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Rethinking Image Aesthetics Assessment: Models, Datasets and Benchmarks

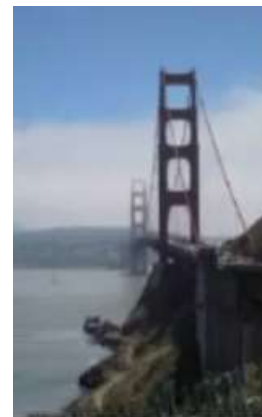
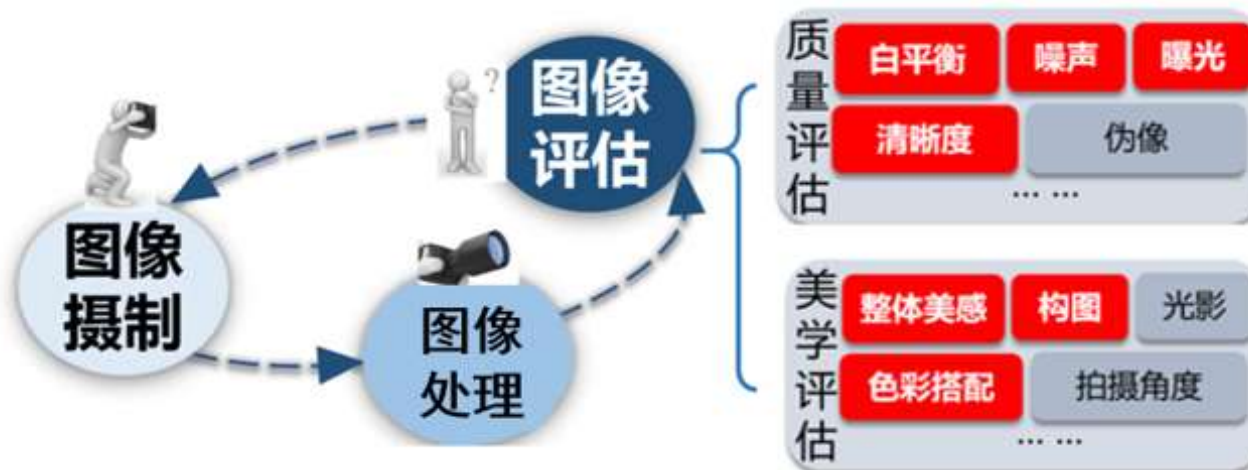
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Background



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Background



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图像美学评估 (IAA)

通用图像美学评估 (GIAA)

- 美学分类问题 — Accuracy
- 美学分数回归问题 — SRCC、LCC
- 美学分布预测问题
- 数据集 — AVA、AADB等

个性化图像美学评估 (PIAA)

- 预测不同用户的美学评分 — SRCC、LCC
- 数据集 — FLICKR-AES

Dataset



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Ratings = (3,3,4,5,5); Avg. = 4.0



