Understanding Regional and Stylistic Diversity in Chinese Rural Paper-Cutting Through Convolutional Neural Network-Based Image Classification

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Supplementary tables

Table S1. Hyperparameters of CNN models in regional classification tasks.

Model	Parameters to be optimized	Results	Package
EfficientNet_B1	The number of FC hidden layer: [2, 3, 4]	2	torch (2.3.1+cu118)
	The neurons of FC1 hidden layer: [1024, 512, 256, 128, 64, 32]	128	
	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.5	
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: Softmax	Softmax	
	The optimizer: Adam	Adam	
	The number of epochs: 500	500	
	The patience of early stopping: 10	10	
	The batch size of DataLoader: 16	16	
EffcientNet_B4	The number of FC hidden layer: [2, 3, 4]	2	torch (2.3.1+cu118)
	The neurons of FC1 hidden layer: [1024, 512, 256, 128, 64, 32]	128	
	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.5	
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: Softmax	Softmax	
	The optimizer: Adam	Adam	
	The number of epochs: 500	500	
	The patience of early stopping: 10	10	
	The batch size of DataLoader: 16	16	
MobileNet_v3_small	The number of FC hidden layer: [2, 3, 4]	2	torch (2.3.1+cu118)
	The neurons of FC1 hidden layer: [1024, 512, 256, 128, 64, 32]	128	

	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.5	
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: Softmax	Softmax	
	The optimizer: Adam	Adam	
	The number of epochs: 500	500	
	The patience of early stopping: 10	10	
	The batch size of DataLoader: 16	16	
MobileVit_ xx_small	The number of FC hidden layer: [2, 3, 4]	2	torch (2.3.1+cu118)
	The neurons of FC1 hidden layer: [1024, 512, 256, 128, 64, 32]	128	
	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.5	
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: Softmax	Softmax	
	The optimizer: Adam	Adam	
	The number of epochs: 500	500	
	The patience of early stopping: 10	10	
	The batch size of DataLoader: 16	16	
MobileVit_ x_small	The number of FC hidden layer: [2, 3, 4]	2	torch (2.3.1+cu118)
	The neurons of FC1 hidden layer: [1024, 512, 256, 128, 64, 32]	128	
	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.5	
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: Softmax	Softmax	
	The optimizer: Adam	Adam	
	The number of epochs: 500	500	
	The patience of early stopping: 10	10	

	The batch size of DataLoader: 16	16	

Table S2. Hyperparameters of CNN models in art style classification tasks.

Model	Parameters to be optimized	Results	Package
EfficientNet_B1	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.4	torch (2.3.1+cu118)
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The optimizer: Adam	Adam	
	The number of epochs: 1000	1000	
	The patience of early stopping: 20, 50	50	
	The batch size of DataLoader: 32	32	
EffcientNet_B4	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.4	torch (2.3.1+cu118)
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The optimizer: Adam	Adam	
	The number of epochs: 1000	1000	
	The patience of early stopping: 20,50	50	
	The batch size of DataLoader: 32	32	
	The number of FC hidden layer: [1, 2, 3]	1	
MobileNet_v3_small	The neurons of FC1 hidden layer: [1024, 512, 256, 128, 64, 32]	1024	torch (2.3.1+cu118)
	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.2	
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: Hardswish	Hardswish	
	The optimizer: Adam	Adam	
	The number of epochs: 1000	1000	
	The patience of early stopping: 20,50	50	

	The batch size of DataLoader: 128	128	
MobileVit_ xx_small	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.1	torch (2.3.1+cu118)
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The activation function: SiLU	SiLU	
	The optimizer: Adam	Adam	
	The number of epochs: 1000	1000	
	The patience of early stopping: 20, 50	50	
	The batch size of DataLoader: 64	64	
MobileVit_ x_small	The dropout rate of FC hidden layer: [0, 0.1, 0.2, 0.3, 0.4, 0.5]	0.1	torch (2.3.1+cu118)
	The learning rate: [1e-3, 1e-4, 1e-5]	1e-3	
	The optimizer: Adam	Adam	
	The number of epochs: 1000	1000	
	The patience of early stopping: 20, 50	50	
	The batch size of DataLoader: 32	32	

Table S3. The performance of SVM using HOG features.

