

```
Last login: Wed May 22 14:14:30 on ttys000
(base) msresearch@MSs-MacBook-Pro scripts % cd /Users/msresearch/
Downloads
(base) msresearch@MSs-MacBook-Pro Downloads % ls
MRIcroGL_macOS.dmg      canproco      dcm2niix      spine.sh
(base) msresearch@MSs-MacBook-Pro Downloads % sh spine.sh /Users/
msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0 /Users/
msresearch/Downloads/canproco/data/qc
/Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0: spine.sh
started at 22/05/2024_02:24:19 pm
```

```
--
Spinal Cord Toolbox (5.7)
```

```
sct_image -i t2.nii.gz -setorient RPI -o t2.nii.gz
```

```
--
```

```
/Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/
t2.nii.gz
```

```
Generate output files...
```

```
File t2.nii.gz already exists. Will overwrite it.
```

```
Done! To view results, run one of the following commands (depending on
your preferred viewer):
```

```
fsleyes t2.nii.gz &
```

```
fslview_deprecated t2.nii.gz &
```

```
fslview t2.nii.gz &
```

```
--
```

```
Spinal Cord Toolbox (5.7)
```

```
sct_deepseg_sc -i t2.nii.gz -c t2 -qc /Users/msresearch/Downloads/
canproco/data/qc
```

```
--
```

```
Config deepseg_sc:
```

```
Centerline algorithm: svm
```

```
Brain in image: True
```

```
Kernel dimension: 2d
```

```
Contrast: t2
```

```
Threshold: 0.7
```

```
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142422.732497-vqaid1g4)
```

```
Reorient the image to RPI, if necessary...
```

```
Finding the spinal cord centerline...
```

```
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142429.102325-dqlb3_sl)
```

```
Remove temporary files...
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142429.102325-dqlb3_sl
Cropping the image around the spinal cord...
Normalizing the intensity...
Segmenting the spinal cord using deep learning on 2D patches...
Reassembling the image...
Resampling the segmentation to the native image resolution using
linear interpolation...
Binarizing the resampled segmentation...
Removing small objects above slice #223
Compute shape analysis: 100%|#####| 224/224 [00:00<00:00,
567.39iter/s]
Found isolated voxels on slice 0, Removing them
Remove temporary files...
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142422.732497-vqaid1g4
```

*** Generate Quality Control (QC) html report ***

```
Resample images to 0.6x0.6 mm
QcImage: layout with Axial slice
Compute center of mass at each slice
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid
value encountered in double_scalars
  for dir in range(input.ndim)]
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/
t2/sct_deepseg_sc/2024_05_22_142445.894790/bkg_img.png
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
css/bootstrap.min.css /Users/msresearch/Downloads/canproco/data/qc/
_assets/css
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
css/bootstrap-table.min.css /Users/msresearch/Downloads/canproco/data/
qc/_assets/css
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
css/select2.min.css /Users/msresearch/Downloads/canproco/data/qc/
_assets/css
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
css/bootstrap.min.css.map /Users/msresearch/Downloads/canproco/data/
qc/_assets/css
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
css/style.css /Users/msresearch/Downloads/canproco/data/qc/_assets/css
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
css/bootstrap-theme.min.css /Users/msresearch/Downloads/canproco/data/
qc/_assets/css
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/select2.min.js /Users/msresearch/Downloads/canproco/data/qc/
_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/filesaver.min.js /Users/msresearch/Downloads/canproco/data/qc/
```

```
_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/jquery-3.1.0.min.js /Users/msresearch/Downloads/canproco/data/qc/
_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/bootstrap-table.min.js /Users/msresearch/Downloads/canproco/data/
qc/_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/main.js /Users/msresearch/Downloads/canproco/data/qc/_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/bootstrap.min.js /Users/msresearch/Downloads/canproco/data/qc/
_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/animation.js /Users/msresearch/Downloads/canproco/data/qc/_assets/
js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
js/yaml.min.js /Users/msresearch/Downloads/canproco/data/qc/_assets/js
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/f-icon.png /Users/msresearch/Downloads/canproco/data/qc/_assets/
imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/axial.png /Users/msresearch/Downloads/canproco/data/qc/_assets/
imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/keyright.png /Users/msresearch/Downloads/canproco/data/qc/
_assets/imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/keydown.png /Users/msresearch/Downloads/canproco/data/qc/_assets/
imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/keyup.png /Users/msresearch/Downloads/canproco/data/qc/_assets/
imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/sagittal.png /Users/msresearch/Downloads/canproco/data/qc/
_assets/imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
imgs/sct_logo.png /Users/msresearch/Downloads/canproco/data/qc/
_assets/imgs
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
fonts/glyphicons-halflings-regular.woff /Users/msresearch/Downloads/
canproco/data/qc/_assets/fonts
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
fonts/glyphicons-halflings-regular.eot /Users/msresearch/Downloads/
canproco/data/qc/_assets/fonts
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
fonts/glyphicons-halflings-regular.woff2 /Users/msresearch/Downloads/
canproco/data/qc/_assets/fonts
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
fonts/glyphicons-halflings-regular.ttf /Users/msresearch/Downloads/
canproco/data/qc/_assets/fonts
```

```
cp /Users/msresearch/sct_5.7/spinalcordtoolbox/reports/assets/_assets/
fonts/glyphicons-halflings-regular.svg /Users/msresearch/Downloads/
canproco/data/qc/_assets/fonts
Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_142445.894790.json
```

To see the results in a browser, type:
open /Users/msresearch/Downloads/canproco/data/qc/index.html

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/
t2/t2.nii.gz -cm greyscale /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2/t2_seg.nii.gz -cm red -a 70.0 &
```

```
fslview_deprecated /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/t2.nii.gz -l Greyscale /Users/msresearch/Downloads/
canproco/data/CAN-01-RRM-133-M0/t2/t2_seg.nii.gz -l Red -t 0.7 &
```

```
fslview /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/
t2/t2.nii.gz -l Greyscale /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2/t2_seg.nii.gz -l Red -t 0.7 &
```

--

Spinal Cord Toolbox (5.7)

```
sct_label_vertebrae -i t2.nii.gz -s t2_seg.nii.gz -c t2 -qc /Users/
msresearch/Downloads/canproco/data/qc
```

--

```
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142448.578547-
label_vertebrae-8aqzlw80)
```

Copying input data to tmp folder...

Straighten spinal cord...

```
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142448.790623-
straighten_spinalcord-005xekty)
```

Copy files to tmp folder...

Fitting centerline using B-spline approximation

Error on approximation = 2.14 mm

Error on approximation = 0.35 mm

Error on approximation = 0.41 mm

Error on approximation = 0.24 mm

Error on approximation = 0.15 mm

Error on approximation = 0.16 mm

vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142448.578547-label_vertebrae-8aqzlw80

Apply straightening to segmentation...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i
segmentation.nii -o segmentation_straight.nii -t
warp_curve2straight.nii.gz -r data_straightr.nii -n Linear # in /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80
File /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80/
segmentation_straight.nii already exists. Will overwrite it.
```

Create label to identify disc...

Creating temporary folder...

```
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142525.415468-2fa_nzw2)
```

Run C2-C3 detector...

C2-C3 detected...

Remove temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142525.415468-2fa_nzw2
```

```
/Users/msresearch/sct_5.7/spinalcordtoolbox/math.py:113:
```

```
FutureWarning: `selem` is a deprecated argument name for `dilation`.
It will be removed in version 1.0. Please use `footprint` instead.
```

```
    return dilation(data, selem=_get_selem(shape, size, dim), out=None)
File /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80/labelz.nii.gz
already exists. Will overwrite it.
```

And apply straightening to label...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i
labelz.nii.gz -o labelz_straight.nii.gz -t warp_curve2straight.nii.gz
-r data_straightr.nii -n NearestNeighbor # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142448.578547-
label_vertebrae-8aqzlw80
```

Get z and disc values from straight label...

```
.. [300, 3]
```

Look for template...

```
Path template: /Users/msresearch/sct_5.7/data/PAM50
```

Open template and vertebral levels...

```
Disc values from template: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
13, 14, 15, 16, 17, 18, 19]
```

```
Z-values for each disc: [963, 938, 907, 870, 833, 800, 769, 735, 692,
646, 600, 551, 500, 449, 396, 342, 289, 231, 168, 104, 79]
```

```
Distances between discs (in voxel): [25.0, 31.0, 37.0, 37.0, 33.0,
31.0, 34.0, 43.0, 46.0, 46.0, 49.0, 51.0, 51.0, 53.0, 54.0, 53.0,
58.0, 63.0, 64.0, 25.0]
```

