Supplementary material for DBT: A Detection Booster Training method for improving the accuracy of classifiers

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1 Ablation study on the position of Auxiliary Binary Classifiers (ABCs) for Face Recognition

In this section, we present ablation studies on choosing the Parameter Estimator Functions (PEFs) by attaching the ABCs to the middle and later layers of the Deep Convolutional Neural Networks (CNNs) for the Face Recognition problem. For the middle layer experiment, we attach the ABCs to the layers 15, 16, and 17 of the deep model and compute the L_{ABC} loss. For the later layer ABC experiment, we attach the ABCs to the last three layers of the network.

Table 1 shows the results of the ablation experiments on LFW, CALFW, and CPLFW datasets for DBT models trained using the MS1MV2 dataset. We find that the DBT model trained with ABCs on the first three layers (ABC-early) outperforms the other models to show that early ABCs are key to improving the feature representations that are fed to the deterministic discriminative functions (DDFs). Table 2 shows a similar trend with ABC-early models being superior to others on YTF, CFP-FP, and AgeDb-30 datasets. From the results, we find that discriminating the face data from non-face data in the early layers of the model provides rich features essential for the DDFs to extract the high-level features needed for face recognition. The results also corroborate with the notion of feature hierarchies learned in deep neural networks where low-level features are learned in the early layers and high-level features are learned in the later layers of the model.

Method (CosFace)	LFW	CALFW	CPLFW
DBT(ABC-early)	99.63	**94.58**	**89.43**
DBT(ABC-mid)	**99.66**	94.53	89.36
DBT(ABC-last)	99.65	94.35	89.10

Method (ArcFace)	LFW	CALFW	CPLFW
DBT(ABC-early)	**99.75**	**95.13**	**90.70**
DBT(ABC-mid)	99.66	94.70	89.61
DBT(ABC-last)	99.68	94.58	89.66

Table 1: Ablation study on the verification performance of DBT models trained using MS1MV2 on LFW, CALFW, CPLFW using CosFace (above) and ArcFace (below) loss.

Method (CosFace)	YTF	CFP-FP	AgeDb-30
DBT(ABC-early)	**97.23**	**96.05**	**95.18**
DBT(ABC-mid)	97.08	96.02	94.86
DBT(ABC-last)	97.18	95.86	94.85

Method (ArcFace)	YTF	CFP-FP	AgeDb-30
DBT(ABC-early)	**97.67**	**96.90**	**96.16**
DBT(ABC-mid)	97.29	96.41	95.38
DBT(ABC-last)	97.23	96.31	95.53

Table 2: Ablation study on the verification performance of DBT models trained using MS1MV2 on YTF, CFP-FP, AgeDb-30 using CosFace (above) and ArcFace (below) loss.