PosterChild: Blend-Aware Artistic Posterization

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George Mason University CraGL Creativity and Graphics Lab

University of Toronto

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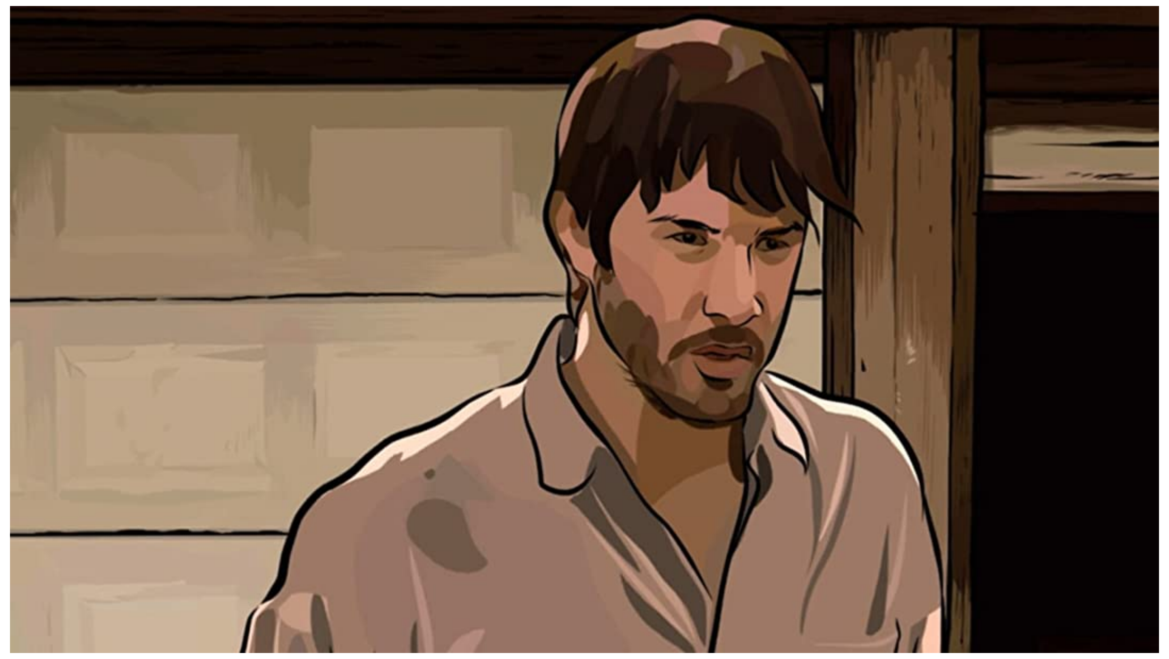

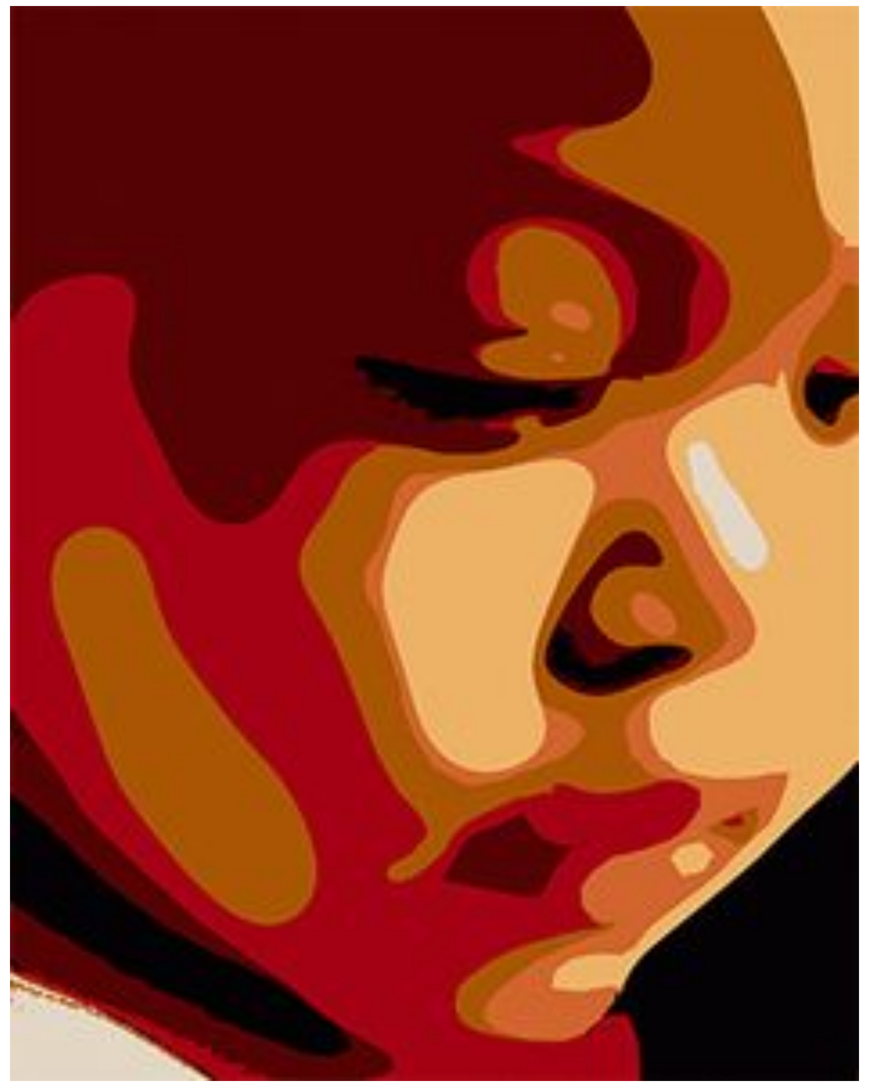

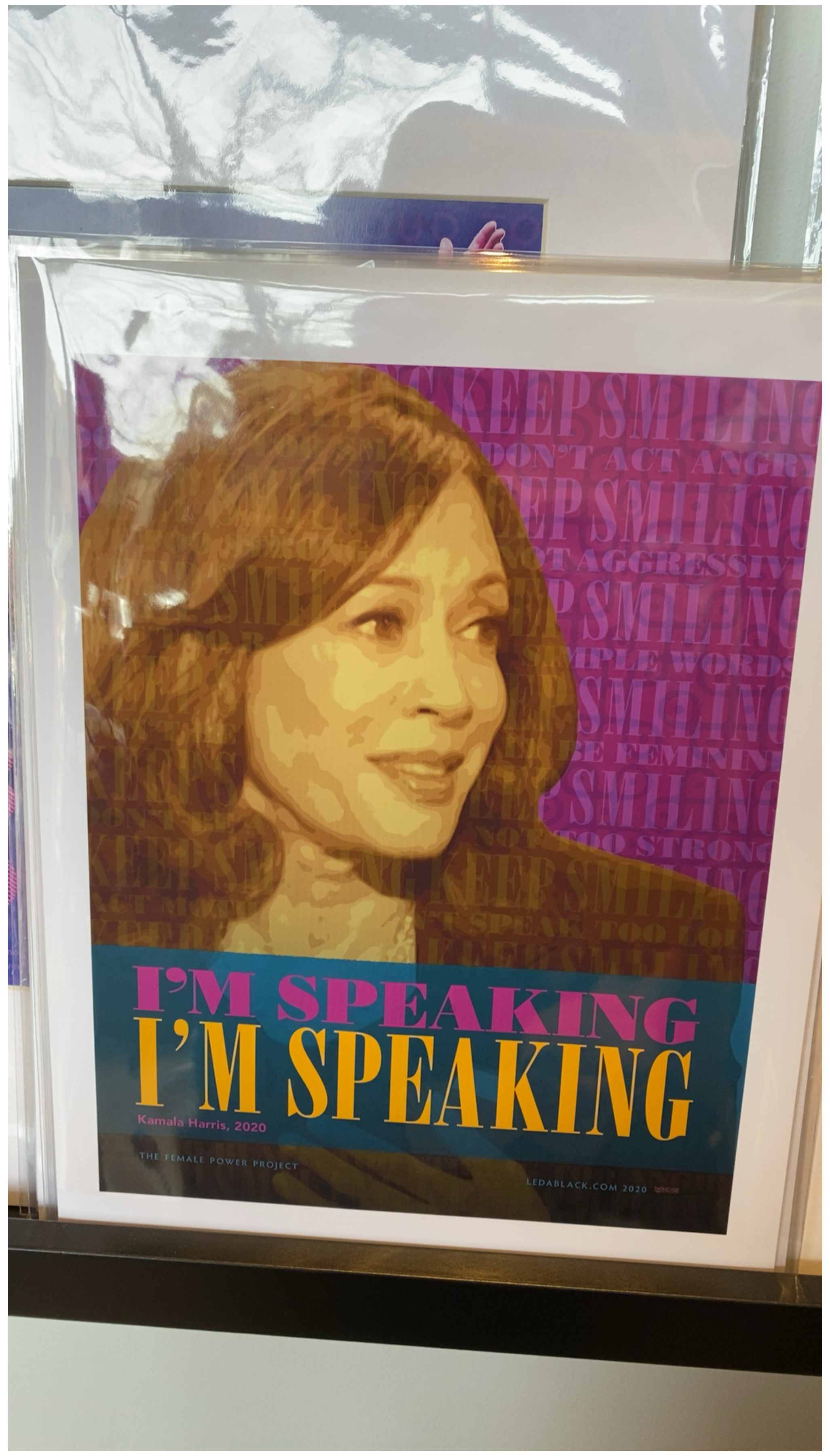

Artistic Posterization

KEEP SMILING
DON'T ACT ANGRY
I'M SPEAKING
I'M SPEAKING
Kamala Harris, 2020
THE FEMALE POWER PROJECT
LEDABLACK.COM 2020

Saarland University

Saarland University

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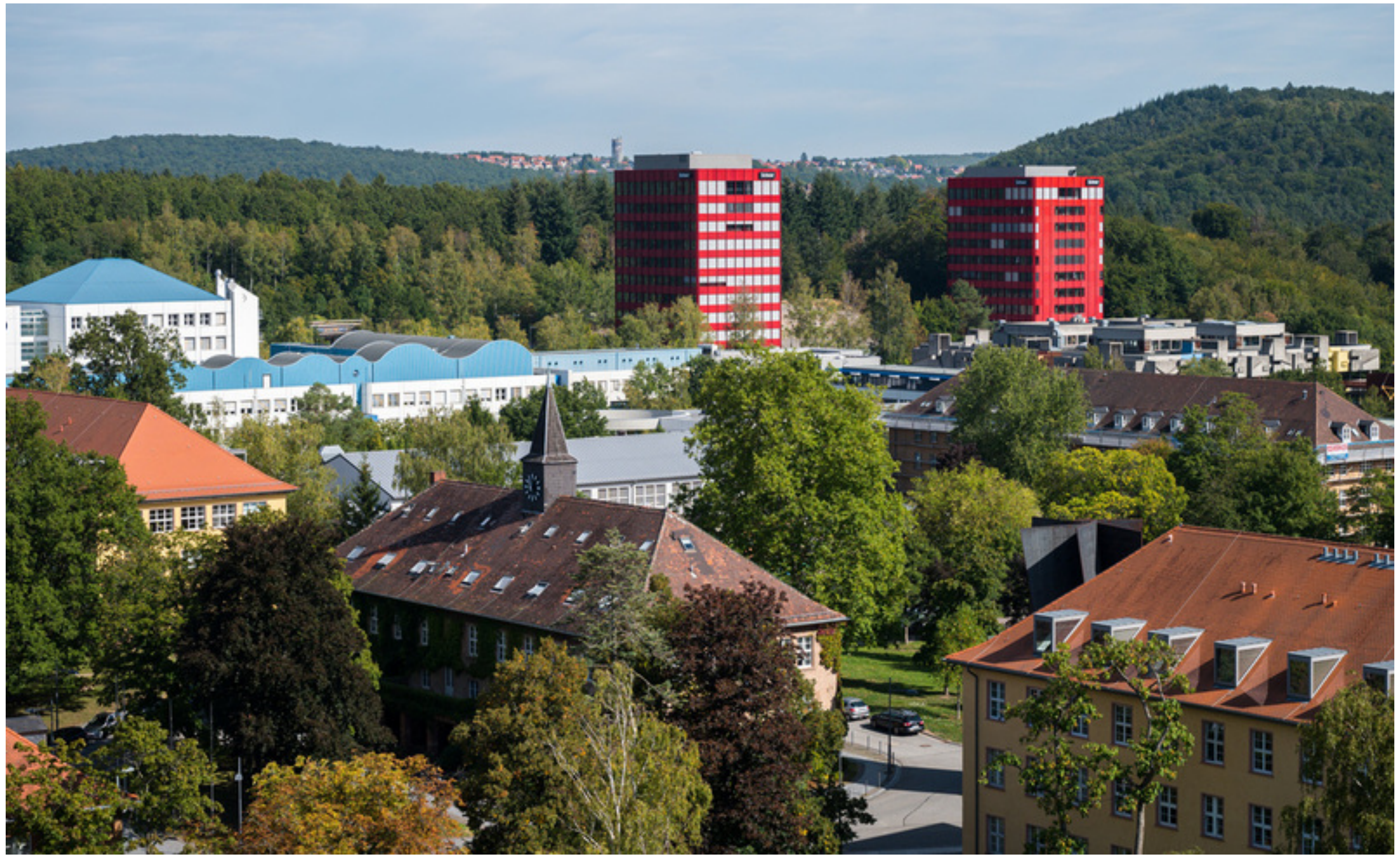

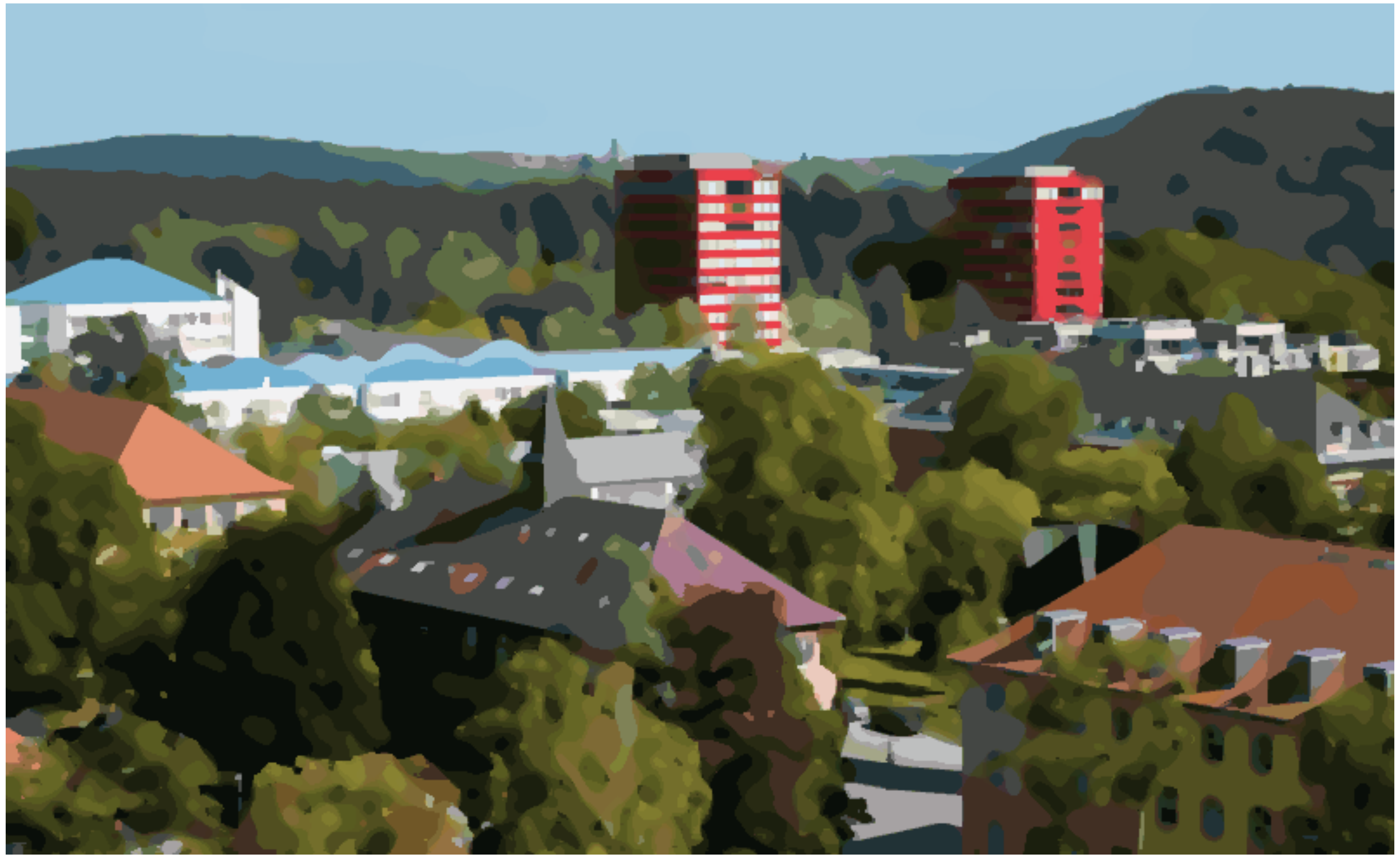

Previous Work: [Xu and Kaplan 2008], [Gerstner et al. 2013], [Afifi 2018]

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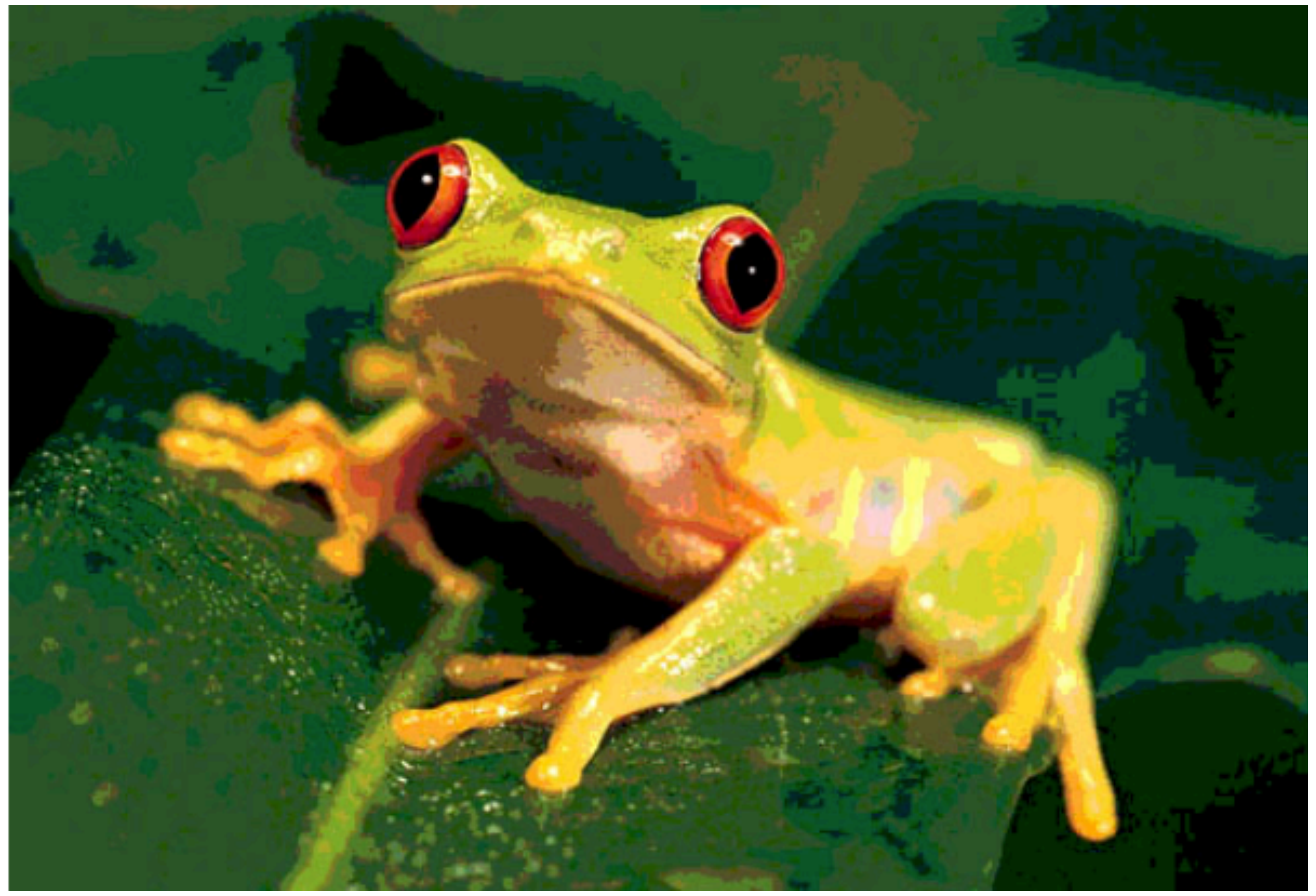