Detect intervertebral discs...

```
Current disc: 2 (z=300). Direction: superior
.. Peak found: z=-4 (correlation = 0.37938540192587955)
Current disc: 1 (z=327). Direction: superior
.. correcting factor: 1.0
.. Switching to inferior direction.
Current disc: 3 (z=263). Direction: inferior
.. Peak found: z=1 (correlation = 0.48398457035106834)
.. correcting factor: 0.9324324324324325
Current disc: 4 (z=230). Direction: inferior
.. Peak found: z=-4 (correlation = 0.4835398597294159)
.. correcting factor: 0.963963963963964
Current disc: 5 (z=194). Direction: inferior
.. Peak found: z=-1 (correlation = 0.46268468461183926)
.. correcting factor: 0.972972972972973
Current disc: 6 (z=163). Direction: inferior
.. Peak found: z=-3 (correlation = 0.517647381293696)
.. correcting factor: 0.99128160418483
Current disc: 7 (z=126). Direction: inferior
.. Peak found: z=3 (correlation = 0.4720523626054202)
.. correcting factor: 0.9780287878010839
Current disc: 8 (z=87). Direction: inferior
.. Peak found: z=1 (correlation = 0.3975588139366609)
.. correcting factor: 0.9745230141285038
Current disc: 9 (z=43). Direction: inferior
.. Peak found: z=4 (correlation = 0.382914888668597)
.. correcting factor: 0.9641206808407017
Current disc: 10 (z=3). Direction: inferior
.. Peak found: z=9 (correlation = 0.3819975470587001)
.. correcting factor: 0.9415372235492226
Adding top disc based on adjusted template distance: #0
.. approximate distance: 24
```

Un-straighten labeling...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i
segmentation_straight_labeled.nii -o segmentation_labeled.nii -t
warp_straight2curve.nii.gz -r segmentation.nii -n NearestNeighbor #
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80
```

Cleaning labeled segmentation:

removing labeled voxels outside segmentation...

Done cleaning.

```
File /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80/
segmentation_labeled.nii already exists. Will overwrite it.
```

Label discs...

Un-straighten labeled discs...

```
/Users/msresearch/sct_5.7/bin/sct_apply_transfo -i
```

```
segmentation_straight_labeled_disc.nii -d segmentation.nii -w
warp_straight2curve.nii.gz -o segmentation_labeled_disc.nii -x label #
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80
```

Generate output files...

```
File created: /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/t2_seg_labeled.nii.gz
File created: /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/t2_seg_labeled_discs.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80/
warp_curve2straight.nii.gz /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2/warp_curve2straight.nii.gz
File created: /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/warp_curve2straight.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80/
warp_straight2curve.nii.gz /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2/warp_straight2curve.nii.gz
File created: /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/warp_straight2curve.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80/
straight_ref.nii.gz /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/straight_ref.nii.gz
File created: /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2/straight_ref.nii.gz
```

Remove temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142448.578547-label_vertebrae-8aqzlw80
```

*** Generate Quality Control (QC) html report ***

```
Resample images to NonexNone mm
QcImage: layout with Sagittal slice
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/
t2/sct_label_vertebrae/2024_05_22_142536.851686/bkg_img.png
Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_142536.851686.json
```

To see the results in a browser, type:

```
open /Users/msresearch/Downloads/canproco/data/qc/index.html
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/
t2/t2.nii.gz -a 100.0 /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2/t2_seg_labeled.nii.gz -cm subcortical -a 50.0 &
```

```
fslview_deprecated /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/t2.nii.gz -t 1 /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/t2_seg_labeled.nii.gz -l MGH-Subcortical -t 0.5 &
```

```
fslview /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/t2.nii.gz -t 1 /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/t2_seg_labeled.nii.gz -l MGH-Subcortical -t 0.5 &
```

--

Spinal Cord Toolbox (5.7)

```
sct_label_utils -i t2_seg_labeled.nii.gz -vert-body 3,5 -o t2_labels_vert.nii.gz
```

--

Generating output files...

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes t2_seg_labeled.nii.gz t2_labels_vert.nii.gz &
```

```
fslview_deprecated t2_seg_labeled.nii.gz t2_labels_vert.nii.gz &
```

```
fslview t2_seg_labeled.nii.gz t2_labels_vert.nii.gz &
```

--

Spinal Cord Toolbox (5.7)

```
sct_qc -i t2.nii.gz -s t2_labels_vert.nii.gz -p sct_label_utils -qc /Users/msresearch/Downloads/canproco/data/qc
```

--

*** Generate Quality Control (QC) html report ***

Resample images to NonexNone mm

QcImage: layout with Sagittal slice

/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/t2/sct_label_utils/2024_05_22_142540.259754/bkg_img.png

Successfully generated the QC results in /Users/msresearch/Downloads/canproco/data/qc/_json/qc_2024_05_22_142540.259754.json

To see the results in a browser, type:

```
open /Users/msresearch/Downloads/canproco/data/qc/index.html
```

--

Spinal Cord Toolbox (5.7)

```
sct_register_to_template -i t2.nii.gz -s t2_seg.nii.gz -l  
t2_labels_vert.nii.gz -c t2 -qc /Users/msresearch/Downloads/canproco/  
data/qc  
--
```

Check template files...

OK: /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t2.nii.gz

OK: /Users/msresearch/sct_5.7/data/PAM50/template/

PAM50_levels.nii.gz

OK: /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_cord.nii.gz

Check parameters:

Data: t2.nii.gz

Landmarks: t2_labels_vert.nii.gz

Segmentation: t2_seg.nii.gz

Path template: /Users/msresearch/sct_5.7/data/PAM50

Remove temp files: 1

Check input labels...

Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f)

Copying input data to tmp folder and convert to nii...

Generate labels from template vertebral labeling

Check if provided labels are available in the template

Binarize segmentation

Resample data to 1mm isotropic...

load data...

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes data_1mm.nii &
```

```
fslview_deprecated data_1mm.nii &
```

```
fslview data_1mm.nii &
```

load data...

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes seg_bin_1mm.nii.gz &
```



```
tmp.anat_rigid_warp.nii.gz ./straight_ref.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142547.346204-straighten_spinalcord-494ygp4/
tmp.anat_rigid_warp.nii.gz /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/seg_bin_1mm_rpi_crop_straight.nii.gz
File created: /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/
T/sct-20240522142543.091173-register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straight.nii.gz
Remove temporary files...
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142547.346204-straighten_spinalcord-494ygp4
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
warp_straight2curve.nii.gz -R /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/data_1mm_rpi.nii
warp_straight2curve.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f
```

Remove unused label on template. Keep only label present in the input label image...

File template_label_body.nii.gz already exists. Will overwrite it.

Dilating input labels using 3vox ball radius

```
/Users/msresearch/sct_5.7/spinalcordtoolbox/math.py:113:
```

```
FutureWarning: `selem` is a deprecated argument name for `dilation`.
```

```
It will be removed in version 1.0. Please use `footprint` instead.
```

```
    return dilation(data, selem=_get_selem(shape, size, dim), out=None)
```

Apply straightening to labels...

Parse list of warping fields...

Get dimensions of data...

```
51 x 256 x 256 x 1
```

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f/
label_projected_1mm_rpi_dilate.nii.gz -o /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
label_projected_1mm_rpi_dilate_straight.nii.gz -t
warp_curve2straight.nii.gz -r /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/seg_bin_1mm_rpi_crop_straight.nii.gz -n
```

NearestNeighbor # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f
Copy affine matrix from destination space to make sure qform/sform are
the same.

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142543.091173-register_to_template-z33ai97f/  
seg_bin_1mm_rpi_crop_straight.nii.gz /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-  
register_to_template-z33ai97f/  
label_projected_1mm_rpi_dilate_straight.nii.gz &
```

```
fslview_deprecated /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-  
register_to_template-z33ai97f/seg_bin_1mm_rpi_crop_straight.nii.gz /  
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142543.091173-register_to_template-z33ai97f/  
label_projected_1mm_rpi_dilate_straight.nii.gz &
```

```
fslview /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142543.091173-register_to_template-z33ai97f/  
seg_bin_1mm_rpi_crop_straight.nii.gz /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-  
register_to_template-z33ai97f/  
label_projected_1mm_rpi_dilate_straight.nii.gz &
```

Estimate transformation for step #0...

Labels src: [[-13.344024439783368, 21.054752379205464,
-116.57209175870693], [-18.065514606195364, 20.809220570857903,
-152.28694002991057]]

Labels dest: [[-0.0, 45.720001220703125, -117.34002685546875], [-0.0,
45.720001220703125, -153.34002685546875]]

Degrees of freedom (dof): Tx_Ty_Tz_Sz

Optimization terminated successfully.

Current function value: 11.176378

Iterations: 2

Function evaluations: 202

Matrix:

```
[[ 1.  0.  0.]  
 [ 0.  1.  0.]  
 [-0.  0.  1.]]
```

Center:

```
[ 0.          45.72000122 -135.34002686]
```

Translation:

```
[[ -15.70476952 -24.78801476  0.91051097]]
```

```
Concatenate transformations: curve --> straight --> affine...
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
warp_curve2straightAffine.nii.gz -R template.nii
straight2templateAffine.txt warp_curve2straight.nii.gz # in /private/
var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f
```

Apply transformation...

Parse list of warping fields...

Get dimensions of data...

51 x 256 x 256 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f/
data_1mm_rpi.nii -o /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/data_1mm_rpi_straightAffine.nii -t
warp_curve2straightAffine.nii.gz -r template.nii -n 'BSpline[3]' #
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f
Copy affine matrix from destination space to make sure qform/sform are
the same.
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes template.nii /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/data_1mm_rpi_straightAffine.nii &
```

```
fslview_deprecated template.nii /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/data_1mm_rpi_straightAffine.nii &
```

```
fslview template.nii /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/data_1mm_rpi_straightAffine.nii &
```

Parse list of warping fields...

