

## CAF dataset for Allen Reference Atlas

The following description is related to Allen Reference Atlas CAF dataset available with the following links: [live preview](#), [dataset details](#).

Detailed description of volume preprocessing:

1. Fetch AtlasAnnotation25.sva sparse volume file from [ABA Website](#).
2. Coordinates in this volume are expressed in Mouse ABAvoxel 1.0 (ABAvoxel, INCF:0100) SRS, in which units of measurements are voxels. In order to express coordinates in stereotaxic coordinates (with bregma point as origin of the coordinate system), the volume has to be transformed into Mouse ABReference 1.0 SRS (ABReference, INCF:0101).
3. Such transformation is given by the [TransfomPOI INCF DAI](#) service (ie. [this request](#)).
4. Transformation may be calculated from 4 points in ABAvoxel SRS ( $p_1, p_2, p_3, p_4$ ) and 4 corresponding point in ABReference SRS ( $p_1', p_2', p_3', p_4'$ ) by solving following equation:

After all, matrix  $M$  is:

```
M=  
[[ 2.71693750e-02 -8.17542750e-05 -5.01197500e-04 -1.25701700e+00]  
 [ 8.92628250e-04 2.82020000e-02 -2.71143000e-04 -1.28628500e+00]  
 [-5.86774750e-04 -8.96920500e-04 -2.59281250e-02 6.04778000e+00]  
 [ 0.00000000e+00 1.73472348e-18 0.00000000e+00 1.00000000e+00]]
```

and  $M'$ :

```
M'=  
[[ 1.00000000e+00 -2.89888217e-03 -1.93302640e-02 -1.25701700e+00]  
 [ 3.28542063e-02 1.00000000e+00 -1.04574858e-02 -1.28628500e+00]  
 [-2.15969175e-02 -3.18034359e-02 -1.00000000e+00 6.04778000e+00]  
 [ 0.00000000e+00 6.15106544e-17 0.00000000e+00 1.00000000e+00]]
```

Then, initial volume from AtlasAnnotation25.sva is transformed using  $M'$  and the resulting volume is used by the 3dBAR parser to create CAF dataset.

Below you may find comparison of brain outlines created using raw volume (dark gray) and volume after transformation (light gray):