Photoshop's Posterization Filter

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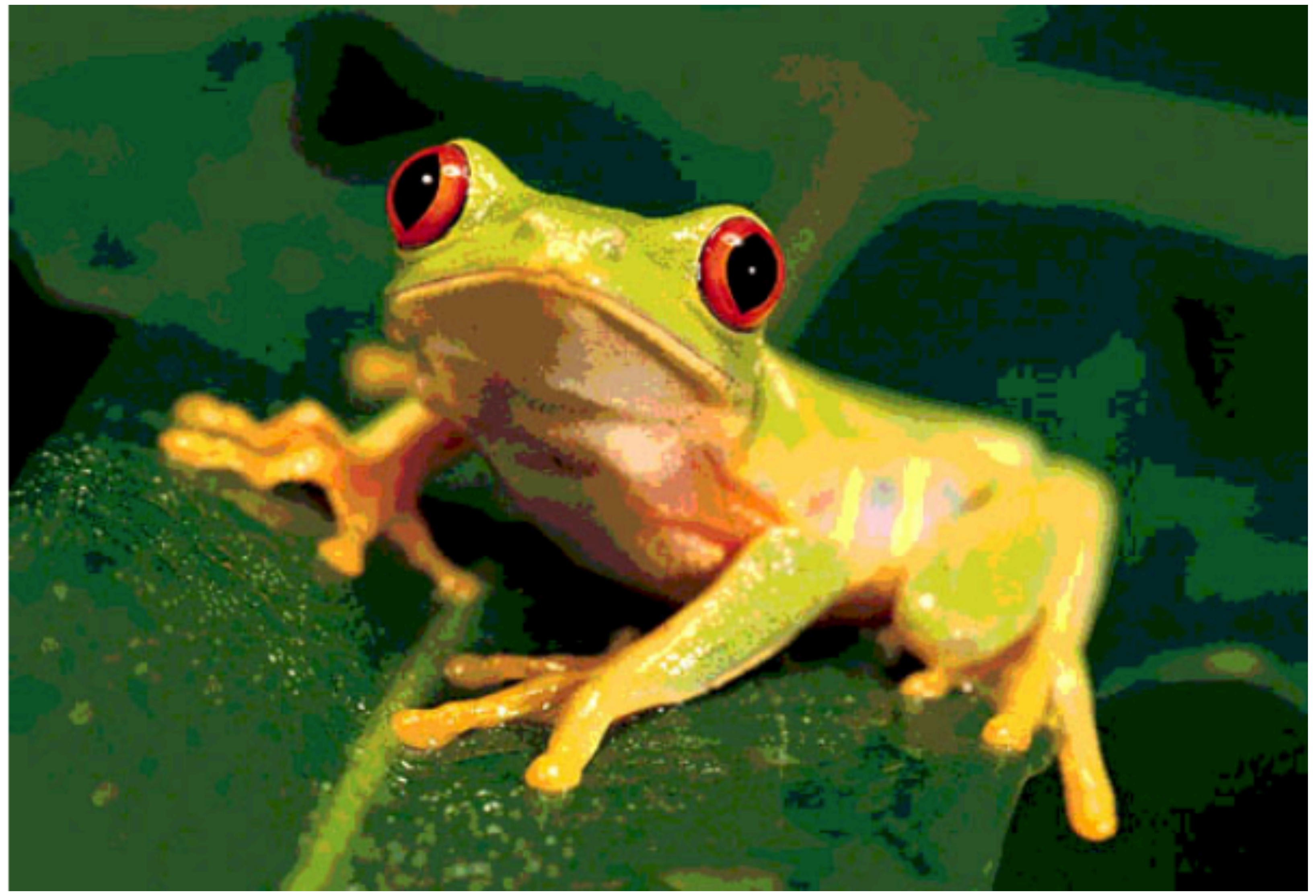

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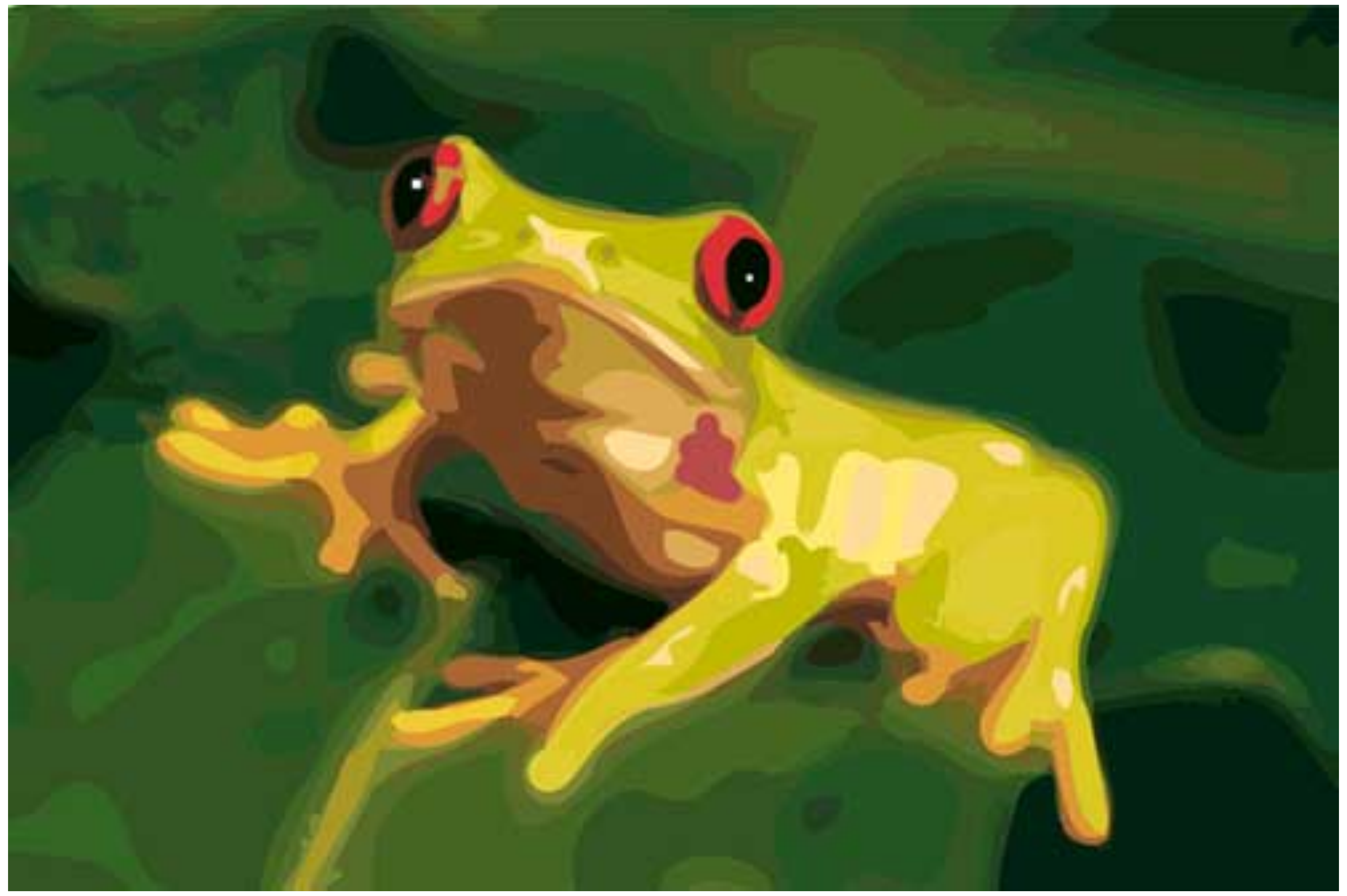

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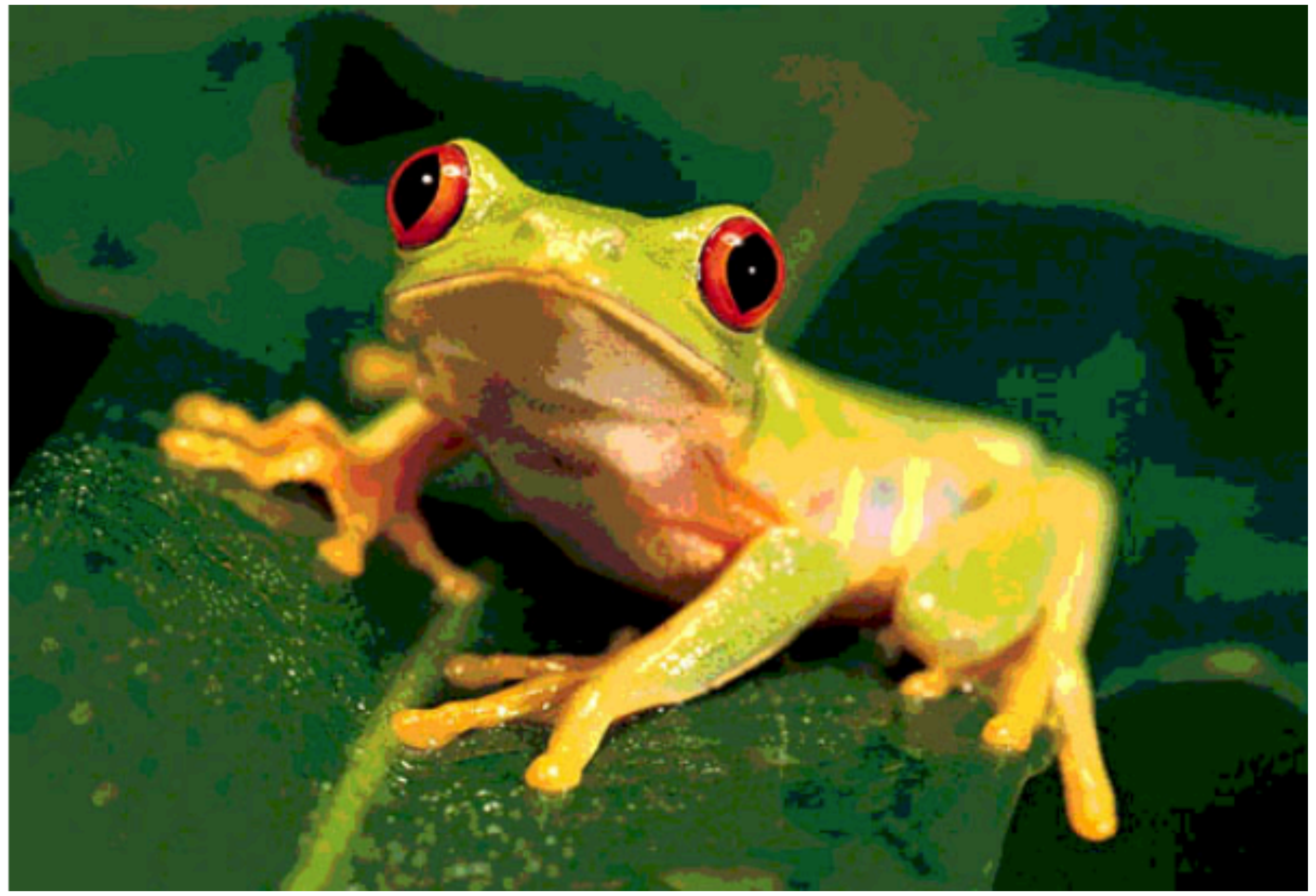

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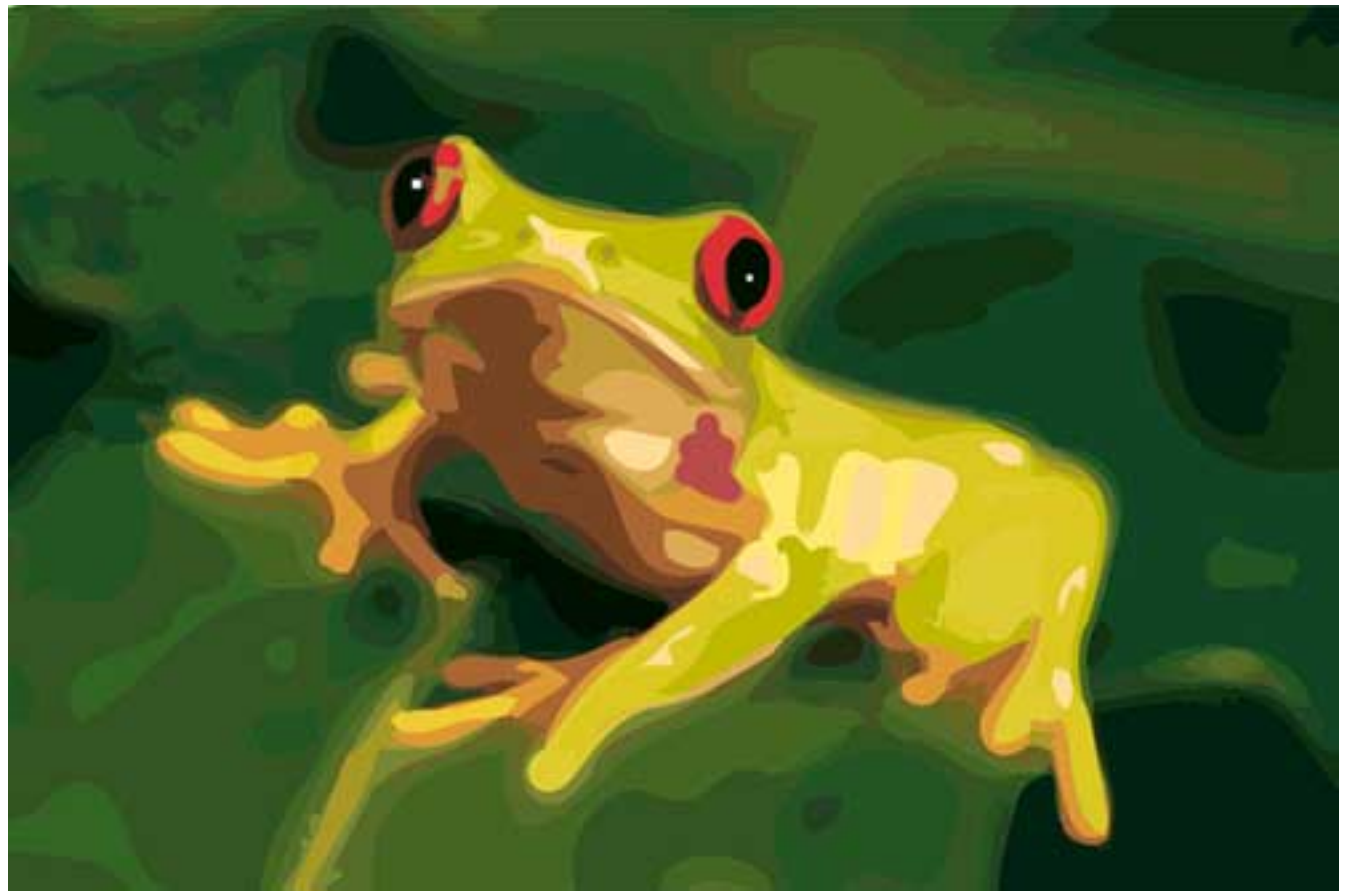

Artist's Creation

Our Approach

- Step 1: Choose a color palette
- Step 2: Form approximate solid-color regions
- Step 3: Improve region color blends
- Step 4: Improve region boundaries

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- Step 1: Convex-hull based palette extraction
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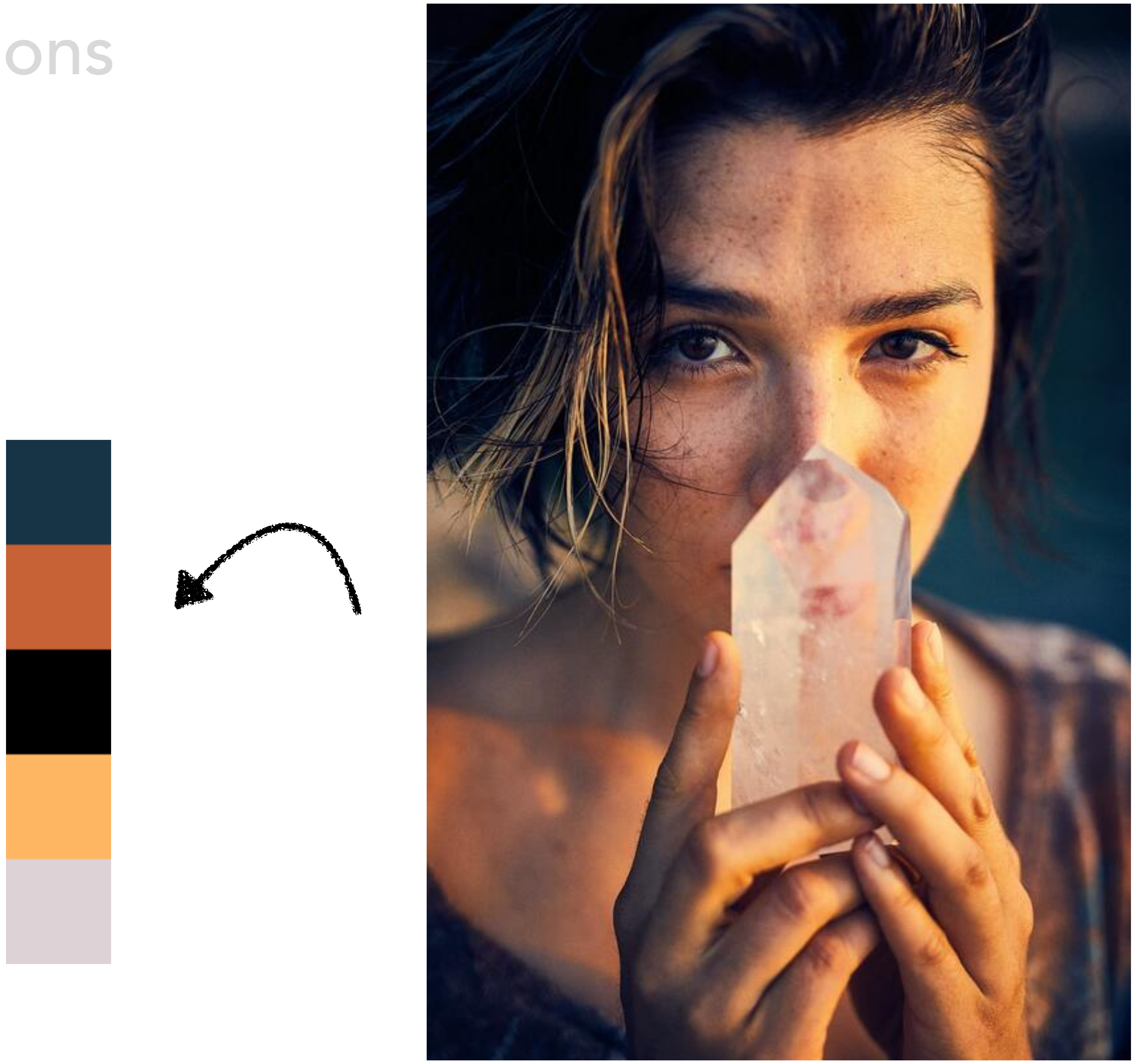

