Supplimentary Materials

1 Full block search results

We choose the following weighting schemes broadly sample all combinations of three decimal values that sum to one. The first is the *equal scheme*, where each weight has the same value: $\frac{1}{3}$, $\frac{1}{3}$, and $\frac{1}{3}$. We also call this equal scheme combination *Naive REBIS*, since it is a naive approach to making a combination of loss function components. The second is the *nearly equal scheme*, which strives to be close to the equal scheme while still summing to one: 0.3, 0.3, and 0.4. The third is the *one lower scheme*, in which one weight is notably lower than the other two (equivalent to testing two higher): 0.2, 0.4, and 0.4. The fourth is the *progressive scheme*, where the weights cover a range of values: 0.2, 0.3, and 0.5. The last is the *one higher scheme*, in which one weight is notably higher than the other two (equivalent to testing two lower): 0.2, 0.2, and 0.6.

The results can be seen in Tables 1 and 2

Table 1. The full AUROC and ECE scores for all 19 models examined in this paper for synthetic face detection. The models using published weights are separated from the REBIS variations. In both sections the highest performing value in each category is highlighted

WEIGHTING	MODEL	α	β	γ	AUROC	ECE	Epsilon at 50% accuracy
Published	Cross entropy	1.0	-	-	0.562±0.05	0.094±0.01	0.274±0.06
Published	DROID	0.56	0.44	-	**0.730±0.01**	0.103±0.01	0.465±0.17
Published	NGEBM	0.5	0.5	-	0.689±0.02	**0.086±0.01**	**3.400±1.23**
Equal	(Naive) REBIS	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	0.720±0.02	0.088±0.01	1.528±0.46
Near equal	REBIS	0.3	0.3	0.4	0.731±0.02	0.089±0.01	1.805±0.52
Near equal	REBIS	0.3	0.4	0.3	0.731±0.01	0.090±0.01	1.691±0.73
Near equal	REBIS	0.4	0.3	0.3	0.726±0.01	0.096±0.00	1.662±0.32
One lower	REBIS	0.2	0.4	0.4	0.715±0.02	0.085±0.01	1.881±0.57
One lower	REBIS	0.4	0.2	0.4	0.717±0.02	0.092±0.01	1.766±0.52
One lower	REBIS	0.4	0.4	0.2	0.729±0.02	0.097±0.00	1.598±0.21
Progressive	REBIS	0.2	0.3	0.5	**0.738±0.02**	0.076±0.01	2.002±0.49
Progressive	REBIS	0.2	0.5	0.3	0.727±0.02	0.093±0.01	1.872±0.63
Progressive	REBIS	0.3	0.2	0.5	0.731±0.01	0.085±0.01	2.147±0.90
Progressive	REBIS	0.3	0.5	0.2	0.736±0.02	0.097±0.00	1.487±0.20
Progressive	REBIS	0.5	0.2	0.3	0.711±0.02	0.093±0.01	1.637±0.58
Progressive	REBIS	0.5	0.3	0.2	0.705±0.02	0.098±0.00	1.416±0.16
One higher	(Optimal) REBIS	0.2	0.2	0.6	**0.738±0.02**	**0.065±0.01**	**2.232±0.65**
One higher	REBIS	0.2	0.6	0.2	0.730±0.03	0.095±0.01	1.920±1.77
One higher	REBIS	0.6	0.2	0.2	0.698±0.03	0.092±0.01	1.521±0.11

In Table 1 we see the block search results of REBIS weights according to our five weighting schemes for synthetic face detection. We find the optimal weights for REBIS are the "one higher" weighting scheme focused on NGEBM ($\alpha = 0.2$,

Table 2. The full AUROC and ECE scores for all 19 models examined in this paper for chest X-rays. The models using published weights are separated from the REBIS variations. In both sections the highest performing value in each category is highlighted

WEIGHTING	MODEL	α	β	γ	AUROC	ECE	Epsilon at 50% accuracy
Published	Cross Entropy	1.0	-	-	**0.866±0.00**	0.095±0.04	0.232±0.14
Published	DROID	0.56	0.44	-	0.860±0.01	**0.037±0.01**	0.215±0.21
Published	NGEBM	0.5	0.5	-	0.864±0.01	0.058±0.05	**5.125±5.85**
Equal	(Naive) REBIS	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	0.871±0.00	0.027±0.01	2.945±33.49
Near equal	(Optimal) REBIS	0.3	0.3	0.4	0.871±0.00	**0.017±0.01**	**7.250±3.23**
Near equal	REBIS	0.3	0.4	0.3	0.868±0.01	0.044±0.04	6.256±4.63
Near equal	REBIS	0.4	0.3	0.3	0.872±0.01	0.018±0.01	2.383±1.62
One lower	REBIS	0.2	0.4	0.4	0.861±0.00	0.054±0.01	4.265±4.92
One lower	REBIS	0.4	0.2	0.4	0.869±0.01	0.034±0.02	3.181±2.24
One lower	REBIS	0.4	0.4	0.2	0.868±0.01	0.022±0.01	1.790±1.33
Progressive	REBIS	0.2	0.3	0.5	0.859±0.01	0.049±0.01	2.295±3.77
Progressive	REBIS	0.2	0.5	0.3	0.848±0.01	0.054±0.01	2.826±1.89
Progressive	REBIS	0.3	0.2	0.5	0.867±0.01	0.023±0.01	6.561±12.90
Progressive	REBIS	0.3	0.5	0.2	0.869±0.00	0.021±0.01	3.523±1.90
Progressive	REBIS	0.5	0.2	0.3	0.875±0.00	0.024±0.01	2.166±0.89
Progressive	REBIS	0.5	0.3	0.2	0.874±0.00	0.024±0.01	1.643±1.06
One higher	REBIS	0.2	0.2	0.6	0.864±0.00	0.045±0.01	3.181±22.59
One higher	REBIS	0.2	0.6	0.2	0.859±0.01	0.051±0.01	1.744±1.99
One higher	REBIS	0.6	0.2	0.2	**0.877±0.00**	0.029±0.01	1.061±0.97

$\beta = 0.2$, $\gamma = 0.6$) which results in the highest performance of any REBIS for all three catagories: AUROC, ECE, and adversarial robustness.

In Table 2 we see the block search results of REBIS weights according to our five weighting schemes for chest X-ray anomaly dectection. Due to the small changes in AUROC, we prioritize choosing the Optimal REBIS to be the one with the best ECE and adversarial robustness. Thus, we find the Optimal REBIS uses the "Near Equal" weighting scheme focused on NGEBM ($\alpha = 0.3$, $\beta = 0.3$, $\gamma = 0.4$).