Ratings = (2,3,4,5,5); Avg. = 3.8



Ratings = (1,2,2,3,4); Avg. = 2.4



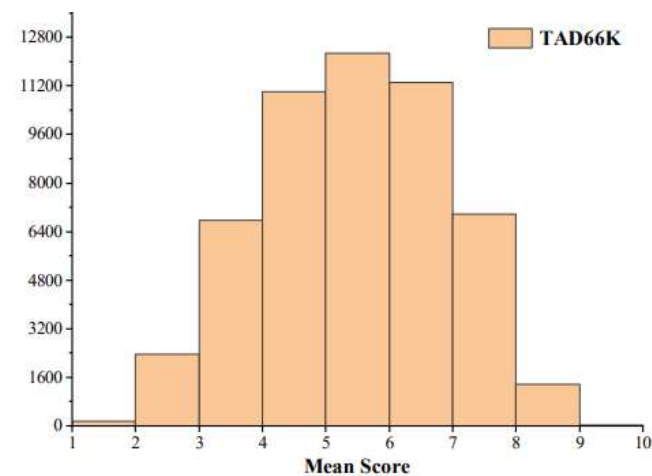
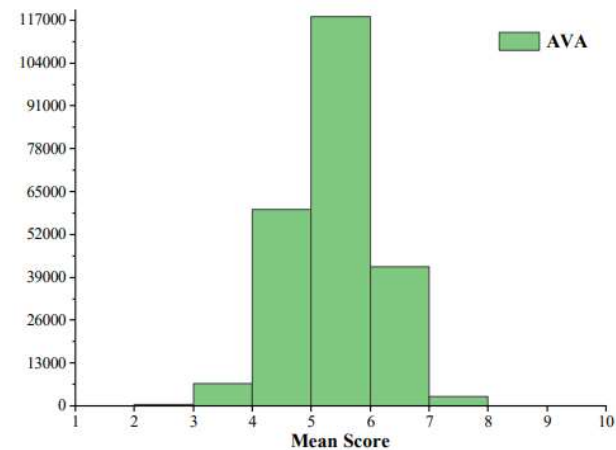
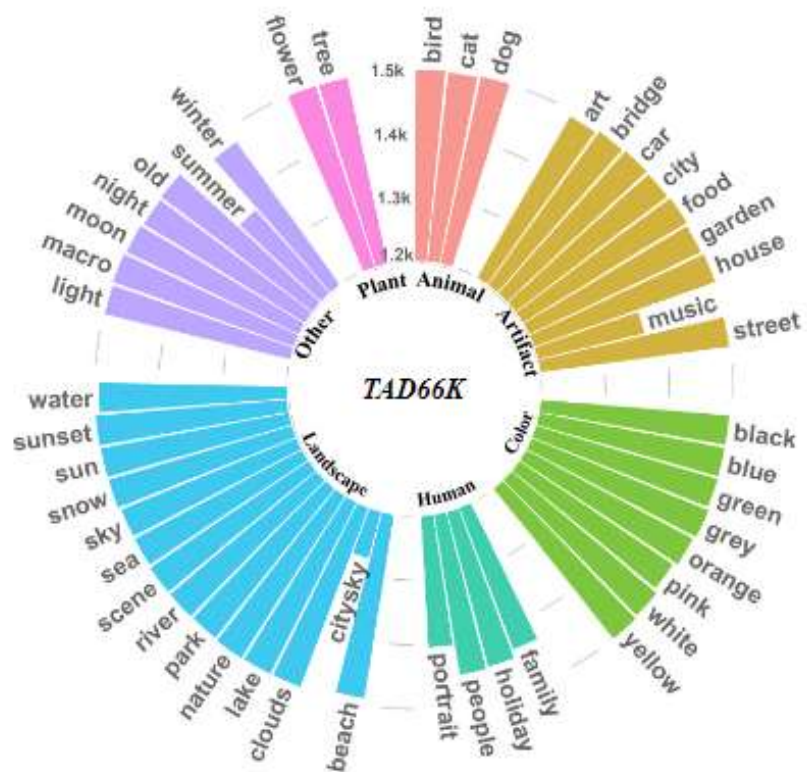
Ratings = (1,1,2,3,3); Avg. = 2.0

Dataset	Image	Rating	Theme
DP Challenge [Datta <i>et al.</i> , 2008]	16,509	100	N/A
Photo.Net [Joshi <i>et al.</i> , 2011]	20,278	500	N/A
CUHK-PQ [Luo <i>et al.</i> , 2011]	17,673	10	7
AVA [Murray <i>et al.</i> , 2012]	255,530	250	N/A
AADB [Kong <i>et al.</i> , 2016]	10,000	5	N/A
PCCD [Chang <i>et al.</i> , 2017]	4,235	7	N/A
FLICKR-AES [Ren <i>et al.</i> , 2017]	40,000	210	N/A
DPC-Captions [Jin <i>et al.</i> , 2019]	154,384	6	N/A
SPAQ [Fang <i>et al.</i> , 2020]	11,125	600	9
<i>TAD66K (Ours)</i>	66,327	12,00	47