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- Step 1: Choose a color palette
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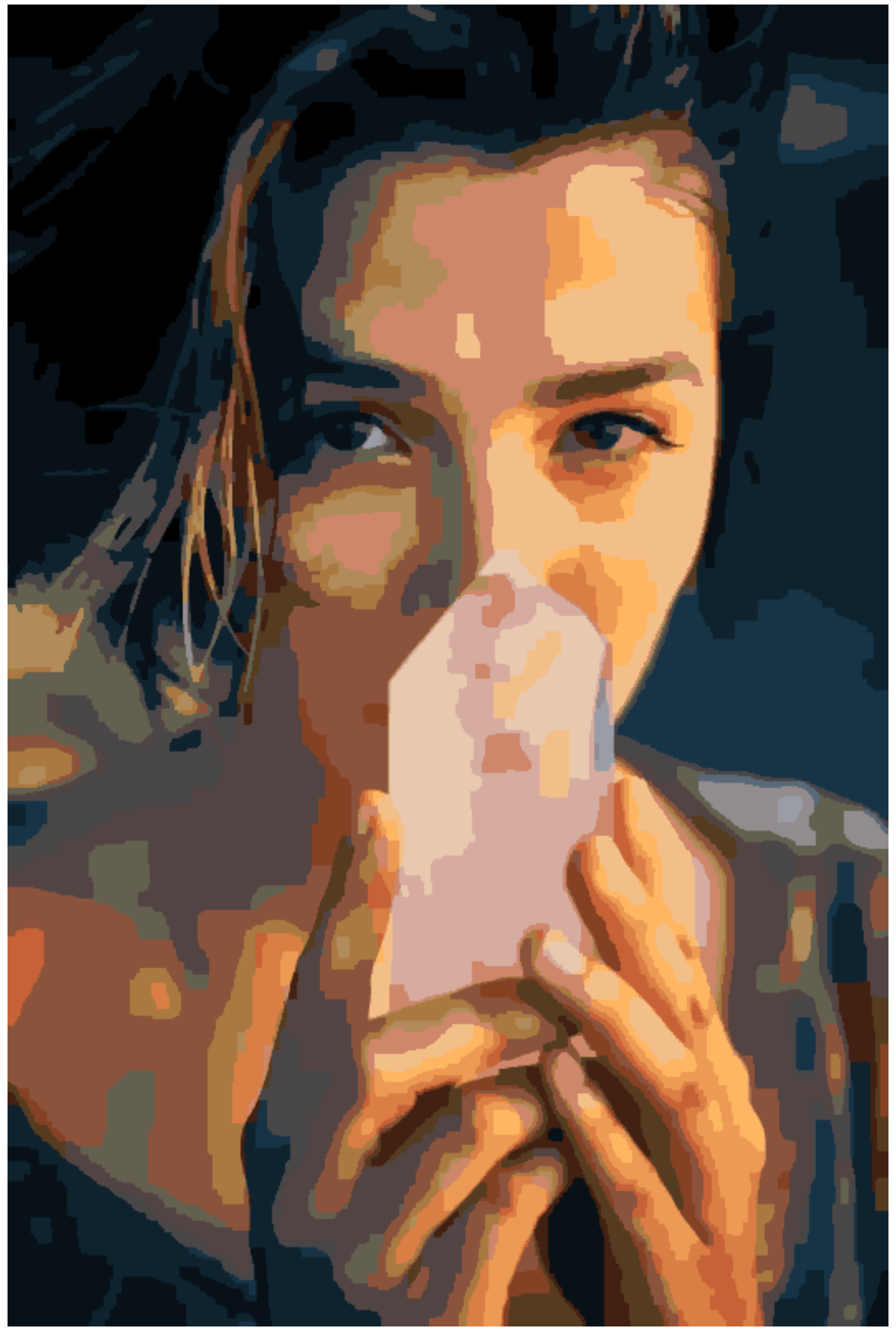

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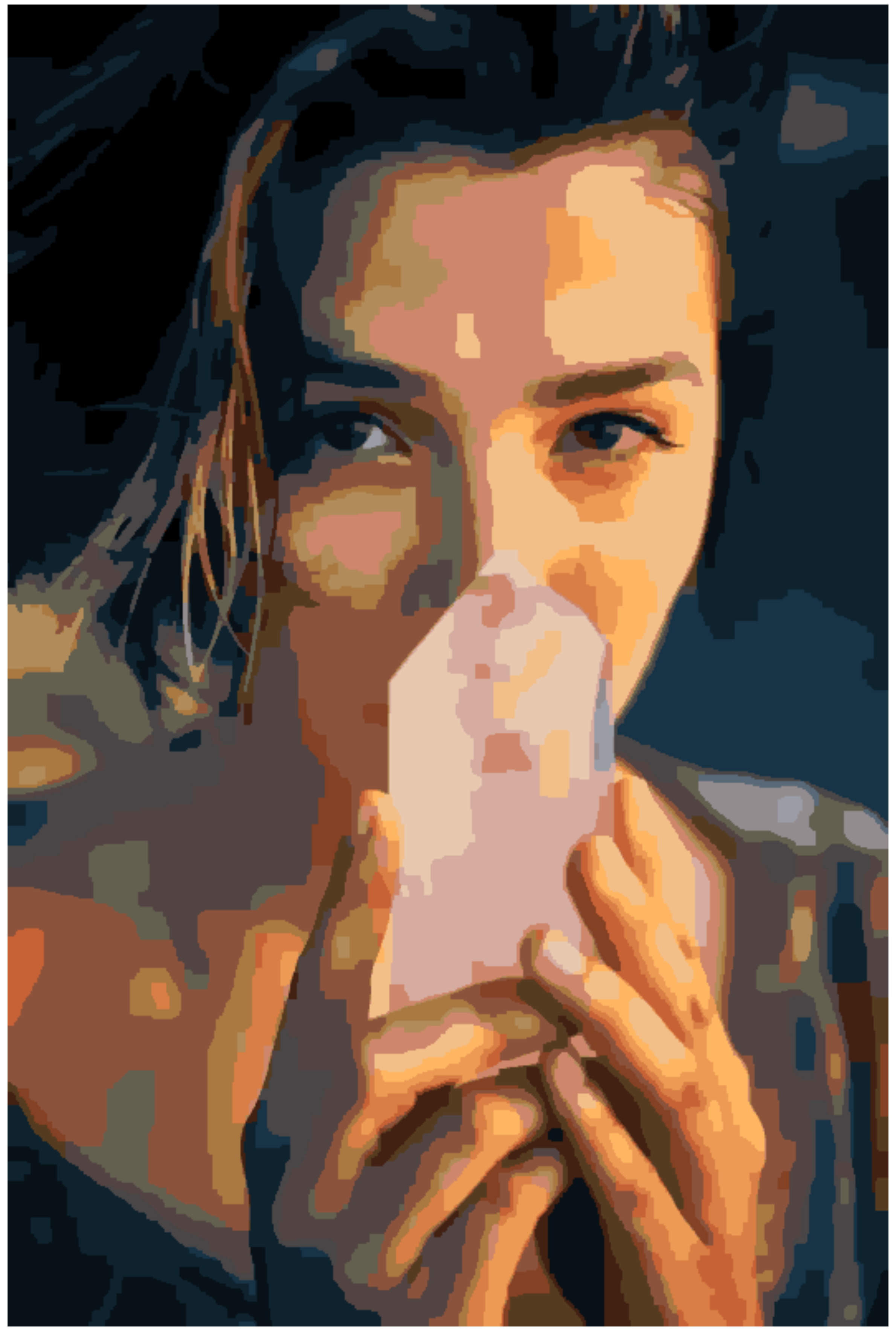

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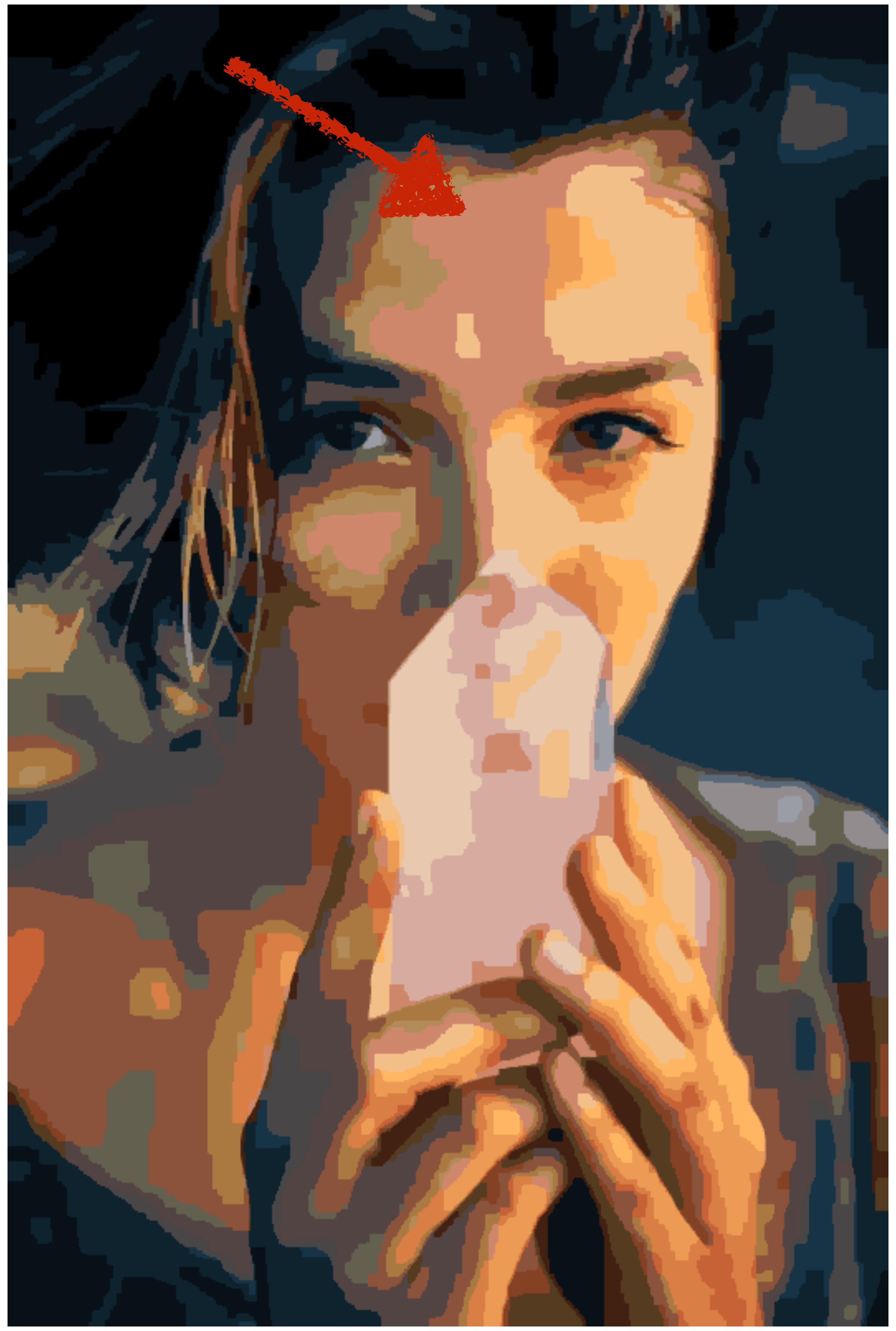

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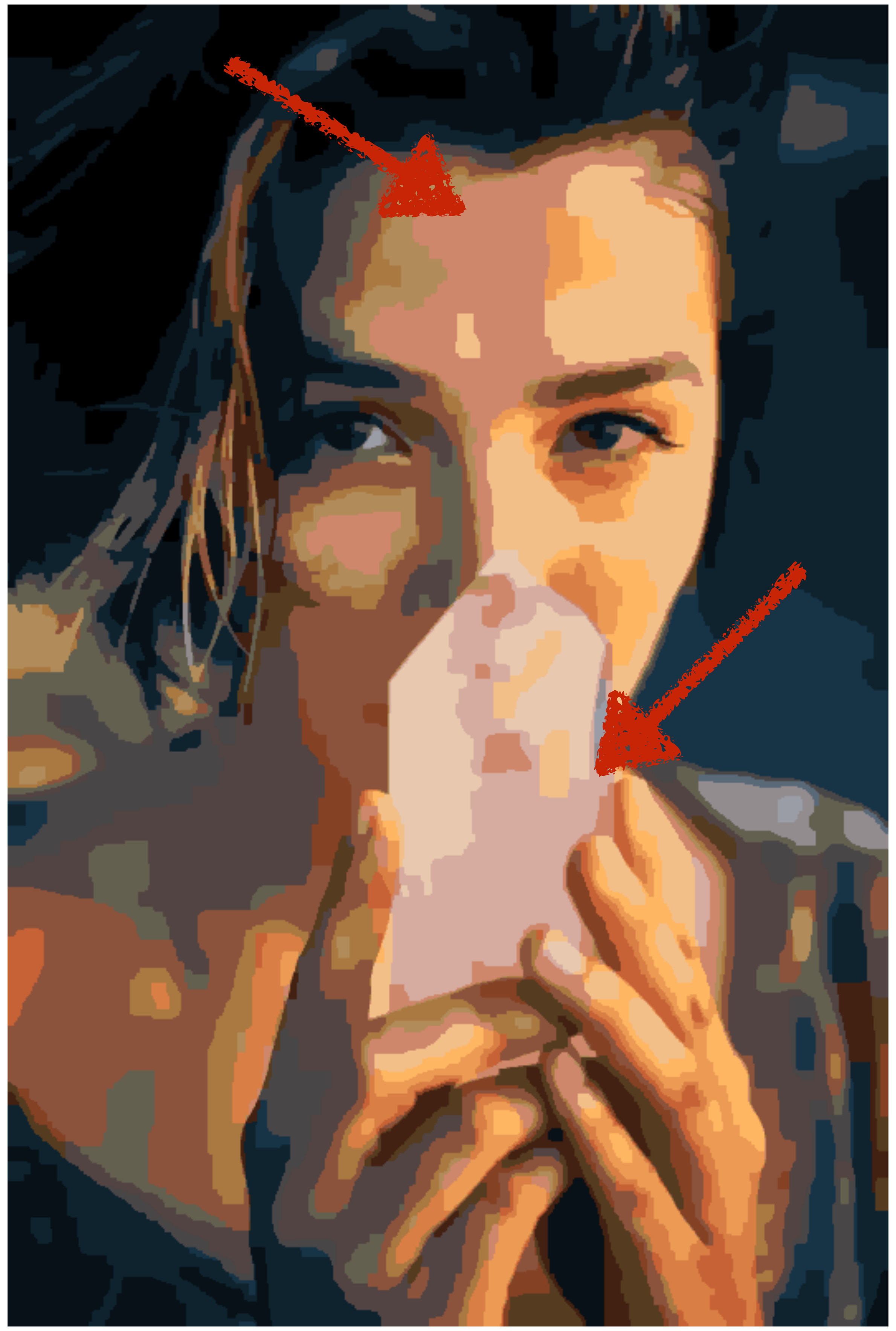

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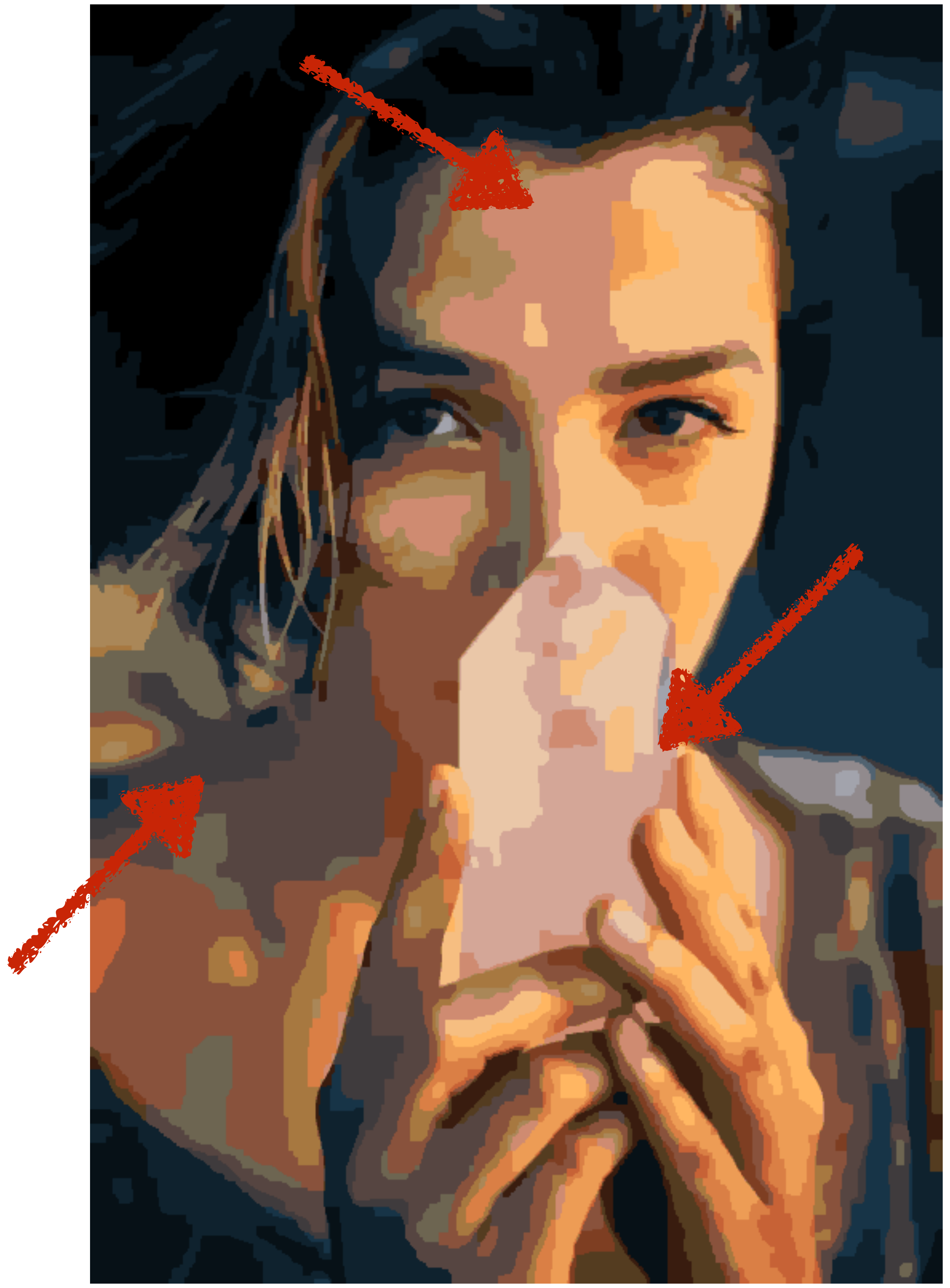

