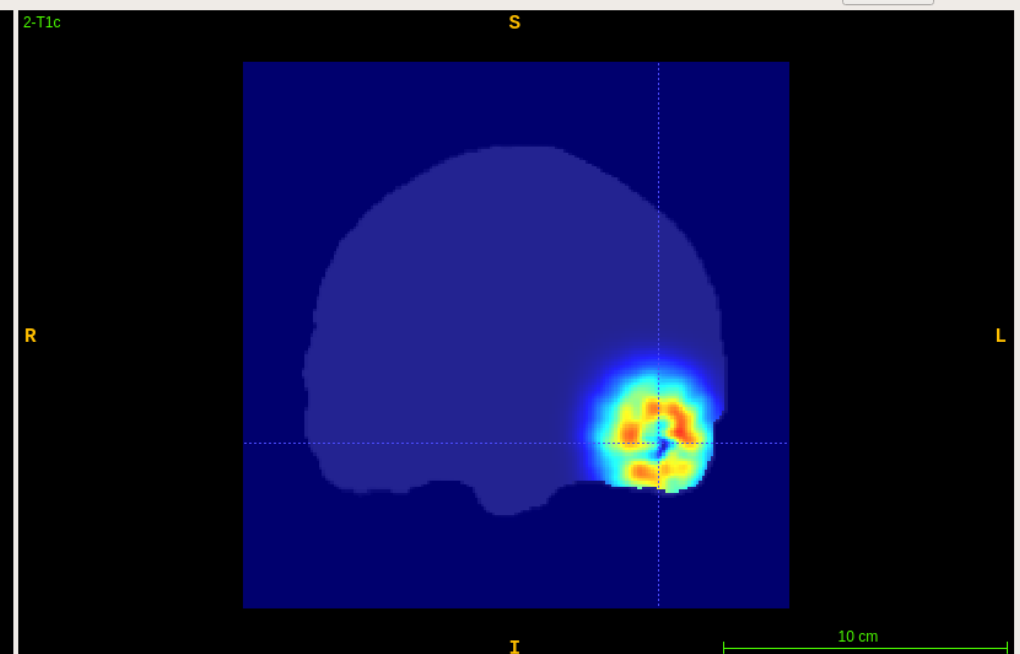
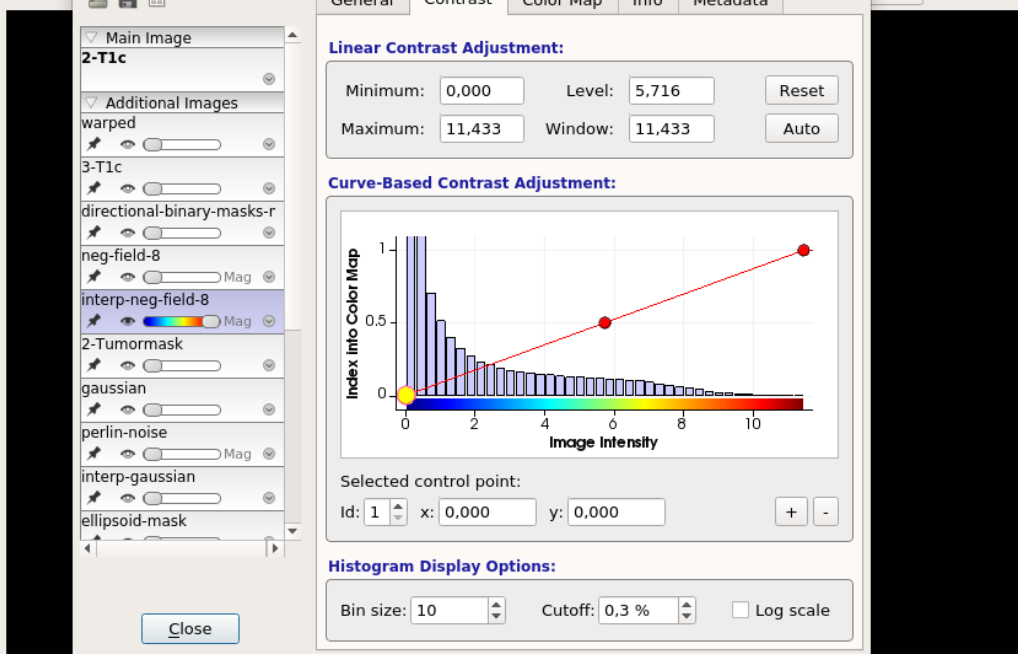
50

3D Toolbar



59 of 193

47 of 193



update

zoom to fit

zoom to fit

116 of 229

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 116 59

Intensity under cursor:

Layer	intensity
2-T1c	19...
warped	24...
3-T1c	21.7
directional-bin...	0
neg-field-8	1.1...
interp-neg-fiel...	-3...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

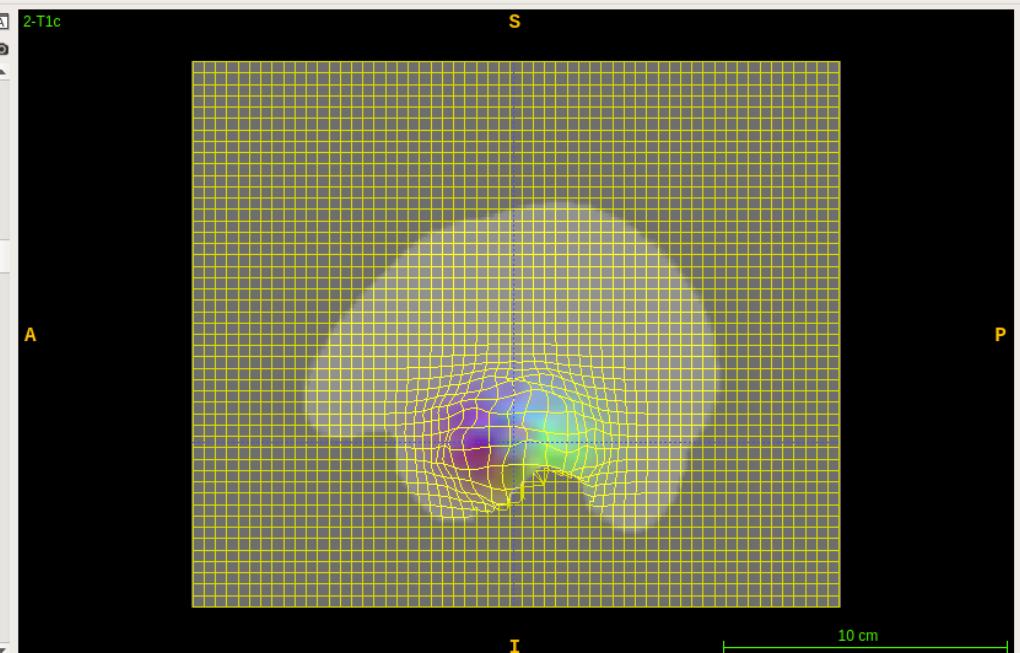
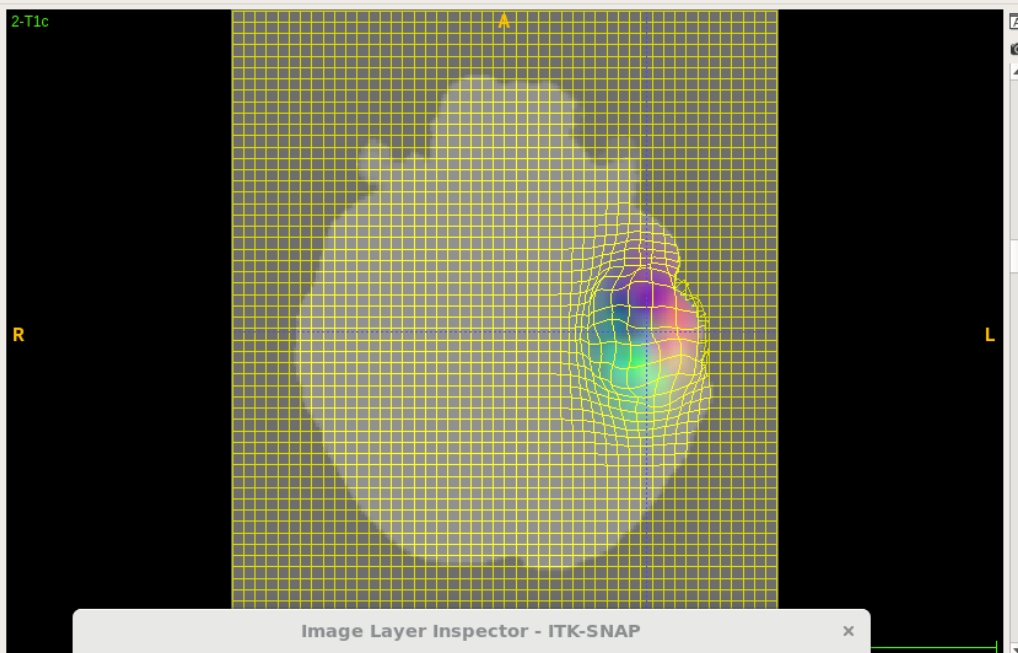


Image Layer Inspector - ITK-SNAP

General Contrast Color Map Info Metadata

Linear Contrast Adjustment:

Minimum: -9,910 Level: 0,038 Reset

Maximum: 9,986 Window: 19,896 Auto

Curve-Based Contrast Adjustment:

Index Into Color Map

Image Intensity

Selected control point:

Id: 1 x: -9,910 y: 0,000 + -

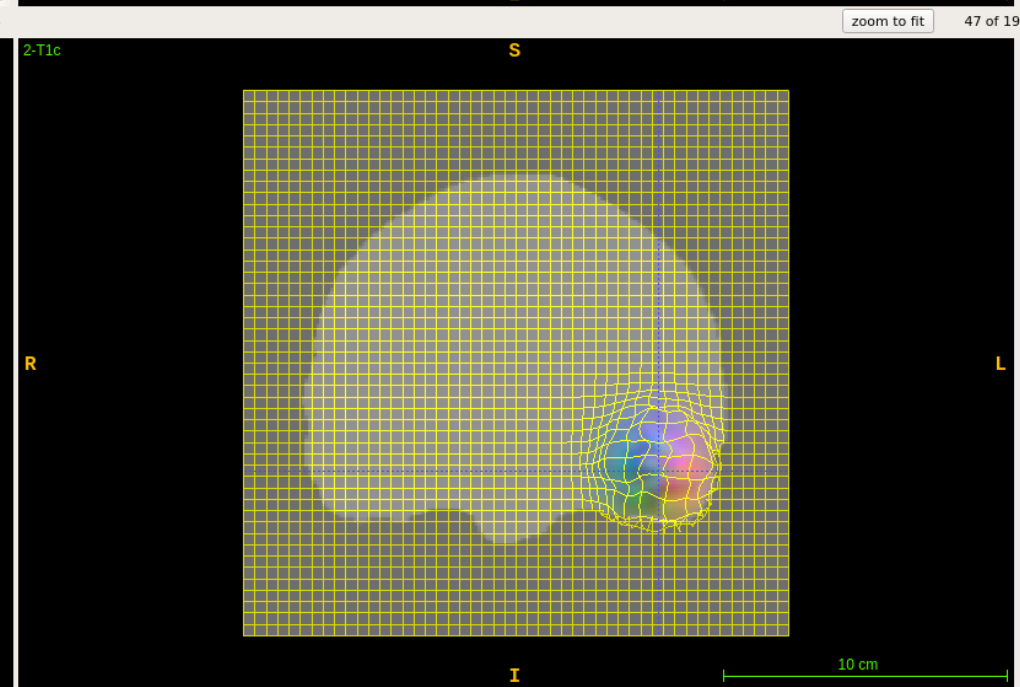
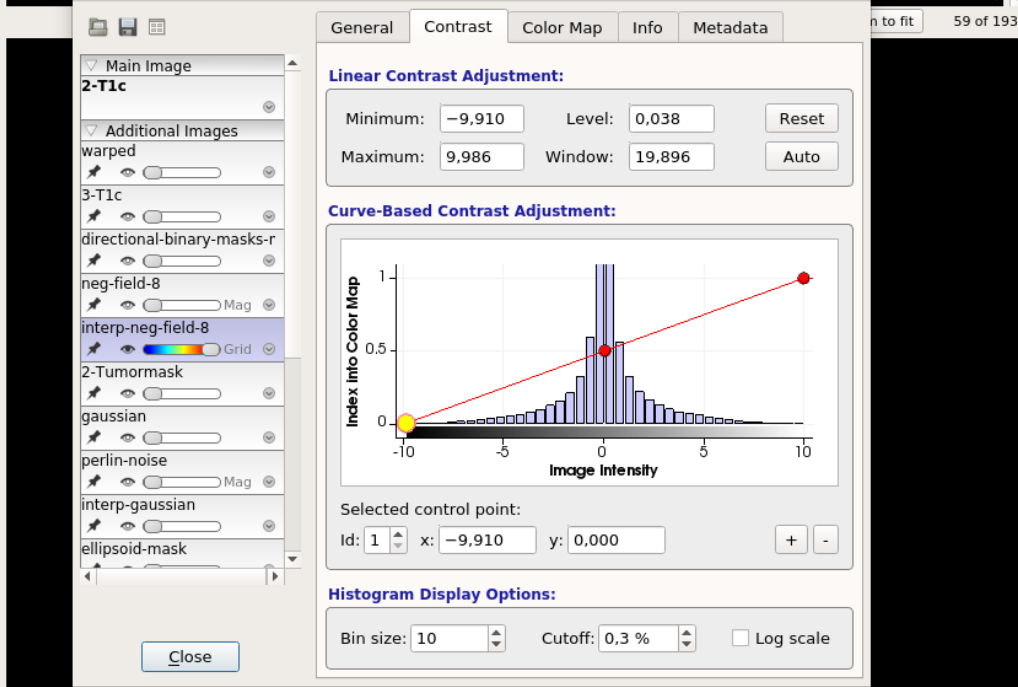
Histogram Display Options:

Bin size: 10 Cutoff: 0,3 % Log scale

Close

59 of 193

47 of 193



update

116 of 229

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 116 59

Intensity under cursor:

Layer	intensity
2-T1c	19...
warped	24...
3-T1c	21.7
directional-bin...	0
neg-field-8	1.1...
interp-neg-fiel...	-3...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

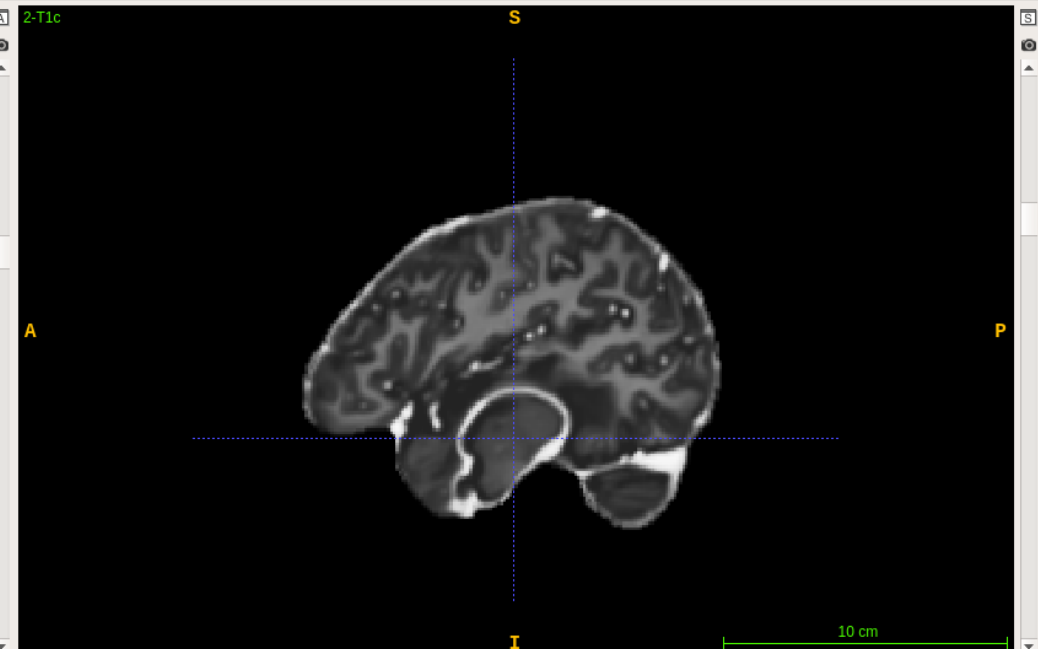


Image Layer Inspector - ITK-SNAP

General Contrast Color Map Info Metadata

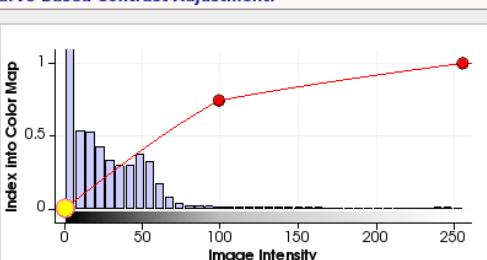
Linear Contrast Adjustment:

Minimum: 0,00 Level: 127,50 Reset

Maximum: 255,00 Window: 255,00 Auto

Curve-Based Contrast Adjustment:

Index Into Color Map



Selected control point:

Id: 1 x: 0,00 y: 0,000 + -

Histogram Display Options:

Bin size: 10 Cutoff: 8,0 % Log scale

Close

59 of 193

zoom to fit

47 of 193

zoom to fit

116 of 229

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 116 59

Intensity under cursor:

Layer	intensity
2-T1c	19...
warped	24...
3-T1c	21.7
directional-bin...	0
neg-field-8	1.1...
interp-neg-fiel...	-3...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

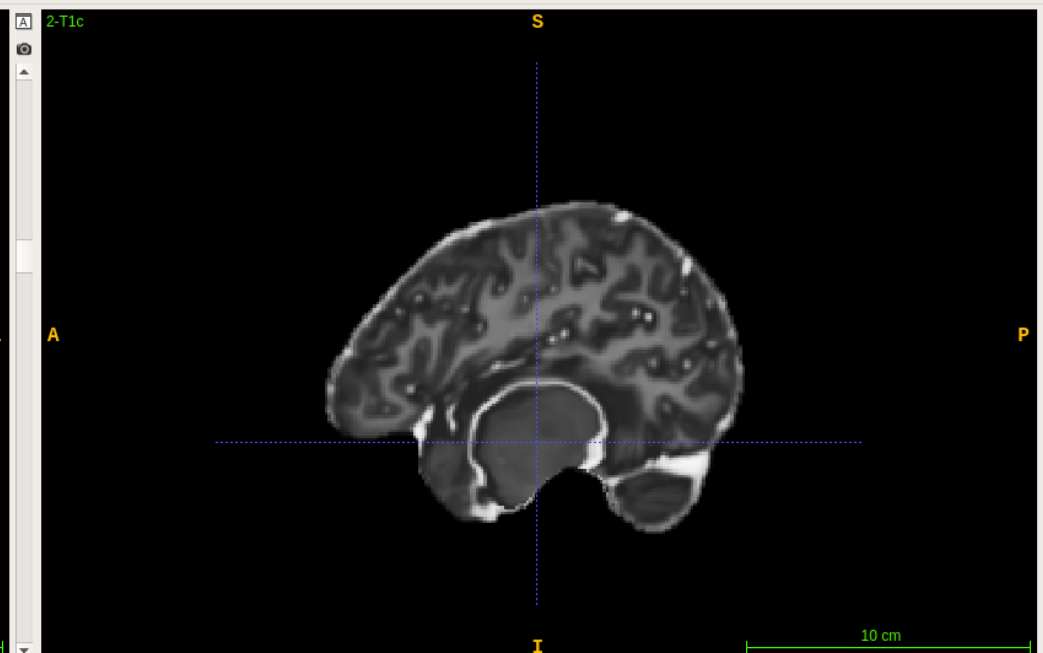


Image Layer Inspector - ITK-SNAP

General Contrast Color Map Info Metadata

Linear Contrast Adjustment:

Minimum: 0,00 Level: 127,50 Reset

Maximum: 255,00 Window: 255,00 Auto

Curve-Based Contrast Adjustment:

Index Into Color Map

Selected control point:

Id: 1 x: 0,00 y: 0,000 + -

Histogram Display Options:

Bin size: 10 Cutoff: 8,0 % Log scale

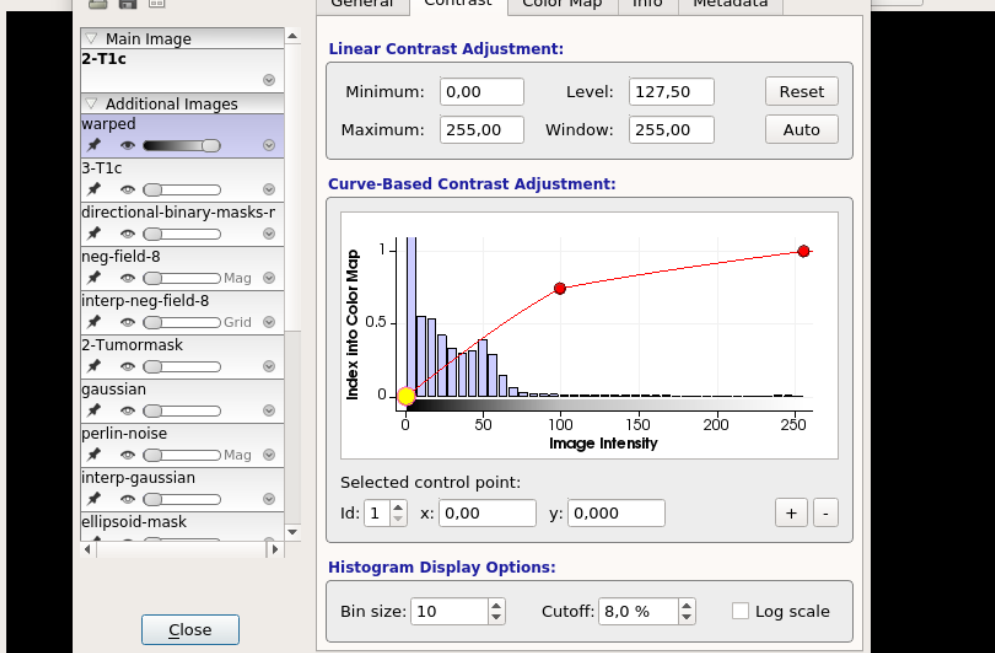
Close

59 of 193

zoom to fit

47 of 193

zoom to fit



update

zoom to fit

zoom to fit

116 of 229



2D

3D

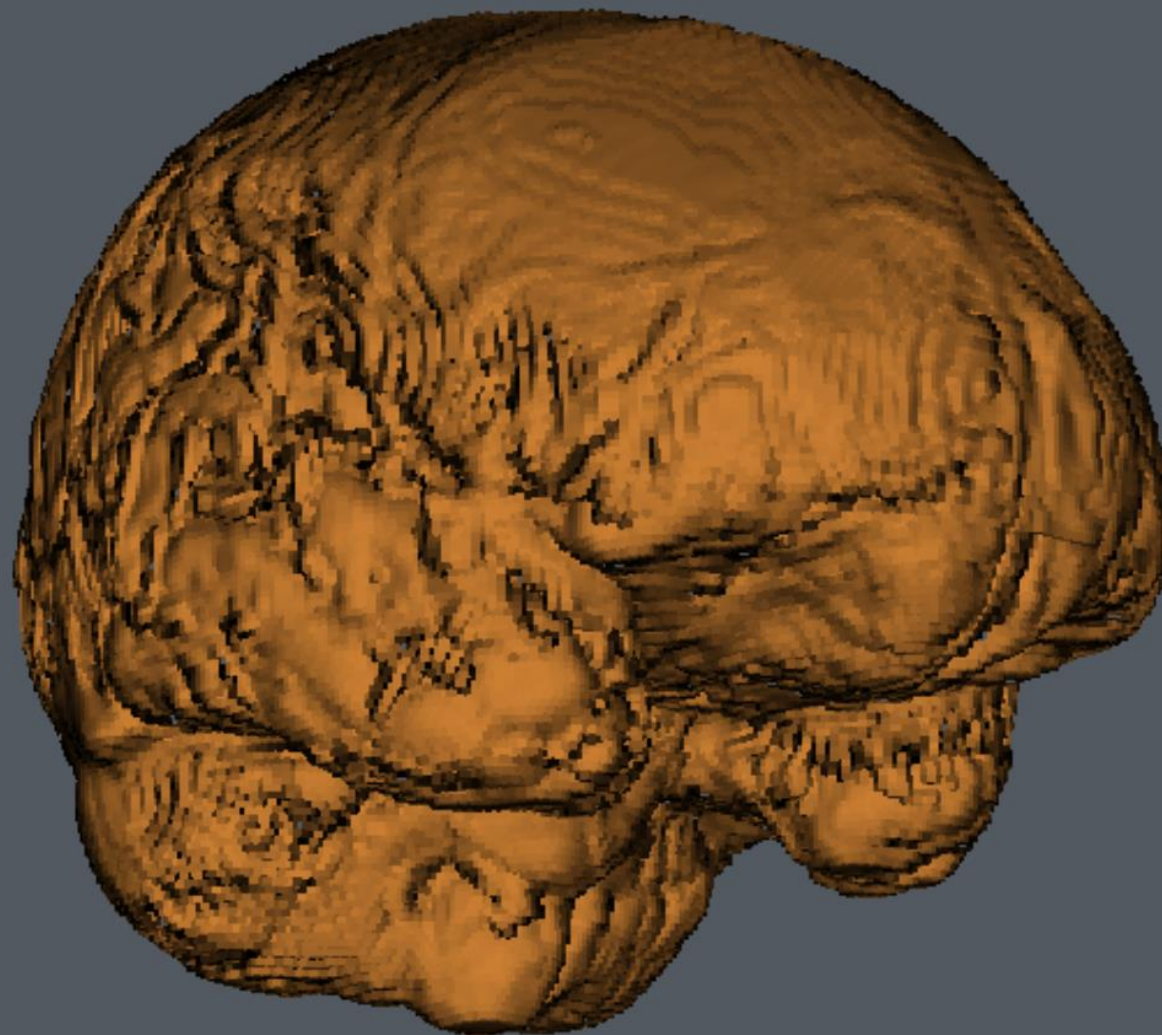
R

R

vtk

a

X



Level 127,500000

Window 255,000000

Linear



Shaded surface, CPU



2D

3D

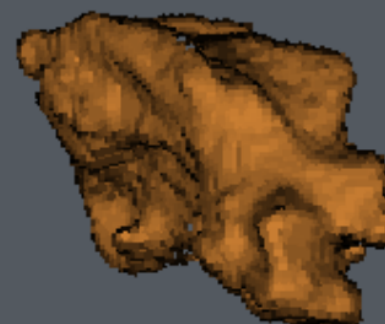
2d

R

vtk

a

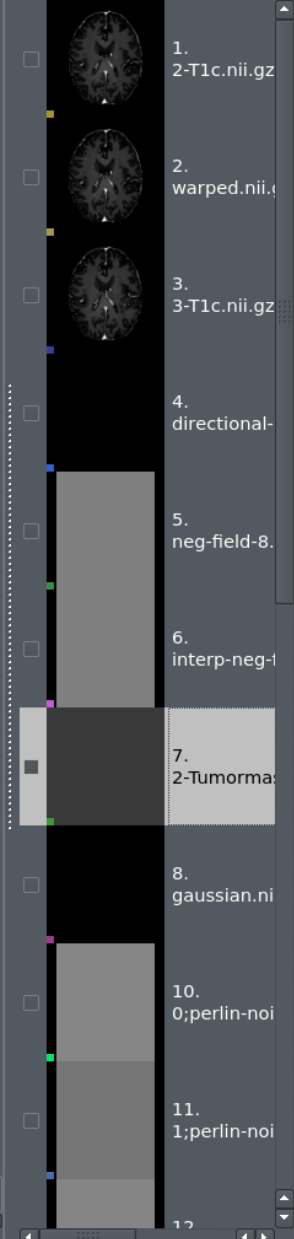
X



Level 0,500000

Window 1,000000

Linear



Shaded surface, CPU

DICOM



2D

3D

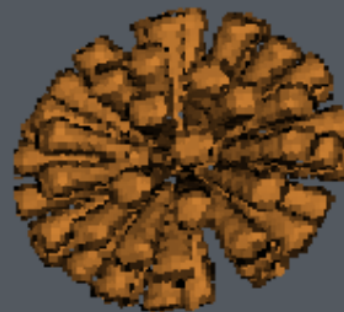
R

R

vtk

a

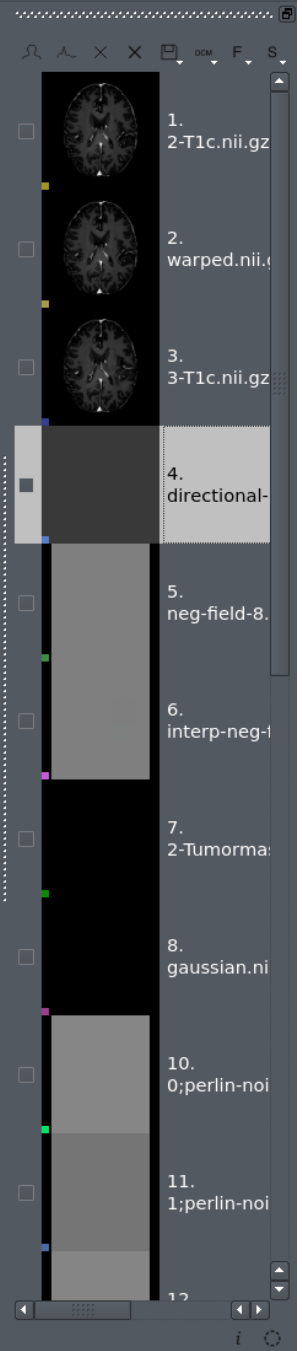
X



Level 0,500000

Window 1,000000

Linear



Shaded surface, CPU

DICOM



2D

3D



R

vtk

a



Level 0,500000

Window 1,000000

Linear

- 7. 2-Tumorma:
- 8. gaussian.ni
- 10. 0;perlin-noi
- 11. 1;perlin-noi
- 12. 2;perlin-noi
- 13. interp-gaus
- 14. ellipsoid-ma
- 15. outer-ellipsi
- 16. interp-ellips
- 17. interp-outer

Shaded surface, CPU



2D

3D



R

vtk

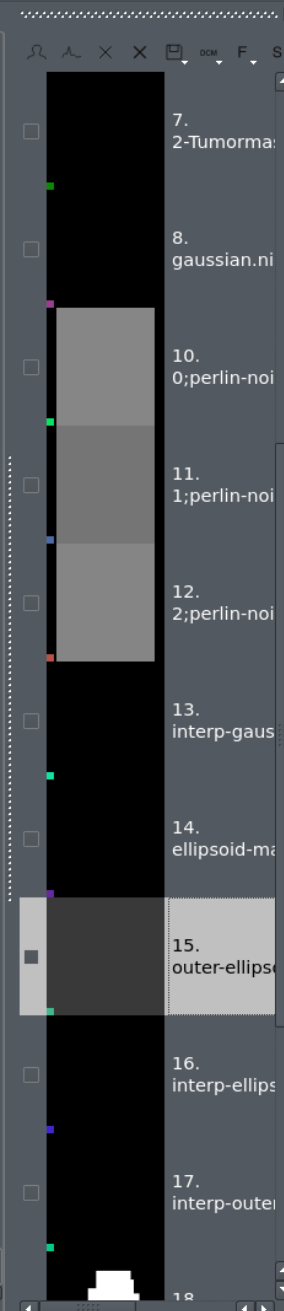
a



Level 0,500000

Window 1,000000

Linear



Shaded surface, CPU

DICOM



2D

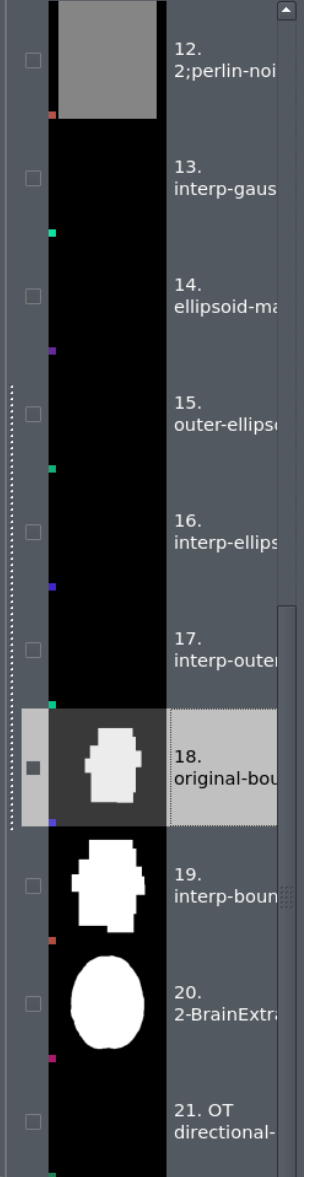
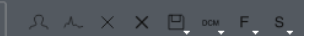
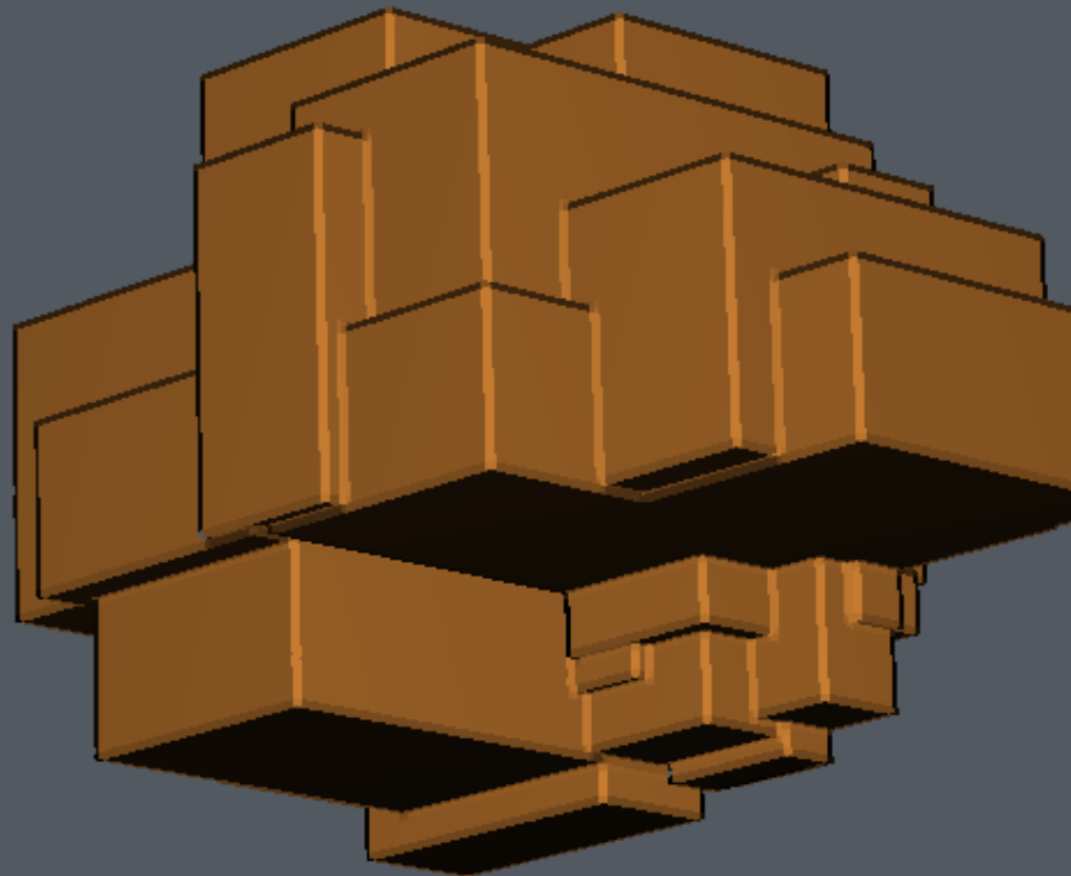
3D



R

vtk

a



Level 0,500000

Window 1,000000

Linear



2D

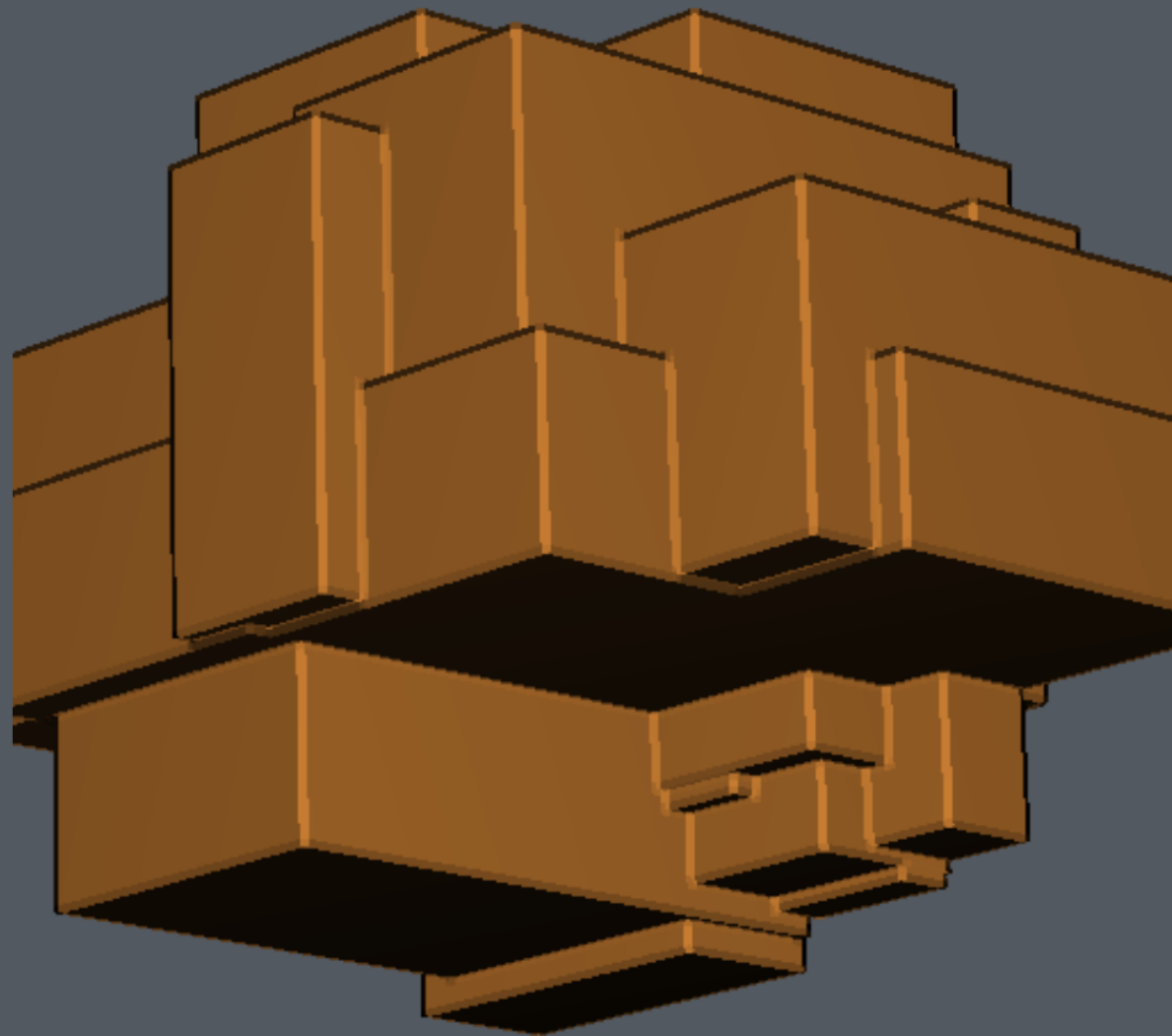
3D



R

vtk

a



- 12. 2;perlin-noi
- 13. interp-gaus
- 14. ellipsoid-ma
- 15. outer-ellipsi
- 16. interp-ellips
- 17. interp-outer
- 18. original-bou
- 19. interp-boun
- 20. 2-BrainExtr
- 21. OT directional-

Level 0,500000

Window 1,000000

Linear

Shaded surface, CPU

DICOM

□

□

i

🔑

2D

3D

R

R

vtk

a

X



Level 0,500000

Window 1,000000

Linear

□

7.
2-Tumorma:

