

Supplementary Material

I. HYPERPARAMETER TUNING EXPERIMENTS

Different loss functions and number of parameters were explored in training MimickNet. The number of parameters were varied by changing the number of filters used at each of the 5 depths in our model. At each depth, two convolutional layers are performed using the number of filters chosen for that depth. No LeakyReLU activations were used, only ReLU activations.

In gray-box training, all models training under SSIM loss achieved a mean SSIM of above 0.967. Training was stable and robust to variation in the number filters and loss chosen.

In black-box training, we observed convergence issues which are common to training GANs unless LeakyReLU activations were used. With the inclusion of LeakyReLU, we use the 52993 model in subsequent analysis.

TABLE I

FILTERS USED AT EACH OF THE 5 DEPTHS IN THE GENERATOR MODEL.

Params	Filters	Shape
13377	8-8-8-8-8	3×3
29601	8-8-8-8-8	7×3
34849	8-8-16-16-16	3×3
52993	16-16-16-16-16	3×3
77185	8-8-16-16-16	7×3
117697	16-16-16-16-16	7×3
330401	16-16-32-64-64	3×3
733025	16-16-32-64-64	7×3

TABLE II

GRAY-BOX HYPERPARAMETER RESULTS. THE MEAN AND STANDARD DEVIATION ACROSS A VALIDATION SET IS SHOWN BELOW. BEST AVERAGE METRICS ARE EMPHASIZED IN BOLD.

Loss	Params	MSE 10^{-3}	MAE 10^{-2}	PSNR	SSIM
ssim	13377	2.78±3.22	3.97±2.40	27.4±3.9	0.967±0.015
mse	13377	2.40±2.65	3.76±2.00	27.7±3.4	0.947±0.022
mae	13377	2.51±2.86	3.83±2.13	27.6±3.5	0.946±0.018
ssim	29601	2.63±3.10	3.91±2.40	27.9±4.0	0.967±0.015
mse	29601	2.19±2.25	3.61±1.81	27.9±3.2	0.940±0.019
mae	29601	3.46±3.20	4.58±2.16	25.7±3.0	0.895±0.028
ssim	34849	2.49±2.88	3.78±2.28	27.9±3.9	0.975±0.013
mse	34849	2.27±2.41	3.67±1.92	27.9±3.3	0.950±0.019
mae	34849	2.31±2.54	3.68±1.96	27.9±3.4	0.951±0.016
ssim	52993	2.28±2.77	3.65±2.24	28.5±4.2	0.979±0.013
mse	52993	2.19±2.40	3.60±1.92	28.1±3.4	0.956±0.017
mae	52993	2.11±2.35	3.52±1.89	28.3±3.4	0.959±0.015
ssim	77185	2.38±2.91	3.70±2.28	28.3±4.0	0.976±0.015
mse	77185	2.02±2.09	3.46±1.70	28.3±3.2	0.946±0.022
mae	77185	2.14±2.23	3.55±1.80	28.0±3.2	0.947±0.020
ssim	117697	2.22±2.65	3.59±2.11	28.4±3.9	0.977±0.014
mse	117697	2.72±2.51	4.07±1.95	26.9±3.1	0.931±0.023
mae	117697	2.93±2.93	4.18±2.11	26.7±3.3	0.927±0.022
ssim	330401	2.25±2.79	3.61±2.22	28.6±4.1	0.977±0.013
mse	330401	2.15±2.20	3.58±1.83	28.1±3.4	0.958±0.016
mae	330401	2.23±2.42	3.61±1.89	28.0±3.4	0.958±0.016
ssim	733025	2.63±3.06	3.93±2.33	27.7±4.0	0.967±0.015
mse	733025	2.40±2.51	3.79±1.97	27.7±3.4	0.945±0.023
mae	733025	2.80±2.83	4.09±2.04	26.9±3.2	0.927±0.022

II. PUBLIC AND PRIVATE DATA SPLIT

To better facilitate reproducibility, we have released a public dataset available on tensorflow datasets which consists only of phantoms and ultrasound images of Dr. Mark Palmeri. We provide model metrics of MimickNet only trained on phantom data, and model metrics if private *in vivo* images are included.

TABLE III

MODELS TRAINED ON DIFFERENT SUBSETS OF DATA. MEAN AND STANDARD DEVIATION ACROSS A TEST SET ARE SHOWN BELOW.

Subset	SSIM	PSNR
Private Training		
All	0.94 ± 0.014	31.95 ± 2.04
Graybox All	0.96 ± 0.012	32.86 ± 1.82
Phantom	0.95 ± 0.007	33.50 ± 1.43
Mark	0.96 ± 0.005	33.12 ± 0.92
Public Training		
Phantom	0.90 ± 0.015	31.40 ± 2.76
Mark	0.91 ± 0.005	31.43 ± 0.69

III. MEDIA

Other media is provided in a .zip file which include the following:

- Image Frame Granularity Metadata
- Image Frame Granularity Metrics
- GIF and Public Data
- Dockerized Code

IV. SELECT METRICS

We provide SSIM, PSNR, MAE, and MSE metrics for images displayed in Fig. 5 from top to bottom. Frame level metrics granularity of all test images in the Image Frame Granularity Metrics .csv file.

TABLE IV

FIG. 5 MIMICKNET METRICS FROM TOP TO BOTTOM.

MSE 10^{-3}	MAE 10^{-2}	PSNR	SSIM	CS	L
6.10	6.84	22.15	0.74	0.93	0.79
4.16	4.72	23.81	0.83	0.93	0.89
3.84	4.53	24.16	0.86	0.93	0.92
8.51	8.91	20.70	0.92	0.96	0.96
2.45	4.32	26.11	0.95	0.95	0.99