Get dimensions of data...

51 x 256 x 180 x 1

Apply transformation...

```
Apply transformation and resample to destination space...
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop.nii.gz -o /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straightAffine.nii.gz -t
warp_curve2straightAffine.nii.gz -r template.nii -n Linear # in /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f
Copy affine matrix from destination space to make sure qform/sform are
the same.
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes template.nii /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straightAffine.nii.gz &
```

```
fslview_deprecated template.nii /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straightAffine.nii.gz &
```

```
fslview template.nii /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straightAffine.nii.gz &
```

Crop data in template space (for faster processing)...

Sub-sample in z-direction (for faster processing)...

```
sct_resample -i template_crop.nii -o template_crop_sub.nii -f 1x1x0.25
# in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f
sct_resample -i template_seg_crop.nii.gz -o
template_seg_crop_sub.nii.gz -f 1x1x0.25 # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f
sct_resample -i /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/data_1mm_rpi_straightAffine_crop.nii
-o /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f/
data_1mm_rpi_straightAffine_crop_sub.nii -f 1x1x0.25 # in /private/
var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142543.091173-register_to_template-z33ai97f
sct_resample -i /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straightAffine_crop.nii.gz -o /private/var/
folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
register_to_template-z33ai97f/
seg_bin_1mm_rpi_crop_straightAffine_crop_sub.nii.gz -f 1x1x0.25 # in /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142543.091173-register_to_template-z33ai97f
```

```
Register straight spinal cord to template...
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-
iul9xaqp)
```

Copying input data to tmp folder and convert to nii...

```
--
ESTIMATE TRANSFORMATION FOR STEP #1
```

Registration parameters:

```
type ..... imseg
algo ..... centermassrot
slicewise ..... 0
metric ..... MeanSquares
samplStrategy .. None
samplPercent ... 0.2
iter ..... 10
smooth ..... 0
laplacian ..... 0
shrink ..... 1
gradStep ..... 0.5
deformation .... 1x1x0
init .....
poly ..... 5
filter_size .... 5
dof ..... Tx_Ty_Tz_Rx_Ry_Rz
smoothWarpXY ... 2
rot_method ..... pcahog
```

```
Creating temporary folder (/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142623.021492-register-
__xyikfz)
```

Copy input data to temp folder...

Get image dimensions of destination image...

```
matrix size: 141 x 141 x 91
voxel size: 0.5mm x 0.5mm x 91mm
```

Split input segmentation...

Split destination segmentation...

Split input image...

Split destination image...

```
Estimate cord angle for each slice: 0%|
| 0/91 [00:00<?, ?iter/s]Switched to method 'hog' for slice: 0
Switched to method 'hog' for slice: 4
Estimate cord angle for each slice: 92%|██████████████████████|
84/91 [00:01<00:00, 50.45iter/s]Switched to method 'hog' for slice: 89
Estimate cord angle for each slice: 99%|██████████████████████|
90/91 [00:01<00:00, 50.51iter/s]Switched to method 'hog' for slice: 90
Estimate cord angle for each slice: 100%|██████████████████████|
91/91 [00:01<00:00, 50.56iter/s]
Build 3D deformation field: 100%|██████████████████████|
91/91 [00:05<00:00, 17.71iter/s]
```

Generate warping field...

--> step1Warp.nii.gz

Generate warping field...

--> step1InverseWarp.nii.gz

Move warping fields...

```
cp step1Warp.nii.gz /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-
iul9xaqp
cp step1InverseWarp.nii.gz /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-
iul9xaqp
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142623.021492-register-__xyikfz
```

--

ESTIMATE TRANSFORMATION FOR STEP #2

Apply transformation from previous step

Parse list of warping fields...

Get dimensions of data...

141 x 141 x 91 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i
src_seg.nii -o src_seg_reg.nii -t warp_forward_1.nii.gz -r
dest_seg_RPI.nii -n NearestNeighbor # in /private/var/folders/mm/
```

vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-iul9xaq
Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest_seg_RPI.nii src_seg_reg.nii &
```

```
fslview_deprecated dest_seg_RPI.nii src_seg_reg.nii &
```

```
fslview dest_seg_RPI.nii src_seg_reg.nii &
```

Registration parameters:

```
type ..... seg  
algo ..... bsplinesyn  
slicewise ..... 0  
metric ..... MeanSquares  
samplStrategy .. None  
samplPercent ... 0.2  
iter ..... 3  
smooth ..... 1  
laplacian ..... 0  
shrink ..... 1  
gradStep ..... 0.5  
deformation .... 1x1x0  
init .....  
poly ..... 5  
filter_size .... 5  
dof ..... Tx_Ty_Tz_Rx_Ry_Rz  
smoothWarpXY ... 2  
rot_method ..... pca
```

```
sct_image -i dest_seg_RPI.nii -o dest_seg_RPI_pad.nii -pad 0,0,10 #  
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142622.789211-register-iul9xaq
```

Estimate transformation

```
/Users/msresearch/sct_5.7/bin/isct_antsRegistration --dimensionality 3  
--transform 'bsplinesyn[0.5,1,3]' --metric  
'MeanSquares[dest_seg_RPI_pad.nii,src_seg_reg.nii,1,4]' --convergence  
3 --shrink-factors 1 --smoothing-sigmas 1mm --restrict-deformation  
1x1x0 --output '[step2,src_seg_reg_regStep2.nii]' --interpolation  
'BSpline[3]' --verbose 1 # in /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-  
iul9xaq
```

Concatenate transformations...

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3  
warp_src2dest.nii.gz -R dest.nii warp_forward_2.nii.gz  
warp_forward_1.nii.gz # in /private/var/folders/mm/
```

```
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-  
iul9xaqp  
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3  
warp_dest2src.nii.gz -R src.nii warp_inverse_1.nii.gz  
warp_inverse_2.nii.gz # in /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142622.789211-register-  
iul9xaqp
```

Apply transfo source --> dest...

Parse list of warping fields...

Get dimensions of data...

141 x 141 x 91 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii  
-o src_reg.nii -t warp_src2dest.nii.gz -r dest.nii -n Linear # in /  
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142622.789211-register-iul9xaqp
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest.nii src_reg.nii &
```

```
fslview_deprecated dest.nii src_reg.nii &
```

```
fslview dest.nii src_reg.nii &
```

Apply transfo dest --> source...

Parse list of warping fields...

Get dimensions of data...

141 x 141 x 91 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i  
dest.nii -o dest_reg.nii -t warp_dest2src.nii.gz -r src.nii -n Linear  
# in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142622.789211-register-iul9xaqp
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes src.nii dest_reg.nii &
```

```
fslview_deprecated src.nii dest_reg.nii &
```

```
fslview src.nii dest_reg.nii &
```

Generate output files...

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142622.789211-register-iul9xaqp/src_reg.nii
```

```
data_1mm_rpi_straightAffine_crop_sub_reg.nii
```

```
File created: data_1mm_rpi_straightAffine_crop_sub_reg.nii
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142622.789211-register-iul9xaqp/warp_src2dest.nii.gz
```

```
warp_data_1mm_rpi_straightAffine_crop_sub2template_crop_sub.nii.gz
```

```
File created:
```

```
warp_data_1mm_rpi_straightAffine_crop_sub2template_crop_sub.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142622.789211-register-iul9xaqp/dest_reg.nii
```

```
template_crop_sub_reg.nii
```

```
File created: template_crop_sub_reg.nii
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142622.789211-register-iul9xaqp/warp_dest2src.nii.gz
```

```
warp_template_crop_sub2data_1mm_rpi_straightAffine_crop_sub.nii.gz
```

```
File created:
```

```
warp_template_crop_sub2data_1mm_rpi_straightAffine_crop_sub.nii.gz
```

Remove temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142622.789211-register-iul9xaqp
```

Concatenate transformations: anat --> template...

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
```

```
warp_anat2template.nii.gz -R template.nii
```

```
warp_data_1mm_rpi_straightAffine_crop_sub2template_crop_sub.nii.gz
```

```
warp_curve2straightAffine.nii.gz # in /private/var/folders/mm/
```

```
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-
```

```
register_to_template-z33ai97f
```

Concatenate transformations: template --> anat...

