

# Appendix 1: operational flow and python code for comparison of focal liver lesion (FLL) segmentations

## Operational flow

### 1. Segmentation of focal liver lesions

- (1) Open Insight Toolkit–SNAP (ITK-SNAP) 4.2.0 (1) and load the diffusion-weighted imaging (DWI) images ( $b=400 \text{ s/mm}^2$ ) containing the focal liver lesion (FLLs).
- (2) Delineate three layers of region of interest (ROIs) for each FLL, including the maximum layer and one layer above and below it.

### 2. Exporting ROIs

- (1) After segmentation, export the three-layer ROIs for each FLL.
- (2) Save the ROIs in NIfTI format for compatibility with Python scripts.

### 3. Calculation of the Dice similarity coefficient

- (1) Develop Python scripts to calculate the Dice similarity coefficient (DSC) between the corresponding ROIs of two FLLs.
- (2) Use the DSC formula to compute the overlap between the two ROIs:

$$DSC = \frac{2 \times |ROI_1 \cap ROI_2|}{|ROI_1| + |ROI_2|}$$

where  $ROI_1$  and  $ROI_2$  are the binary masks of the two ROIs, and  $\cap$  denotes the intersection operation.

- (3) Repeat the DSC calculation for all pairs of corresponding ROIs.

### 4. Comparison of segmentations

- (1) Use the computed DSC values to quantify the

- agreement between the segmentations of the FLLs.
- (2) Higher DSC values indicate greater spatial overlap, suggesting more agreement in the delineation of the FLLs.

## Python code for calculating the DSC

```
import nibabel as nib
import numpy as np

def load_nii(file_path):
    img = nib.load(file_path)
    data = img.get_fdata()
    return data

# Load the ROIs
roi1_path = r'PATH_TO_ROI1.nii.gz'
roi2_path = r'PATH_TO_ROI2.nii.gz'

roi1 = load_nii(roi1_path)
roi2 = load_nii(roi2_path)

# Flatten the ROIs to binary masks
roi1_mask = roi1.astype(bool)
roi2_mask = roi2.astype(bool)

# Calculate the DICE coefficient
intersection = np.sum(roi1_mask & roi2_mask)
dice_coefficient = 2.0 * intersection / (np.sum(roi1_mask) + np.sum(roi2_mask))

print(f"DICE coefficient: {dice_coefficient}")
```

Note: Please replace `PATH_TO_ROI1.nii.gz` and `PATH_TO_ROI2.nii.gz` with the actual paths to your ROI files.

**Table S1** The interreader agreement between the radiologists for image quality on SMS-DWI and CON-DWI

Category	SMS-DWI		Kappa	CON-DWI		Kappa
	Reader 1	Reader 2		Reader 1	Reader 2	
Overall image quality						
b=50 s/mm <sup>2</sup>	4.61 (4–5)	4.56 (4–5)	0.762 (0.670–0.890)	4.60 (4–5)	4.55 (4–5)	0.737 (0.618–0.847)
b=400 s/mm <sup>2</sup>	4.26 (4–5)	4.24 (4–5)	0.739 (0.632–0.862)	4.28 (4–5)	4.25 (4–5)	0.713 (0.587–0.833)
b=800 s/mm <sup>2</sup>	3.85 (3–4)	3.81 (3–4)	0.611 (0.464–0.752)	3.87 (3–4)	3.84 (3–4)	0.654 (0.519–0.790)
Clarity of intrahepatic vessels						
b=50 s/mm <sup>2</sup>	4.32 (4–5)	4.27 (4–5)	0.767 (0.691–0.827)	4.39 (4–5)	4.26 (4–5)	0.627 (0.507–0.763)
b=400 s/mm <sup>2</sup>	3.95 (3–4)	3.92 (3–4)	0.724 (0.605–0.842)	3.93 (3–4)	3.91 (3–4)	0.721 (0.607–0.843)
b=800 s/mm <sup>2</sup>	3.54 (3–4)	3.50 (3–4)	0.783 (0.708–0.882)	3.55 (3–4)	3.50 (3–4)	0.762 (0.658–0.867)
Sharpness of hepatic edge						
b=50 s/mm <sup>2</sup>	4.51 (4–5)	4.45 (4–5)	0.722 (0.608–0.835)	4.50 (4–5)	4.47 (4–5)	0.696 (0.576–0.817)
b=400 s/mm <sup>2</sup>	4.23 (4–5)	4.12 (4–5)	0.742 (0.633–0.848)	4.27 (4–5)	4.13 (4–5)	0.703 (0.585–0.813)
b=800 s/mm <sup>2</sup>	3.86 (3–4)	3.71 (3–4)	0.609 (0.479–0.728)	3.87 (3–4)	3.70 (3–4)	0.654 (0.534–0.762)
Artifacts						
b=50 s/mm <sup>2</sup>	3.98 (3–4)	3.97 (3–4)	0.693 (0.619–0.817)	3.99 (3–4)	3.98 (3–4)	0.630 (0.345–0.884)
b=400 s/mm <sup>2</sup>	3.91 (3–4)	3.88 (3–4)	0.781 (0.595–0.945)	3.93 (3–4)	3.91 (3–4)	0.624 (0.411–0.844)
b=800 s/mm <sup>2</sup>	3.80 (3–4)	3.82 (3–4)	0.681 (0.514–0.849)	3.85 (3–4)	3.82 (3–4)	0.661 (0.491–0.831)
Lesion conspicuity						
b=50 s/mm <sup>2</sup>	4.72 (4–5)	4.74 (4–5)	0.861 (0.759–0.976)	4.71 (4–5)	4.73 (4–5)	0.830 (0.716–0.944)
b=400 s/mm <sup>2</sup>	4.49 (4–5)	4.50 (4–5)	0.853 (0.780–0.937)	4.46 (4–5)	4.47 (4–5)	0.831 (0.739–0.906)
b=800 s/mm <sup>2</sup>	4.15 (4–5)	4.12 (4–5)	0.878 (0.792–0.936)	4.09 (3–5)	4.06 (3–5)	0.837 (0.746–0.924)