□

8.
gaussian.ni

□

10.
0;perlin-noi

□

11.
1;perlin-noi

□

12.
2;perlin-noi

□

13.
interp-gaus

□

14.
ellipsoid-ma

□

15.
outer-ellipsi

■

16.
interp-ellips

□

17.
interp-outel

18

i

Shaded surface, CPU



2D

3D



R

vtk

a

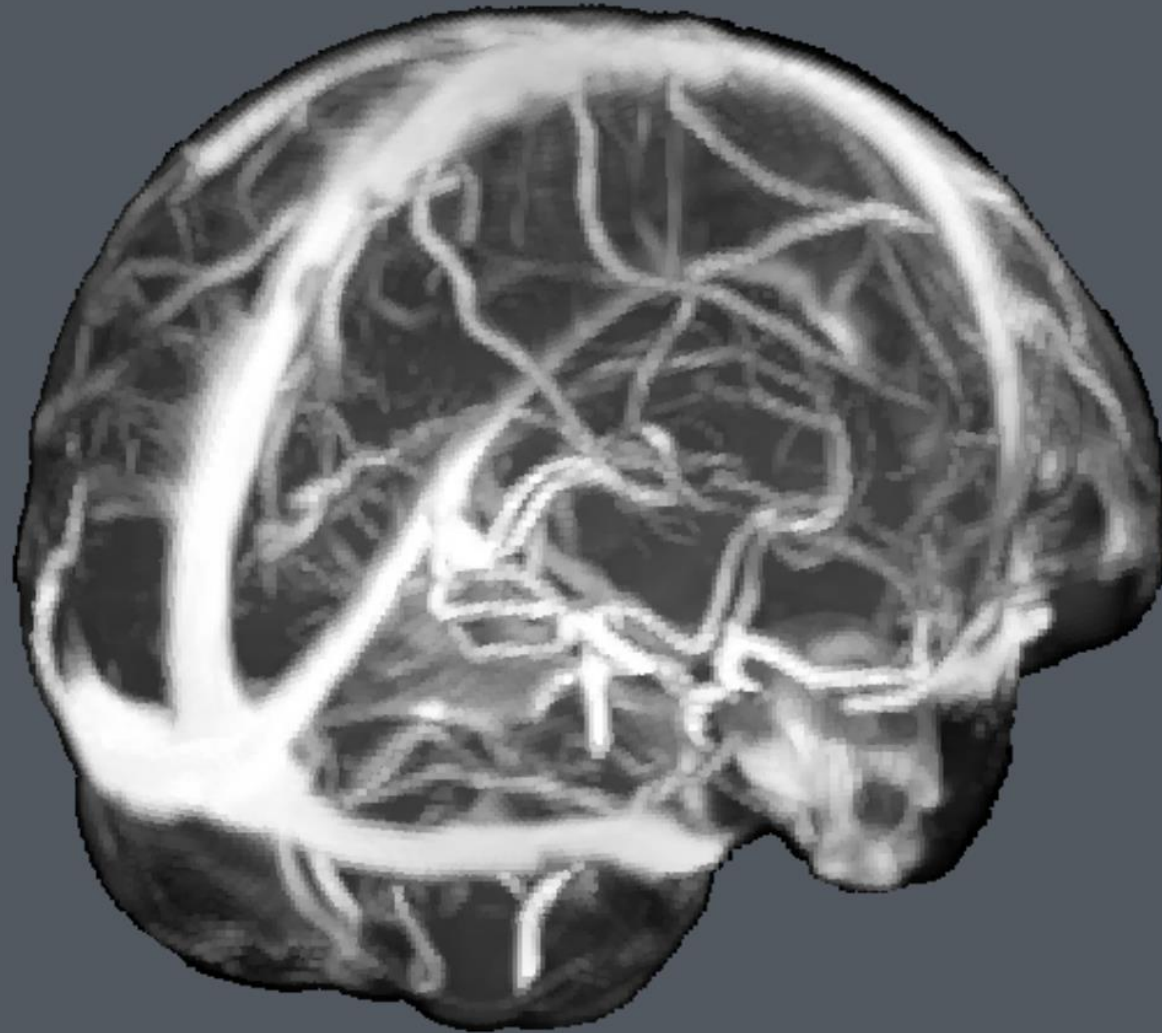


Level 0,500000

Window 1,000000

Linear

7.
2-Tumorma:8.
gaussian.ni10.
0;perlin-noi11.
1;perlin-noi12.
2;perlin-noi13.
interp-gaus14.
ellipsoid-ma15.
outer-ellips16.
interp-ellips17.
interp-outer



12

9

Maximum intensity projection, CPU

DICOM

□

□

i

🔗

2D

3D

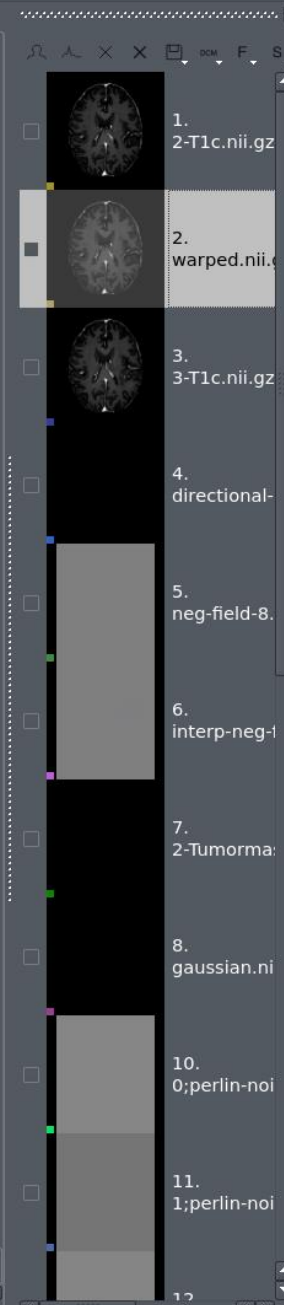
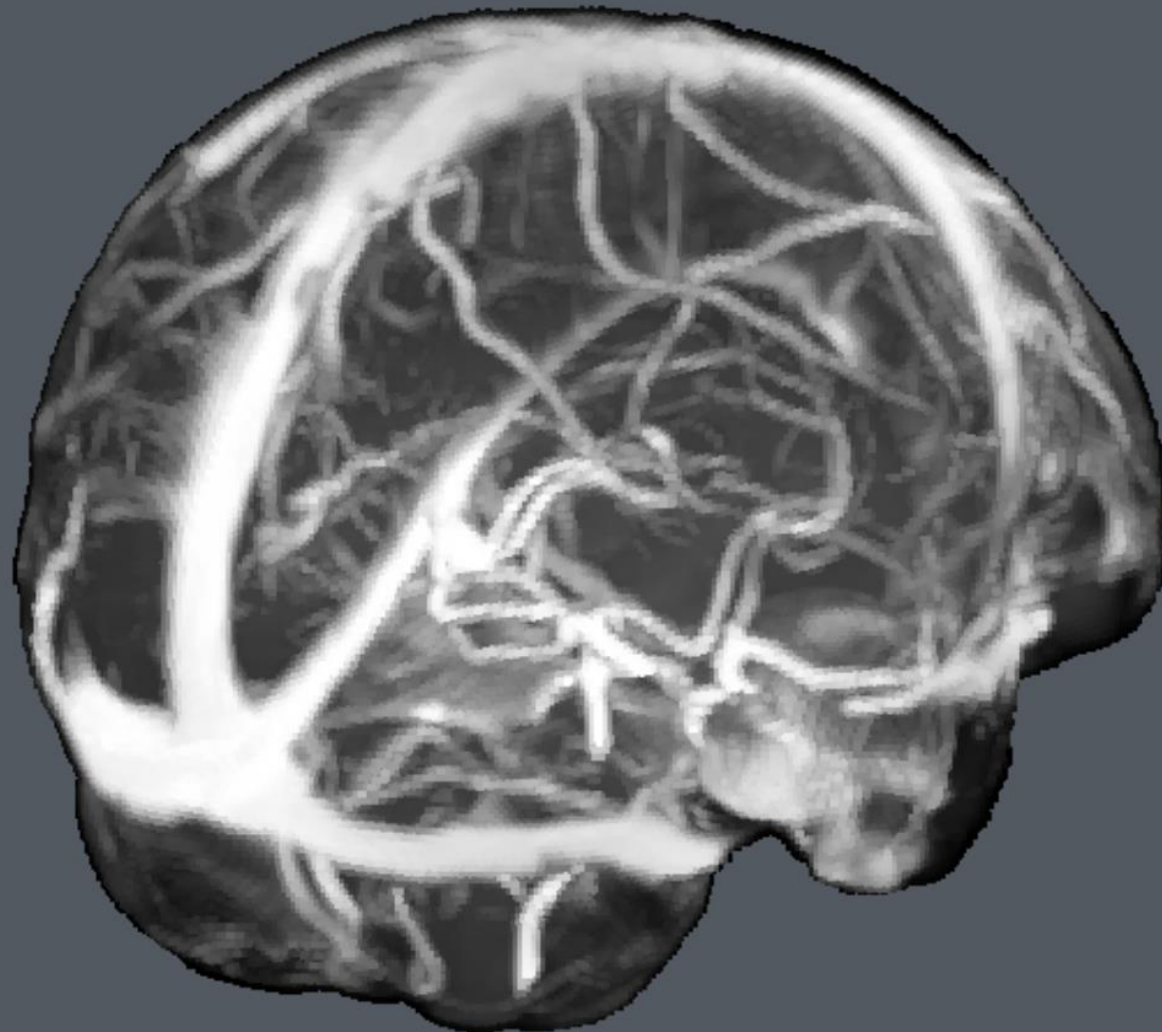
R

R

vtk

a

X



Level 127,500000

Window 255,000000

Linear

Maximum intensity projection, CPU

DICOM

□

□

i

⚙

2D

3D

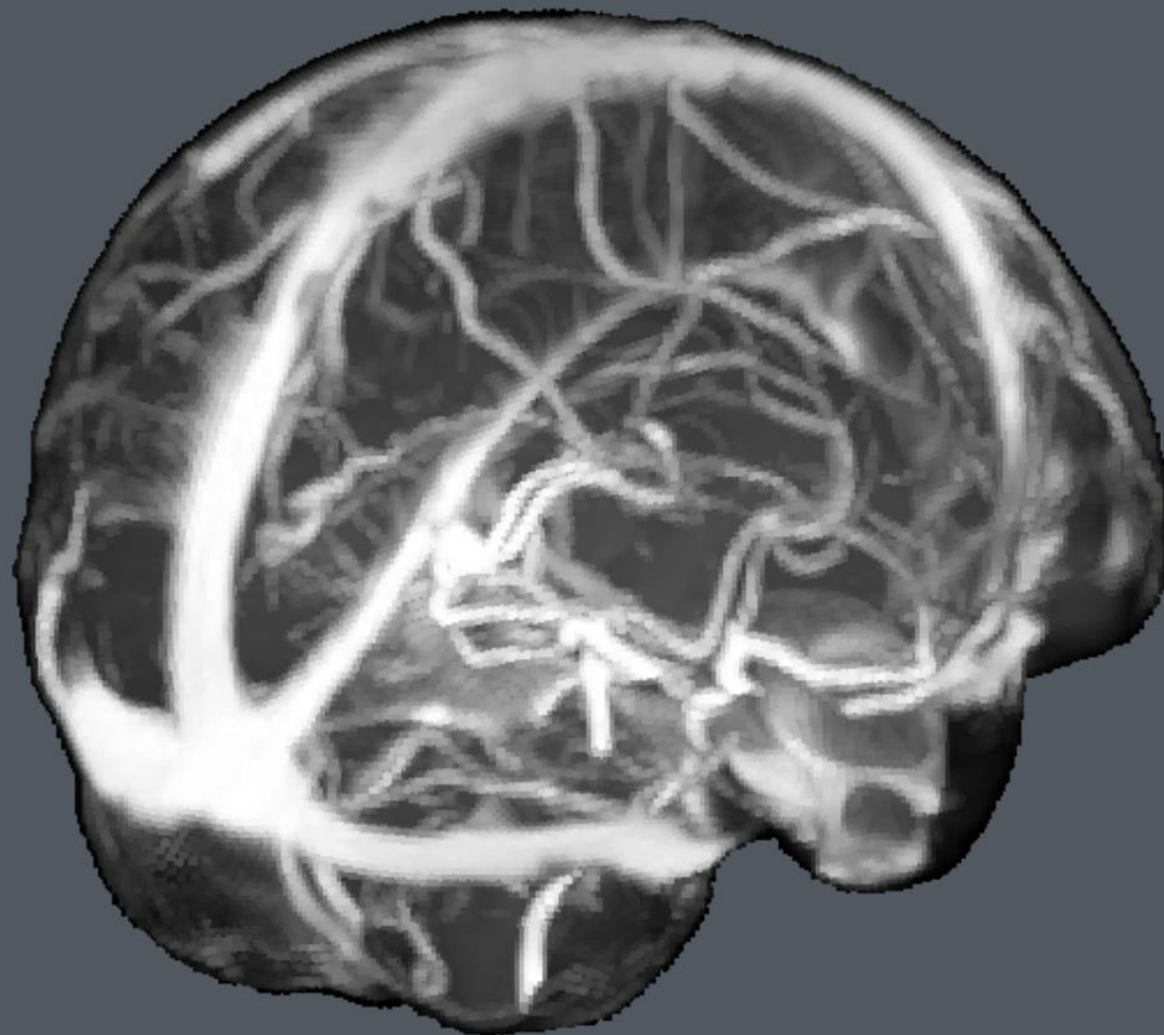
R

R

vtk

a

X



- 1. 2-T1c.nii.gz
- 2. warped.nii.gz
- 3. 3-T1c.nii.gz
- 4. directional-
- 5. neg-field-8.
- 6. interp-neg-1
- 7. 2-Tumorma:
- 8. gaussian.ni
- 10. 0;perlin-noi
- 11. 1;perlin-noi

Level 127,500000

Window 255,000000

Linear

Parameter space

```
displacement=8  
gaussian_range_one_sided=5  
intensity_decay_fraction=0  
num_vecs=64  
angle_thr=7  
spline_order=1  
smoothing_std=4  
perlin_noise_res=0.04  
perlin_noise_abs_max=0.6
```

Global

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 115 60

Intensity under cursor:

Layer	intensity
2-T1c	17...
warped	20...
3-T1c	21...
directional-bin...	0
neg-field-8	2.2...
interp-neg-fiel...	1.82