TAD66K



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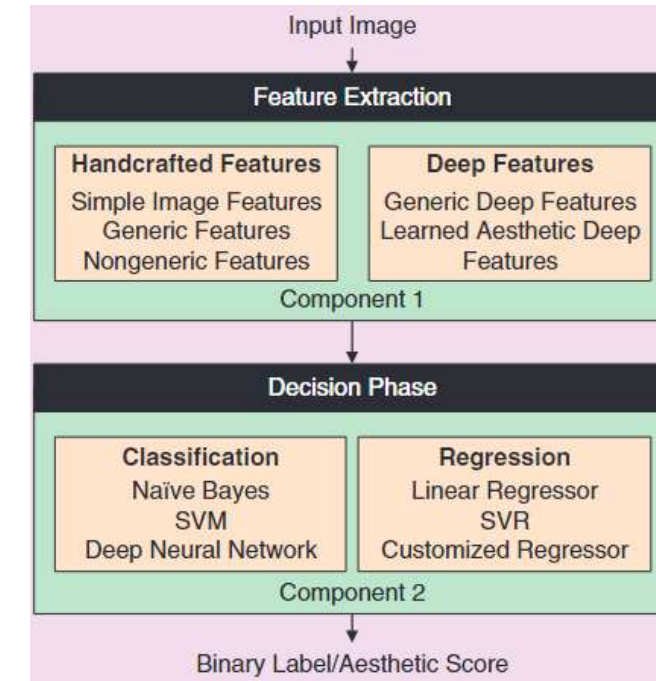
Model



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No.	Model	Pub.	Training Set	Basic
1	RAPID [Lu <i>et al.</i> , 2014]	ACMMM	AVA	incorporate heterogeneous
2	DMA [Lu <i>et al.</i> , 2015]	ICCV	AVA	multi-patch aggregation
3	MNA [Mai <i>et al.</i> , 2016]	CVPR	AVA	adaptive spatial pooling
4	AADB [Kong <i>et al.</i> , 2016]	ECCV	AADB+AVA	sampling strategy, ranking loss
5	PAM [Ren <i>et al.</i> , 2017]	ICCV	AES+CUR	residual-based, active learning
6	ALamp [Ma <i>et al.</i> , 2017]	CVPR	AVA	layout-aware, multi-patch
7	NIMA [Talebi and Milanfar, 2018]	TIP	AVA	predict distribution
8	MP _{ada} [Sheng <i>et al.</i> , 2018]	ACMMM	AVA	attention, multi-patch
9	CFAN [Wang <i>et al.</i> , 2018]	IJCAI	AVA	collaborative filterin
10	MLSP [Hosu <i>et al.</i> , 2019]	CVPR	AVA	staged training, multi-level features
11	BIAA [Zhu <i>et al.</i> , 2020]	TCYB	AES+CUR+AADB	meta-learning, bilevel optimization
12	UIAA [Zeng <i>et al.</i> , 2019]	TIP	AVA+AADB	unified probabilistic formulation
13	AFDC [Chen <i>et al.</i> , 2020]	CVPR	AVA	fractional dilated kernel
14	PIAA [Li <i>et al.</i> , 2020]	TIP	AVA+AES	personality-assisted multi-task
15	UGIAA [Lv <i>et al.</i> , 2021]	TMM	AVA+AES	deep reinforcement learning
16	MUSIQ [Ke <i>et al.</i> , 2021]	ICCV	AVA	multi-scale representation
17	HGCN [She <i>et al.</i> , 2021]	CVPR	AVA+AADB	graph convolution networks
18	TANet (Ours)	IJCAI	AVA+AES+TAD66K	attention, adaptive features

