

A. Per-Class analysis Table

Model	BT	IS	IC	IW	KP	CK	S-Intes	Thread	Clamps	SN	SI	UP
U-Net	0.65	0.72	0.37	0.45	0.43	0.07	0.70	0.38	0.76	<u>0.91</u>	0.70	0.18
DeeplabV3+	<u>0.68</u>	0.69	0.59	<u>0.55</u>	0.58	0.53	0.50	0.45	0.57	0.55	0.58	0.54
Mask-RCNN	<u>0.68</u>	0.82	<u>0.40</u>	0.56	<u>0.64</u>	0.18	0.00	0.03	0.45	0.00	0.00	0.43
TransUnet	0.59	0.60	0.32	0.33	0.01	1.00	0.61	0.04	0.64	0.63	0.61	0.48
SegFormer	0.48	0.15	0.12	0.18	0.05	0.52	1.00	<u>0.90</u>	0.93	0.91	1.00	<u>0.77</u>
MedT	0.40	0.54	0.16	0.44	0.82	0.96	0.84	<u>0.90</u>	0.61	0.78	<u>0.84</u>	0.65
SNN	0.60	0.60	0.40	0.30	0.35	0.20	0.35	0.17	0.45	0.30	0.32	0.40
HERS	0.58	0.55	0.44	0.40	0.48	0.52	0.38	0.28	0.50	0.42	0.46	0.41
BRDG	0.69	<u>0.76</u>	0.29	0.43	0.52	<u>0.55</u>	<u>0.90</u>	0.94	<u>0.91</u>	0.99	0.78	0.89

Table 4. Per-class Intersection over Union (IoU) analysis on EndoVis2018 parts (Including Anatomy and tools parts) dataset. BT: Background Tissue, IS: Instrument Shaft, IC: Instrument Clasper, IW: Instrument Wrist, KP: Kidney Parenchyma, CK: Covered Kidney, S-Intes: Small Intestine, SN: Suturing-Needle, SI: Suction Instrument, UP: Ultrasound Probe. Bold indicates highest IoU per class; underlined indicates second highest.

Model	BF	PF	LND	SI	CA	MCS	UP
U-Net	0.66	0.18	0.48	0.74	0.80	0.67	0.62
DeepLabv3+	0.82	0.70	0.66	0.83	<u>0.92</u>	0.78	0.78
Mask-RCNN	0.55	0.40	0.32	0.50	0.58	0.45	0.42
TransUNet	0.60	0.48	0.42	0.55	0.65	0.50	0.48
SegFormer	0.11	<u>0.87</u>	0.82	<u>0.85</u>	0.95	0.27	0.97
MedT	0.58	0.50	0.45	0.60	0.70	0.55	0.52
SSN	0.45	0.40	0.32	0.48	0.55	0.38	0.37
HERS	0.70	0.68	0.60	0.72	0.82	<u>0.75</u>	0.68
BRDG	0.86	0.90	0.84	0.88	0.90	0.88	<u>0.89</u>

Table 5. Per-class Intersection over Union (IoU) analysis on EndoVis2018 dataset tools type. BF: Bipolar Forceps, PF: Prograsp Forceps, LND: Large Needle Driver, SI: Suction Instrument, CA: Clip Applier, MCS: Monopolar Curved Scissors, UP: Ultrasound Probe. Bold indicates highest IoU per class; underlined indicates second highest.

Model	BF	PF	LND	VS	GR	MCS	UP
U-Net	0.48	0.28	0.38	0.46	0.50	0.44	0.40
DeepLabv3+	0.70	0.66	0.58	0.72	<u>0.78</u>	0.64	0.64
Mask-RCNN	0.40	0.32	0.26	0.34	0.38	0.30	0.28
TransUNet	0.45	0.38	0.32	0.40	0.44	0.35	0.34
SegFormer	0.68	0.70	<u>0.62</u>	<u>0.74</u>	0.76	<u>0.67</u>	<u>0.70</u>
MedT	0.53	0.46	0.40	0.48	0.52	0.45	0.44
SSN	0.32	0.28	0.22	0.30	0.33	0.24	0.25
HERS	0.60	0.55	0.48	0.58	0.62	0.52	0.50
BRDG	0.82	0.84	0.76	0.86	0.88	0.80	0.85

Table 6. Per-class Intersection over Union (IoU) analysis on EndoVis2017 dataset tools. BF: Bipolar Forceps, PF: Prograsp Forceps, LND: Large Needle Driver, VS: Vessel Sealer, GR: Grasping Retractor, MCS: Monopolar Curved Scissors, UP: Ultrasound Probe. Bold indicates highest IoU per class; underlined indicates second highest.