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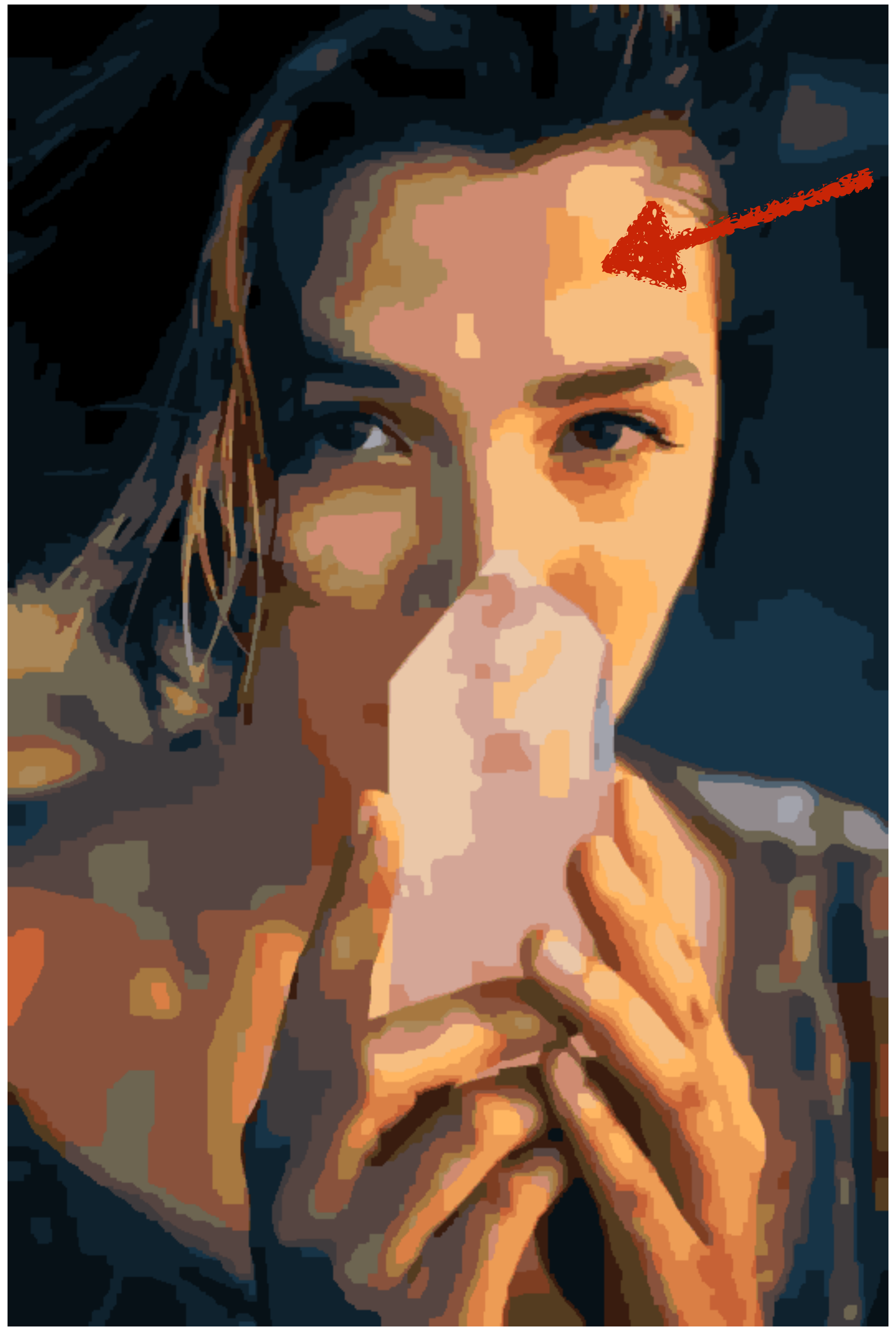

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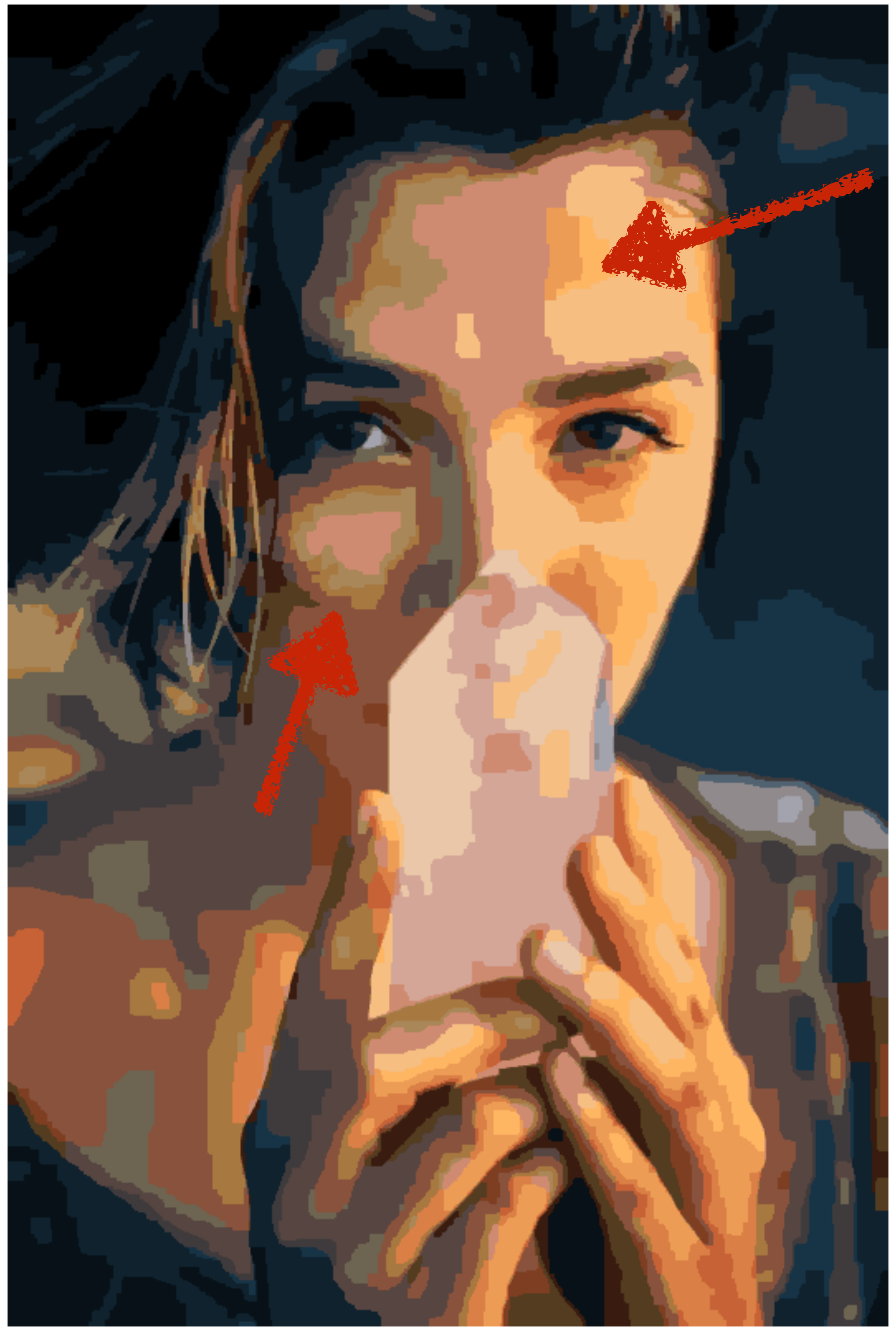

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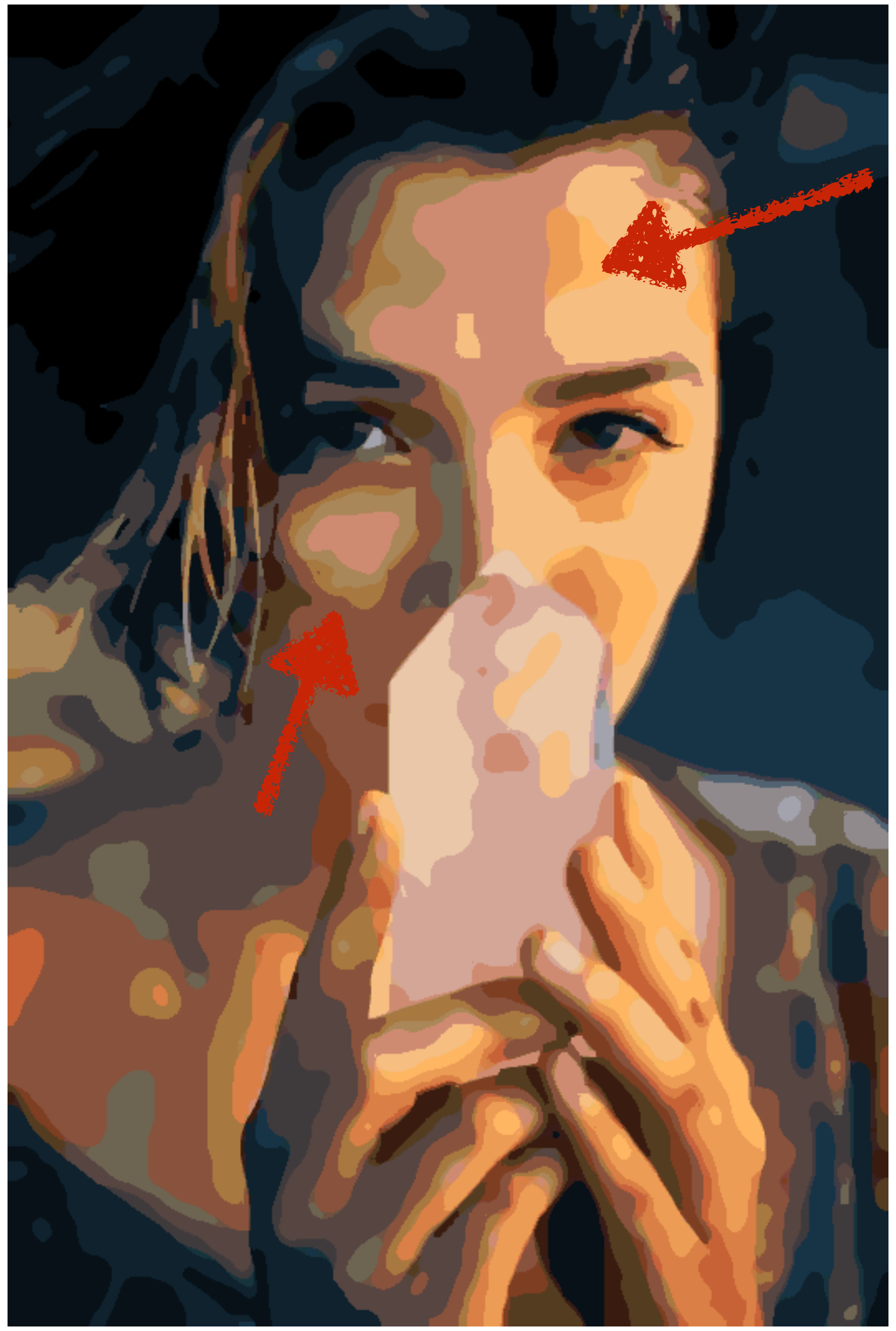

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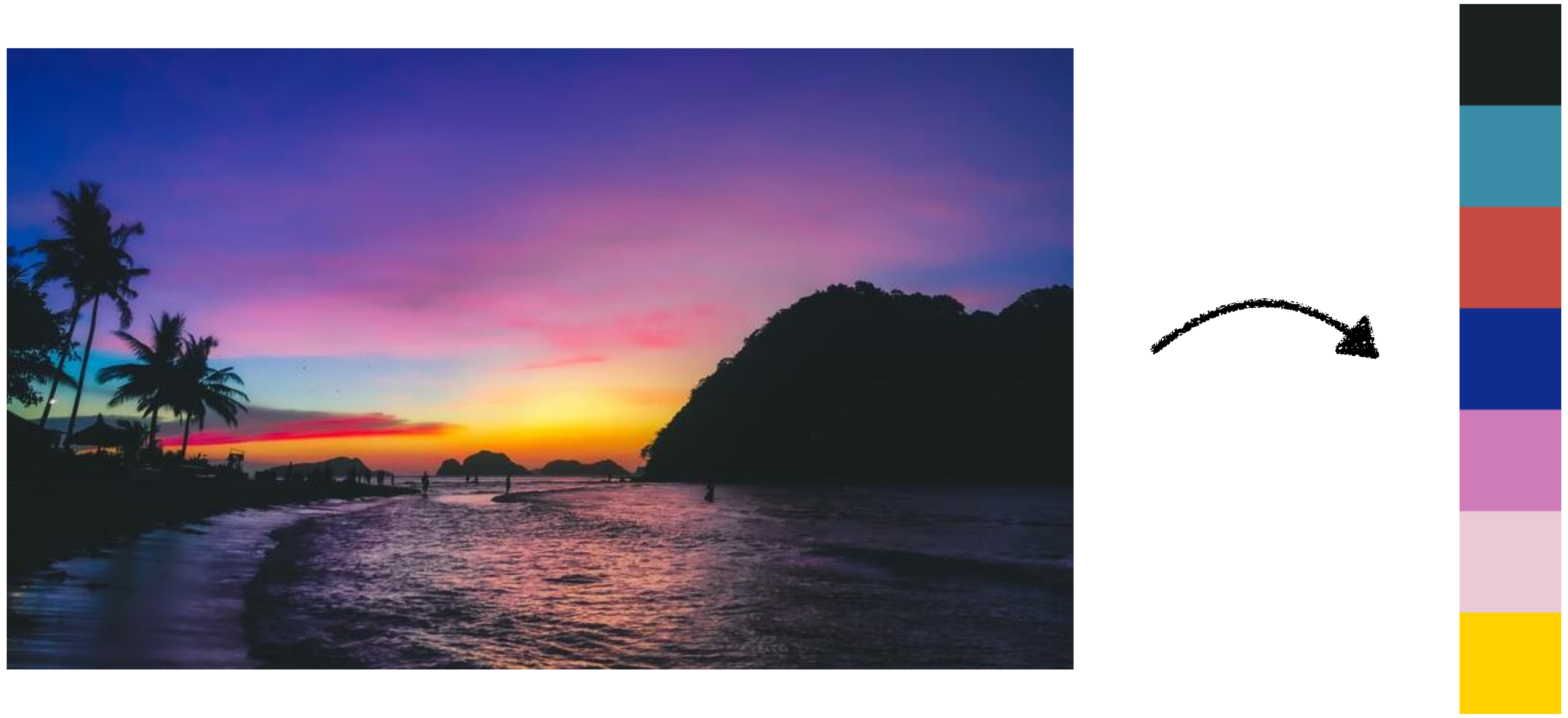

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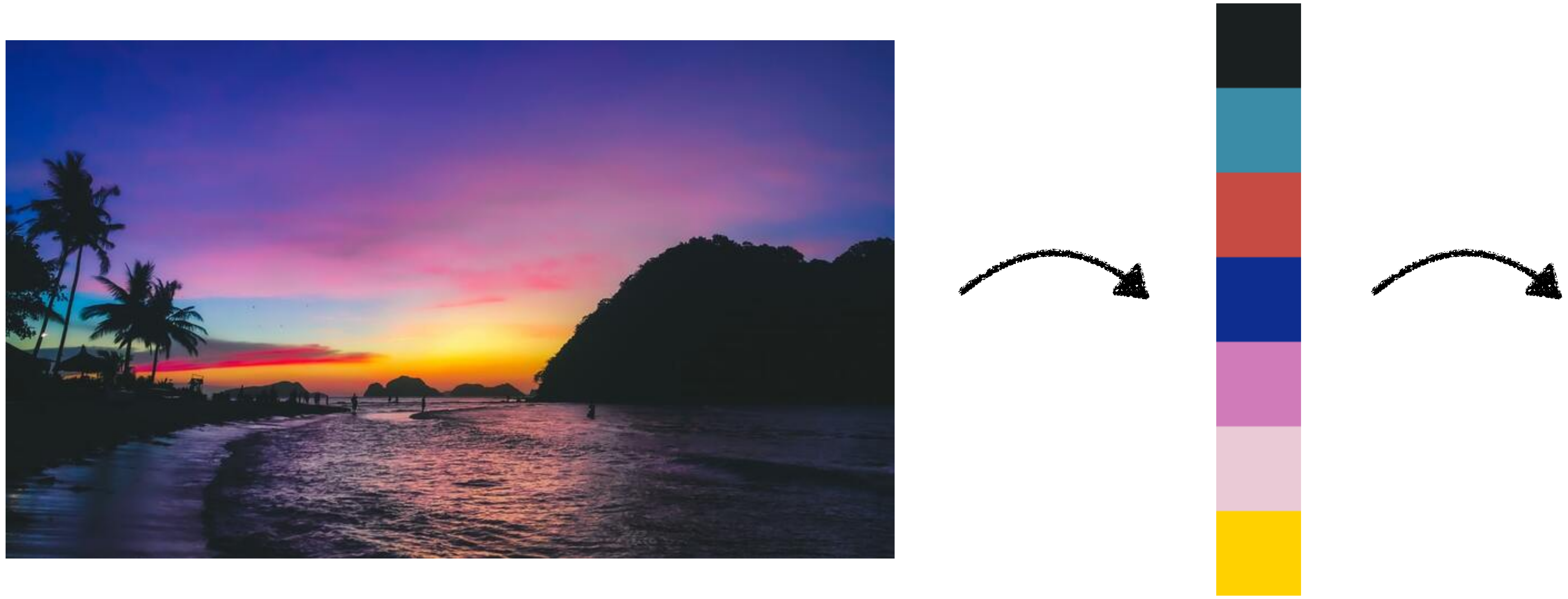

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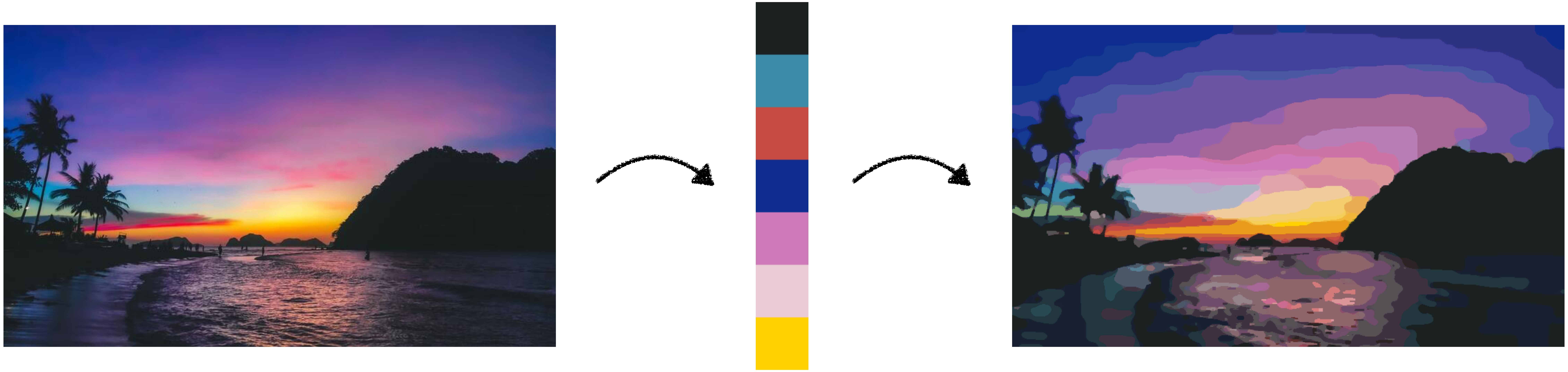

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  - We solve this problem with multi-label optimization [Boykov and Kolmogorov 2001].