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

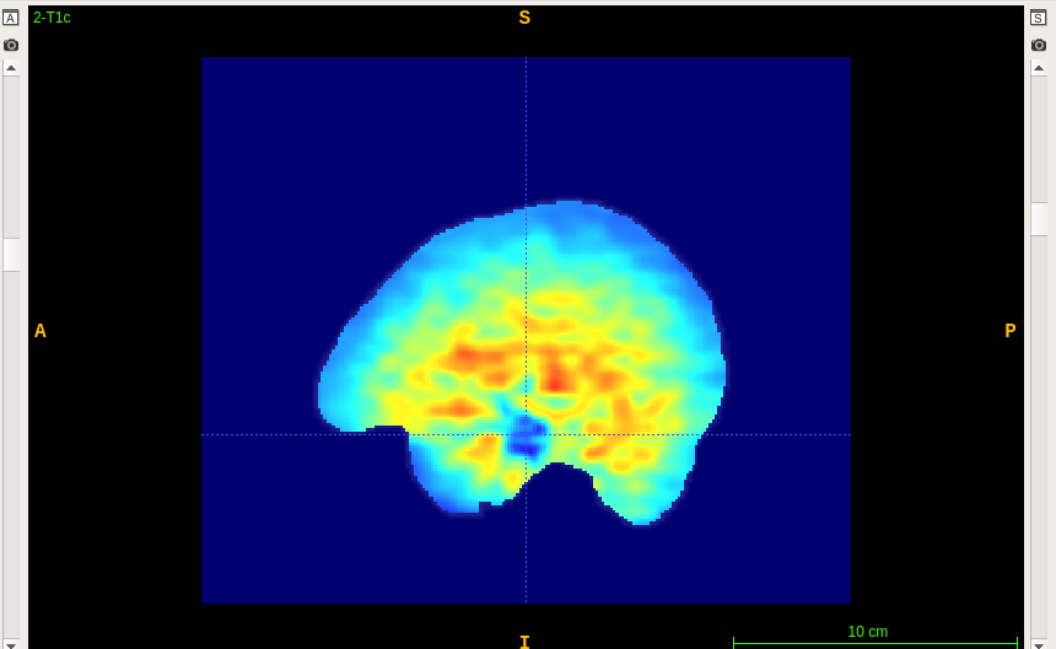
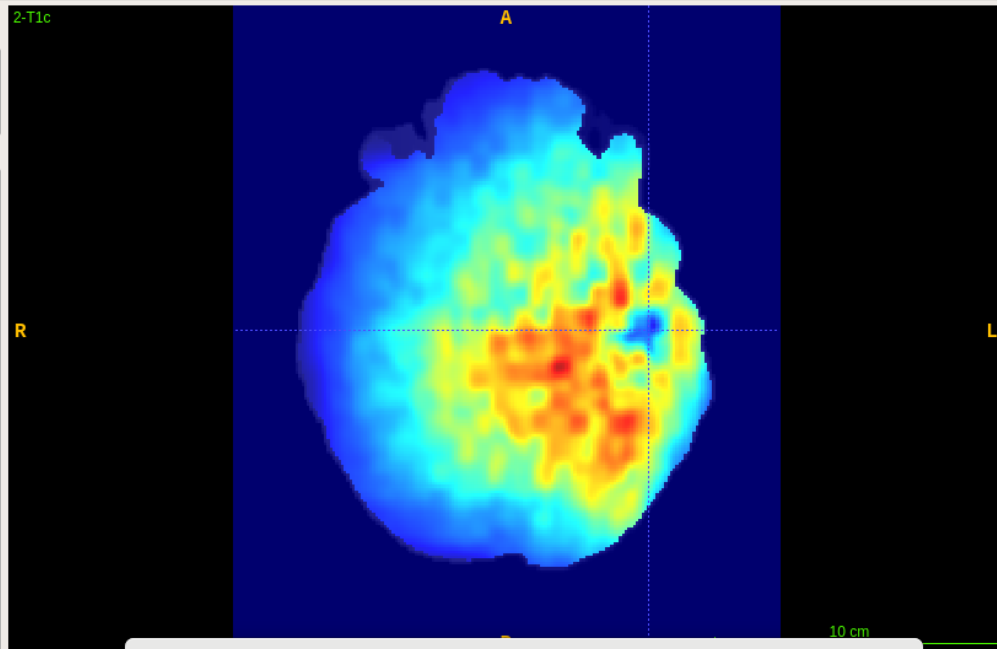


Image Layer Inspector - ITK-SNAP



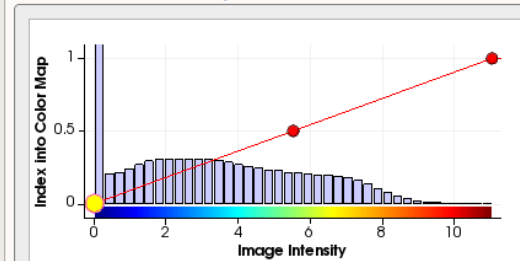
- Main Image: 2-T1c
- Additional Images:
 - warped
 - 3-T1c
 - directional-binary-masks-r
 - neg-field-8
 - interp-neg-field-8
 - 2-Tumormask
 - gaussian
 - perlin-noise
 - interp-gaussian
 - ellipsoid-mask

General Contrast Color Map Info Metadata

Linear Contrast Adjustment:

Minimum: 0,000 Level: 5,511 Reset
Maximum: 11,022 Window: 11,022 Auto

Curve-Based Contrast Adjustment:



Selected control point:

Id: 1 x: 0,000 y: 0,000

Histogram Display Options:

Bin size: 10 Cutoff: 4,0 % Log scale

Close

update

60 of 193

zoom to fit

47 of 193

zoom to fit

115 of 229

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 115 60

Intensity under cursor:

Layer	intensity
2-T1c	17...
warped	20...
3-T1c	21...
directional-bin...	0
neg-field-8	2.2...
interp-neg-fiel...	-0...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

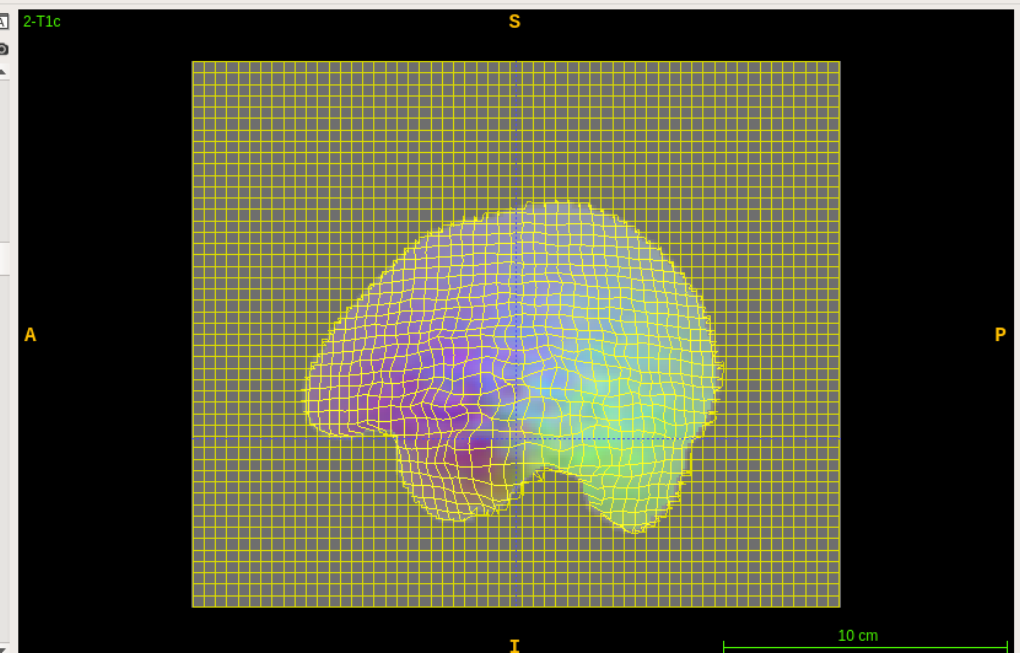
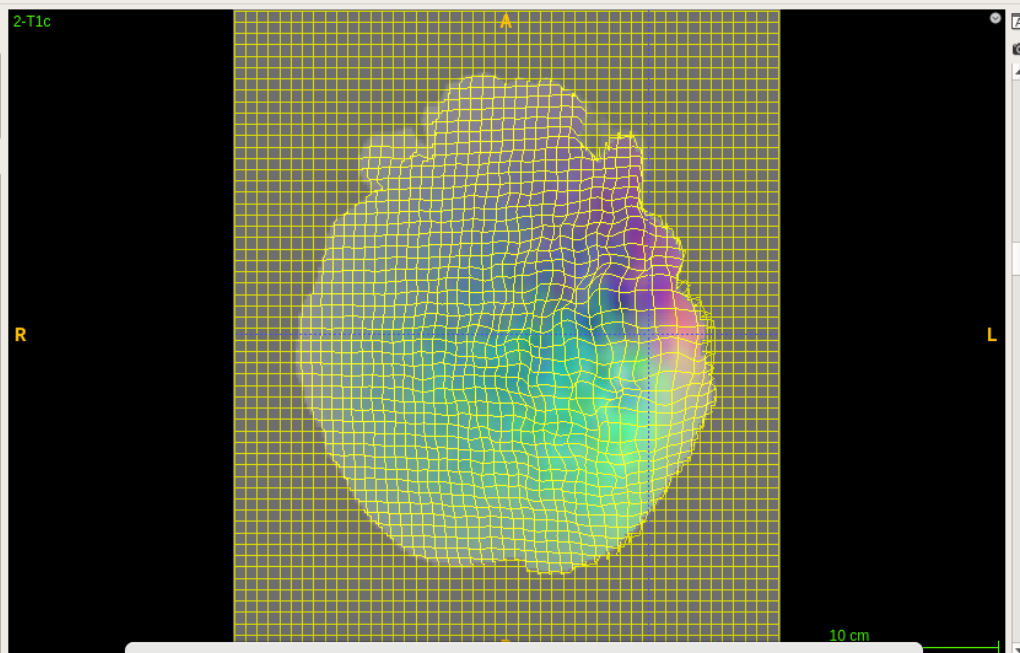


Image Layer Inspector - ITK-SNAP



Main Image

2-T1c

Additional Images

warped

3-T1c

directional-binary-masks-r

neg-field-8

interp-neg-field-8

2-Tumormask

gaussian

perlin-noise

interp-gaussian

ellipsoid-mask

General Contrast Color Map Info Metadata

Linear Contrast Adjustment:

Minimum: -9,816

Level: -0,101

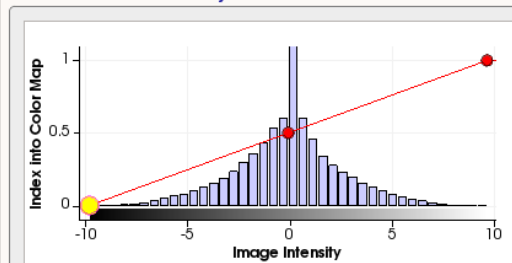
Reset

Maximum: 9,614

Window: 19,430

Auto

Curve-Based Contrast Adjustment:



Selected control point:

Id: 1 x: -9,816 y: 0,000

+ -

Histogram Display Options:

Bin size: 10

Cutoff: 4,0 %

☐ Log scale

update

Close

60 of 193

zoom to fit

47 of 193

115 of 229

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 115 60

Intensity under cursor:

Layer	Intensity
2-T1c	17...
warped	20...
3-T1c	21...
directional-bin...	0
neg-field-8	2.2...
interp-neg-fiel...	-0...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

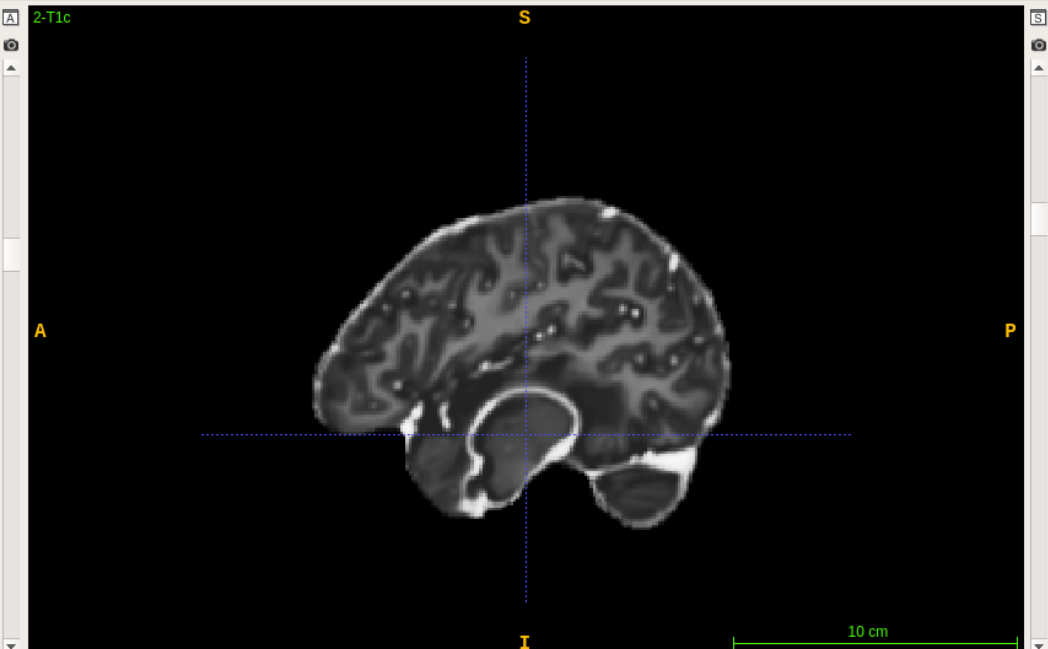
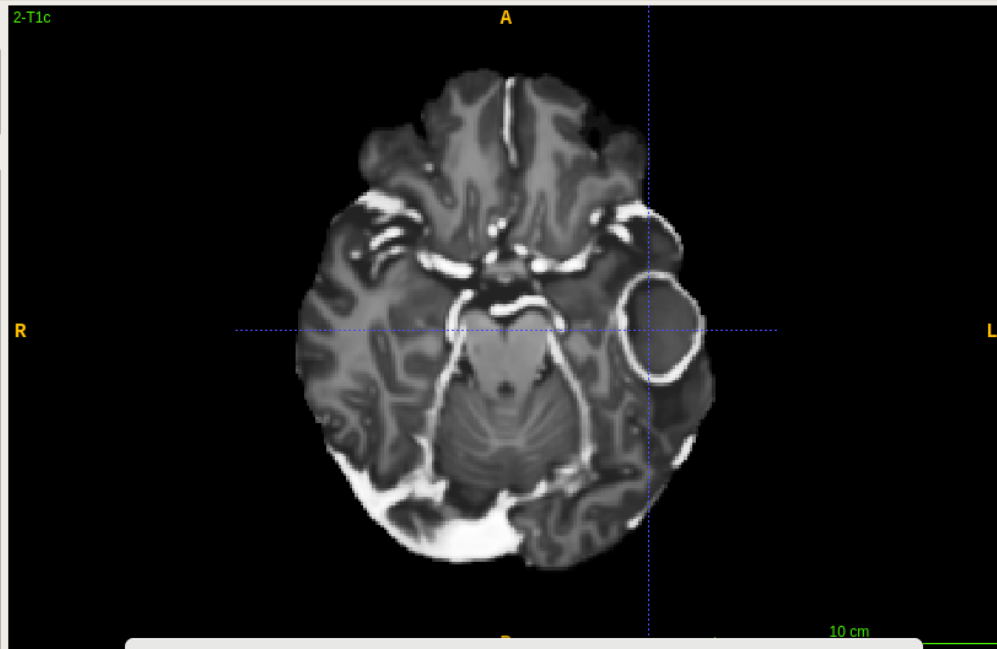


