A simple and widely used method to read and use nifti files like the Julich-Brain Atlas is the Statistical Parametric Mapping Toolbox (SPM), which can be integrated into Matlab for free.

For this we first check if SPM is integrated in Matlab. In the output there should be a line "Statistical Parametric Mapping Toolbox".

If this is not the case, please install SPM first.

```
ver
```

```
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MATLAB Version: 9.10.0.1739362 (R2021a) Update 5
MATLAB License Number: xxx
Operating System: Microsoft Windows 10 Enterprise Version 10.0 (Build 19043)
Java Version: Java 1.8.0_202-b08 with Oracle Corporation Java HotSpot(TM) 64-Bit Server VM
mixed mode
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MATLAB                                                Version 9.10        (R2021a)
Image Processing Toolbox                              Version 11.3        (R2021a)
Signal Processing Toolbox                             Version 8.6         (R2021a)
Statistical Parametric Mapping                        Version 7771        (SPM12)
Statistics and Machine Learning Toolbox               Version 12.1        (R2021a)
```

First load the header information of the 4D nifti file

```
julich_brain_colin27_v2_9=spm_vol('JULICH_BRAIN_CYTOARCHITECTONIC_MAPS_2_9_MNI1
52_2009C_NONL_ASYM.pmaps.nii');
```

julich_brain_colin27_v2_9 is a struct array with 302 fields. The 302 fields result from the fact that probability maps of 151 areas are included, each separated by left and right hemisphere.

The indexes of the maps and their HBP labels are stored in the appropriate text file (JULICH_BRAIN_CYTOARCHITECTONIC_MAPS_2_9_MNI152_2009C_NONL_ASYM.txt).

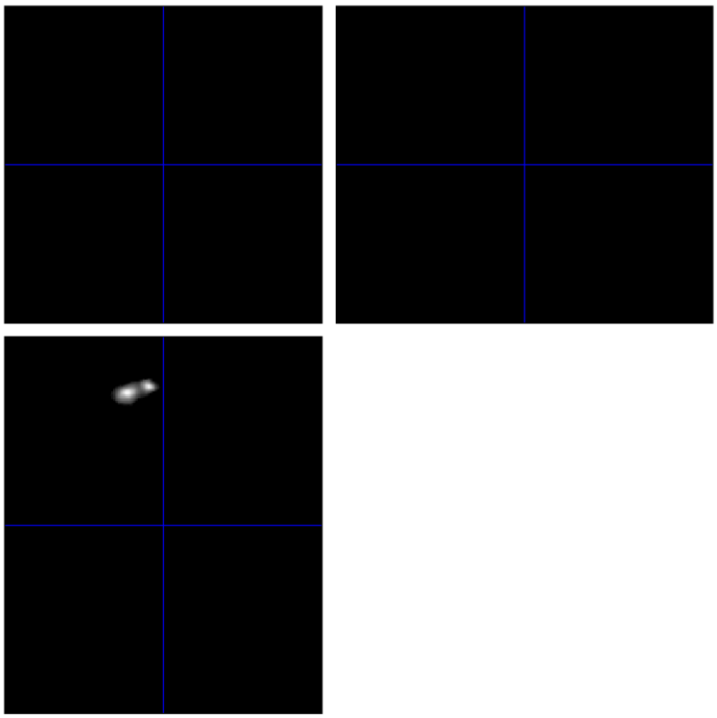
For example, if we want to load the map for the left frontal pole, the following line of the text file is relevant for us:

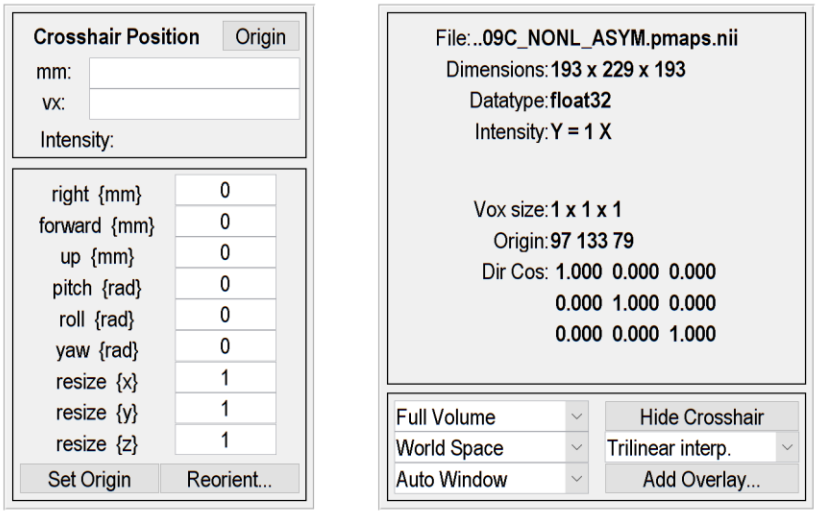
"131 Area Fp1 (FPole) left".