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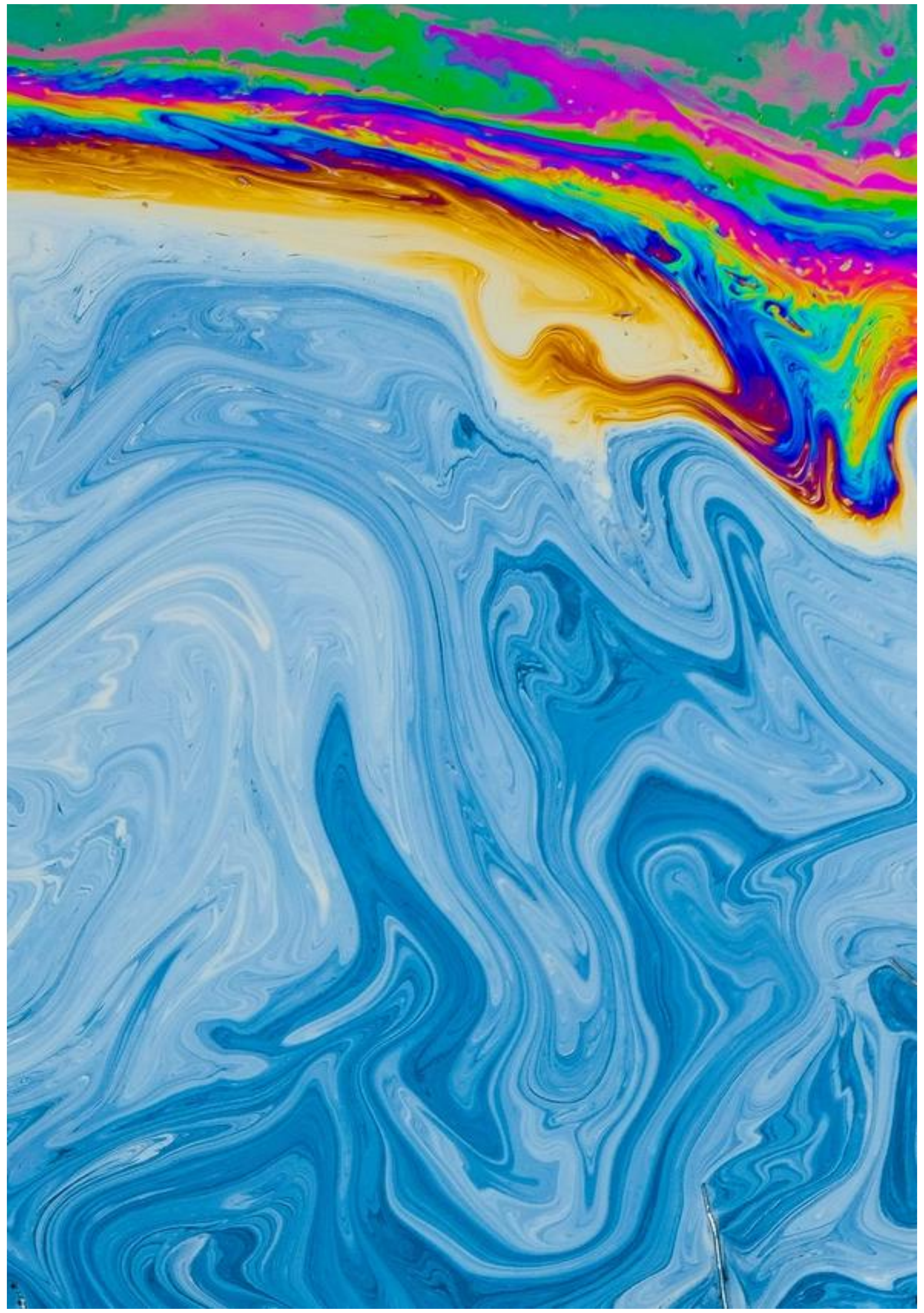

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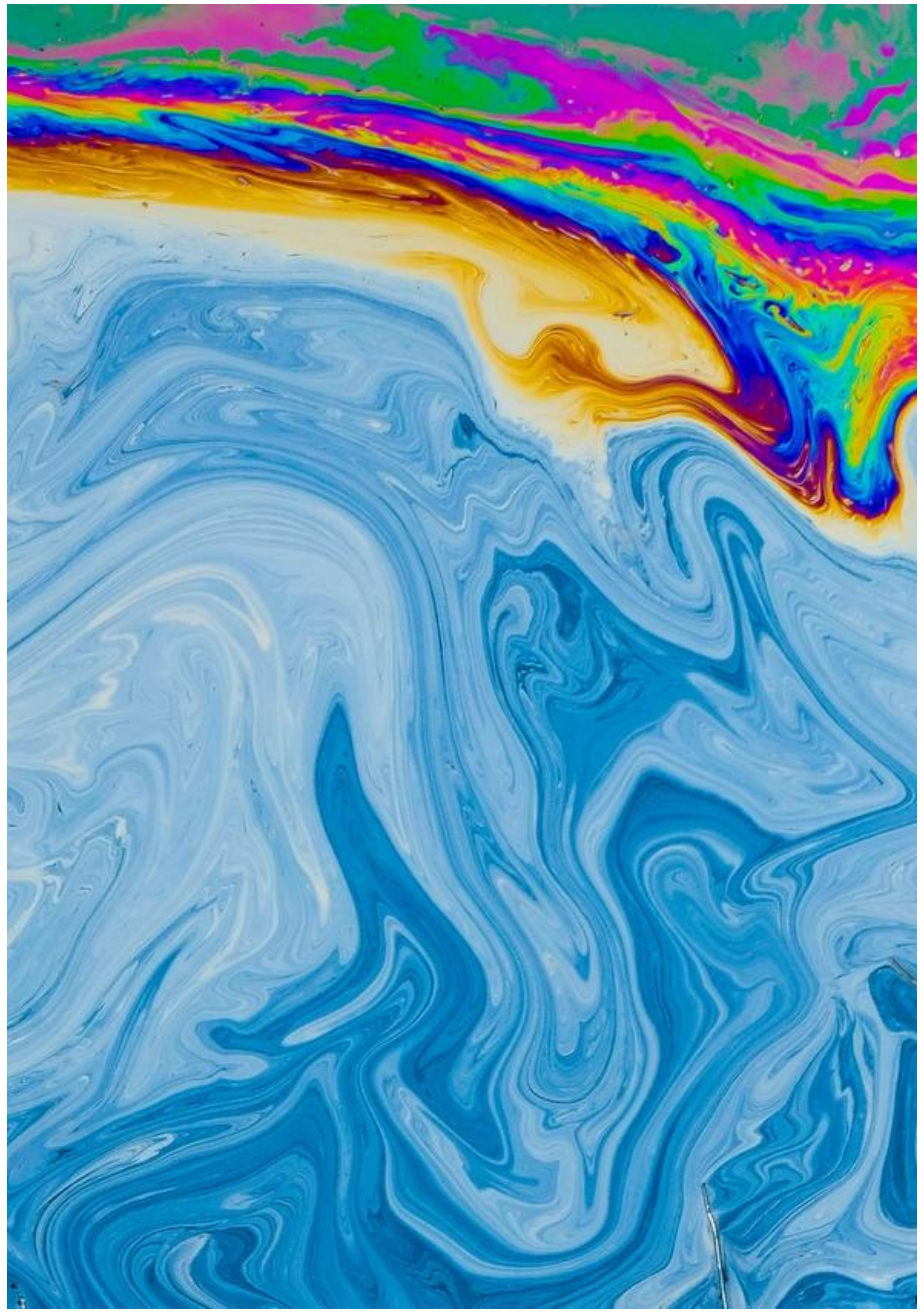

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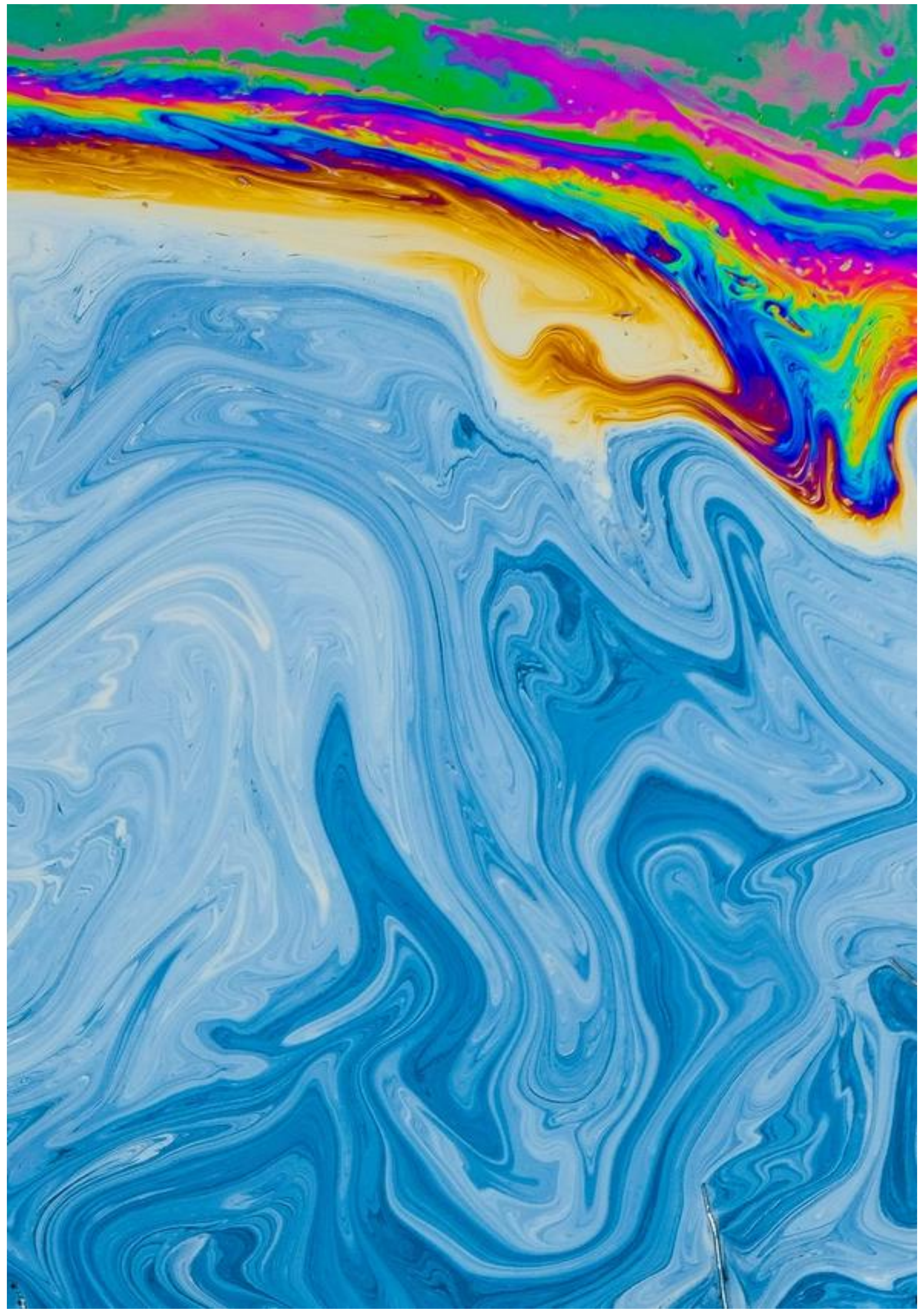

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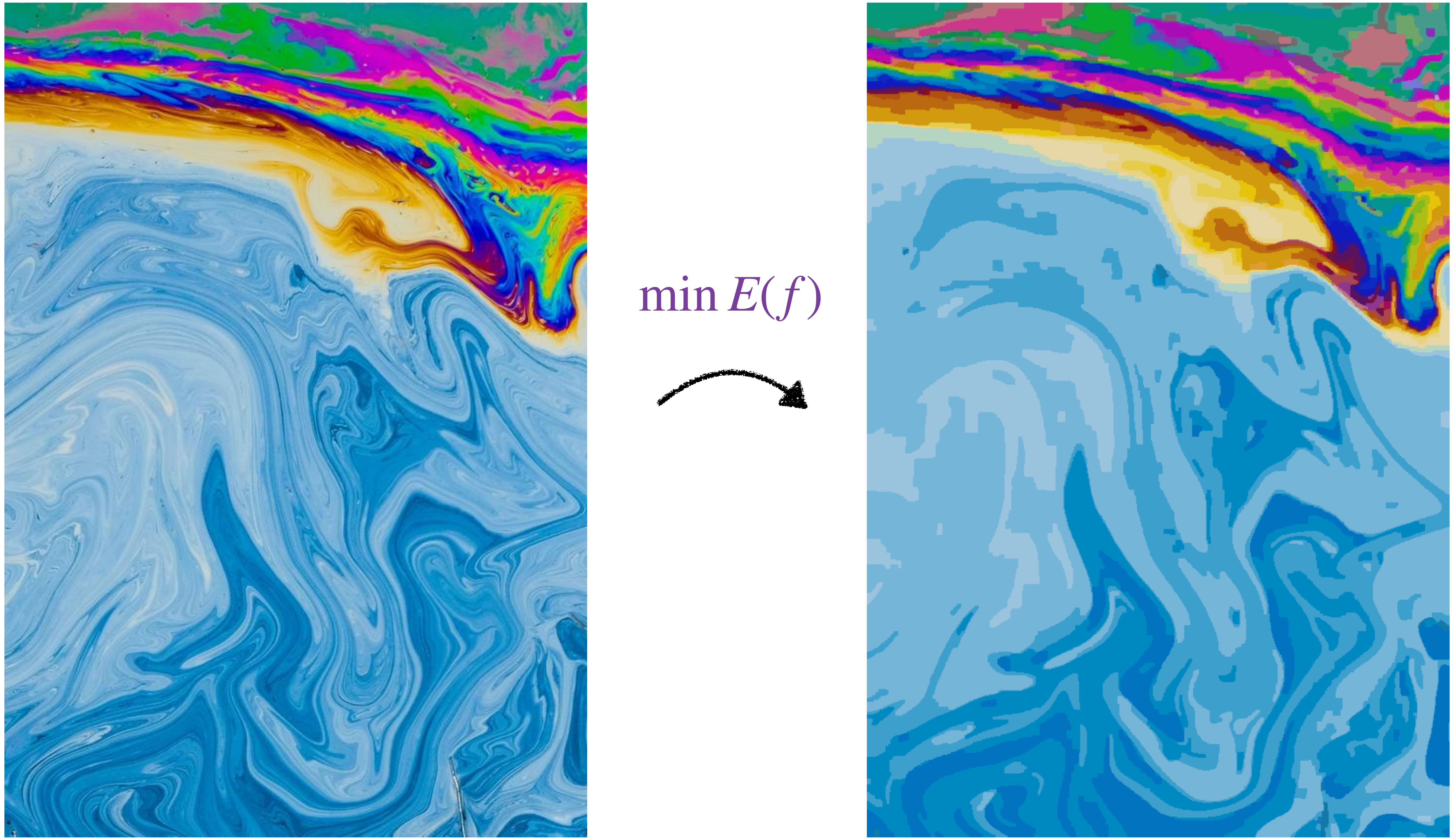

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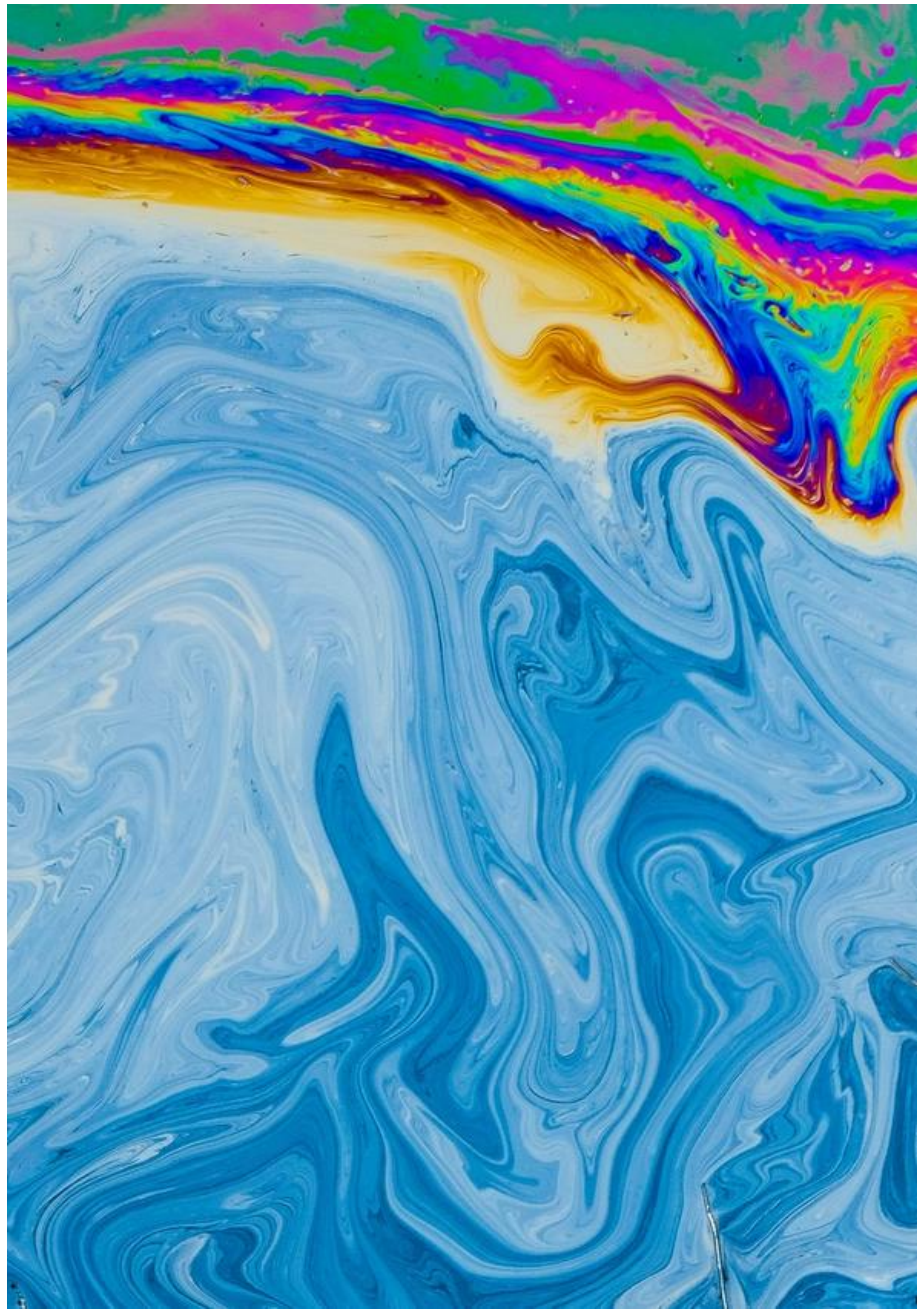