Image Layer Inspector - ITK-SNAP



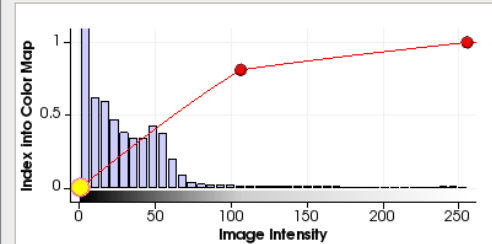
- Main Image
 - 2-T1c
- Additional Images
 - warped
 - 3-T1c
 - directional-binary-masks-r
 - neg-field-8
 - interp-neg-field-8
 - 2-Tumormask
 - gaussian
 - perlin-noise
 - interp-gaussian
 - ellipsoid-mask

General Contrast Color Map Info Metadata

Linear Contrast Adjustment:

Minimum: 0,00 Level: 127,50 Reset
Maximum: 255,00 Window: 255,00 Auto

Curve-Based Contrast Adjustment:



Selected control point:

Id: 1 x: 0,00 y: 0,000 + -

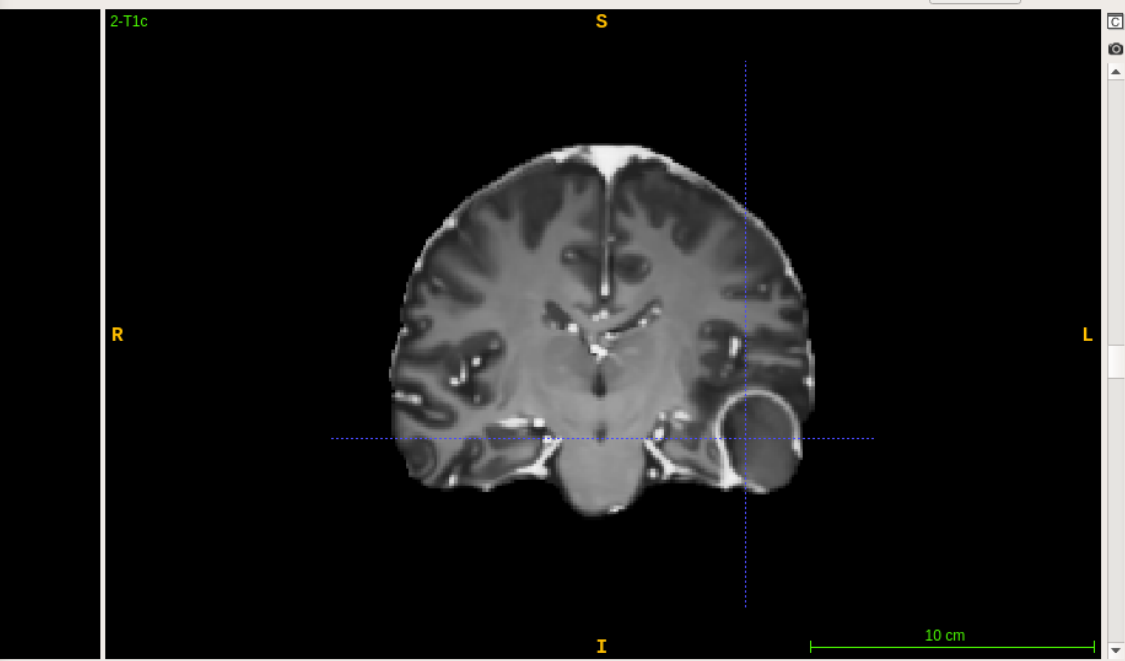
Histogram Display Options:

Bin size: 10 Cutoff: 7,0 % Log scale

60 of 193

zoom to fit

47 of 193



10 cm

zoom to fit

115 of 229

ITK-SNAP Toolbox

Main Toolbar



Cursor Inspector



Cursor position (x,y,z):

47 115 60

Intensity under cursor:

Layer	Intensity
2-T1c	17...
warped	20...
3-T1c	21...
directional-bin...	0
neg-field-8	2.2...
interp-neg-fiel...	-0...

Label under cursor:

0 Clear Label

Segmentation Labels

Active label:

Label 1

Paint over:

All labels

Overall label opacity:

50

3D Toolbar

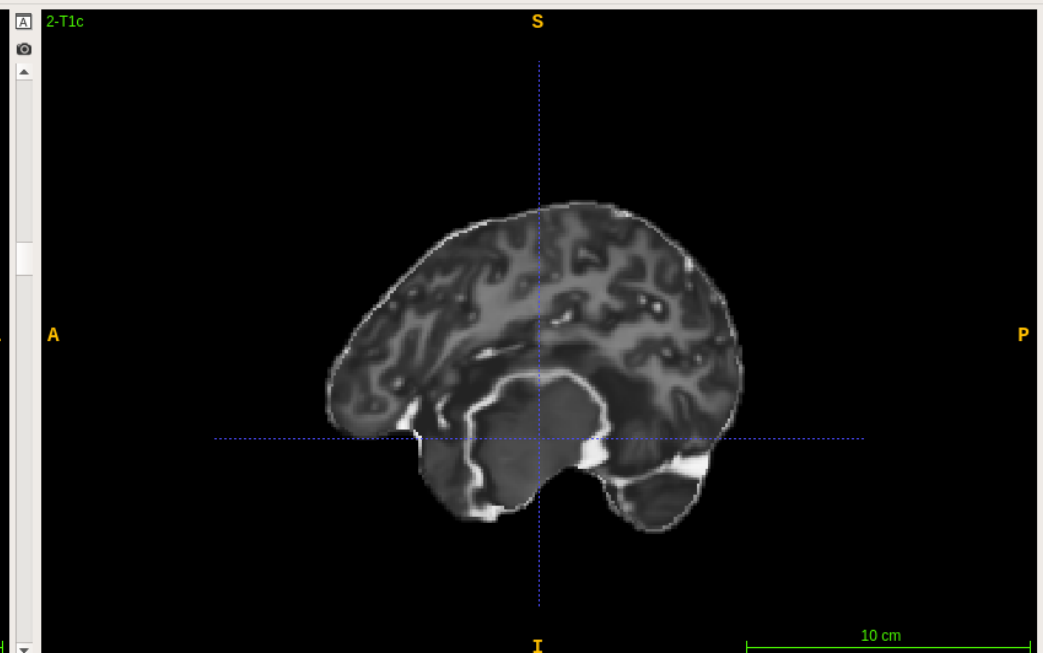
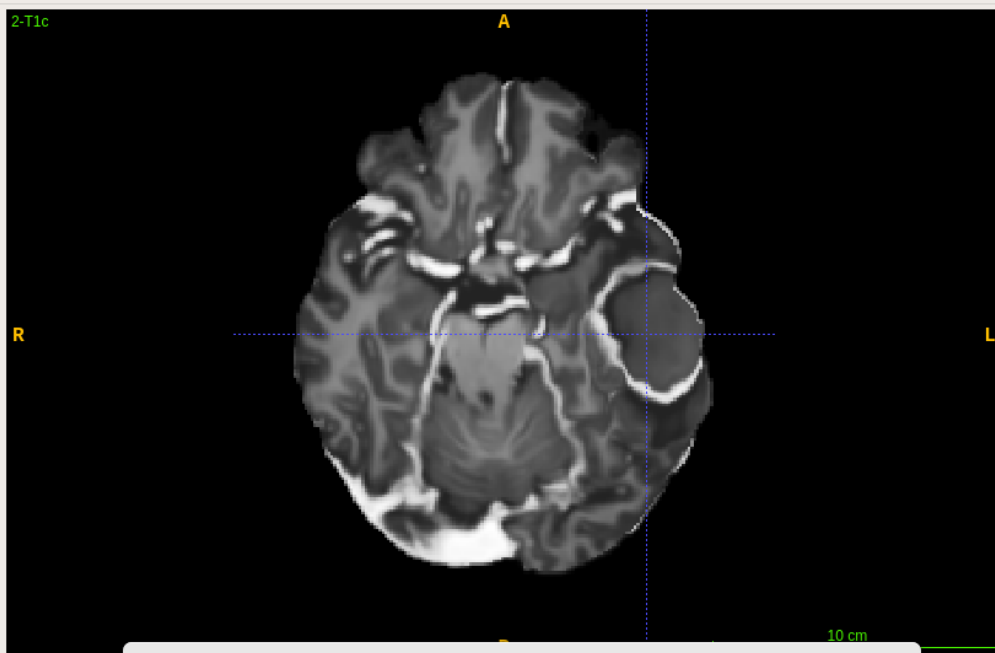


Image Layer Inspector - ITK-SNAP



Main Image

2-T1c

Additional Images

warped

3-T1c

directional-binary-masks-r

neg-field-8

interp-neg-field-8

2-Tumormask

gaussian

perlin-noise

interp-gaussian

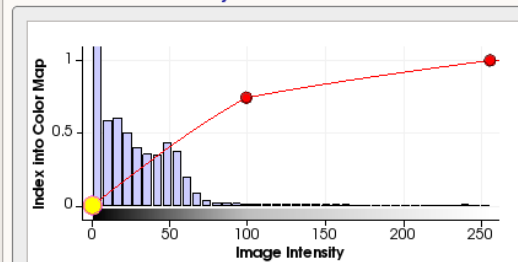
ellipsoid-mask

General Contrast Color Map Info Metadata

Linear Contrast Adjustment:

Minimum: 0,00 Level: 127,50 Reset
Maximum: 255,00 Window: 255,00 Auto

Curve-Based Contrast Adjustment:



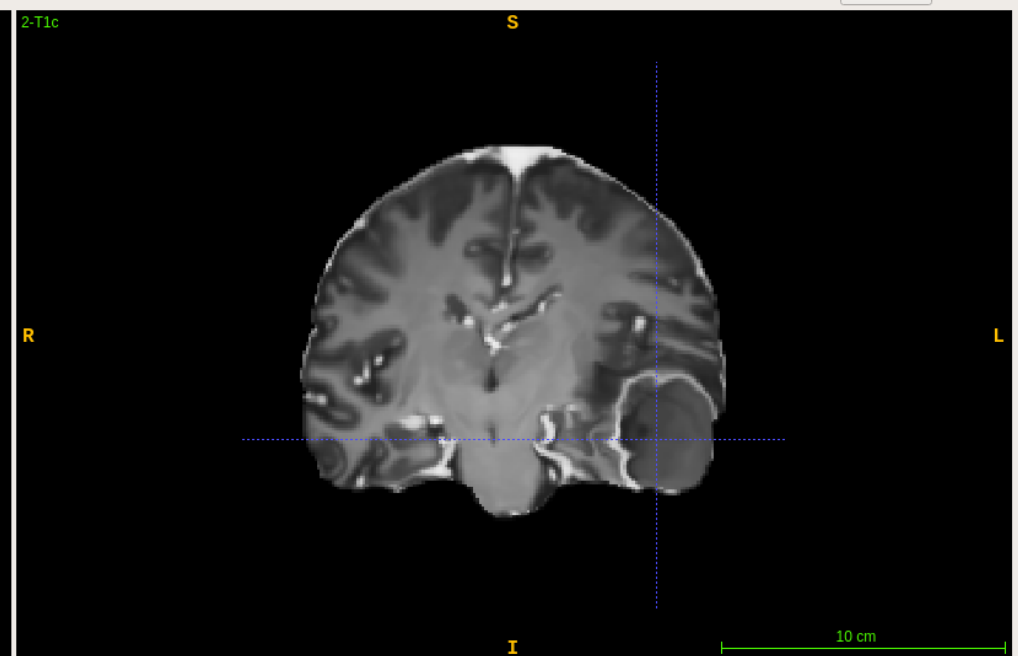
Histogram Display Options:

Bin size: 10 Cutoff: 7,0 % Log scale

60 of 193

zoom to fit

47 of 193



10 cm

zoom to fit

115 of 229

Shaded surface, CPU

DICOM

□

□

i

🔗

2D

3D

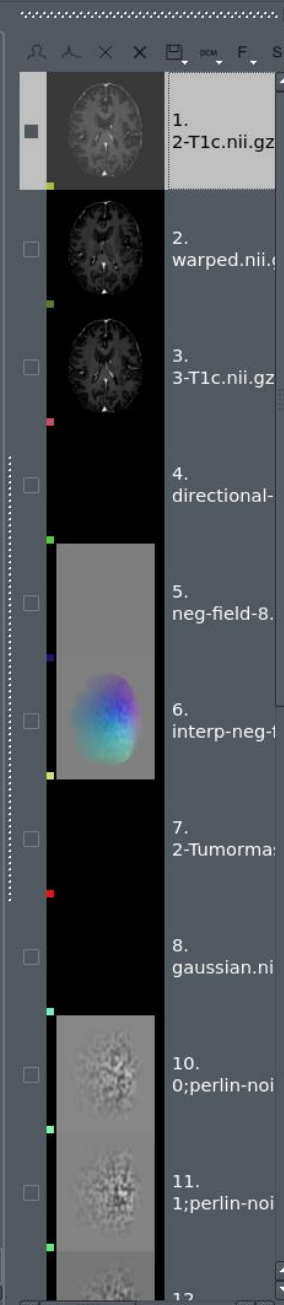
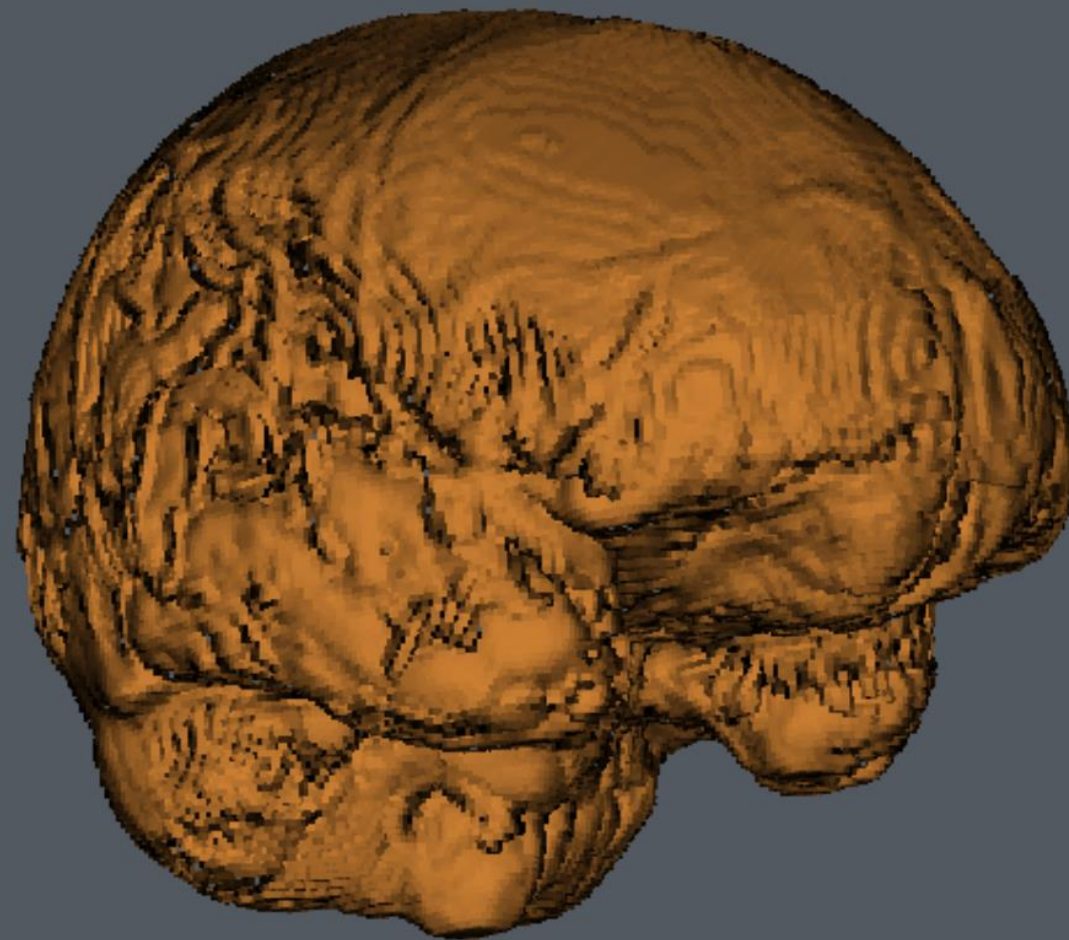
R

R

vtk

a

X



Level 127,500000

Window 255,000000

Linear

Application Views Tools Export DICOM Filters Segmentation

Medical imaging and DICOM viewer

DICOM scanner

Document

DICOM metadata

De-identify

Settings

Shaded surface, CPU

DICOM

□

□

i

🔑

2D

3D

2d

R

vtk

a

X



Level 0,500000

Window 1,000000

Linear

- 1. 2-T1c.nii.gz
- 2. warped.nii.gz
- 3. 3-T1c.nii.gz
- 4. directional-
- 5. neg-field-8.
- 6. interp-neg-1
- 7. 2-Tumorma
- 8. gaussian.ni
- 10. 0;perlin-noi
- 11. 1;perlin-noi

Application Views Tools Export DICOM Filters Segmentation

Medical imaging and DICOM viewer

DICOM scanner

Document

DICOM metadata

De-identify

Settings

Shaded surface, CPU

DICOM



2D

3D

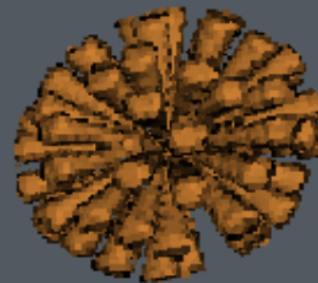
R

R

vtk

a

X



Level 0,500000

Window 1,000000

Linear

- 1. 2-T1c.nii.gz
- 2. warped.nii.gz
- 3. 3-T1c.nii.gz
- 4. directional-
- 5. neg-field-8.
- 6. interp-neg-1
- 7. 2-Tumorma:
- 8. gaussian.ni
- 10. 0;perlin-noi
- 11. 1;perlin-noi

Shaded surface, CPU



2D

3D



R

vtk

a

11.
1;perlin-noi12.
2;perlin-noi13.
interp-gaus14.
ellipsoid-ma15.
outer-ellips16.
interp-ellips17.
interp-outer18.
original-bou19.
interp-boun20.
2-BrainExtr

Level 0,500000

Window 1,000000

Linear



Shaded surface, CPU



2D

3D



R

vtk

a



Level 0,500000

Window 1,000000

Linear



Shaded surface, CPU



2D

3D



R

vtk

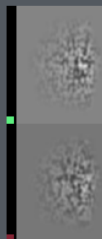
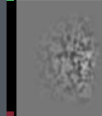
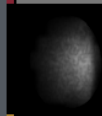
a



Level 0,500000

Window 1,000000

Linear

11.
1;perlin-noi12.
2;perlin-noi13.
interp-gaus14.
ellipsoid-ma15.
outer-ellips16.
interp-ellips17.
interp-outer18.
original-bou19.
interp-boun20.
2-BrainExtr



2D

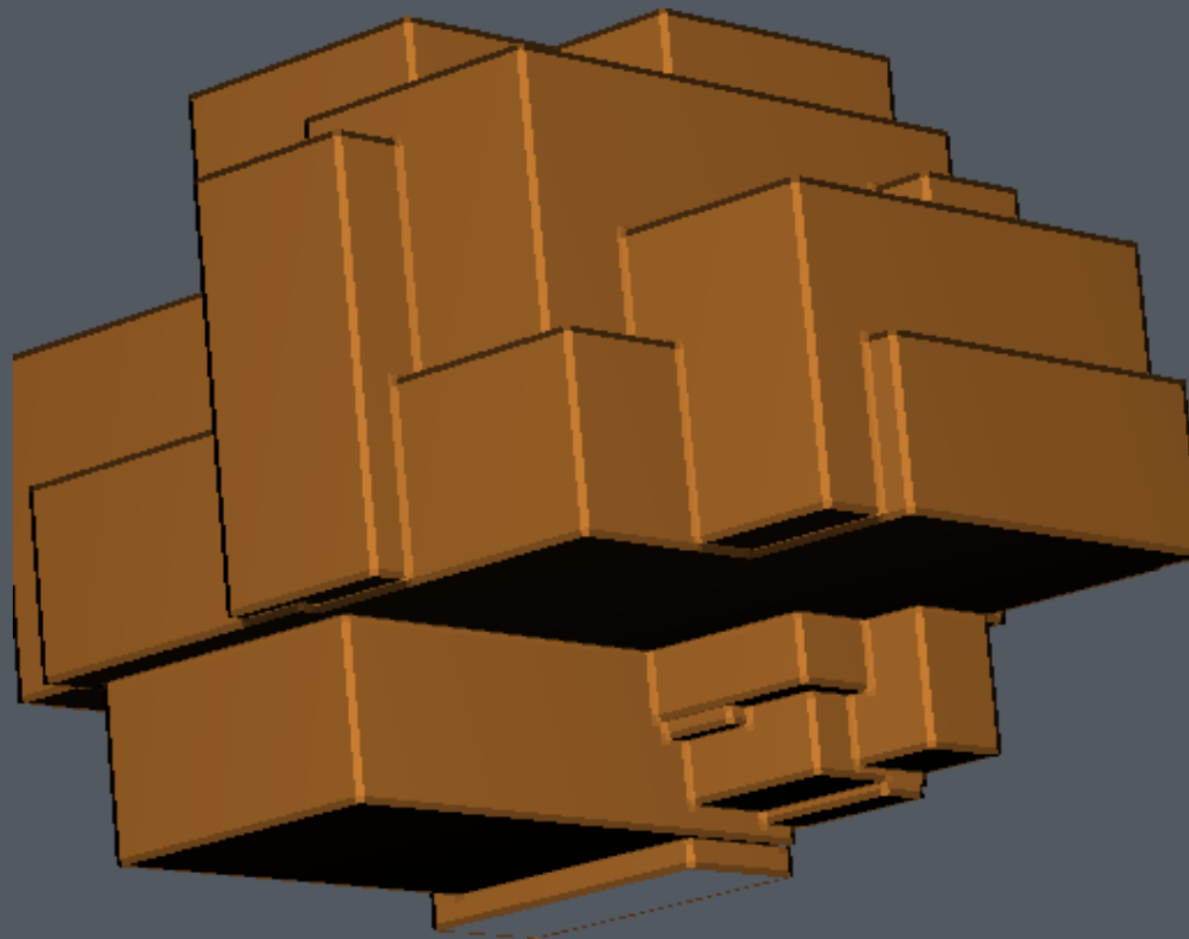
3D



R

vtk

a



11. 1;perlin-noi

12. 2;perlin-noi

13. interp-gaus

14. ellipsoid-ma

15. outer-ellips

16. interp-ellips

17. interp-outer

18. original-bou

19. interp-boun

20. 2-BrainExtr

Level 0,500000

Window 1,000000

Linear

Shaded surface, CPU



2D

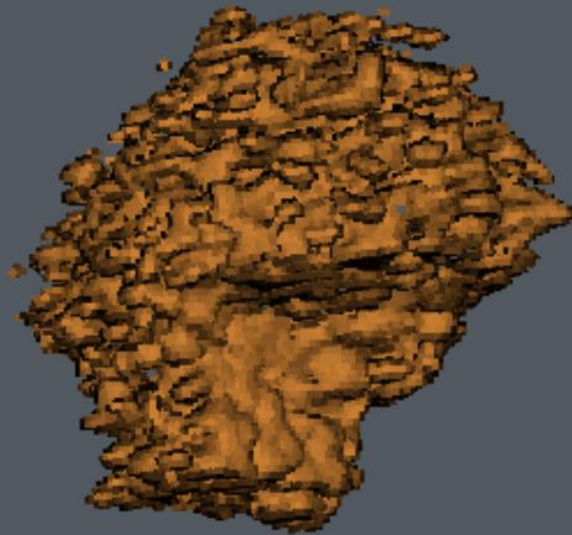
3D



R

vtk

a



Level 0,500000

Window 1,000000

Linear

20.
2-BrainExtr



2D

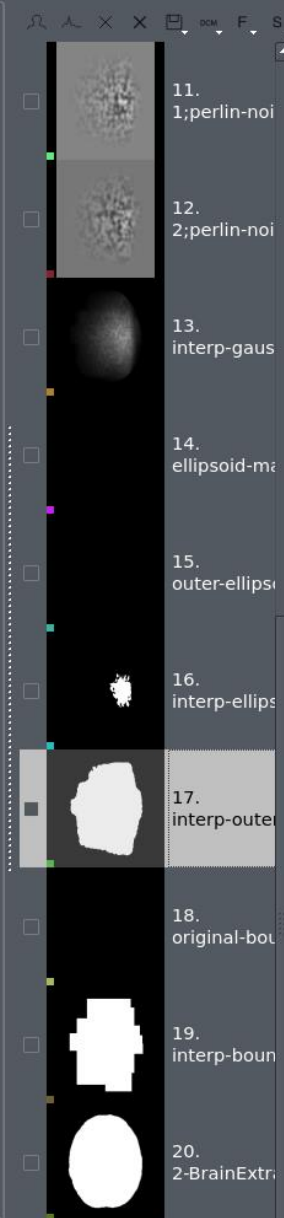
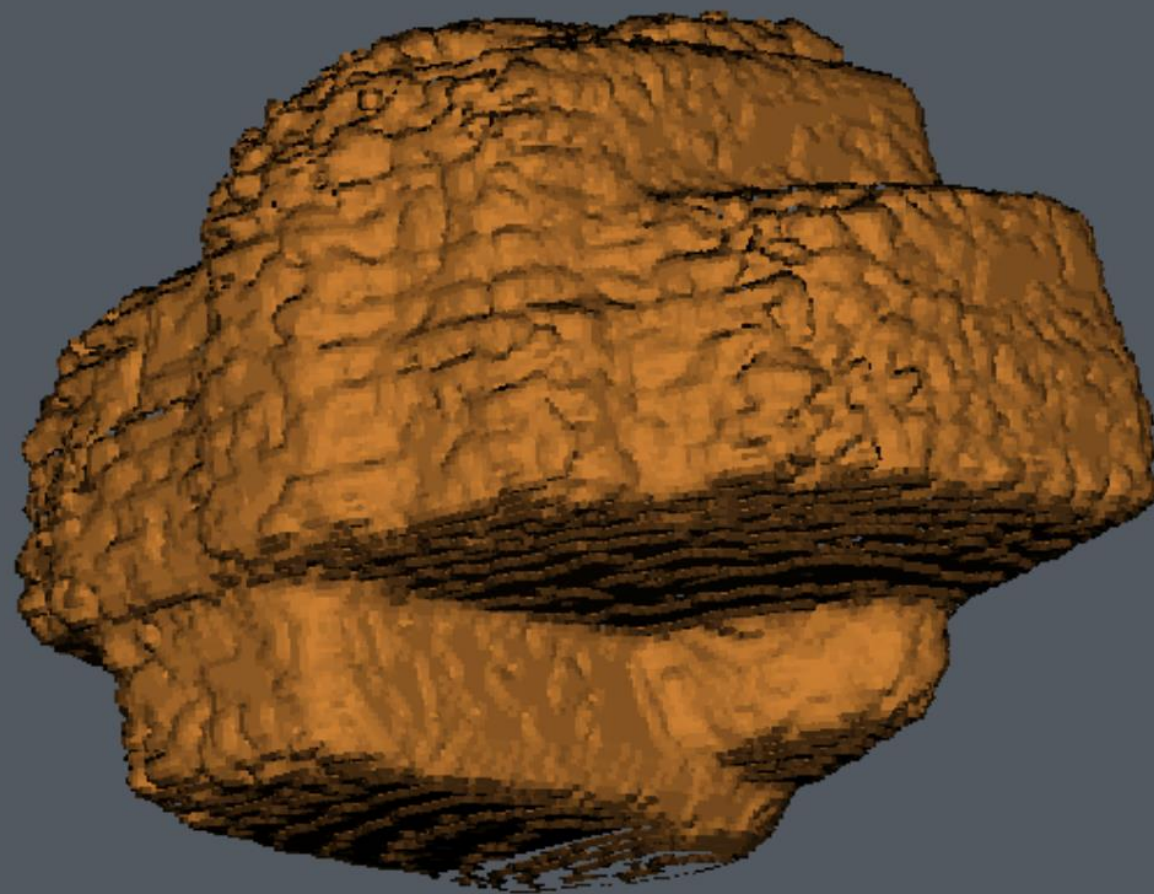
3D