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
```

```
warp_template2anat.nii.gz -R data.nii warp_straight2curve.nii.gz -i
```

```
straight2templateAffine.txt
```

```
warp_template_crop_sub2data_1mm_rpi_straightAffine_crop_sub.nii.gz #
```

```
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522142543.091173-register_to_template-z33ai97f
```

```
sct_apply_transfo -i template.nii -o template2anat.nii.gz -d data.nii
```

```
-w warp_template2anat.nii.gz -crop 0 # in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f
sct_apply_transfo -i data.nii -o anat2template.nii.gz -d template.nii
-w warp_anat2template.nii.gz -crop 0 # in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f
```

Generate output files...

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/warp_template2anat.nii.gz warp_template2anat.nii.gz
File created: warp_template2anat.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/warp_anat2template.nii.gz warp_anat2template.nii.gz
File created: warp_anat2template.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/template2anat.nii.gz template2anat.nii.gz
File created: template2anat.nii.gz
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/anat2template.nii.gz anat2template.nii.gz
File created: anat2template.nii.gz
File warp_curve2straight.nii.gz already exists. Deleting it..
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/warp_curve2straight.nii.gz warp_curve2straight.nii.gz
File created: warp_curve2straight.nii.gz
File warp_straight2curve.nii.gz already exists. Deleting it..
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/warp_straight2curve.nii.gz warp_straight2curve.nii.gz
File created: warp_straight2curve.nii.gz
File straight_ref.nii.gz already exists. Deleting it..
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f/straight_ref.nii.gz straight_ref.nii.gz
File created: straight_ref.nii.gz
```

Delete temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142543.091173-register_to_template-z33ai97f
```

Finished! Elapsed time: 108s

*** Generate Quality Control (QC) html report ***

Resample images to 0.6x0.6 mm

QcImage: layout with Axial slice

```
Compute center of mass at each slice
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid
value encountered in double_scalars
  for dir in range(input.ndim)]
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/
t2/sct_register_to_template/2024_05_22_142737.508537/bkg_img.png
Mask type float64
Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_142737.508537.json
```

To see the results in a browser, type:
open /Users/msresearch/Downloads/canproco/data/qc/index.html

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes t2.nii.gz template2anat.nii.gz &
```

```
fslview_deprecated t2.nii.gz template2anat.nii.gz &
```

```
fslview t2.nii.gz template2anat.nii.gz &
```

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t2.nii.gz
anat2template.nii.gz &
```

```
fslview_deprecated /Users/msresearch/sct_5.7/data/PAM50/template/
PAM50_t2.nii.gz anat2template.nii.gz &
```

```
fslview /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t2.nii.gz
anat2template.nii.gz &
```

```
--
Spinal Cord Toolbox (5.7)
```

```
sct_warp_template -d t2.nii.gz -w warp_template2anat.nii.gz -a 0 -qc /
Users/msresearch/Downloads/canproco/data/qc
--
```

Check parameters:

```
Working directory ..... /Users/msresearch/Downloads/canproco/
data/CAN-01-RRM-133-M0/t2
Destination image ..... t2.nii.gz
Warping field ..... warp_template2anat.nii.gz
Path template ..... /Users/msresearch/sct_5.7/data/PAM50
```

Output folder label

WARP TEMPLATE:

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t1.nii.gz -o label/template/PAM50_t1.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t2.nii.gz -o label/template/PAM50_t2.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t2s.nii.gz -o label/template/PAM50_t2s.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_cord.nii.gz -o label/template/PAM50_cord.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n NearestNeighbor # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_wm.nii.gz -o label/template/PAM50_wm.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_gm.nii.gz -o label/template/PAM50_gm.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_csf.nii.gz -o label/template/PAM50_csf.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n NearestNeighbor # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_levels.nii.gz -o label/template/PAM50_levels.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n NearestNeighbor # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_levels_continuous.nii.gz -o label/template/PAM50_levels_continuous.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
```

```
msresearch/sct_5.7/data/PAM50/template/PAM50_label_body.nii.gz -o
label/template/PAM50_label_body.nii.gz -t warp_template2anat.nii.gz -r
t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/template/PAM50_label_disc.nii.gz -o
label/template/PAM50_label_disc.nii.gz -t warp_template2anat.nii.gz -r
t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/template/
PAM50_label_discPosterior.nii.gz -o label/template/
PAM50_label_discPosterior.nii.gz -t warp_template2anat.nii.gz -r
t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/template/PAM50_spine.nii.gz -o label/
template/PAM50_spine.nii.gz -t warp_template2anat.nii.gz -r t2.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/t2
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/template/PAM50_centerline.nii.gz -o
label/template/PAM50_centerline.nii.gz -t warp_template2anat.nii.gz -r
t2.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/template/
PAM50_label_spinal_levels.nii.gz -o label/template/
PAM50_label_spinal_levels.nii.gz -t warp_template2anat.nii.gz -r
t2.nii.gz -n NearestNeighbor # in /Users/msresearch/Downloads/
canproco/data/CAN-01-RRM-133-M0/t2
cp /Users/msresearch/sct_5.7/data/PAM50/template/info_label.txt label/
template
```

*** Generate Quality Control (QC) html report ***

Resample images to 0.6x0.6 mm

QcImage: layout with Axialslice

Compute center of mass at each slice

```
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid
value encountered in double_scalars
```

```
    for dir in range(input.ndim)]
```

```
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/
t2/sct_warp_template/2024_05_22_142813.007651/bkg_img.png
```

```
Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_142813.007651.json
```

To see the results in a browser, type:

```
open /Users/msresearch/Downloads/canproco/data/qc/index.html
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes t2.nii.gz -cm greyscale -a 100.0 label/template/  
PAM50_t2.nii.gz -cm greyscale -dr 0 4000 -a 100.0 label/template/  
PAM50_gm.nii.gz -cm red-yellow -dr 0.4 1 -a 50.0 label/template/  
PAM50_wm.nii.gz -cm blue-lightblue -dr 0.4 1 -a 50.0 &
```

```
fslview_deprecated t2.nii.gz -l Greyscale -t 1 label/template/  
PAM50_t2.nii.gz -l Greyscale -b 0,4000 -t 1 label/template/  
PAM50_gm.nii.gz -l Red-Yellow -b 0.4,1 -t 0.5 label/template/  
PAM50_wm.nii.gz -l Blue-Lightblue -b 0.4,1 -t 0.5 &
```

```
fslview t2.nii.gz -l Greyscale -t 1 label/template/PAM50_t2.nii.gz -l  
Greyscale -b 0,4000 -t 1 label/template/PAM50_gm.nii.gz -l Red-Yellow  
-b 0.4,1 -t 0.5 label/template/PAM50_wm.nii.gz -l Blue-Lightblue -b  
0.4,1 -t 0.5 &
```

--

Spinal Cord Toolbox (5.7)

```
sct_process_segmentation -i t2_seg.nii.gz -vert 2:4 -vertfile ./label/  
template/PAM50_levels.nii.gz -o csa_c2c4.csv -append 0
```

--

```
Compute shape analysis: 100%|#####| 223/223 [00:00<00:00,  
487.50iter/s]
```

Done! To view results, type:

```
open /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/  
csa_c2c4.csv
```

--

Spinal Cord Toolbox (5.7)

```
sct_image -i mt_t1.nii.gz -setorient RPI -o mt_t1.nii.gz
```

--

```
/Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/  
mt_t1.nii.gz
```

Generate output files...

File mt_t1.nii.gz already exists. Will overwrite it.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes mt_t1.nii.gz &
```

```
fslview_deprecated mt_t1.nii.gz &
```

```
fslview mt_t1.nii.gz &
```

```
--
```

```
Spinal Cord Toolbox (5.7)
```

```
sct_deepseg_sc -i mt_t1.nii.gz -c t1 -qc /Users/msresearch/Downloads/  
canproco/data/qc
```

```
--
```

```
Config deepseg_sc:
```

```
Centerline algorithm: svm
```

```
Brain in image: True
```

```
Kernel dimension: 2d
```

```
Contrast: t1
```

```
Threshold: 0.15
```

```
Creating temporary folder (/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142821.665575-j62_irfl)
```

```
Reorient the image to RPI, if necessary...
```

```
Finding the spinal cord centerline...
```

```
Creating temporary folder (/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142822.672941-kknbj1li)
```

```
Remove temporary files...
```

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142822.672941-kknbj1li
```

```
Cropping the image around the spinal cord...
```

```
Normalizing the intensity...
```

```
Segmenting the spinal cord using deep learning on 2D patches...
```

```
Reassembling the image...
```

```
Resampling the segmentation to the native image resolution using  
linear interpolation...
```

```
Binarizing the resampled segmentation...
```

```
Compute shape analysis: 100%|#####| 20/20 [00:00<00:00,  
319.60iter/s]
```

```
Remove temporary files...
```

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142821.665575-j62_irfl
```

```
*** Generate Quality Control (QC) html report ***
```

```
Resample images to 0.6x0.6 mm
```

```
QcImage: layout with Axial slice
```

```
Compute center of mass at each slice
```

```
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-  
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid  
value encountered in double_scalars
```

```
for dir in range(input.ndim)]
```

```
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/  
mt/sct_deepseg_sc/2024_05_22_142825.536226/bkg_img.png
```

```
Successfully generated the QC results in /Users/msresearch/Downloads/
```

```
canproco/data/qc/_json/qc_2024_05_22_142825.536226.json
```

To see the results in a browser, type:
open /Users/msresearch/Downloads/canproco/data/qc/index.html

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/mt_t1.nii.gz -cm greyscale /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/mt_t1_seg.nii.gz -cm red -a 70.0 &
```

```
fslview_deprecated /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/mt_t1.nii.gz -l Greyscale /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/mt_t1_seg.nii.gz -l Red -t 0.7 &
```

```
fslview /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/mt_t1.nii.gz -l Greyscale /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt/mt_t1_seg.nii.gz -l Red -t 0.7 &
```

```
--
```