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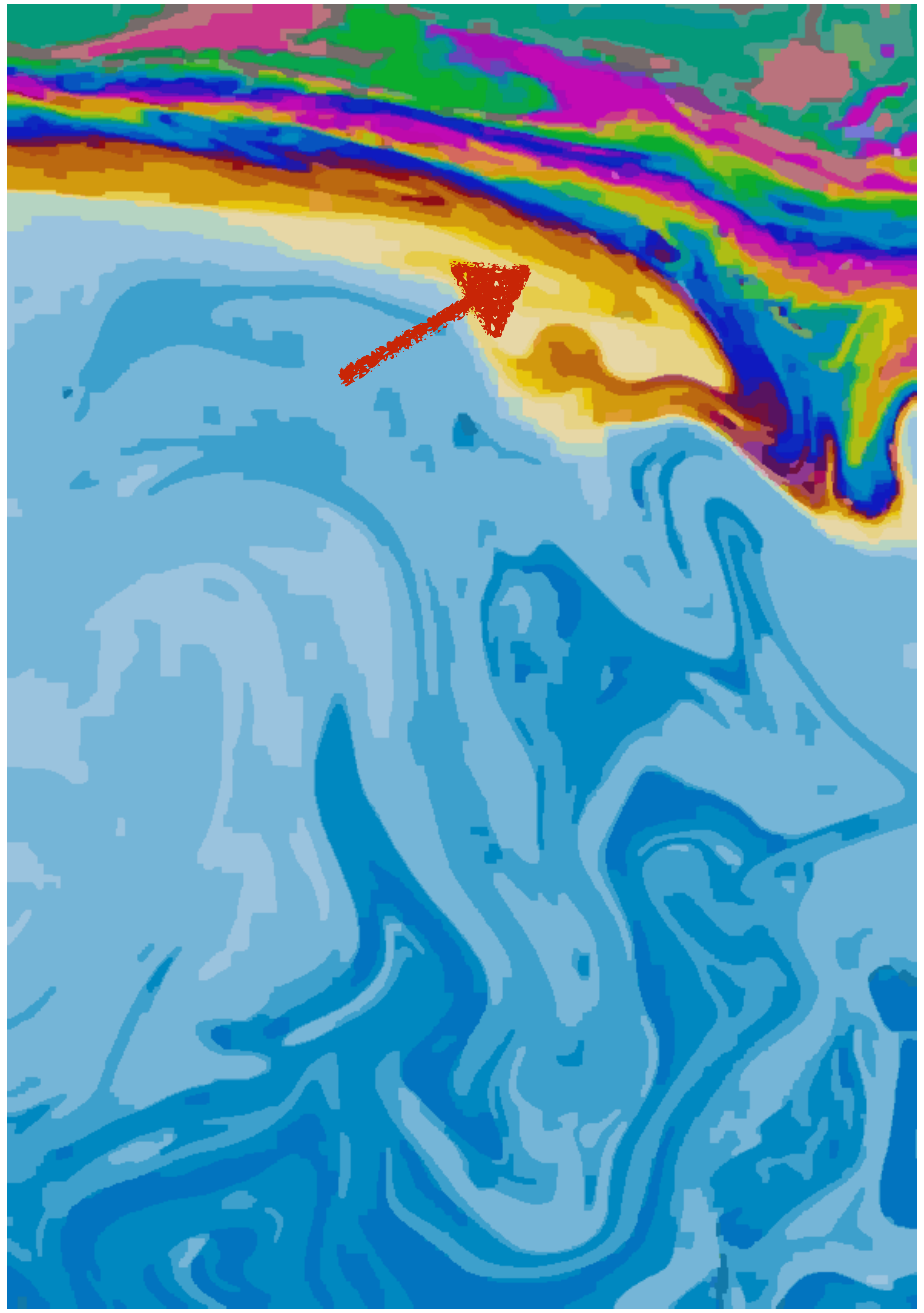

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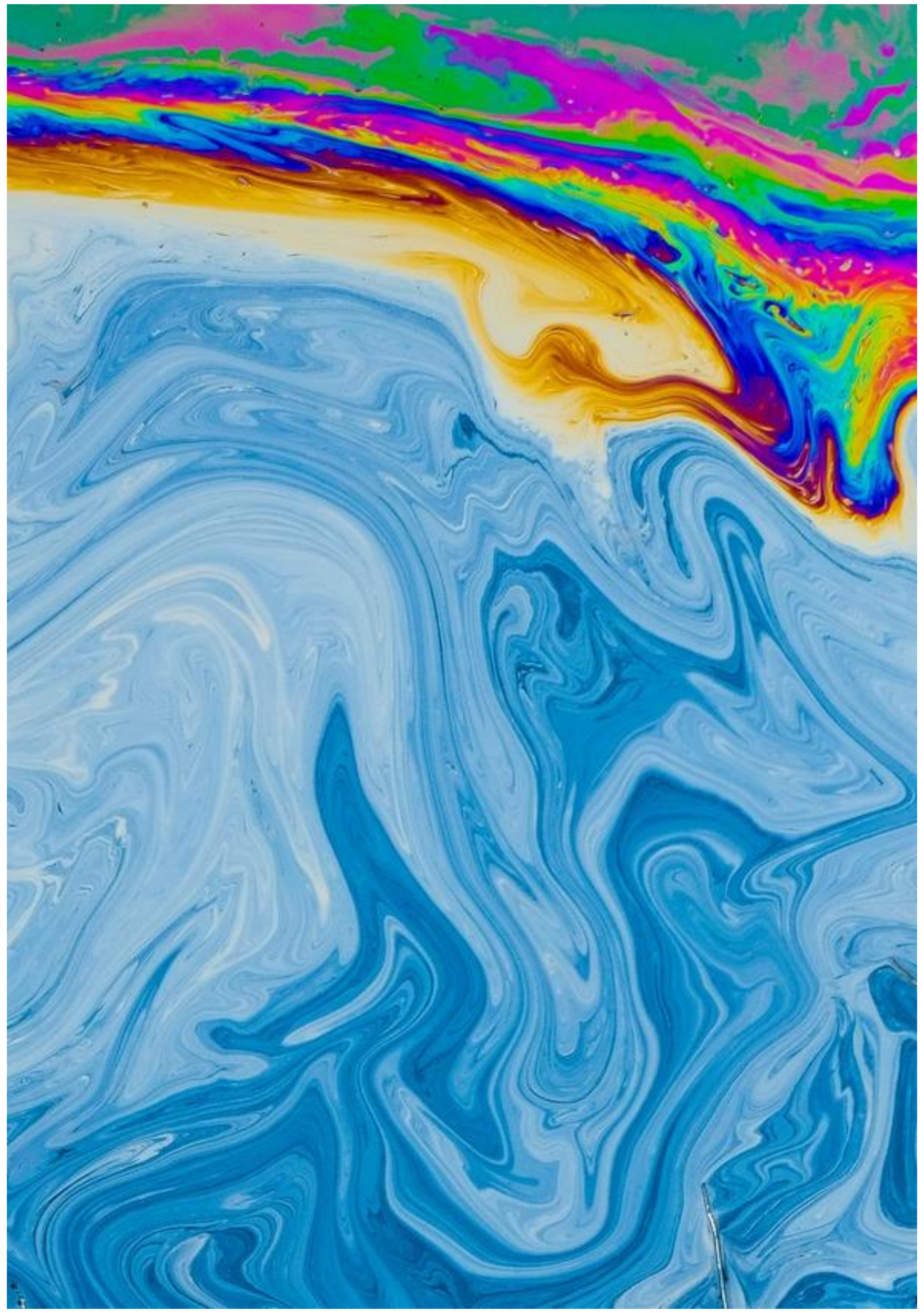

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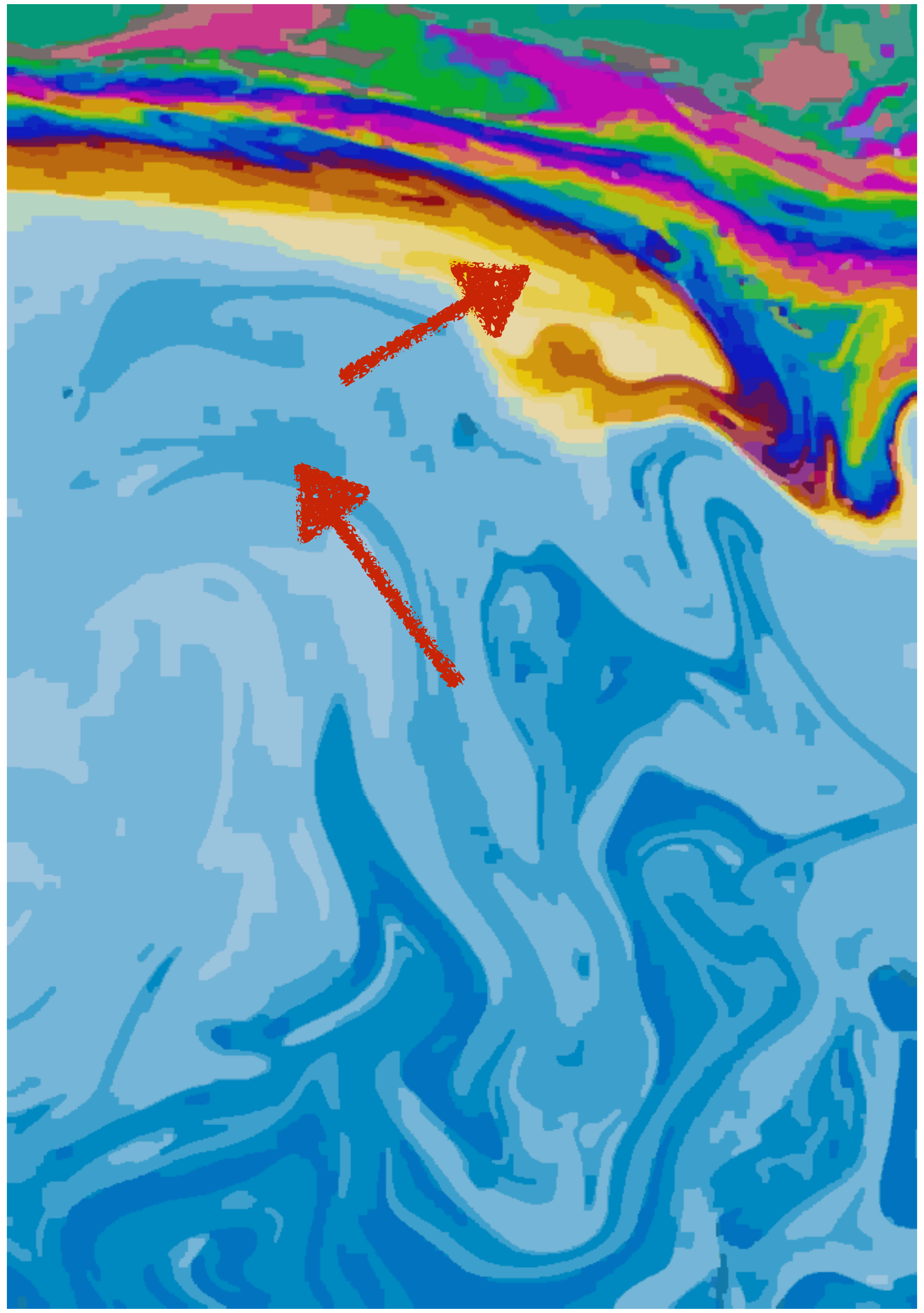

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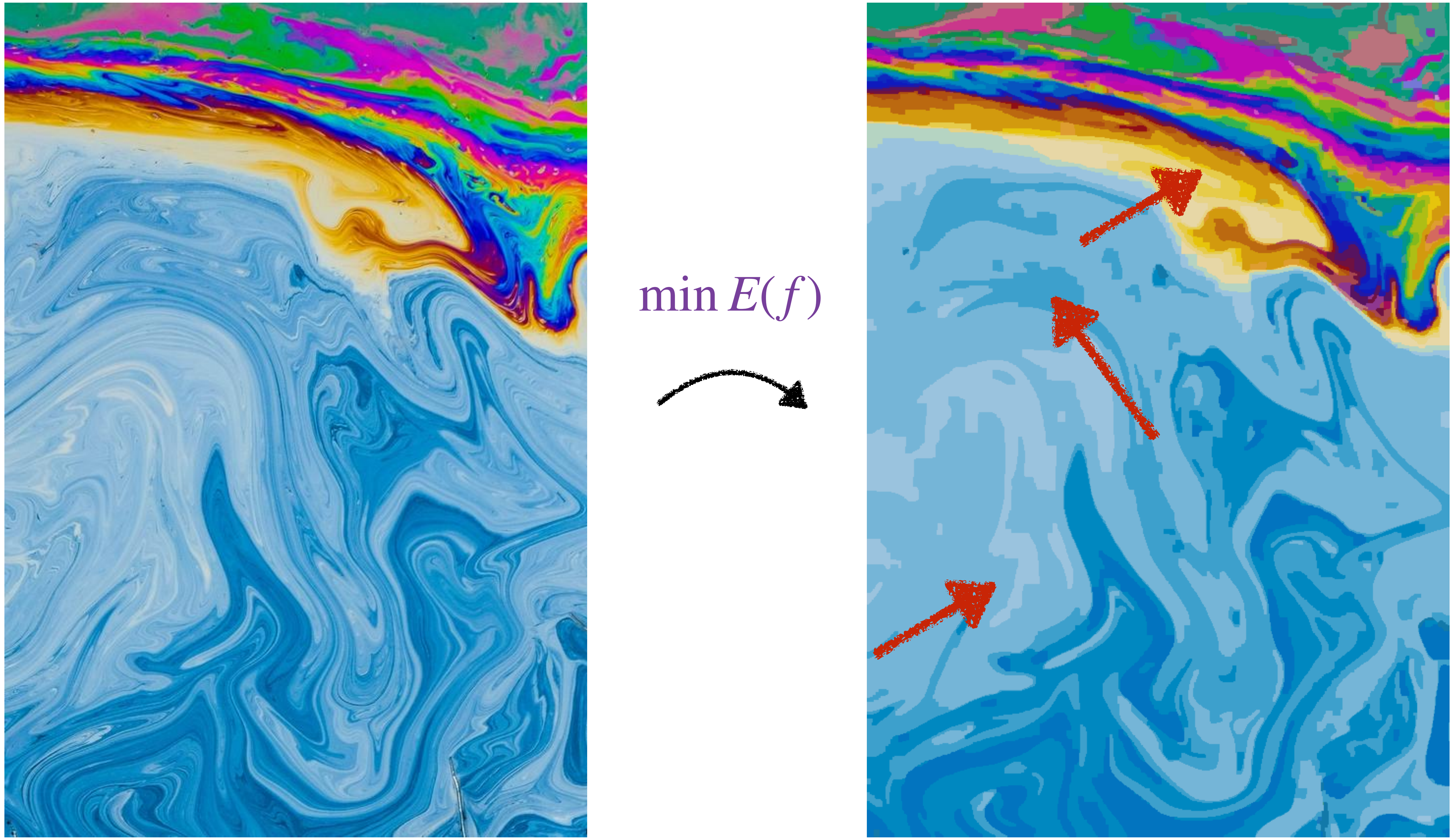

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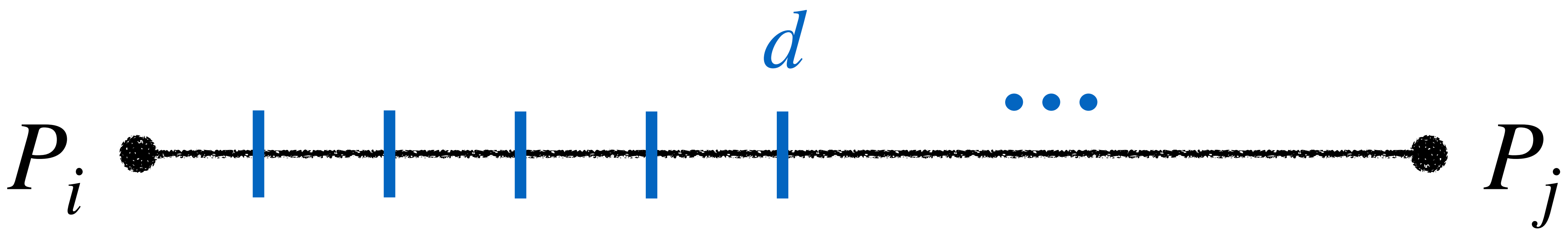

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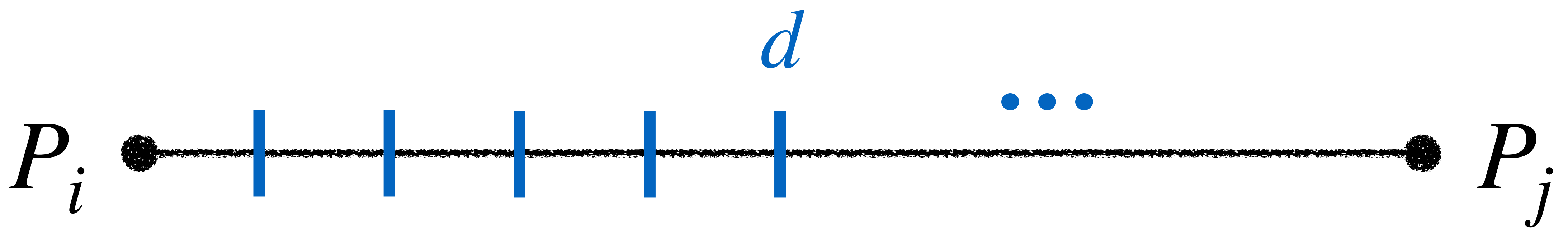

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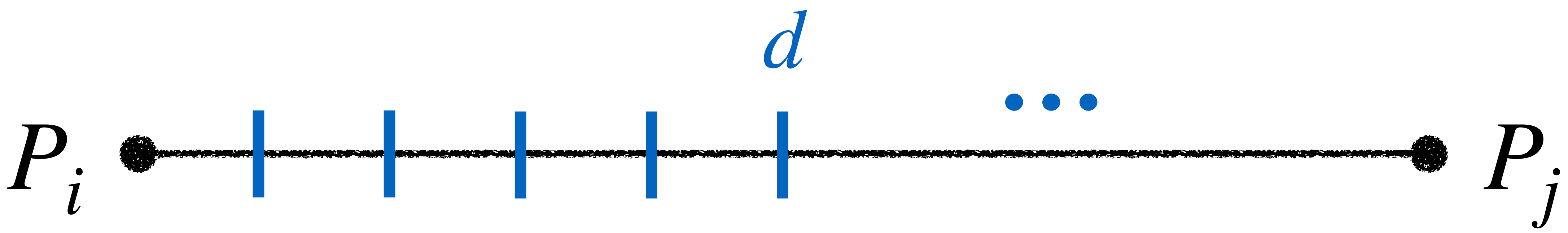

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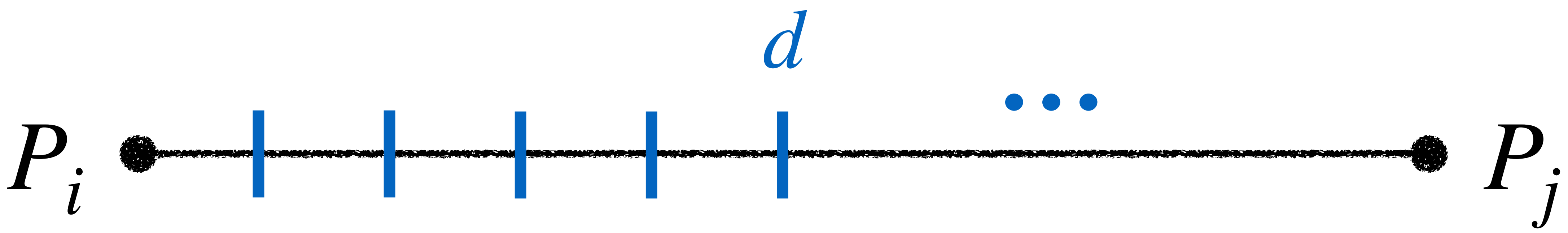

