# Self-supervised Denoising and Bulk Motion Artifact Removal of 3D Optical Coherence Tomography Angiography of Awake Brain

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**Table 1.** Comparison of the influence of the normal B-scan selection threshold.

|  | Normal B-scans | | | | Corrupted B-scans | | | |
|---|---|---|---|---|---|---|---|---|
|  | CNR | MSR | Dice | Dice$_s$ | CNR | MSR | Dice | Dice$_s$ |
| 1∗std | **14.60** | 14.63 | 87.93 | 69.94 | **15.33** | 17.12 | 87.17 | 65.04 |
| 1.5∗std | 14.50 | 15.28 | **88.18** | **70.52** | 14.92 | 17.63 | **87.64** | **65.91** |
| 2∗std | 14.56 | 15.62 | 87.80 | 69.77 | 15.04 | 18.22 | 87.30 | 65.29 |
| w/o selection | 14.24 | **15.69** | 87.67 | 69.51 | 13.75 | **19.09** | 84.81 | 60.79 |
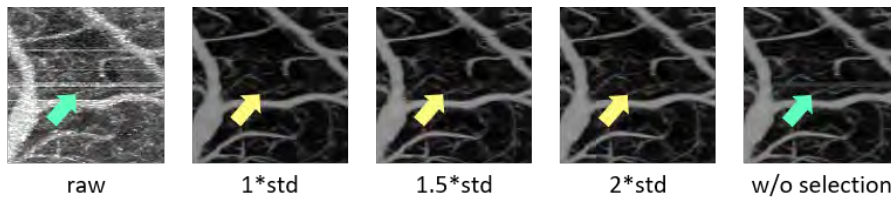


**Fig. 1.** Comparison of normal B-scan selection thresholds. Stripes are marked by green arrows, and removed stripes are marked by yellow arrows. With reasonable thresholds for normal B-scan selection for training, SOAD can remove the BMA in several consecutive corrupted B-scans. However, without normal B-scan selection, SOAD may not be effective in removing BMA in such cases.

**Table 2.** Comparison of the influence of $\alpha$ in the weighted loss.

| | Normal B-scans | | | | Corrupted B-scans | | | |
|---|---|---|---|---|---|---|---|---|
| | CNR | MSR | Dice | Dice$_s$ | CNR | MSR | Dice | Dice$_s$ |
| $\alpha = 10$ | 14.31 | **15.71** | 87.93 | 69.97 | 14.76 | **17.94** | 87.20 | 65.23 |
| $\alpha = 100$ | **14.50** | 15.28 | **88.18** | **70.52** | **14.92** | 17.63 | **87.64** | **65.91** |
| $\alpha = 1000$ | 14.27 | 14.67 | 88.00 | 70.31 | 14.76 | 16.70 | 87.45 | 65.46 |

**Table 3.** Comparison of the influence of $\gamma$ in the weighted loss.

| | Normal B-scans | | | | Corrupted B-scans | | | |
|---|---|---|---|---|---|---|---|---|
| | CNR | MSR | Dice | Dice$_s$ | CNR | MSR | Dice | Dice$_s$ |
| $\gamma = 1$ | 14.06 | 14.32 | 87.98 | 70.07 | 14.36 | 16.64 | 86.90 | 64.43 |
| $\gamma = 1/2$ | 14.14 | 14.57 | 88.09 | 70.47 | 14.62 | 16.70 | 87.41 | 65.54 |
| $\gamma = 1/3$ | **14.50** | **15.28** | **88.18** | **70.52** | **14.92** | **17.63** | 87.64 | 65.91 |
| $\gamma = 1/5$ | 14.27 | 14.68 | 87.85 | 69.82 | 14.75 | 16.69 | **87.66** | **66.10** |

**Table 4.** Comparison of the influence of the window size $T$.

| | Normal B-scans | | | | Corrupted B-scans | | | |
|---|---|---|---|---|---|---|---|---|
| | CNR | MSR | Dice | Dice$_s$ | CNR | MSR | Dice | Dice$_s$ |
| $T = 5$ | 13.87 | 14.24 | 87.55 | 69.10 | 14.32 | 16.52 | 86.98 | 64.16 |
| $T = 7$ | **14.50** | **15.28** | **88.18** | **70.52** | **14.92** | **17.63** | **87.64** | **65.91** |
| $T = 9$ | 13.91 | 14.62 | 87.83 | 69.86 | 14.36 | 16.79 | 87.33 | 65.86 |



(a) Raw                    (b) SOAD (S)
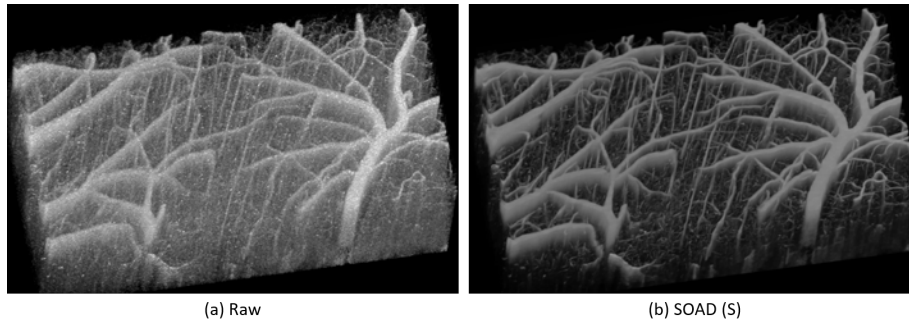
**Fig. 2.** 3D visualization of the raw volume and SOAD (S) results. SOAD can effectively remove the noise in OCTA volumes and improve the 3D visual quality of the volume.