



# A FRAMEWORK FOR CONTRAST ENHANCEMENT ALGORITHMS OPTIMIZATION



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## Abstract

We define a regression module for image acceptability, based on deep neural features, trained on a large dataset of user preferences. This is used to guide a Bayesian optimization process, searching for the optimal parameters of a given contrast enhancement algorithm.

## Dataset

Jaroensri et al. [2015]  
 500 images x 600 brightness-contrast variations  
 User labels for "acceptable" / "non acceptable" image editing

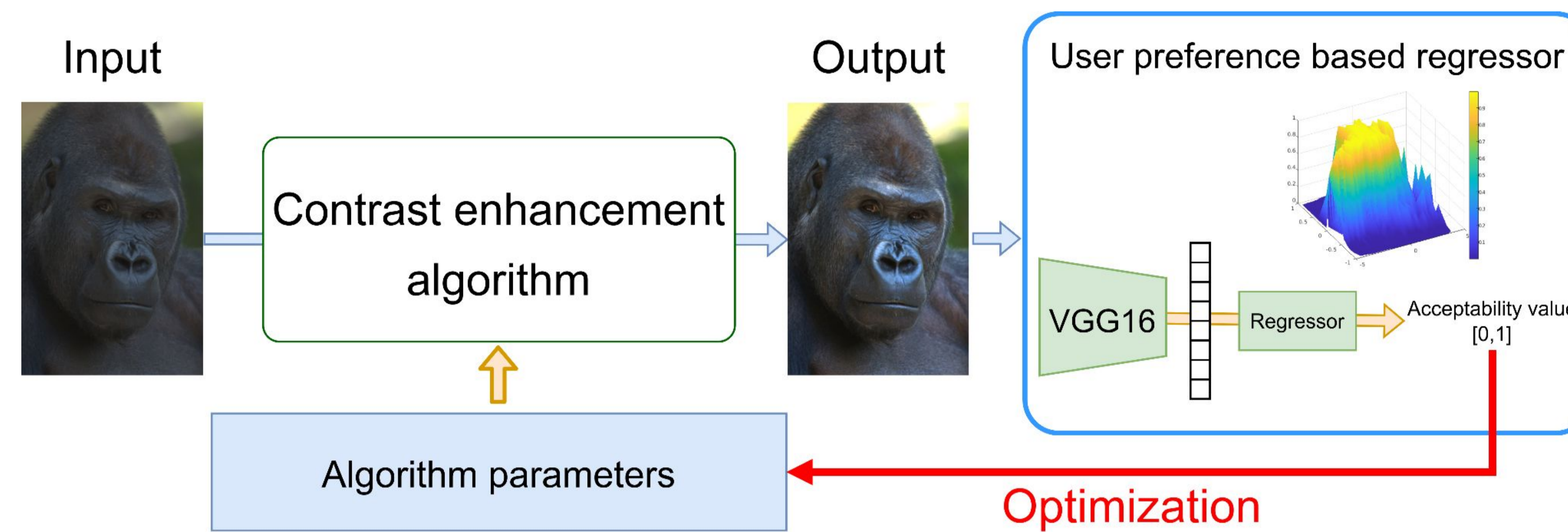
## Optimization algorithm

Step 1: logistic regression on VGG features  
 Step 2: Bayesian optimization of parameters

