

## NamedCurves: Learned Image Enhancement via Color Naming David Serrano-Lozano<sup>1,2</sup>, Luis Herranz<sup>3</sup>, Michael S. Brown<sup>4</sup>, Javier Vazquez-Corral<sup>1,2</sup> <sup>3</sup>UAM YORK U UAB

# Color Naming

Color Naming decomposes an image into 11 probability maps. Each value corresponds to the probability of belonging to a color name:





**Orange-Brown-Yellow** 

Red



Achromatic



Green



Blue







\*For the sake of visualization, we use different color maps for each color name, with colors proportional to the probability.

We blend the color names with similar hues, as our method aims to learn a curve to be applied at all intensities levels:





## User Study

- Two-alternative forced choice (2AFC)
- 15 observers
- 25 images from MIT5K and PPR10K

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Enhancing images through color names for intuitive and precise human-centric adjustments

Our method adjusts globally the image by estimating a set of control points (  $\times \times \times$  ) that define RGB tone curves for each color name. The globally-adjusted images are then fused using an attention-based mechanism and color naming probabilities.





Project page

# Experiments & Results



Method	$\mathrm{PSNR}\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	$\Delta E_{00}\downarrow$	$\Delta E_{ab}\downarrow$	Time (ms)
3DLUT	25.29	0.923	0.043	6.76	7.55	13
$\operatorname{SepLUT}$	25.47	0.921	0.042	6.71	7.49	10
AdaInt	25.49	0.926	0.041	6.69	7.47	13
NamedCurves	25.59	0.936	0.038	6.07	7.40	26



	Expert A		Expe	ert B	Expert C	
Method	$PSNR\uparrow$	$\Delta E_{ab}\downarrow$	$PSNR\uparrow$	$\Delta E_{ab}\downarrow$	$PSNR \uparrow$	$\Delta E_{ab}\downarrow$
HDRNet	23.93	8.70	23.96	8.84	24.08	8.87
3DLUT	25.64	6.97	24.70	7.71	25.18	7.58
$\operatorname{SepLUT}$	26.28	6.59	25.23	7.49	25.59	7.51
AdaInt	26.33	6.56	25.40	7.33	25.68	7.31
NamedCurves	26.81	6.48	25.91	7.18	25.69	7.27

Adding Color Naming (CN & WN-Avg) into the architecure produces the largest boosts in performance.

Backbone	Curves	s CN	Att.	WN-Avg	$\mathrm{PSNR}\uparrow$	SSIM $\uparrow$	$\Delta E_{00}\downarrow$
$\checkmark$	6				24.24	0.922	7.50
$\checkmark$	6	$\checkmark$			24.56	0.926	7.07
$\checkmark$	6	$\checkmark$		$\checkmark$	24.68	0.926	6.88
$\checkmark$	6	$\checkmark$	$\checkmark$		24.60	0.926	6.92
$\checkmark$	6	$\checkmark$	$\checkmark$	$\checkmark$	24.91	0.927	6.60

![](_page_0_Figure_37.jpeg)

![](_page_0_Figure_38.jpeg)

![](_page_0_Picture_39.jpeg)

\*Showing the pixels with probability > 0.5 for color name Red. We also show the RGB tone curves of this category and the retouched image.

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