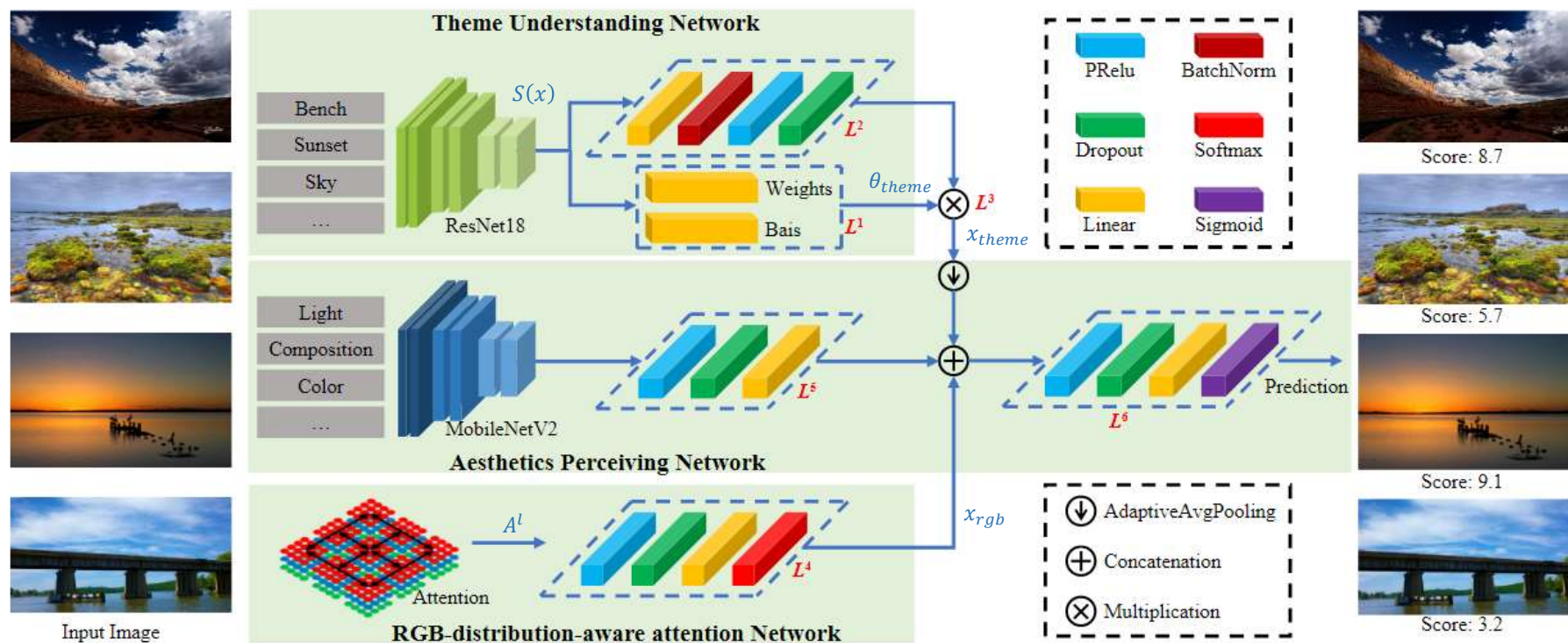
$$p = F(x, \theta)$$



Model



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$$\theta_{theme} = L^1(S(x), \delta)$$