Spinal Cord Toolbox (5.7)

```
sct_create_mask -i mt_t1.nii.gz -p centerline,mt_t1_seg.nii.gz -size 35mm -f cylinder -o mt_t1_mask.nii.gz
```

```
--
```

```
OK: mt_t1_seg.nii.gz  
Creating temporary folder (/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142826.772738-create_mask-efmf4eyi)
```

Orientation:
RPI

Dimensions:
(256, 256, 22, 1, 0.89843744, 0.89843744, 5.0000043, 1)

```
Create mask...  
/Users/msresearch/sct_5.7/spinalcordtoolbox/scripts/sct_create_mask.py:227: DeprecationWarning: get_header method is deprecated.  
Please use the ``img.header`` property instead.
```

```
* deprecated from version: 2.1  
* Will raise <class 'nibabel.deprecator.ExpiredDeprecationError'> as of version: 4.0
```

```
hdr = centerline.get_header() # get header  
/Users/msresearch/sct_5.7/spinalcordtoolbox/scripts/
```

```
sct_create_mask.py:230: DeprecationWarning: get_data() is deprecated
in favor of get_fdata(), which has a more predictable return type. To
obtain get_data() behavior going forward, use
numpy.asanyarray(img.dataobj).
```

```
* deprecated from version: 3.0
* Will raise <class 'nibabel.deprecator.ExpiredDeprecationError'> as
of version: 5.0
    data_centerline = centerline.get_data() # get centerline
```

Remove temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142826.772738-create_mask-efmf4eyi
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/
mt/mt_t1.nii.gz -cm greyscale /Users/msresearch/Downloads/canproco/
data/CAN-01-RRM-133-M0/mt/mt_t1_mask.nii.gz -cm red -a 50.0 &
```

```
fslview_deprecated /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt/mt_t1.nii.gz -l Greyscale /Users/msresearch/Downloads/
canproco/data/CAN-01-RRM-133-M0/mt/mt_t1_mask.nii.gz -l Red -t 0.5 &
```

```
fslview /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/
mt/mt_t1.nii.gz -l Greyscale /Users/msresearch/Downloads/canproco/
data/CAN-01-RRM-133-M0/mt/mt_t1_mask.nii.gz -l Red -t 0.5 &
```

--

Spinal Cord Toolbox (5.7)

```
sct_register_multimodal -i /Users/msresearch/sct_5.7/data/PAM50/
template/PAM50_t1.nii.gz -iseg /Users/msresearch/sct_5.7/data/PAM50/
template/PAM50_cord.nii.gz -d mt_t1.nii.gz -dseg mt_t1_seg.nii.gz -m
mt_t1_mask.nii.gz -param
step=1,type=seg,algo=slicereg,metric=MeanSquares,smooth=2:step=2,type=
im,algo=syn,metric=CC,iter=5,gradStep=0.5 -initwarp /Users/msresearch/
Downloads/canproco/data/CAN-01-RRM-133-M0/t2/warp_template2anat.nii.gz
-initwarpinv /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-
M0/t2/warp_anat2template.nii.gz -owarp warp_template2mt.nii.gz -qc /
Users/msresearch/Downloads/canproco/data/qc
```

--

Input parameters:

```
Source ..... /Users/msresearch/sct_5.7/data/PAM50/template/
PAM50_t1.nii.gz
Destination ..... mt_t1.nii.gz
Init transfo ..... /Users/msresearch/Downloads/canproco/data/
```

CAN-01-RRM-133-M0/t2/warp_template2anat.nii.gz

Mask mt_t1_mask.nii.gz

Output name

Remove temp files ... 1

Verbose 1

Check if input data are 3D...

Creating temporary folder (/var/folders/mm/

vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-register-
_lev2yvvh)

Copying input data to tmp folder and convert to nii...

File mask.nii.gz already exists. Will overwrite it.

Skip step=0 and replace with initial transformations:

/Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/t2/
warp_template2anat.nii.gz

--

ESTIMATE TRANSFORMATION FOR STEP #1

Apply transformation from previous step

Parse list of warping fields...

Get dimensions of data...

141 x 141 x 991 x 1

Apply transformation...

Apply transformation and resample to destination space...

/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i
src_seg.nii -o src_seg_reg.nii -t /Users/msresearch/Downloads/
canproco/data/CAN-01-RRM-133-M0/t2/warp_template2anat.nii.gz -r
dest_seg_RPI.nii -n NearestNeighbor # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-register-
_lev2yvvh

Copy affine matrix from destination space to make sure qform/sform are
the same.

Done! To view results, run one of the following commands (depending on
your preferred viewer):

fsleyes dest_seg_RPI.nii src_seg_reg.nii &

fslview_deprecated dest_seg_RPI.nii src_seg_reg.nii &

fslview dest_seg_RPI.nii src_seg_reg.nii &

Registration parameters:

type seg

```

algo ..... slicereg
slicewise ..... 0
metric ..... MeanSquares
samplStrategy .. None
samplPercent ... 0.2
iter ..... 10
smooth ..... 2
laplacian ..... 0
shrink ..... 1
gradStep ..... 0.5
deformation .... 1x1x0
init .....
poly ..... 5
filter_size .... 5
dof ..... Tx_Ty_Tz_Rx_Ry_Rz
smoothWarpXY ... 2
rot_method ..... pca
/Users/msresearch/sct_5.7/bin/isct_antsSliceRegularizedRegistration -t
'Translation[0.5]' -m
'MeanSquares[dest_seg_RPI_crop.nii,src_seg_reg_crop.nii,1,4,None,0.2]'
-p 5 -i 10 -f 1 -s 2 -v 1 -o '[step1,src_seg_reg_crop_regStep1.nii]'
-x mask.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-register-
_lev2yvh

```

--

ESTIMATE TRANSFORMATION FOR STEP #2

Apply transformation from previous step

Parse list of warping fields...

Get dimensions of data...

141 x 141 x 991 x 1

Apply transformation...

Apply transformation and resample to destination space...

```

/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii
-o src_reg.nii -t warp_forward_1.nii.gz /Users/msresearch/Downloads/
canproco/data/CAN-01-RRM-133-M0/t2/warp_template2anat.nii.gz -r
dest_RPI.nii -n 'BSpline[3]' # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-register-
_lev2yvh

```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest_RPI.nii src_reg.nii &
```

```
fslview_deprecated dest_RPI.nii src_reg.nii &
```

```
fslview dest_RPI.nii src_reg.nii &
```

Registration parameters:

```
type ..... im
algo ..... syn
slicewise ..... 0
metric ..... CC
samplStrategy .. None
samplPercent ... 0.2
iter ..... 5
smooth ..... 0
laplacian ..... 0
shrink ..... 1
gradStep ..... 0.5
deformation .... 1x1x0
init .....
poly ..... 5
filter_size .... 5
dof ..... Tx_Ty_Tz_Rx_Ry_Rz
smoothWarpXY ... 2
rot_method ..... pca
```

```
sct_image -i dest_RPI.nii -o dest_RPI_pad.nii -pad 0,0,5 # in /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522142829.108685-register-_lev2yvh
```

Estimate transformation

```
/Users/msresearch/sct_5.7/bin/isct_antsRegistration --dimensionality 3
--transform 'syn[0.5,3,0]' --metric
'CC[dest_RPI_pad.nii,src_reg.nii,1,4]' --convergence 5 --shrink-
factors 1 --smoothing-sigmas 0mm --restrict-deformation 1x1x0 --output
'[step2,src_reg_regStep2.nii]' --interpolation 'BSpline[3]' --verbose
1 -x mask.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-register-
_lev2yvh
```

Concatenate transformations...

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
warp_src2dest.nii.gz -R dest.nii warp_forward_2.nii.gz
warp_forward_1.nii.gz /Users/msresearch/Downloads/canproco/data/
CAN-01-RRM-133-M0/t2/warp_template2anat.nii.gz # in /private/var/
folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-
register-_lev2yvh
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
warp_dest2src.nii.gz -R src.nii /Users/msresearch/Downloads/canproco/
data/CAN-01-RRM-133-M0/t2/warp_anat2template.nii.gz
warp_inverse_1.nii.gz warp_inverse_2.nii.gz # in /private/var/folders/
mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522142829.108685-
```

register-_lev2yvvh

Apply transfo source --> dest...

Parse list of warping fields...

Get dimensions of data...

141 x 141 x 991 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii  
-o src_reg.nii -t warp_src2dest.nii.gz -r dest.nii -n Linear # in /  
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142829.108685-register-_lev2yvvh
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest.nii src_reg.nii &
```

```
fslview_deprecated dest.nii src_reg.nii &
```

```
fslview dest.nii src_reg.nii &
```

Apply transfo dest --> source...

Parse list of warping fields...

Get dimensions of data...