- Per single image
- Per dataset

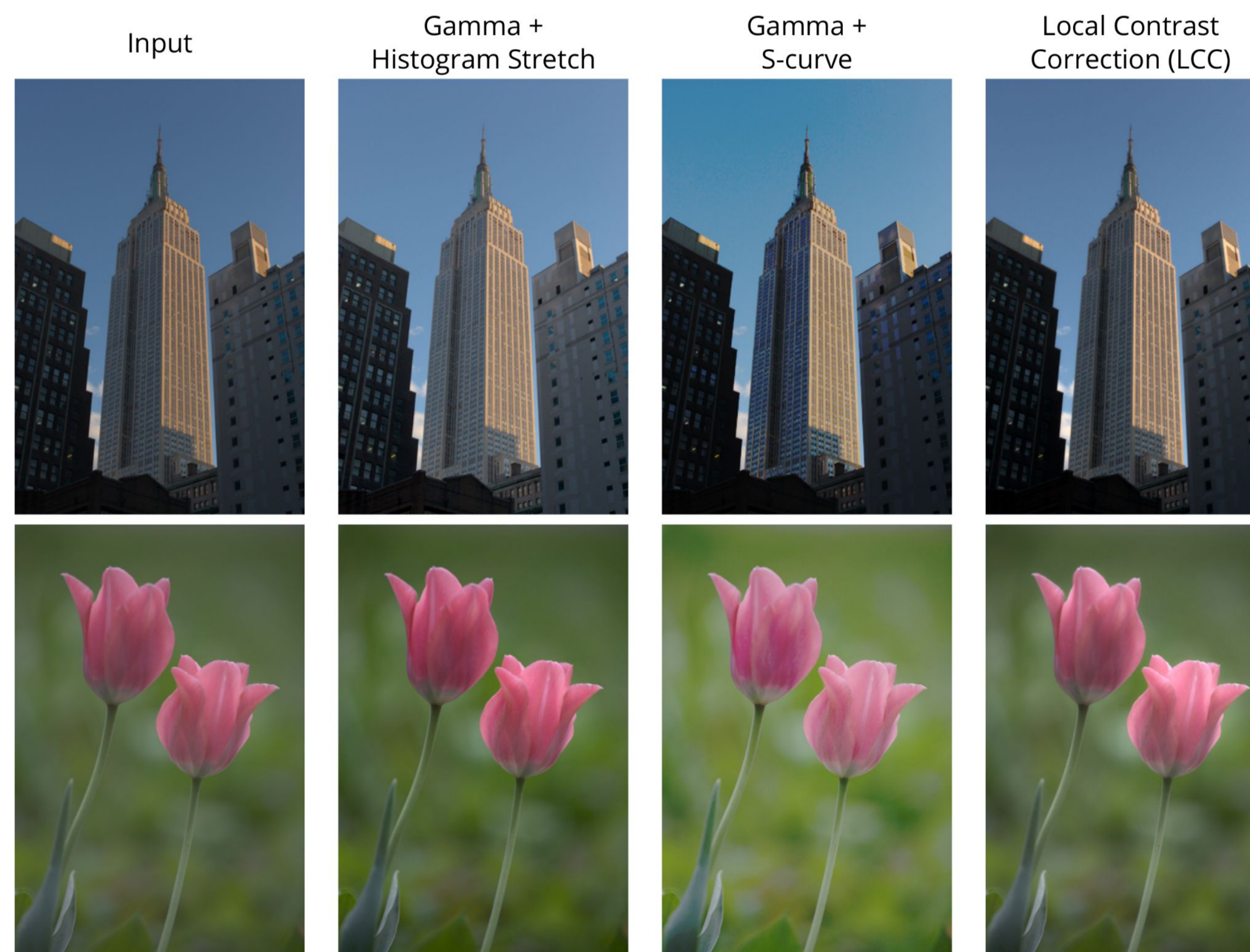
## Contrast enhancement algorithms

- Gamma + Histogram Stretch
- Gamma + S-curve [Kang 2010]
- Local Contrast Correction [Schettini 2010]