R

vtk

a



Level 0,500000

Window 1,000000

Linear

Maximum intensity projection, CPU

DICOM

□

□

i

🔗

2D

3D

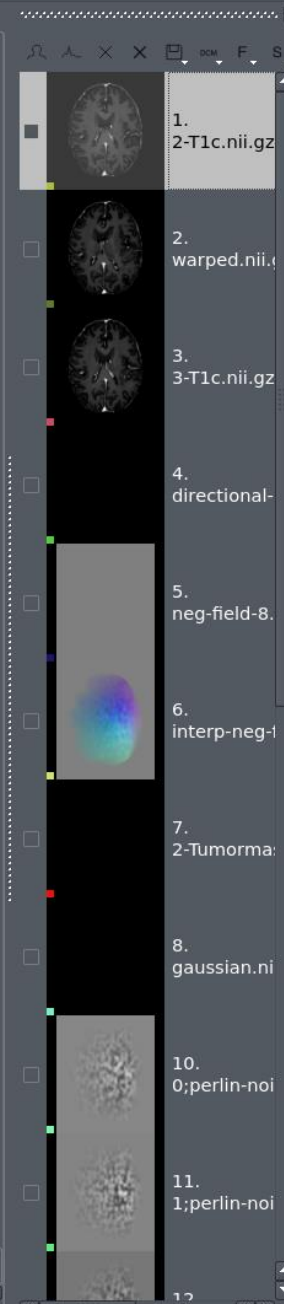
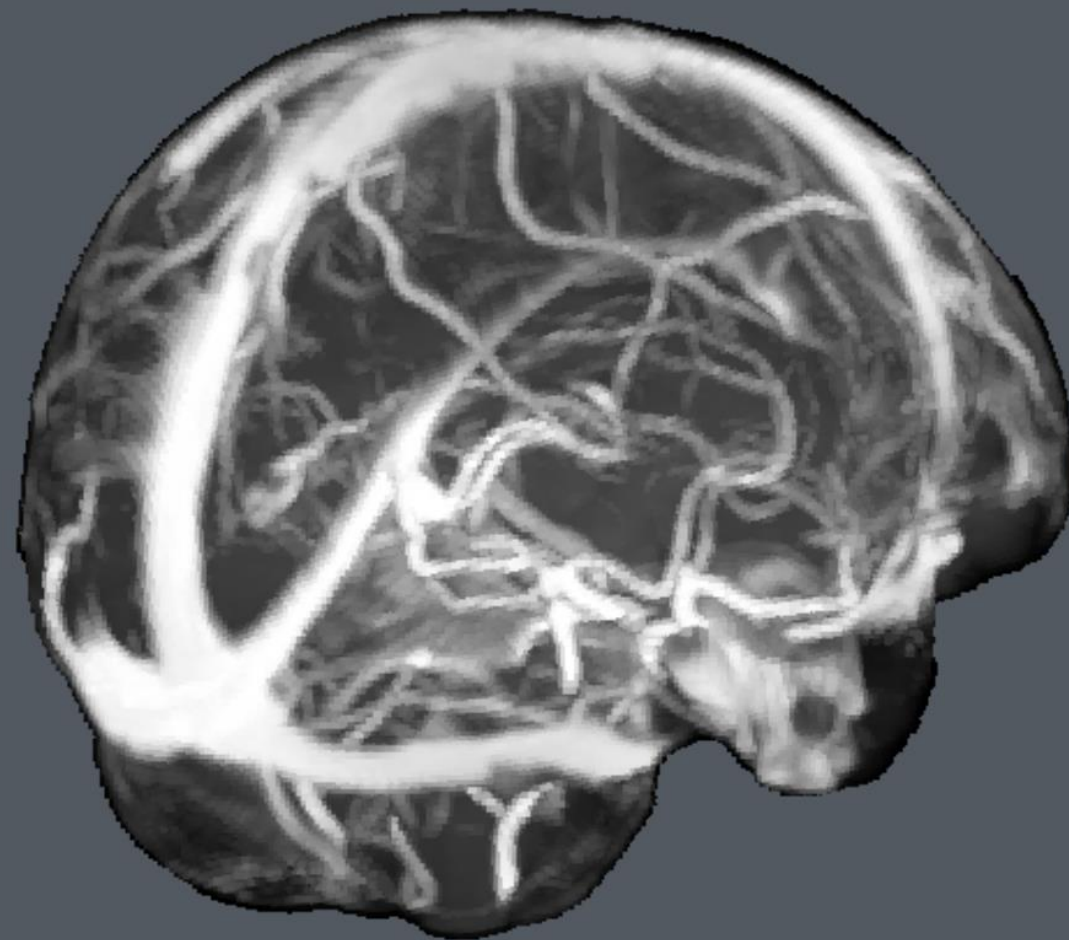
R

R

vtk

a

×



Level 127,500000

Window 255,000000

Linear

Maximum intensity projection, CPU

DICOM

□

□

i

🔗

2D

3D

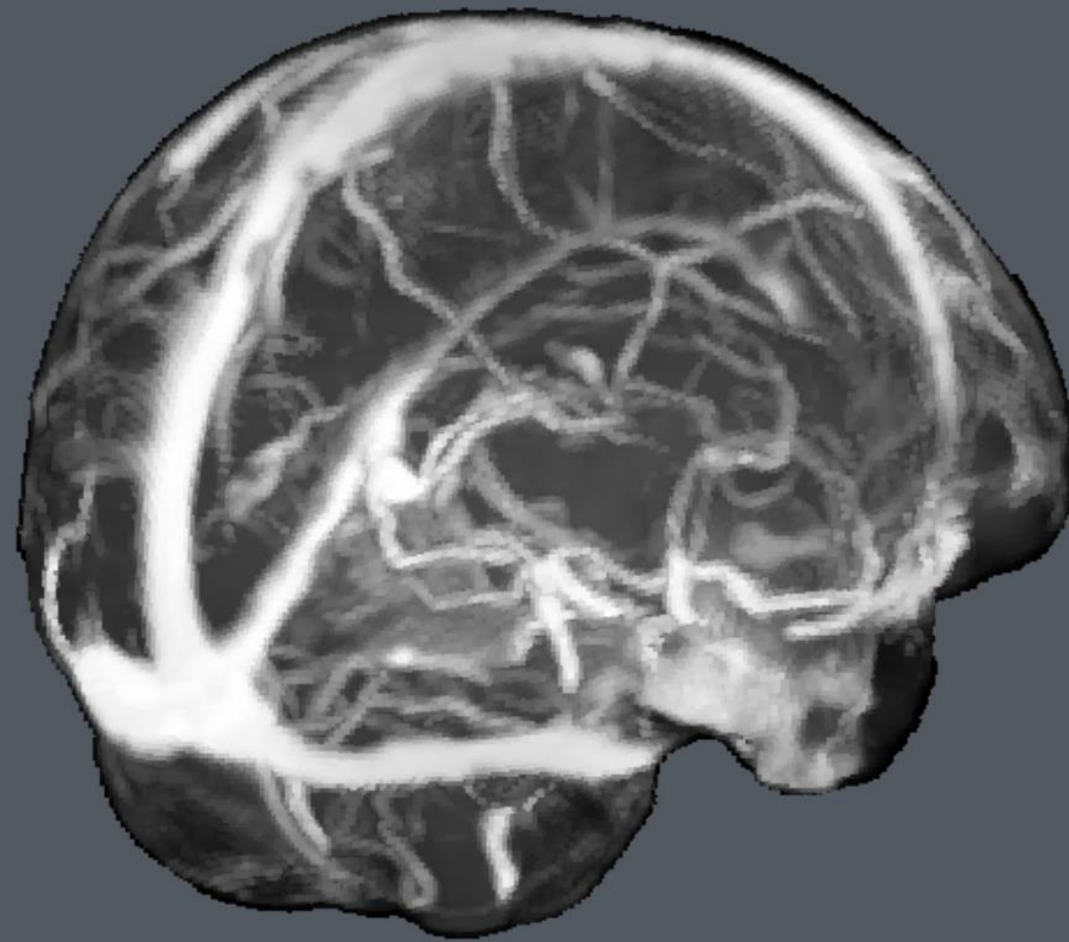
R

R

vtk

a

X



- 1. 2-T1c.nii.gz
- 2. warped.nii.gz
- 3. 3-T1c.nii.gz
- 4. directional-
- 5. neg-field-8.
- 6. interp-neg-1
- 7. 2-Tumorma:
- 8. gaussian.ni
- 10. 0;perlin-noi
- 11. 1;perlin-noi

Level 127,500000

Window 255,000000

Linear

Maximum intensity projection, CPU

DICOM

□

□

i

🔗

2D

3D

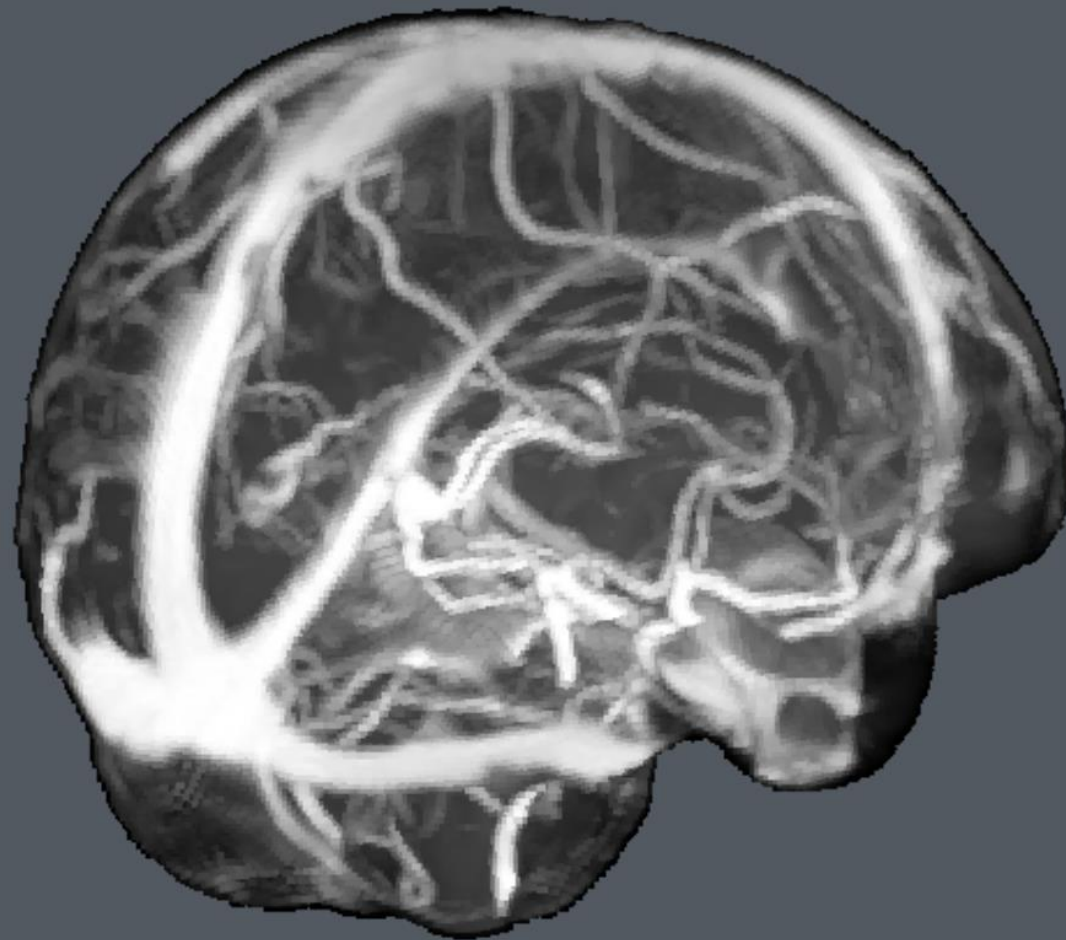
R

R

vtk

a

X



- 1. 2-T1c.nii.gz
- 2. warped.nii.gz
- 3. 3-T1c.nii.gz
- 4. directional-
- 5. neg-field-8.
- 6. interp-neg-1
- 7. 2-Tumorma:
- 8. gaussian.ni
- 10. 0;perlin-noi
- 11. 1;perlin-noi

Level 127,500000

Window 255,000000

Linear

Future

- Best ANTs SyN registration parameters for preprocessed SAILOR data?
- Publication plan