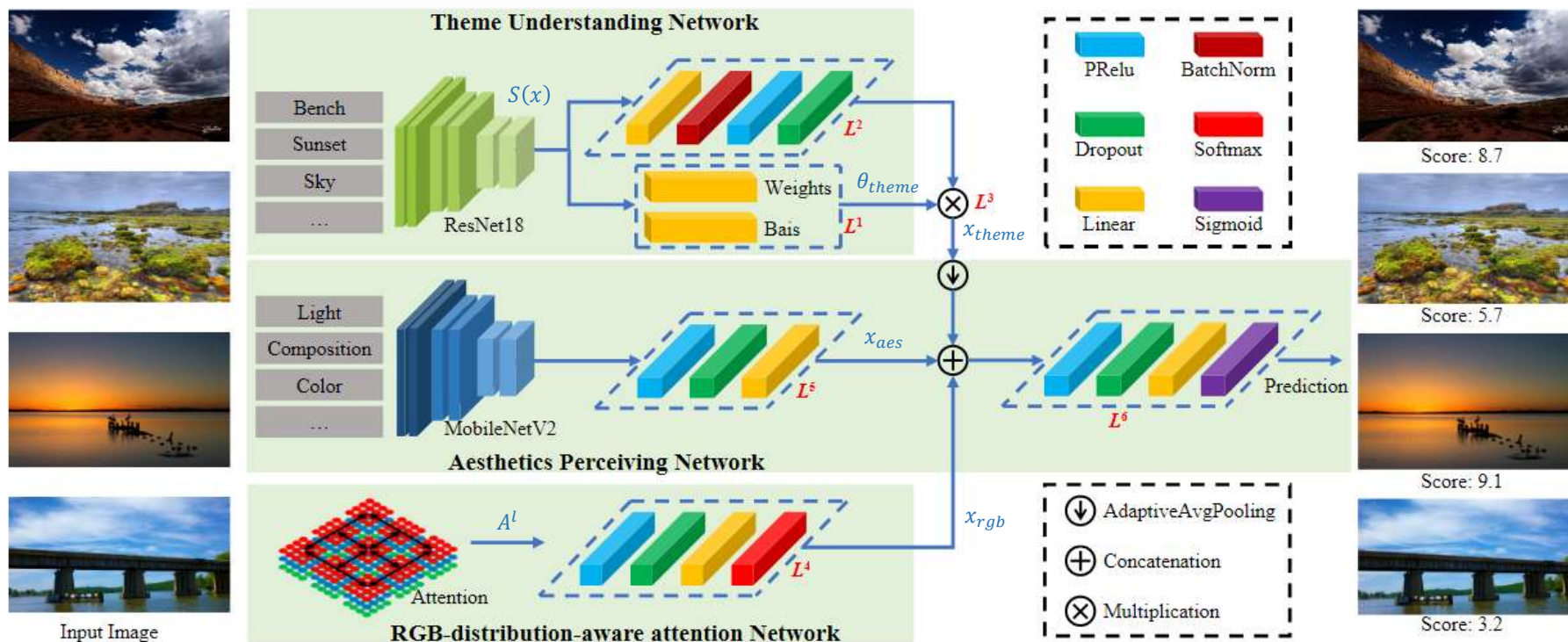
$$x_{theme} = L^3(L^2(S(x)), \theta_{theme})$$

$$x_{rgb} = ||_{l=1}^N (L^4(A^l))$$

Model



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$$p = F_{aes}(x_{theme} \oplus x_{rgb} \oplus x_{aes}, \theta_{aes})$$