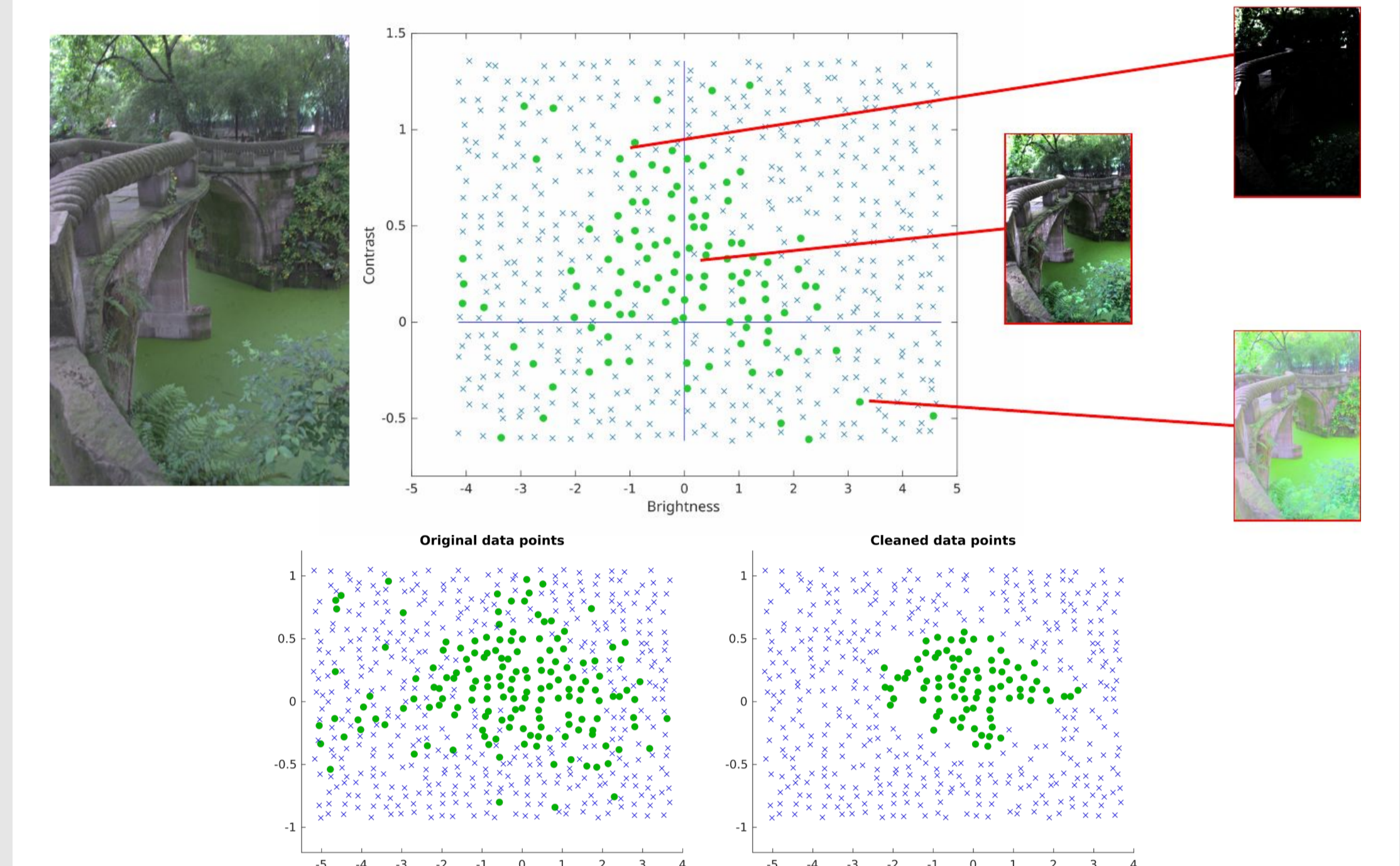
**Step 1:** Learn a no-reference acceptability metric