The probability map of the area Fp1 (FPole) of the left hemisphere has the index 131. Use e.g. spm_image() to display the map in an interactive window.

```
spm_image('Display',julich_brain_colin27_v2_9(131));
```

```
SPM12: spm_image (v7573)                              16:04:03 - 04/10/2021
========================================================================
Display JULICH_BRAIN_CYTOARCHITECTONIC_MAPS_2_9_MNI152_2009C_NONL_ASYM.pmaps.nii,131
```



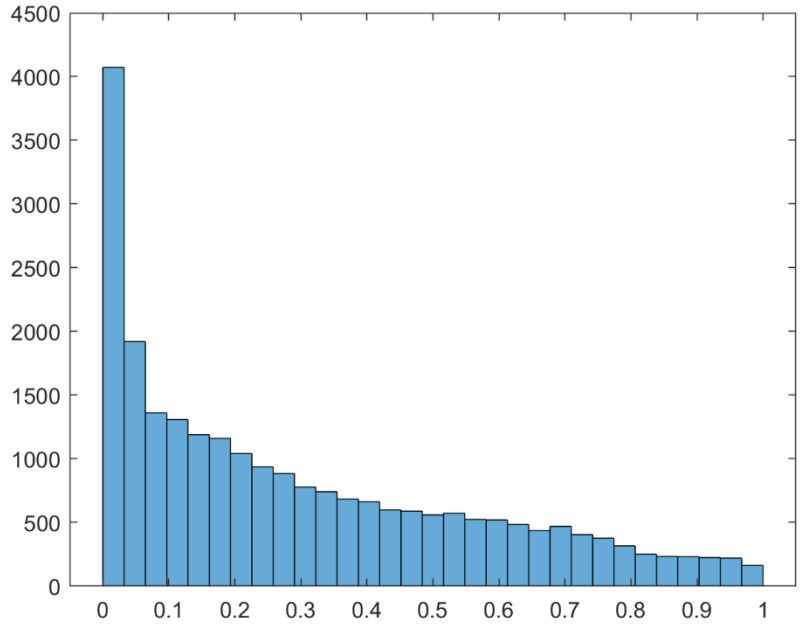


Furthermore, the volume of the probability map can be loaded to query simple statistical values.

```
%read the volume of area Fp1 l
volume_fp1_l=spm_read_vols(julich_brain_colin27_v2_9(131));
%check the dimensions of the dataset
size(volume_fp1_l)
```

```
ans = 1×3
   193   229   193
```

```
% plot a histogram of the probability distribution
histogram(volume_fp1_l,'BinLimits',[0.0001,1])
```




```
% create binary mask of map to measure properties of 3-D volumetric image regions
bwMask = volume_fp1_l;
bwMask(bwMask>0)=1;

stats = regionprops3(bwMask,volume_fp1_l,'all');

for col = 1 : width(stats)
  stats(:, col)
end
```

ans = 1×1 table

	Volume
1	24018

ans = 1×1 table

	Centroid		
1	195.4160	78.0423	79.1550

ans = 1×1 table

	BoundingBox				...
1	180.5000	53.5000	48.5000	27	

ans = 1×1 table

	SubarrayIdx		
1	1×45 double	1×27 double	1×63 double

ans = 1×1 table

	Image
1	45×27×63 logical

ans = 1×1 table

	EquivDiameter
1	35.7970

ans = 1×1 table

	Extent
1	0.3138

ans = 1×1 table

	VoxelIdxList
1	24018×1 double

ans = 1×1 table

	VoxelList
1	24018×3 double

ans = 1×1 table

	PrincipalAxisLength		
1	53.7372	40.1096	18.3282

ans = 1×1 table

	Orientation		
1	-23.8714	81.7141	-129.2498

ans = 1×1 table

	EigenVectors
1	[-0.1318,0.9568,-0.2592;0.0583,0.2685,0.9615;0.9896,0.1116,-0.0912]

ans = 1×1 table

	EigenValues
1	[180.4802;100.5487;20.9953]

ans = 1×1 table

	ConvexHull
1	188×3 double

ans = 1×1 table

	ConvexImage
1	45×27×63 logical

ans = 1×1 table

	ConvexVolume
1	34301

ans = 1×1 table

	Solidity
1	0.7002

ans = 1×1 table

	SurfaceArea

	SurfaceArea
1	6.0494e+03

ans = 1×1 table

	VoxelValues
1	24018×1 double

ans = 1×1 table

	WeightedCentroid		
1	195.9198	78.2397	77.3710

ans = 1×1 table

	MeanIntensity
1	0.2972

ans = 1×1 table

	MinIntensity
1	1.6322e-07

ans = 1×1 table

	MaxIntensity
1	0.9998