		ACC	Precision	Recall	F1
Regional classification tasks	Train	0.8731	0.8658	0.8731	0.8673
	Test	0.8154	0.8061	0.8154	0.8086
Style classification tasks	Train	0.5544	0.5385	0.5544	0.5426
	Test	0.5458	0.5296	0.5458	0.5352

Supplementary figures

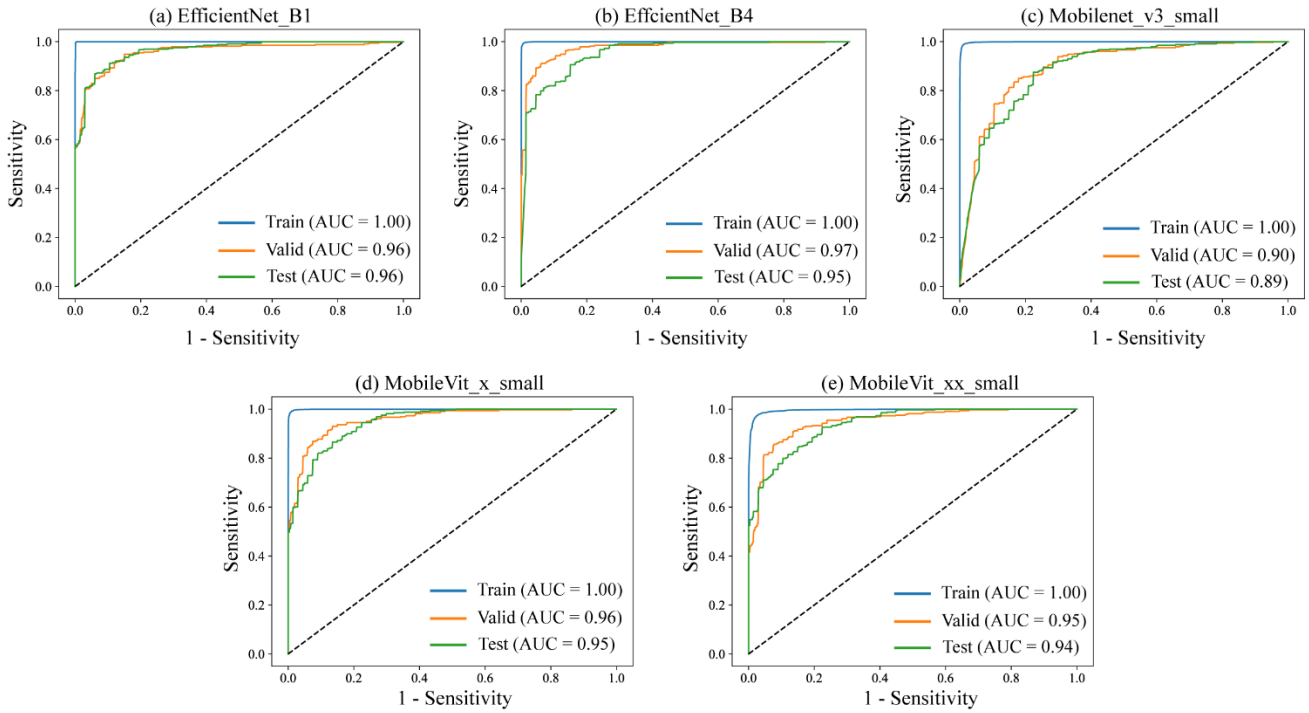


Figure S1 . The ROC curves for CNN models on training set, validation set, and test set in regional classification tasks. (a) EfficientNet_B1, (b) EffcientNet_B4, (c) MobileNet_v3_small, (d) MobileVit_x_small, and (e) MobileVit_xx_small.