**Step 2:** Use it to optimize parametric contrast enhancement

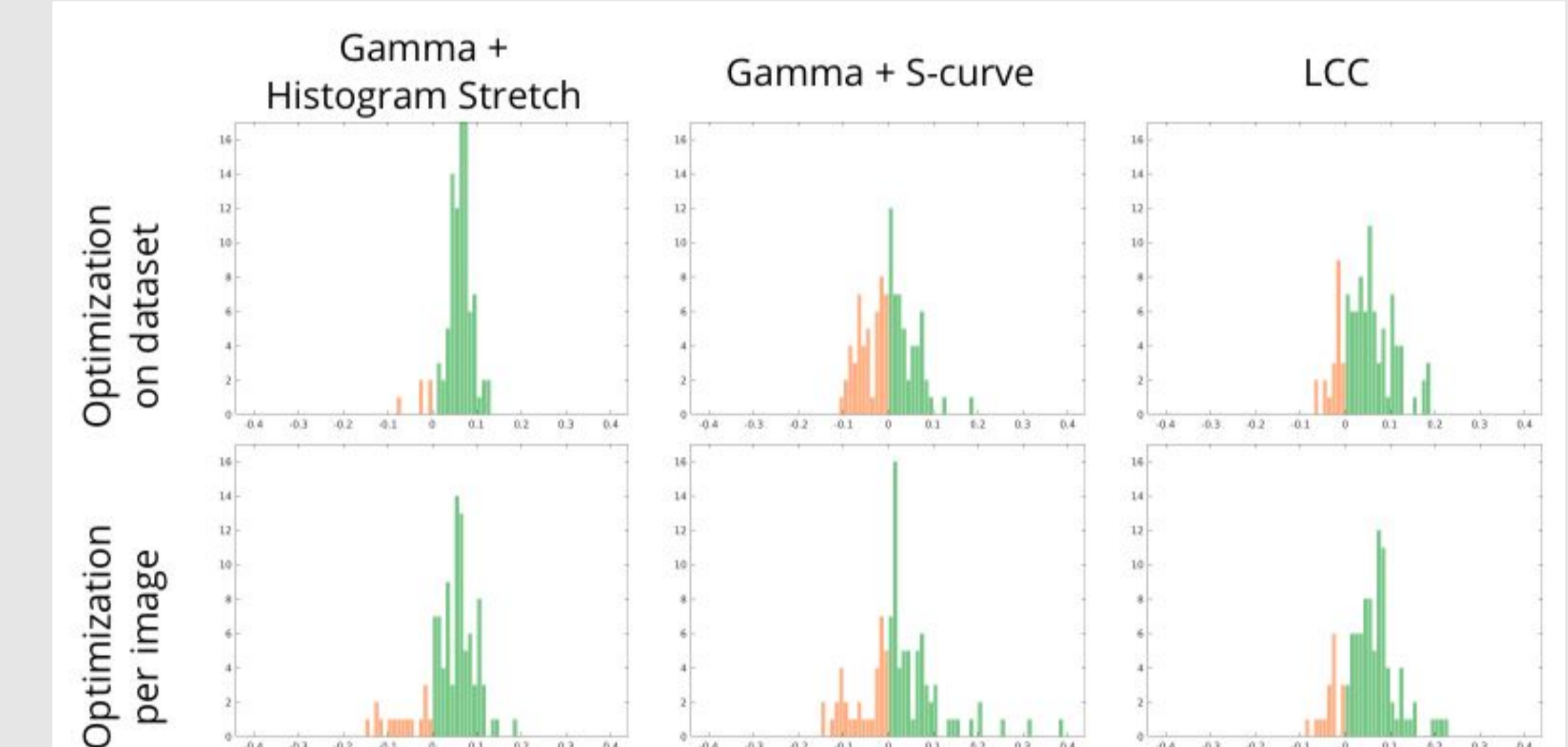


Check out our repo and paper!

## Data pre-processing



Data balancing	Outliers removed	Micro Accuracy	Macro Accuracy	Precision	Recall	F-Score
		78.85%	64.26%	0.6071	0.3597	0.4517
✓	✓	75.01%	73.19%	0.4890	0.6966	0.5746
	✓	74.98%	73.33%	0.4886	0.7013	0.5760



Distributions of the differences in VIF-P values between the enhanced images and the original input ones.

Optim. level	Contrast enhancement algorithm	VIF-P	% improved images
None	Original input	0.8162	-
	Local Contrast Correction (LCC)	0.7874	31%
Dataset	Gamma + Histogram Stretch	0.8765	95%
	Gamma + S-Curve	0.8166	52%
	Local Contrast Correction (LCC)	0.8645	80%
Image	Gamma + Histogram Stretch	0.8582	85%
	Gamma + S-Curve	0.8405	66%
	Local Contrast Correction (LCC)	0.8720	84%

Results in terms of VIF-P score and percentage of images improved after our contrast enhancement.