256 x 256 x 22 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i  
dest.nii -o dest_reg.nii -t warp_dest2src.nii.gz -r src.nii -n Linear  
# in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142829.108685-register-_lev2yvvh
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes src.nii dest_reg.nii &
```

```
fslview_deprecated src.nii dest_reg.nii &
```

```
fslview src.nii dest_reg.nii &
```

```
Generate output files...
```

```
File created: PAM50_t1_reg.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142829.108685-register-_lev2yvvh/warp_src2dest.nii.gz  
warp_template2mt.nii.gz
```

```
File created: warp_template2mt.nii.gz
```

```
File created: mt_t1_reg.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142829.108685-register-_lev2yvvh/warp_dest2src.nii.gz  
warp_mt_t12PAM50_t1.nii.gz
```

```
File created: warp_mt_t12PAM50_t1.nii.gz
```

```
Remove temporary files...
```

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522142829.108685-register-_lev2yvvh
```

```
Finished! Elapsed time: 58s
```

```
*** Generate Quality Control (QC) html report ***
```

```
Resample images to 0.6x0.6 mm
```

```
QcImage: layout with Axial slice
```

```
Compute center of mass at each slice
```

```
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-  
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid  
value encountered in double_scalars
```

```
  for dir in range(input.ndim)]
```

```
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/  
mt/sct_register_multimodal/2024_05_22_142930.248532/bkg_img.png
```

```
Mask type float64
```

```
Successfully generated the QC results in /Users/msresearch/Downloads/  
canproco/data/qc/_json/qc_2024_05_22_142930.248532.json
```

```
To see the results in a browser, type:
```

```
open /Users/msresearch/Downloads/canproco/data/qc/index.html
```

```
Done! To view results, run one of the following commands (depending on  
your preferred viewer):
```

```
fsleyes /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t1.nii.gz  
mt_t1_reg.nii.gz &
```

```
fslview_deprecated /Users/msresearch/sct_5.7/data/PAM50/template/  
PAM50_t1.nii.gz mt_t1_reg.nii.gz &
```

```
fslview /Users/msresearch/sct_5.7/data/PAM50/template/PAM50_t1.nii.gz  
mt_t1_reg.nii.gz &
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes mt_t1.nii.gz PAM50_t1_reg.nii.gz &
```

```
fslview_deprecated mt_t1.nii.gz PAM50_t1_reg.nii.gz &
```

```
fslview mt_t1.nii.gz PAM50_t1_reg.nii.gz &
```

```
--  
Spinal Cord Toolbox (5.7)
```

```
sct_warp_template -d mt_t1.nii.gz -w warp_template2mt.nii.gz -a 1  
-qc /Users/msresearch/Downloads/canproco/data/qc
```

```
--  
Check parameters:
```

```
Working directory ..... /Users/msresearch/Downloads/canproco/  
data/CAN-01-RRM-133-M0/mt  
Destination image ..... mt_t1.nii.gz  
Warping field ..... warp_template2mt.nii.gz  
Path template ..... /Users/msresearch/sct_5.7/data/PAM50  
Output folder ..... label
```

WARP TEMPLATE:

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_t1.nii.gz -o label/  
template/PAM50_t1.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz -n  
Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-  
M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_t2.nii.gz -o label/  
template/PAM50_t2.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz -n  
Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-  
M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_t2s.nii.gz -o label/  
template/PAM50_t2s.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_cord.nii.gz -o label/  
template/PAM50_cord.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n NearestNeighbor # in /Users/msresearch/Downloads/canproco/data/  
CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
```

```
msresearch/sct_5.7/data/PAM50/template/PAM50_wm.nii.gz -o label/  
template/PAM50_wm.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz -n  
Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-  
M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_gm.nii.gz -o label/  
template/PAM50_gm.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz -n  
Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-  
M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_csf.nii.gz -o label/  
template/PAM50_csf.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n NearestNeighbor # in /Users/msresearch/Downloads/canproco/data/  
CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_levels.nii.gz -o label/  
template/PAM50_levels.nii.gz -t warp_template2mt.nii.gz -r  
mt_t1.nii.gz -n NearestNeighbor # in /Users/msresearch/Downloads/  
canproco/data/CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_levels_continuous.nii.gz  
-o label/template/PAM50_levels_continuous.nii.gz -t  
warp_template2mt.nii.gz -r mt_t1.nii.gz -n Linear # in /Users/  
msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_label_body.nii.gz -o  
label/template/PAM50_label_body.nii.gz -t warp_template2mt.nii.gz -r  
mt_t1.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/  
CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_label_disc.nii.gz -o  
label/template/PAM50_label_disc.nii.gz -t warp_template2mt.nii.gz -r  
mt_t1.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/  
CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/  
PAM50_label_discPosterior.nii.gz -o label/template/  
PAM50_label_discPosterior.nii.gz -t warp_template2mt.nii.gz -r  
mt_t1.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/  
CAN-01-RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_spine.nii.gz -o label/  
template/PAM50_spine.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt  
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/PAM50_centerline.nii.gz -o  
label/template/PAM50_centerline.nii.gz -t warp_template2mt.nii.gz -r  
mt_t1.nii.gz -n Linear # in /Users/msresearch/Downloads/canproco/data/  
CAN-01-RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/template/  
PAM50_label_spinal_levels.nii.gz -o label/template/  
PAM50_label_spinal_levels.nii.gz -t warp_template2mt.nii.gz -r  
mt_t1.nii.gz -n NearestNeighbor # in /Users/msresearch/Downloads/  
canproco/data/CAN-01-RRM-133-M0/mt  
cp /Users/msresearch/sct_5.7/data/PAM50/template/info_label.txt label/  
template
```

WARP ATLAS OF WHITE MATTER TRACTS:

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_00.nii.gz -o label/  
atlas/PAM50_atlas_00.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_01.nii.gz -o label/  
atlas/PAM50_atlas_01.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_02.nii.gz -o label/  
atlas/PAM50_atlas_02.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_03.nii.gz -o label/  
atlas/PAM50_atlas_03.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_04.nii.gz -o label/  
atlas/PAM50_atlas_04.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_05.nii.gz -o label/  
atlas/PAM50_atlas_05.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_06.nii.gz -o label/  
atlas/PAM50_atlas_06.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/  
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_07.nii.gz -o label/  
atlas/PAM50_atlas_07.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz  
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-  
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_08.nii.gz -o label/
atlas/PAM50_atlas_08.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_09.nii.gz -o label/
atlas/PAM50_atlas_09.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_10.nii.gz -o label/
atlas/PAM50_atlas_10.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_11.nii.gz -o label/
atlas/PAM50_atlas_11.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_12.nii.gz -o label/
atlas/PAM50_atlas_12.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_13.nii.gz -o label/
atlas/PAM50_atlas_13.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_14.nii.gz -o label/
atlas/PAM50_atlas_14.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_15.nii.gz -o label/
atlas/PAM50_atlas_15.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_16.nii.gz -o label/
atlas/PAM50_atlas_16.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_17.nii.gz -o label/
atlas/PAM50_atlas_17.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_18.nii.gz -o label/
atlas/PAM50_atlas_18.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_19.nii.gz -o label/
atlas/PAM50_atlas_19.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_20.nii.gz -o label/
atlas/PAM50_atlas_20.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_21.nii.gz -o label/
atlas/PAM50_atlas_21.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_22.nii.gz -o label/
atlas/PAM50_atlas_22.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_23.nii.gz -o label/
atlas/PAM50_atlas_23.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_24.nii.gz -o label/
atlas/PAM50_atlas_24.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_25.nii.gz -o label/
atlas/PAM50_atlas_25.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_26.nii.gz -o label/
atlas/PAM50_atlas_26.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_27.nii.gz -o label/
atlas/PAM50_atlas_27.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_28.nii.gz -o label/
atlas/PAM50_atlas_28.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_29.nii.gz -o label/
atlas/PAM50_atlas_29.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_30.nii.gz -o label/
atlas/PAM50_atlas_30.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_31.nii.gz -o label/
atlas/PAM50_atlas_31.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_32.nii.gz -o label/
atlas/PAM50_atlas_32.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_33.nii.gz -o label/
atlas/PAM50_atlas_33.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_34.nii.gz -o label/
atlas/PAM50_atlas_34.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_35.nii.gz -o label/
atlas/PAM50_atlas_35.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i /Users/
msresearch/sct_5.7/data/PAM50/atlas/PAM50_atlas_36.nii.gz -o label/
atlas/PAM50_atlas_36.nii.gz -t warp_template2mt.nii.gz -r mt_t1.nii.gz
-n Linear # in /Users/msresearch/Downloads/canproco/data/CAN-01-
RRM-133-M0/mt
cp /Users/msresearch/sct_5.7/data/PAM50/atlas/info_label.txt label/
atlas
```

*** Generate Quality Control (QC) html report ***
Resample images to 0.6x0.6 mm

```
QcImage: layout with Axial slice
Compute center of mass at each slice
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid
value encountered in double_scalars
  for dir in range(input.ndim)]
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/
mt/sct_warp_template/2024_05_22_143012.573901/bkg_img.png
Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_143012.573901.json
```

To see the results in a browser, type:
open /Users/msresearch/Downloads/canproco/data/qc/index.html

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes mt_t1.nii.gz -cm greyscale -a 100.0 label/template/
PAM50_t2.nii.gz -cm greyscale -dr 0 4000 -a 100.0 label/template/
PAM50_gm.nii.gz -cm red-yellow -dr 0.4 1 -a 50.0 label/template/
PAM50_wm.nii.gz -cm blue-lightblue -dr 0.4 1 -a 50.0 &
```