Experiments



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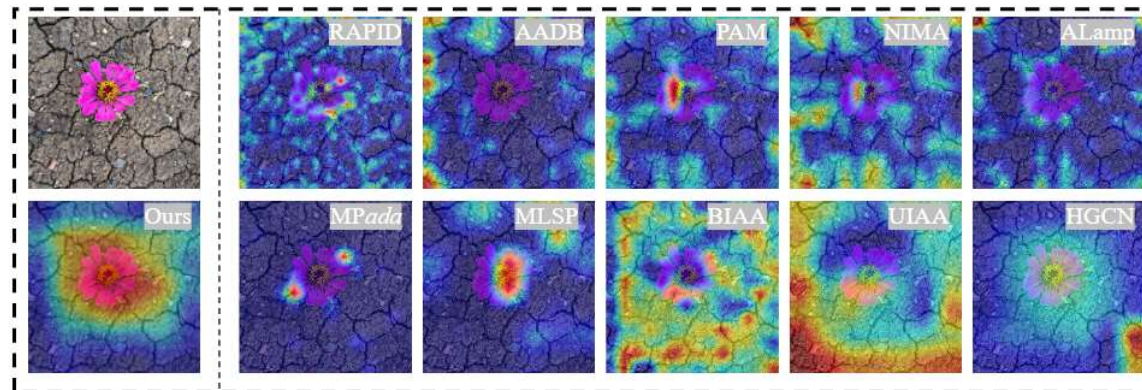
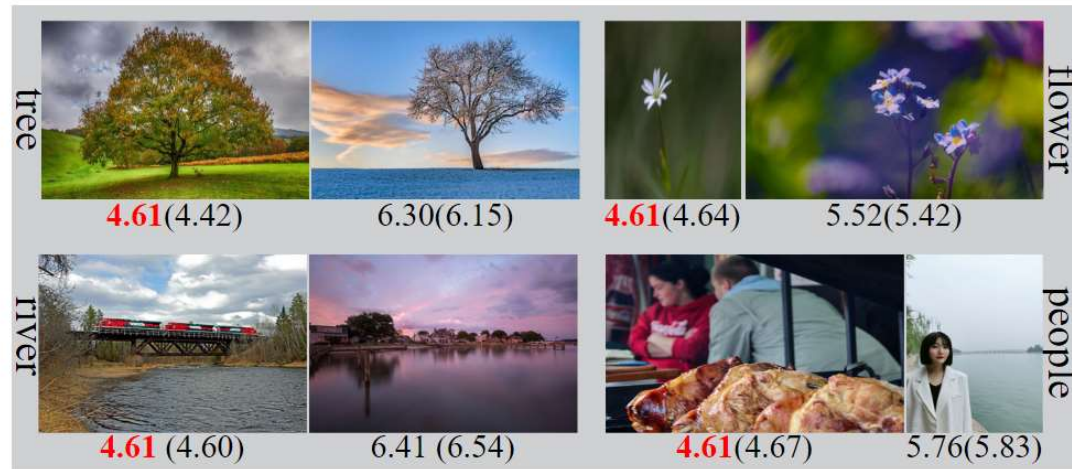
Metric		RAPID	AADB	PAM	NIMA	ALamp	MP _{ada}	MLSP	BIAA	UIAA	HGCN	Ours
AVA	$S \uparrow$	.447*	.558	.712*	.612	.666*	.727	.756	.651*	.719	.665	.758
	$\mathcal{L} \uparrow$	.453*	.580*	.715*	.636	.671*	.731	.757	.668*	.720	.687	.765
	$\mathcal{R} \uparrow$	.628*	.722	.876*	.751	.807*	.875	.925	.853*	.890	.786	.940
ITAD66K	$S \uparrow$	.314*	.379*	.422*	.390*	.411*	.466*	.490*	.417*	.433*	.486*	.513
	$\mathcal{L} \uparrow$	.332*	.400*	.440*	.405*	.422*	.480*	.508*	.431*	.441*	.493*	.531
	$\mathcal{M} \downarrow$	.022*	.021*	.020*	.021*	.019*	.022*	.019*	.020*	.021*	.020*	.016

- S : Spearman's rank correlation coefficient (SRCC)
- $\mathcal{L}$: linear correlation coefficient (LCC)
- $\mathcal{R}$: ratio= SRCC/accuracy
- $\mathcal{M}$: mean squared error (MSE)