The subjective scores of a 5-point scale are presented as the mean (interquartile range). The intra- and interreader agreement of subjective scores of a 5-point scale for SMS-DWI and CON-DWI was assessed using the kappa statistic. SMS, simultaneous multislice; DWI, diffusion-weighted imaging; CON, conventional.

**Table S2** The ICC of intra- and interreader agreement between the radiologists for the SNR and CNR measurements on SMS-DWI and CON-DWI

Parameter	SMS-DWI			CON-DWI		
	Intrareader		Interreader	Intrareader		Interreader
	Reader 1	Reader 2		Reader 1	Reader 2	
SNR	0.818 (0.785–0.844)	0.821 (0.805–0.851)	0.763 (0.654–0.829)	0.810 (0.791–0.837)	0.807 (0.784–0.831)	0.758 (0.668–0.809)
CNR	0.803 (0.773–0.831)	0.801 (0.768–0.824)	0.779 (0.680–0.858)	0.792 (0.765–0.818)	0.812 (0.796–0.844)	0.761 (0.675–0.810)

The data are presented as the point estimate (95% confidence interval). The intra- and interreader agreement of the SNR and CNR measurements for SMS-DWI and CON-DWI was assessed using the intraclass correlation coefficient. SNR, signal-to-noise ratio; CNR, contrast-to-noise ratio; SMS, simultaneous multislice; DWI, diffusion-weighted imaging; CON, conventional; ICC, intraclass correlation coefficients.

**Table S3** The ICC of intra- and interreader agreement between the radiologists for ADC measurements on SMS-DWI and CON-DWI

Lesion type	SMS-DWI			CON-DWI			P value
	Intrareader		Interreader	Intrareader		Interreader	
	Reader 1	Reader 2		Reader 1	Reader 2		
All lesions	0.938 (0.915–0.964)	0.928 (0.902–0.941)	0.857 (0.768–0.916)	0.917 (0.885–0.942)	0.924 (0.909–0.935)	0.835 (0.762–0.889)	0.004*
Solid lesions	0.944 (0.925–0.973)	0.916 (0.876–0.948)	0.839 (0.721–0.871)	0.928 (0.910–0.942)	0.919 (0.882–0.958)	0.776 (0.691–0.832)	0.002*
Other lesions	0.930 (0.912–0.946)	0.929 (0.911–0.943)	0.861 (0.774–0.919)	0.900 (0.865–0.928)	0.931 (0.914–0.950)	0.860 (0.771–0.895)	0.540

The data are presented as the point estimate (95% confidence interval). The intra- and interreader agreement of ADC measurements for SMS-DWI and CON-DWI was assessed using the ICC. The P values were calculated as a comparison of the average ADC measurements between SMS-DWI and CON-DWI. \*, statistically significant ( $P < 0.05$ ). Solid lesions include all lesions except hemangiomas and cysts. Other lesions specifically refer to hemangiomas and cysts. ICC, intraclass correlation coefficient; ADC, apparent diffusion coefficient; SMS, simultaneous multislice; DWI, diffusion-weighted imaging; CON, conventional.

**Table S4** The DSC of ROI segmentations on SMS-DWI and CON-DWI between the radiologists

Lesion type	SMS-DWI	CON-DWI	P value
All lesions	0.777 (0.756–0.800)	0.773 (0.751–0.794)	0.101
Solid lesions	0.752 (0.691–0.810)	0.749 (0.684–0.801)	0.124
Other lesions	0.789 (0.762–0.801)	0.785 (0.756–0.802)	0.582

DSC are presented as the mean (interquartile range). The DSC for ROI segmentations from SMS-DWI and CON-DWI was assessed using the Wilcoxon signed-rank test. Solid lesions include all lesions except hemangiomas and cysts. Other lesions specifically refer to hemangiomas and cysts. DSC, Dice similarity coefficient; ROI, region of interest; SMS, simultaneous multislice; DWI, diffusion-weighted imaging; CON, conventional.