```
fslview_deprecated mt_t1.nii.gz -l Greyscale -t 1 label/template/
PAM50_t2.nii.gz -l Greyscale -b 0,4000 -t 1 label/template/
PAM50_gm.nii.gz -l Red-Yellow -b 0.4,1 -t 0.5 label/template/
PAM50_wm.nii.gz -l Blue-Lightblue -b 0.4,1 -t 0.5 &
```

```
fslview mt_t1.nii.gz -l Greyscale -t 1 label/template/PAM50_t2.nii.gz
-l Greyscale -b 0,4000 -t 1 label/template/PAM50_gm.nii.gz -l Red-
Yellow -b 0.4,1 -t 0.5 label/template/PAM50_wm.nii.gz -l Blue-
Lightblue -b 0.4,1 -t 0.5 &
```

--

Spinal Cord Toolbox (5.7)

```
sct_register_multimodal -i mt0.nii.gz -d mt_t1.nii.gz -dseg
mt_t1_seg.nii.gz -m mt_t1_mask.nii.gz -param
step=1,type=im,algo=slicereg,metric=CC -x spline -o mt0_reg.nii.gz
-qc /Users/msresearch/Downloads/canproco/data/qc
--
```

Input parameters:

```
Source ..... mt0.nii.gz
Destination ..... mt_t1.nii.gz
Init transfo .....
Mask ..... mt_t1_mask.nii.gz
Output name ..... mt0_reg.nii.gz
Remove temp files ... 1
```

Verbose 1

Check if input data are 3D...

Creating temporary folder (/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143014.732292-register-1f3vo751)

Copying input data to tmp folder and convert to nii...

File mask.nii.gz already exists. Will overwrite it.

--

ESTIMATE TRANSFORMATION FOR STEP #0

Registration parameters:

type im
algo syn
slicewise 0
metric MI
samplStrategy .. None
samplPercent ... 0.2
iter 0
smooth 0
laplacian 0
shrink 1
gradStep 0.5
deformation 1x1x0
init
poly 5
filter_size 5
dof Tx_Ty_Tz_Rx_Ry_Rz
smoothWarpXY ... 2
rot_method pca

Estimate transformation

/Users/msresearch/sct_5.7/bin/isct_antsRegistration --dimensionality 3
--transform 'syn[0.5,3,0]' --metric 'MI[dest_RPI.nii,src.nii,1,32]' --
convergence 0 --shrink-factors 1 --smoothing-sigmas 0mm --restrict-
deformation 1x1x0 --output '[step0,src_regStep0.nii]' --interpolation
'BSpline[3]' --verbose 1 -x mask.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143014.732292-
register-1f3vo751

--

ESTIMATE TRANSFORMATION FOR STEP #1

Apply transformation from previous step

Parse list of warping fields...

Get dimensions of data...

256 x 256 x 22 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii  
-o src_reg.nii -t warp_forward_0.nii.gz -r dest_RPI.nii -n  
'BSpline[3]' # in /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143014.732292-  
register-1f3vo751
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest_RPI.nii src_reg.nii &
```

```
fslview_deprecated dest_RPI.nii src_reg.nii &
```

```
fslview dest_RPI.nii src_reg.nii &
```

Registration parameters:

```
type ..... im  
algo ..... slicereg  
slicewise ..... 0  
metric ..... CC  
samplStrategy .. None  
samplPercent ... 0.2  
iter ..... 10  
smooth ..... 0  
laplacian ..... 0  
shrink ..... 1  
gradStep ..... 0.5  
deformation .... 1x1x0  
init .....  
poly ..... 5  
filter_size .... 5  
dof ..... Tx_Ty_Tz_Rx_Ry_Rz  
smoothWarpXY ... 2  
rot_method ..... pca
```

```
/Users/msresearch/sct_5.7/bin/isct_antsSliceRegularizedRegistration -t  
'Translation[0.5]' -m  
'CC[dest_RPI_crop.nii,src_reg_crop.nii,1,4,None,0.2]' -p 5 -i 10 -f 1  
-s 0 -v 1 -o '[step1,src_reg_crop_regStep1.nii]' -x mask.nii.gz # in /  
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522143014.732292-register-1f3vo751
```

Concatenate transformations...

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3  
warp_src2dest.nii.gz -R dest.nii warp_forward_1.nii.gz  
warp_forward_0.nii.gz # in /private/var/folders/mm/
```

```
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143014.732292-  
register-1f3vo751  
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3  
warp_dest2src.nii.gz -R src.nii warp_inverse_0.nii.gz  
warp_inverse_1.nii.gz # in /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143014.732292-  
register-1f3vo751
```

Apply transfo source --> dest...

Parse list of warping fields...

Get dimensions of data...

256 x 256 x 22 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii  
-o src_reg.nii -t warp_src2dest.nii.gz -r dest.nii -n 'BSpline[3]' #  
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522143014.732292-register-1f3vo751
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest.nii src_reg.nii &
```

```
fslview_deprecated dest.nii src_reg.nii &
```

```
fslview dest.nii src_reg.nii &
```

Apply transfo dest --> source...

Parse list of warping fields...

Get dimensions of data...

256 x 256 x 22 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i  
dest.nii -o dest_reg.nii -t warp_dest2src.nii.gz -r src.nii -n  
'BSpline[3]' # in /private/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143014.732292-  
register-1f3vo751
```

Copy affine matrix from destination space to make sure qform/sform are

the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes src.nii dest_reg.nii &
```

```
fslview_deprecated src.nii dest_reg.nii &
```

```
fslview src.nii dest_reg.nii &
```

Generate output files...

```
File created: mt0_reg.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522143014.732292-register-1f3vo751/warp_src2dest.nii.gz
```

```
warp_mt02mt_t1.nii.gz
```

```
File created: warp_mt02mt_t1.nii.gz
```

```
File created: mt0_reg_inv.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522143014.732292-register-1f3vo751/warp_dest2src.nii.gz
```

```
warp_mt_t12mt0.nii.gz
```

```
File created: warp_mt_t12mt0.nii.gz
```

Remove temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522143014.732292-register-1f3vo751
```

Finished! Elapsed time: 29s

*** Generate Quality Control (QC) html report ***

Resample images to 0.6x0.6 mm

QcImage: layout with Axial slice

Compute center of mass at each slice

```
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-  
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid  
value encountered in double_scalars
```

```
  for dir in range(input.ndim)]
```

```
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/  
mt/sct_register_multimodal/2024_05_22_143045.781107/bkg_img.png
```

Mask type float64

Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_143045.781107.json

To see the results in a browser, type:

```
open /Users/msresearch/Downloads/canproco/data/qc/index.html
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes mt0.nii.gz mt0_reg_inv.nii.gz &
```

```
fslview_deprecated mt0.nii.gz mt0_reg_inv.nii.gz &
```

```
fslview mt0.nii.gz mt0_reg_inv.nii.gz &
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes mt_t1.nii.gz mt0_reg.nii.gz &
```

```
fslview_deprecated mt_t1.nii.gz mt0_reg.nii.gz &
```

```
fslview mt_t1.nii.gz mt0_reg.nii.gz &
```

```
--
```

Spinal Cord Toolbox (5.7)

```
sct_register_multimodal -i mt1.nii.gz -d mt_t1.nii.gz -dseg  
mt_t1_seg.nii.gz -m mt_t1_mask.nii.gz -param  
step=1,type=im,algo=slicereg,metric=CC -x spline -o mt1_reg.nii.gz  
-qc /Users/msresearch/Downloads/canproco/data/qc  
--
```

Input parameters:

```
Source ..... mt1.nii.gz  
Destination ..... mt_t1.nii.gz  
Init transfo .....  
Mask ..... mt_t1_mask.nii.gz  
Output name ..... mt1_reg.nii.gz  
Remove temp files ... 1  
Verbose ..... 1
```

Check if input data are 3D...

```
Creating temporary folder (/var/folders/mm/  
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143047.954123-register-  
rw_fxy8e)
```

Copying input data to tmp folder and convert to nii...

File mask.nii.gz already exists. Will overwrite it.