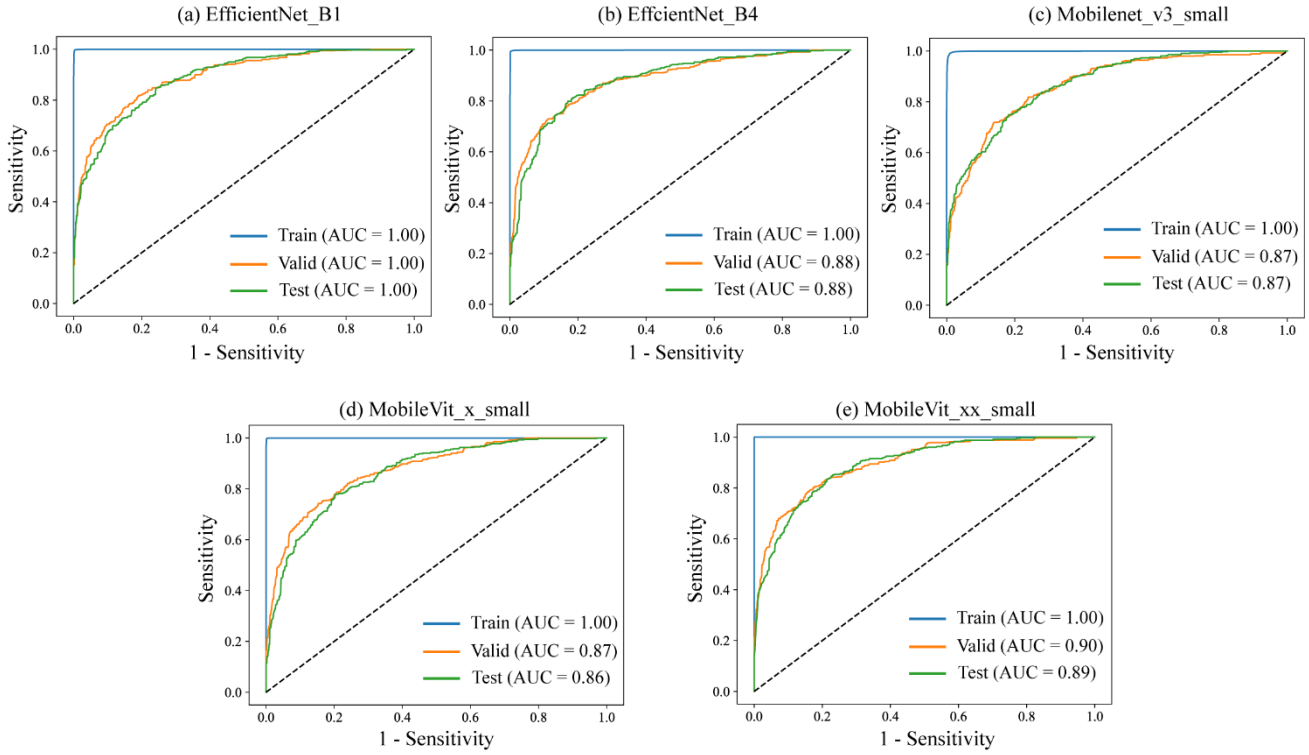


Figure S2 . The ROC curves for CNN models on training set, validation set, and test set in art style classification tasks. (a) EfficientNet_B1, (b) EffcientNet_B4, (c) MobileNet_v3_small, (d) MobileVit_x_small, and (e) MobileVit_xx_small.