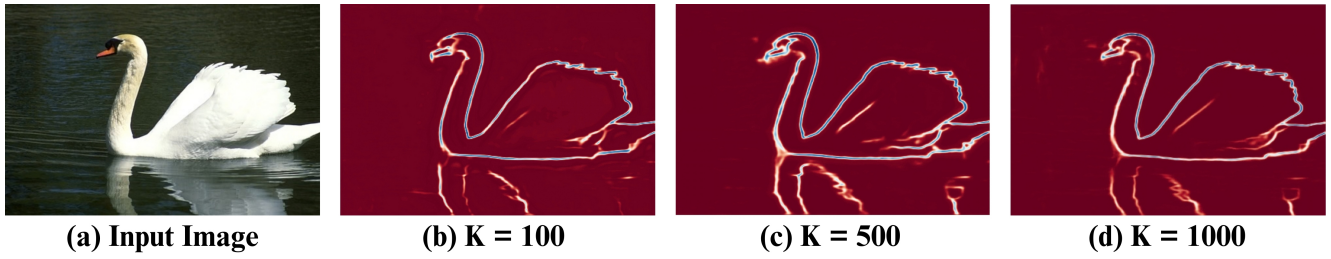


Figure 7. Effect of the number of superpixels (K) on the BRDG's performance on the BSDS500 dataset, measured using Boundary Recall (BF)

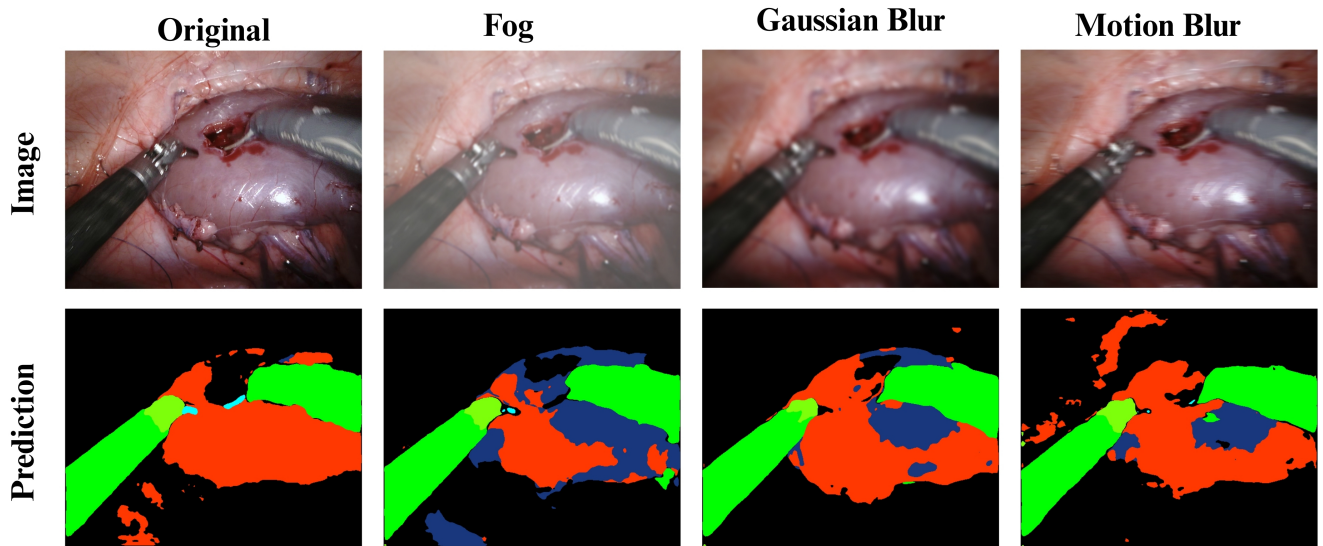


Figure 8. BRDG performance on augmented images

B. Code

GitHub link: <https://github.com/fatma936-sudo/BRDG>