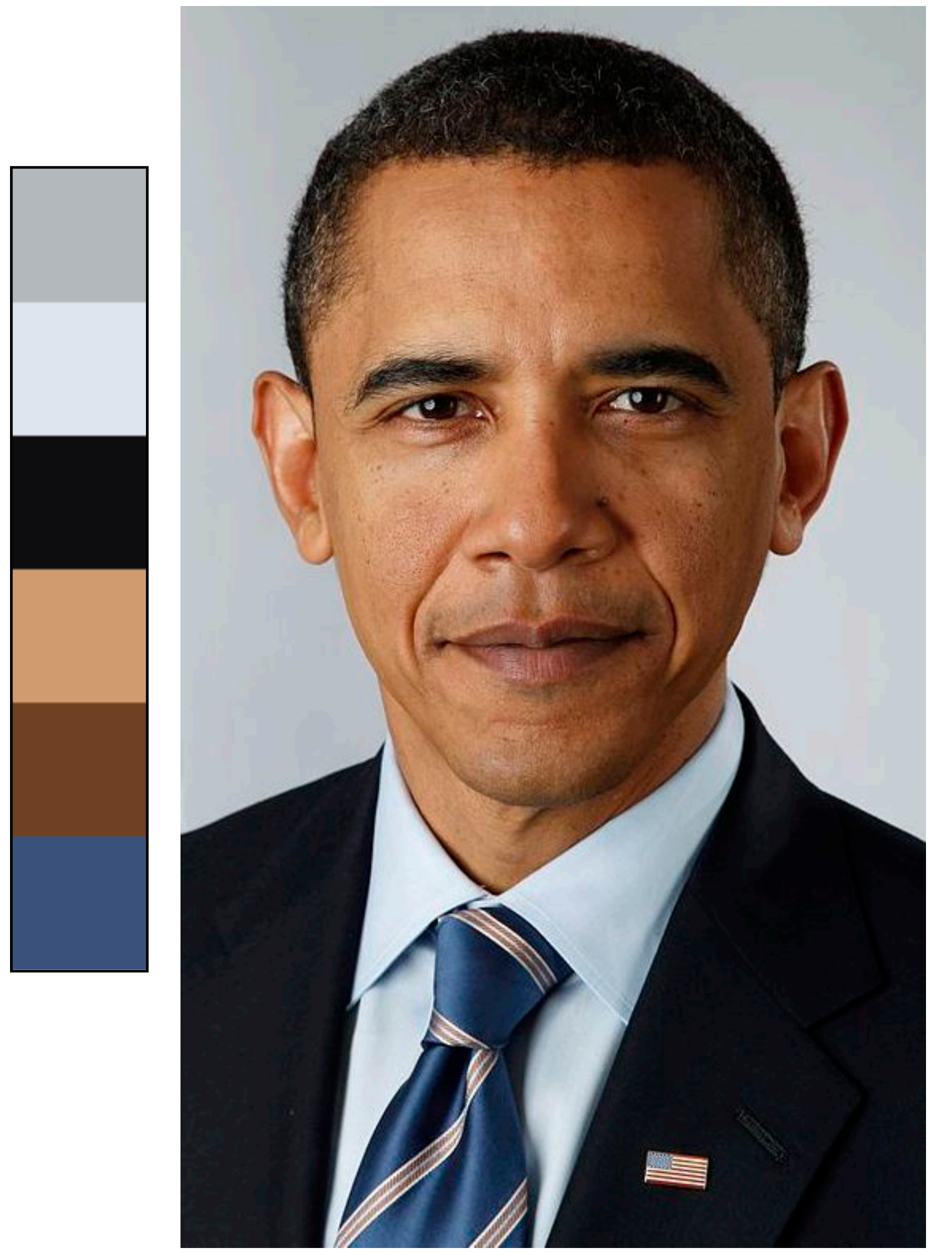

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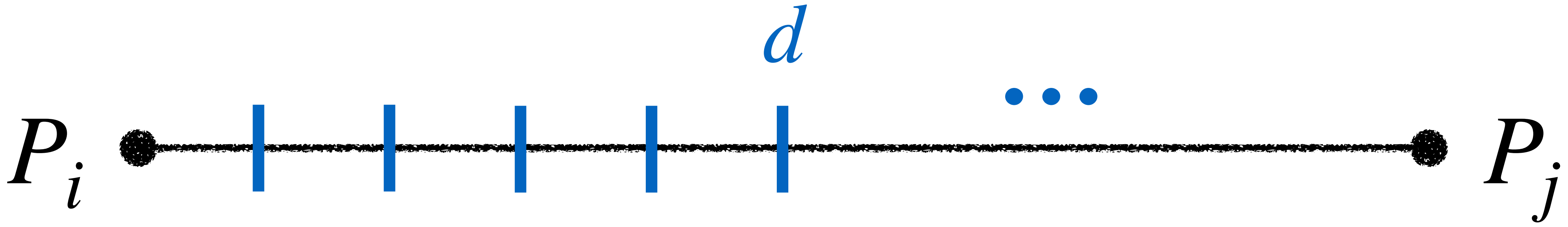

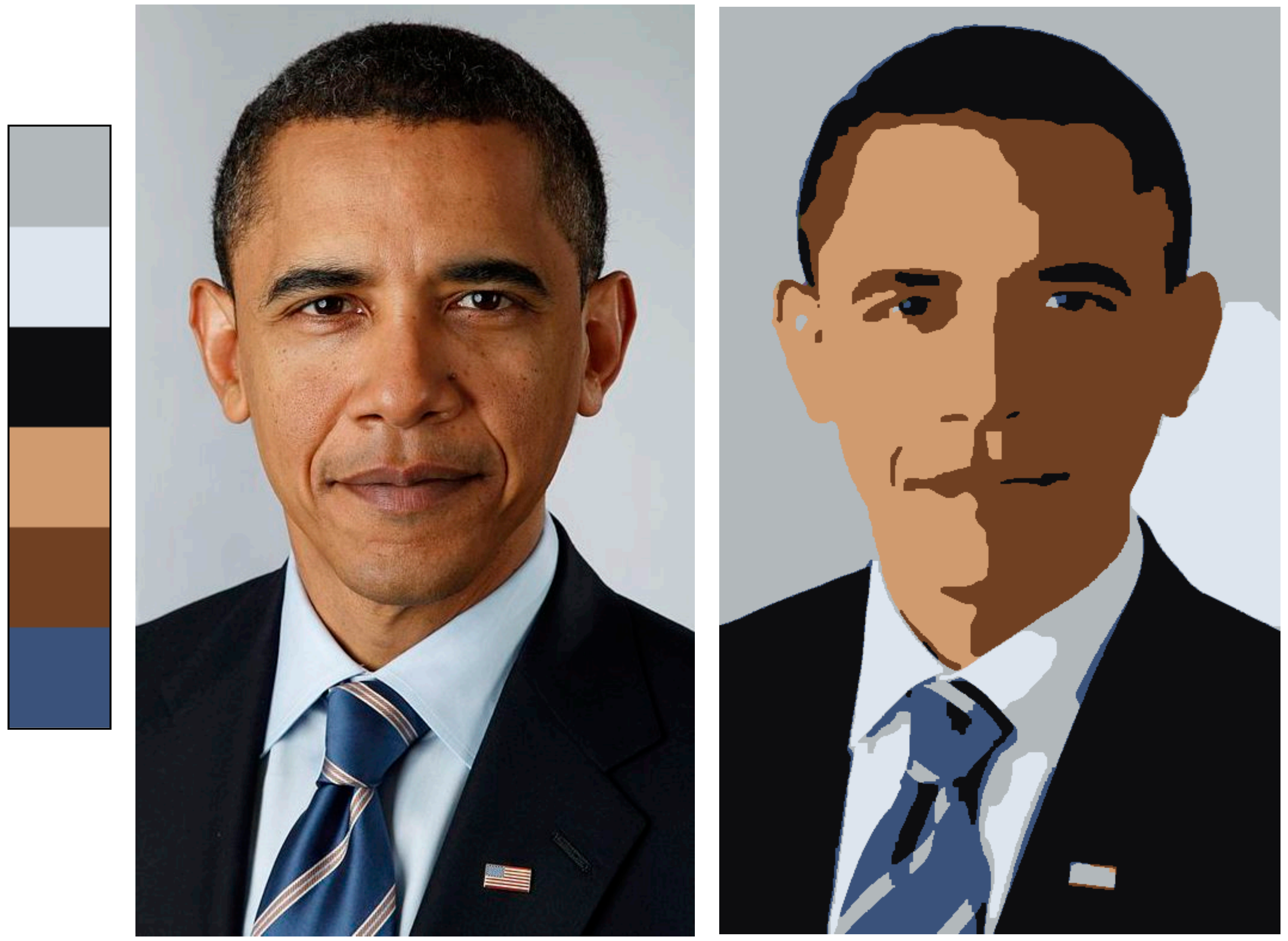

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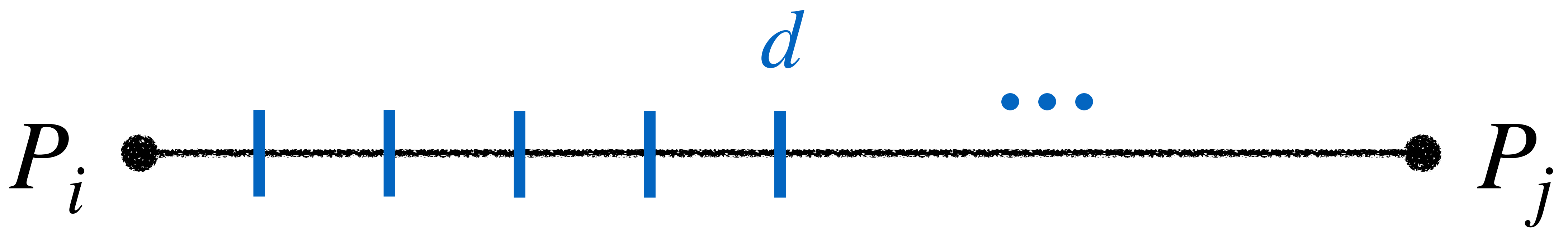
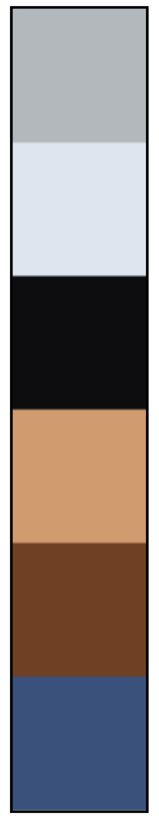
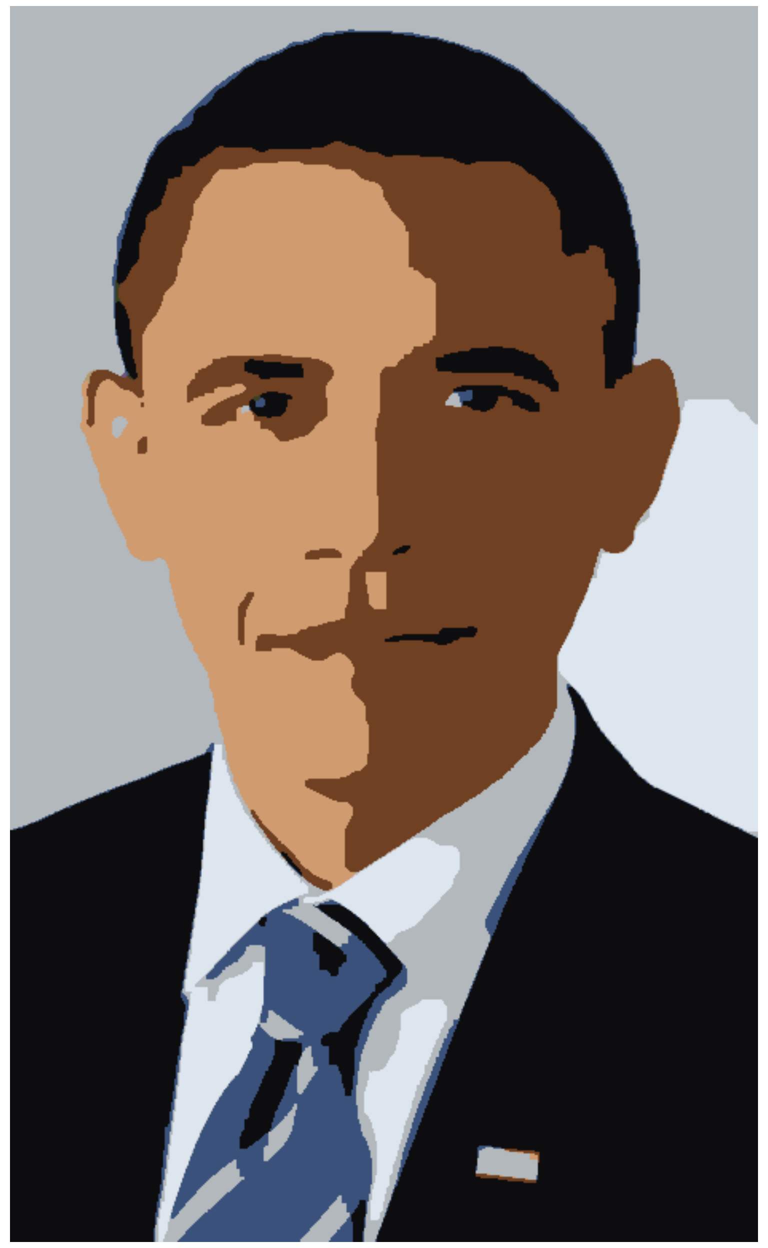




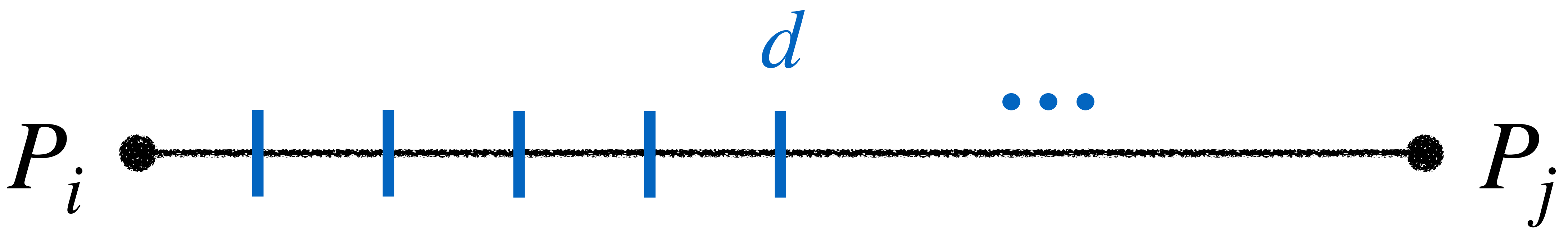
Input

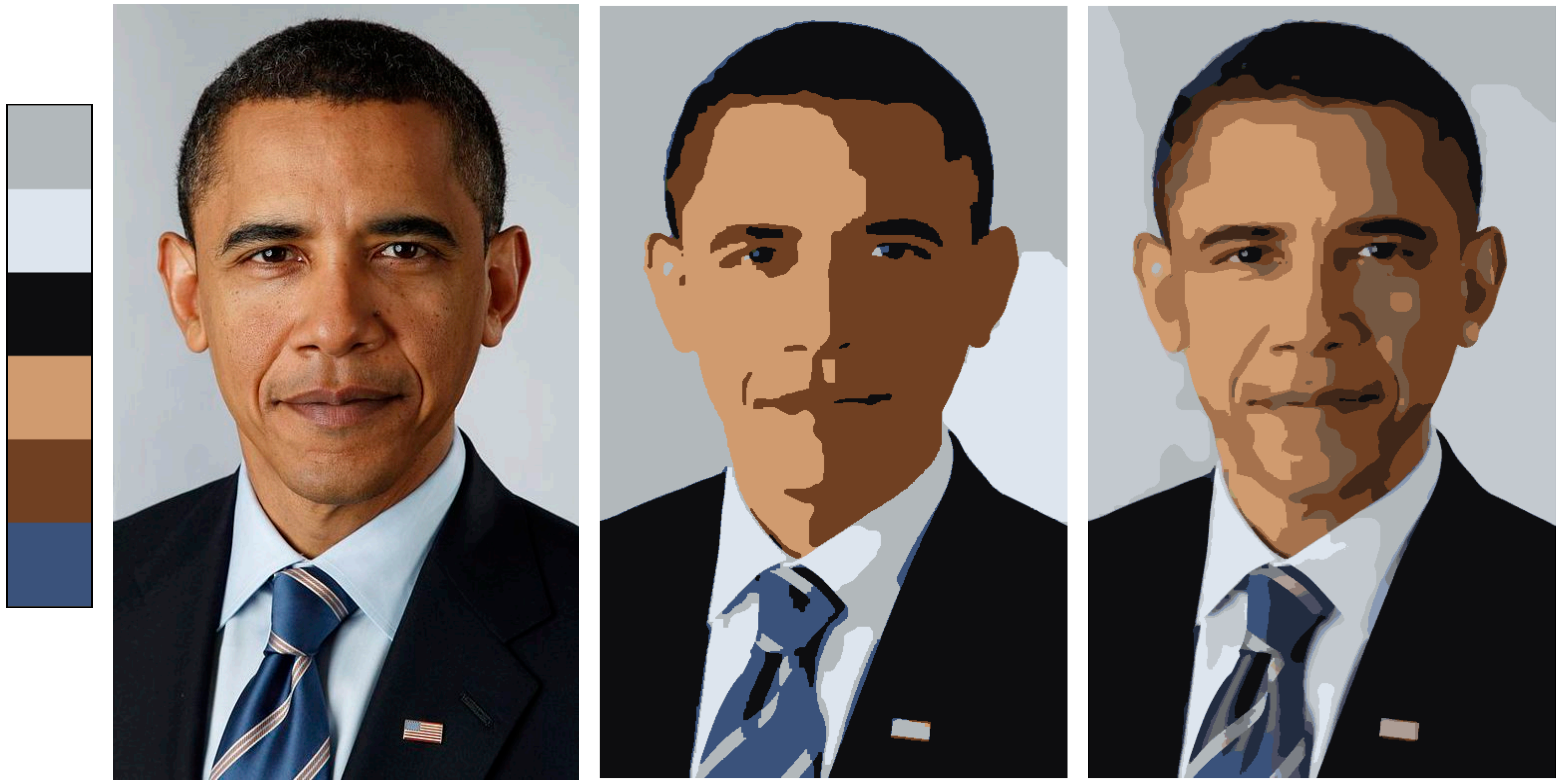


$d = 0$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.