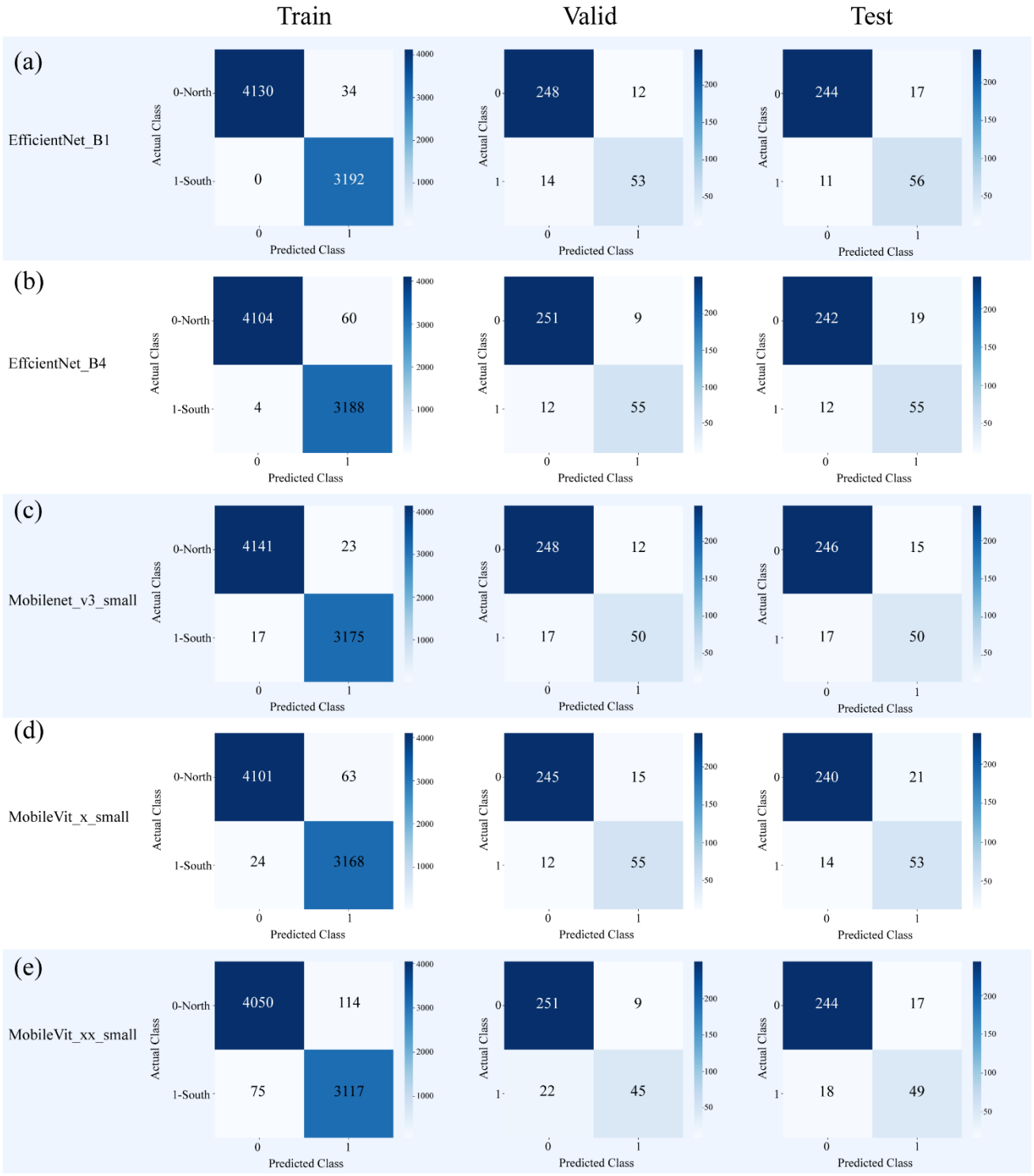


Figure S3 . The confusion matrices for CNN models on the training, validation and test sets in regional classification tasks. (a) EfficientNet_B1, (b) EfficientNet_B4, (c) Mobilenet_v3_small, (d) MobileVit_x_small and (e) MobileVit_xx_small.