Experiments



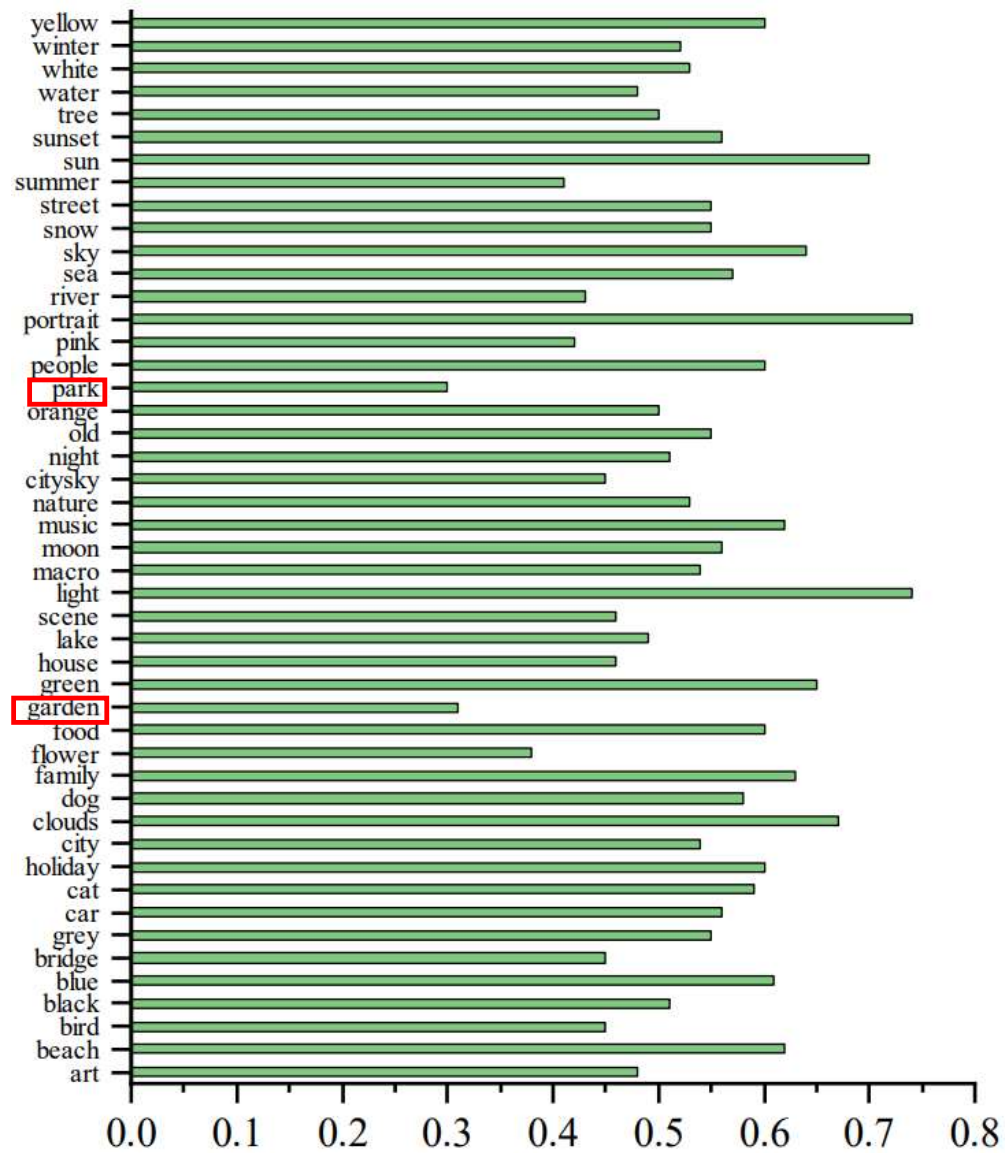
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Experiments



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Model	10 images	100 images
PAM(att&con)	0.520±0.003	0.553±0.012
PIAA	0.543±0.003	0.639±0.011
UGIAA	0.559±0.002	0.660±0.013
BIAA	0.561±0.005	0.669±0.013
Ours	0.609±0.005	0.717±0.011

Type	$\mathcal{S} \uparrow$	$\mathcal{L} \uparrow$	$\mathcal{M} \downarrow$
APNet	0.440	0.457	0.020
(AP + TU)Net	0.483	0.513	0.017
(AP + RGB)Net	0.462	0.478	0.019
(AP + RGB + TU)Net	0.513	0.531	0.016



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Thanks