```
--
```

ESTIMATE TRANSFORMATION FOR STEP #0

Registration parameters:

```
type ..... im  
algo ..... syn  
slicewise ..... 0  
metric ..... MI  
samplStrategy .. None
```

```
samplPercent ... 0.2
iter ..... 0
smooth ..... 0
laplacian ..... 0
shrink ..... 1
gradStep ..... 0.5
deformation .... 1x1x0
init .....
poly ..... 5
filter_size .... 5
dof ..... Tx_Ty_Tz_Rx_Ry_Rz
smoothWarpXY ... 2
rot_method ..... pca
```

Estimate transformation

```
/Users/msresearch/sct_5.7/bin/isct_antsRegistration --dimensionality 3
--transform 'syn[0.5,3,0]' --metric 'MI[dest_RPI.nii,src.nii,1,32]' --
convergence 0 --shrink-factors 1 --smoothing-sigmas 0mm --restrict-
deformation 1x1x0 --output '[step0,src_regStep0.nii]' --interpolation
'BSpline[3]' --verbose 1 -x mask.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143047.954123-register-
rw_fxy8e
```

--

ESTIMATE TRANSFORMATION FOR STEP #1

Apply transformation from previous step

Parse list of warping fields...

Get dimensions of data...

256 x 256 x 22 x 1

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii
-o src_reg.nii -t warp_forward_0.nii.gz -r dest_RPI.nii -n
'BSpline[3]' # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143047.954123-register-
rw_fxy8e
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest_RPI.nii src_reg.nii &
```

```
fslview_deprecated dest_RPI.nii src_reg.nii &
```

```
fslview dest_RPI.nii src_reg.nii &
```

```
Registration parameters:
```

```
type ..... im
algo ..... slicereg
slicewise ..... 0
metric ..... CC
samplStrategy .. None
samplPercent ... 0.2
iter ..... 10
smooth ..... 0
laplacian ..... 0
shrink ..... 1
gradStep ..... 0.5
deformation .... 1x1x0
init .....
poly ..... 5
filter_size .... 5
dof ..... Tx_Ty_Tz_Rx_Ry_Rz
smoothWarpXY ... 2
rot_method ..... pca
```

```
/Users/msresearch/sct_5.7/bin/isct_antsSliceRegularizedRegistration -t
'Translation[0.5]' -m
'CC[dest_RPI_crop.nii,src_reg_crop.nii,1,4,None,0.2]' -p 5 -i 10 -f 1
-s 0 -v 1 -o '[step1,src_reg_crop_regStep1.nii]' -x mask.nii.gz # in /
private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522143047.954123-register-rw_fxy8e
```

```
Concatenate transformations...
```

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
warp_src2dest.nii.gz -R dest.nii warp_forward_1.nii.gz
warp_forward_0.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143047.954123-register-
rw_fxy8e
```

```
/Users/msresearch/sct_5.7/bin/isct_ComposeMultiTransform 3
warp_dest2src.nii.gz -R src.nii warp_inverse_0.nii.gz
warp_inverse_1.nii.gz # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143047.954123-register-
rw_fxy8e
```

```
Apply transfo source --> dest...
```

```
Parse list of warping fields...
```

```
Get dimensions of data...
```

```
256 x 256 x 22 x 1
```

```
Apply transformation...
```

```
Apply transformation and resample to destination space...
```

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i src.nii
-o src_reg.nii -t warp_src2dest.nii.gz -r dest.nii -n 'BSpline[3]' #
in /private/var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
sct-20240522143047.954123-register-rw_fxy8e
Copy affine matrix from destination space to make sure qform/sform are
the same.
```

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes dest.nii src_reg.nii &
```

```
fslview_deprecated dest.nii src_reg.nii &
```

```
fslview dest.nii src_reg.nii &
```

Apply transfo dest --> source...

Parse list of warping fields...

Get dimensions of data...

```
256 x 256 x 22 x 1
```

Apply transformation...

Apply transformation and resample to destination space...

```
/Users/msresearch/sct_5.7/bin/isct_antsApplyTransforms -d 3 -i
dest.nii -o dest_reg.nii -t warp_dest2src.nii.gz -r src.nii -n
'BSpline[3]' # in /private/var/folders/mm/
vhlf215s7k338w7srsxw2chm0000gn/T/sct-20240522143047.954123-register-
rw_fxy8e
```

Copy affine matrix from destination space to make sure qform/sform are the same.

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes src.nii dest_reg.nii &
```

```
fslview_deprecated src.nii dest_reg.nii &
```

```
fslview src.nii dest_reg.nii &
```

Generate output files...

```
File created: mt1_reg.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/
```

```
sct-20240522143047.954123-register-rw_fxy8e/warp_src2dest.nii.gz
```

```
warp_mt12mt_t1.nii.gz
```

```
File created: warp_mt12mt_t1.nii.gz
```

```
File created: mt1_reg_inv.nii.gz
```

```
mv /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522143047.954123-register-rw_fxy8e/warp_dest2src.nii.gz  
warp_mt_t12mt1.nii.gz  
File created: warp_mt_t12mt1.nii.gz
```

Remove temporary files...

```
rm -rf /var/folders/mm/vhlf215s7k338w7srsxw2chm0000gn/T/  
sct-20240522143047.954123-register-rw_fxy8e
```

Finished! Elapsed time: 28s

*** Generate Quality Control (QC) html report ***

Resample images to 0.6x0.6 mm

QcImage: layout with Axial slice

Compute center of mass at each slice

```
/Users/msresearch/sct_5.7/python/envs/venv_sct/lib/python3.7/site-  
packages/scipy/ndimage/measurements.py:1407: RuntimeWarning: invalid  
value encountered in double_scalars
```

```
  for dir in range(input.ndim)]
```

```
/Users/msresearch/Downloads/canproco/data/qc/data/CAN-01-RRM-133-M0/  
mt/sct_register_multimodal/2024_05_22_143118.239778/bkg_img.png
```

Mask type float64

Successfully generated the QC results in /Users/msresearch/Downloads/
canproco/data/qc/_json/qc_2024_05_22_143118.239778.json

To see the results in a browser, type:

```
open /Users/msresearch/Downloads/canproco/data/qc/index.html
```

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes mt1.nii.gz mt1_reg_inv.nii.gz &
```

```
fslview_deprecated mt1.nii.gz mt1_reg_inv.nii.gz &
```

```
fslview mt1.nii.gz mt1_reg_inv.nii.gz &
```

Done! To view results, run one of the following commands (depending on
your preferred viewer):

```
fsleyes mt_t1.nii.gz mt1_reg.nii.gz &
```

```
fslview_deprecated mt_t1.nii.gz mt1_reg.nii.gz &
```

```
fslview mt_t1.nii.gz mt1_reg.nii.gz &
```

--

Spinal Cord Toolbox (5.7)

```
sct_compute_mtr -mt0 mt0_reg.nii.gz -mt1 mt1_reg.nii.gz  
--
```

Compute MTR...

Found 0 voxels with value=0. These will be replaced by nan.

Threshold to clip values: +/- 100

Done! To view results, run one of the following commands (depending on your preferred viewer):

```
fsleyes mt0_reg.nii.gz mt1_reg.nii.gz ./mtr.nii.gz &
```

```
fslview_deprecated mt0_reg.nii.gz mt1_reg.nii.gz ./mtr.nii.gz &
```

```
fslview mt0_reg.nii.gz mt1_reg.nii.gz ./mtr.nii.gz &
```

--

Spinal Cord Toolbox (5.7)

```
sct_extract_metric -i mtr.nii.gz -f label/atlas -method map -l 50  
-vert 2:4 -vertfile label/template/PAM50_levels.nii.gz -z 3:18 -o csv/  
mtr_cord.csv -append 0  
--
```

Load metric image...

Estimation for label: spinal cord

Done! To view results, type:

```
open csv/mtr_cord.csv
```

--

Spinal Cord Toolbox (5.7)

```
sct_extract_metric -i mtr.nii.gz -f label/atlas -method map -l 52  
-vert 2:4 -vertfile label/template/PAM50_levels.nii.gz -z 3:18 -o csv/  
mtr_gm.csv -append 0  
--
```

Load metric image...

Estimation for label: gray matter

Done! To view results, type:

```
open csv/mtr_gm.csv
```

--

Spinal Cord Toolbox (5.7)

```
sct_extract_metric -i mtr.nii.gz -f label/atlas -method map -l 51  
-vert 2:4 -vertfile label/template/PAM50_levels.nii.gz -z 3:18 -o csv/  
mtr_wm.csv -append 0  
--
```

Load metric image...
Estimation for label: white matter

Done! To view results, type:
open csv/mtr_wm.csv

--
Spinal Cord Toolbox (5.7)

```
sct_extract_metric -i mtr.nii.gz -f label/atlas -method map -l 53  
-vert 2:4 -vertfile label/template/PAM50_levels.nii.gz -z 3:18 -o csv/  
mtr_dc.csv -append 0  
--
```

Load metric image...
Estimation for label: dorsal columns

Done! To view results, type:
open csv/mtr_dc.csv

--
Spinal Cord Toolbox (5.7)

```
sct_extract_metric -i mtr.nii.gz -f label/atlas -method map -l 54  
-vert 2:4 -vertfile label/template/PAM50_levels.nii.gz -z 3:18 -o csv/  
mtr_lf.csv -append 0  
--
```

Load metric image...
Estimation for label: lateral funiculi

Done! To view results, type:
open csv/mtr_lf.csv

--
Spinal Cord Toolbox (5.7)

```
sct_extract_metric -i mtr.nii.gz -f label/atlas -method map -l 55  
-vert 2:4 -vertfile label/template/PAM50_levels.nii.gz -z 3:18 -o csv/  
mtr_vf.csv -append 0  
--
```

```
Load metric image...  
Estimation for label: ventral funiculi
```

```
Done! To view results, type:  
open csv/mtr_vf.csv
```

```
/Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0: spine.sh  
finished at 22/05/2024_02:31:35 pm  
/Users/msresearch/Downloads/canproco/data/CAN-01-RRM-133-M0: spine.sh  
duration: 436 seconds  
(base) msresearch@MSs-MacBook-Pro Downloads %
```