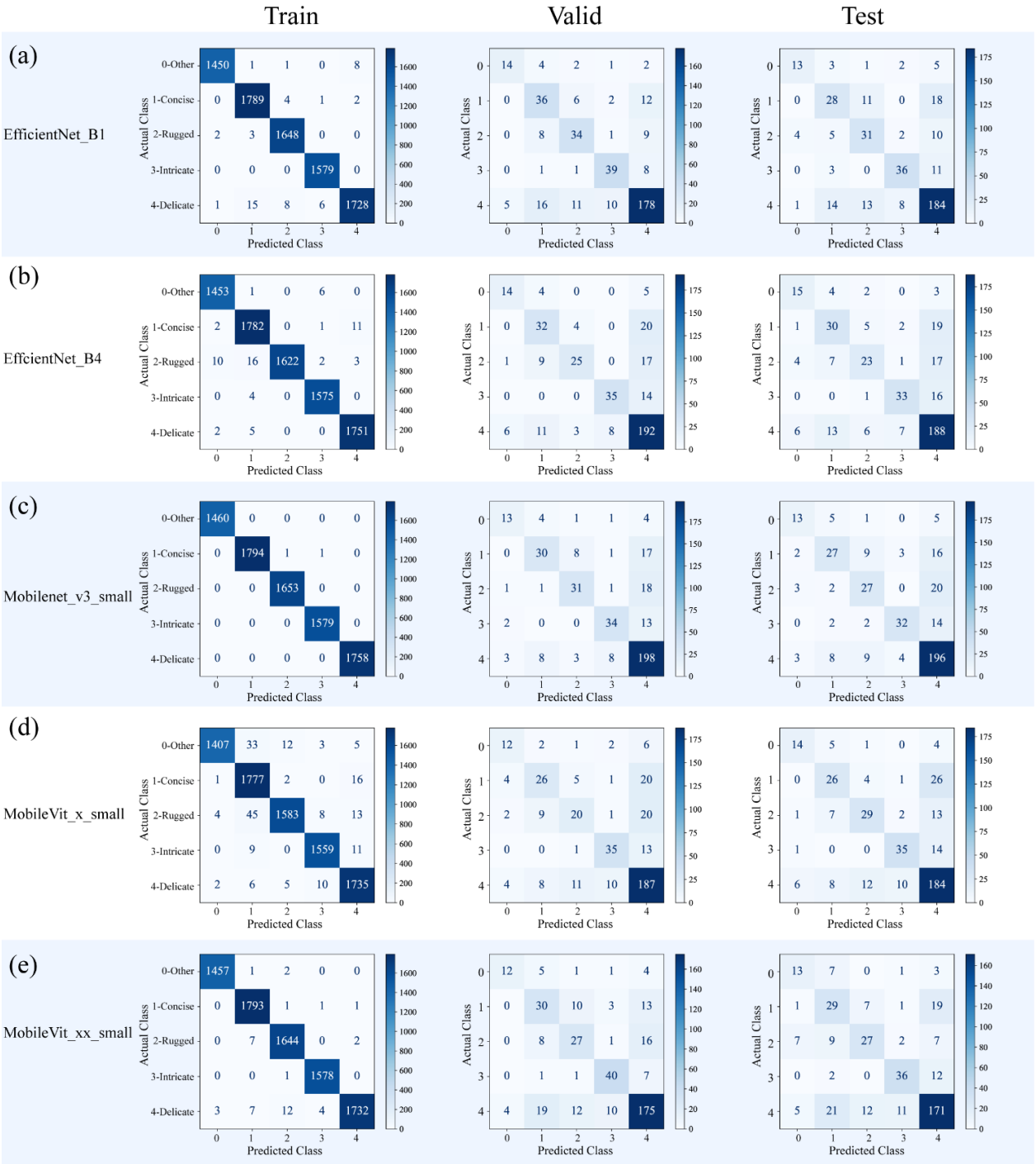


Figure S4 . The confusion matrices for CNN models on the training, validation and test sets in art style classification tasks. (a) EfficientNet_B1, (b) EfficientNet_B4, (c) Mobilenet_v3_small, (d) MobileVit_x_small and (e) MobileVit_xx_small