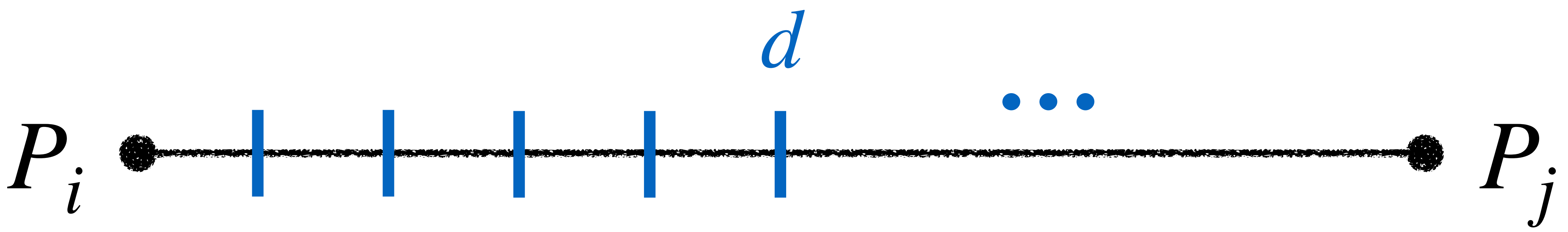


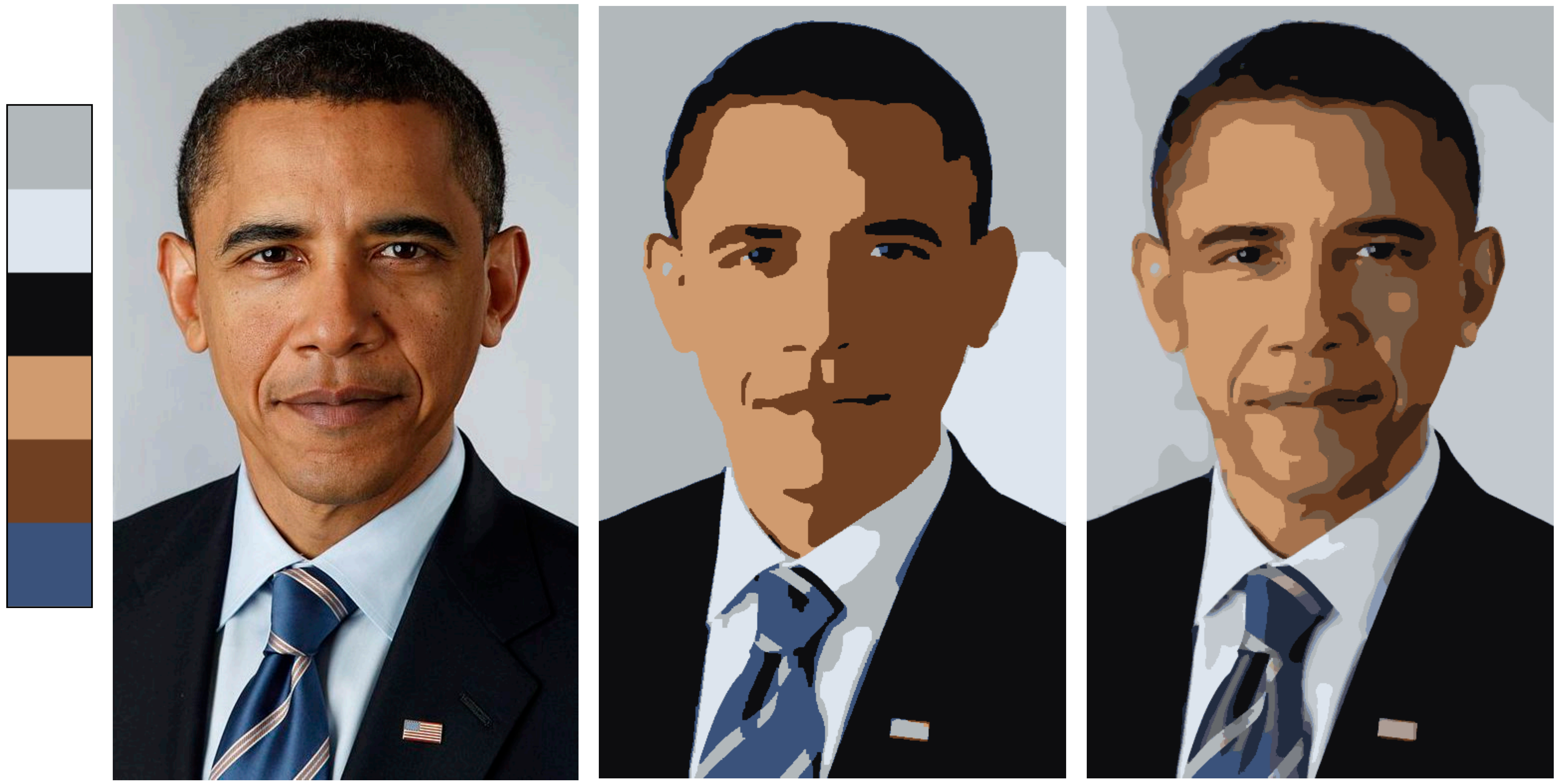
Input

$d = 0$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.

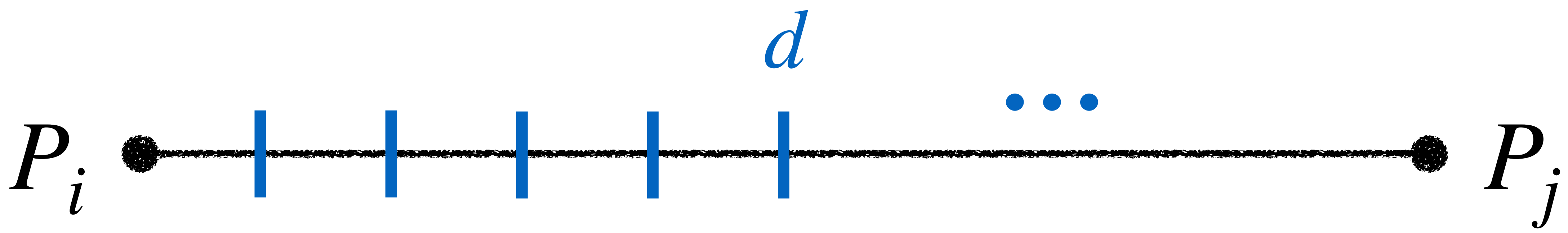


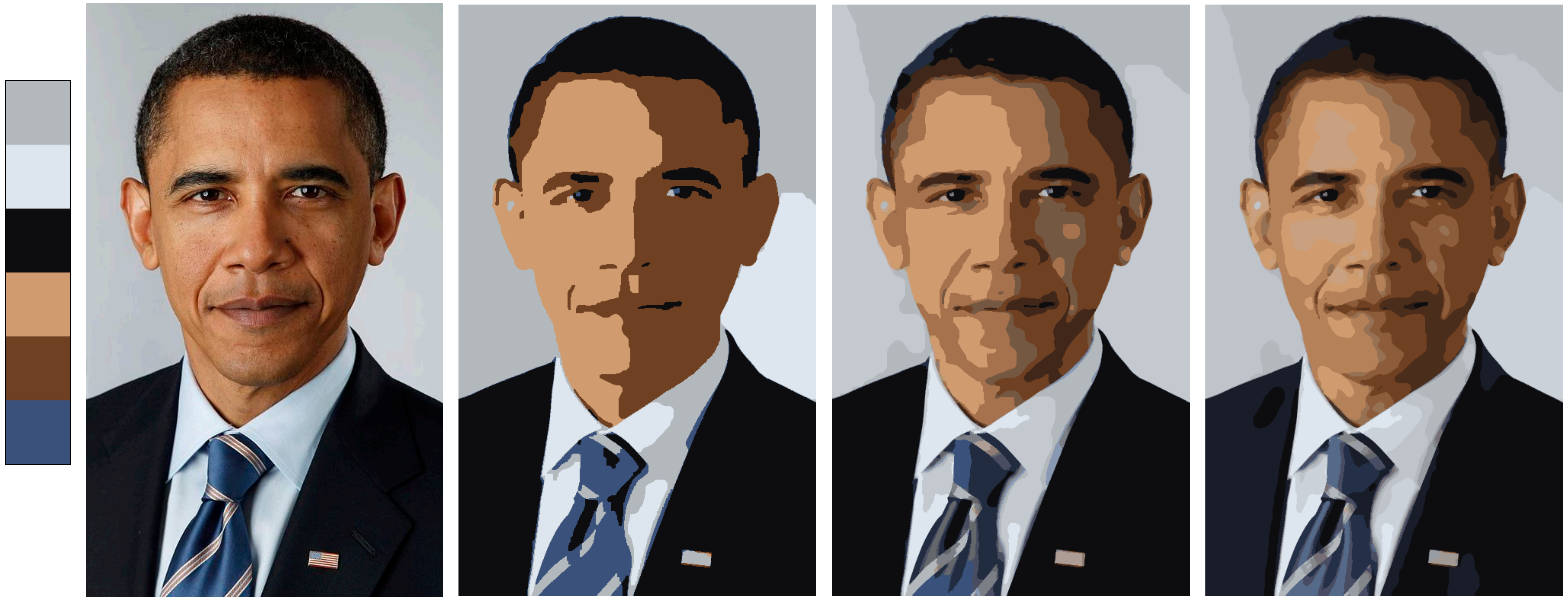


Input $d = 0$ $d = 1$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.





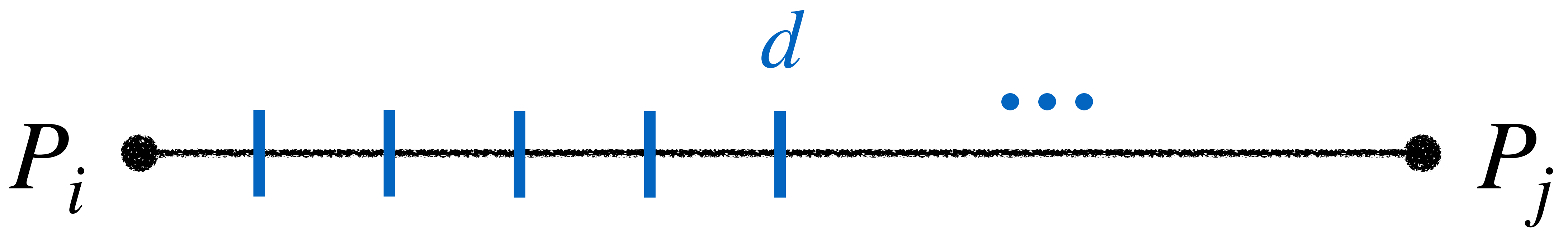
Input

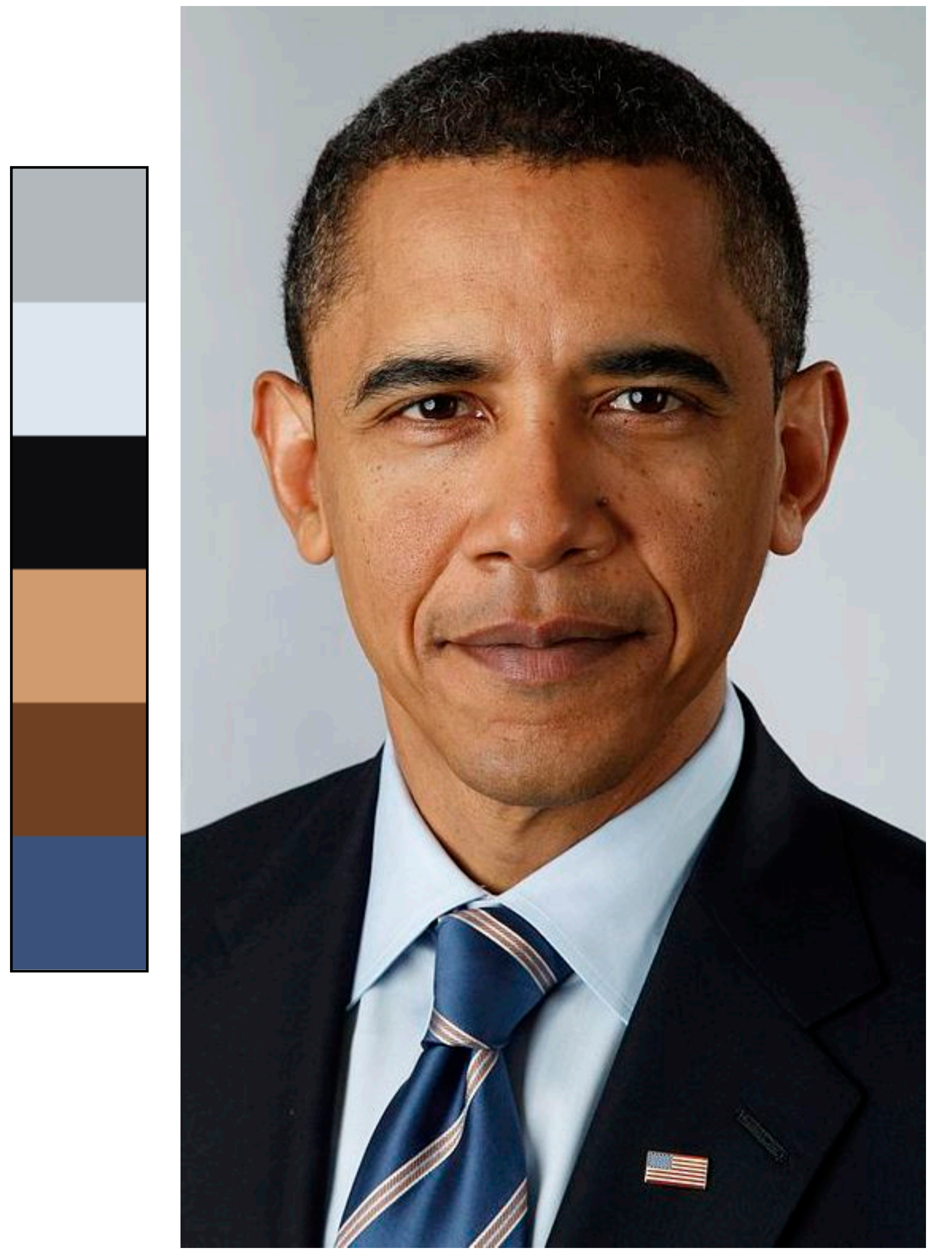
$d = 0$

$d = 1$

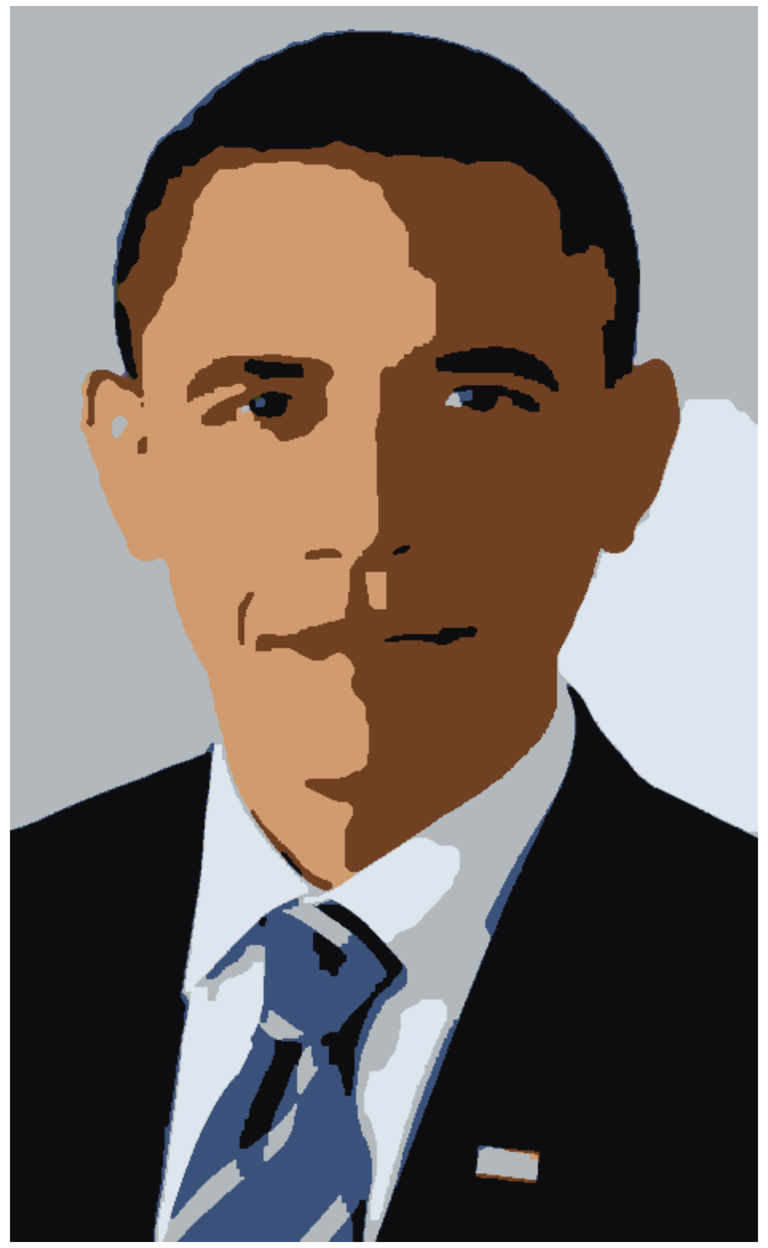
Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.

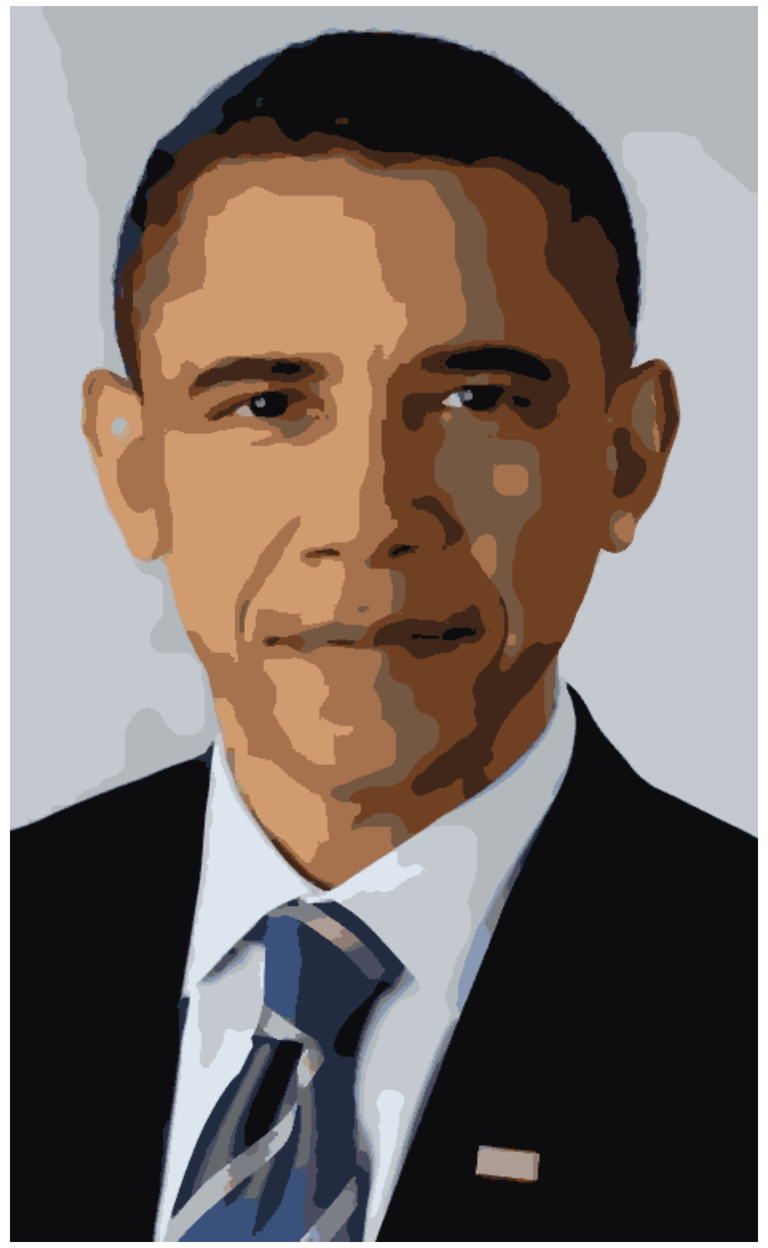




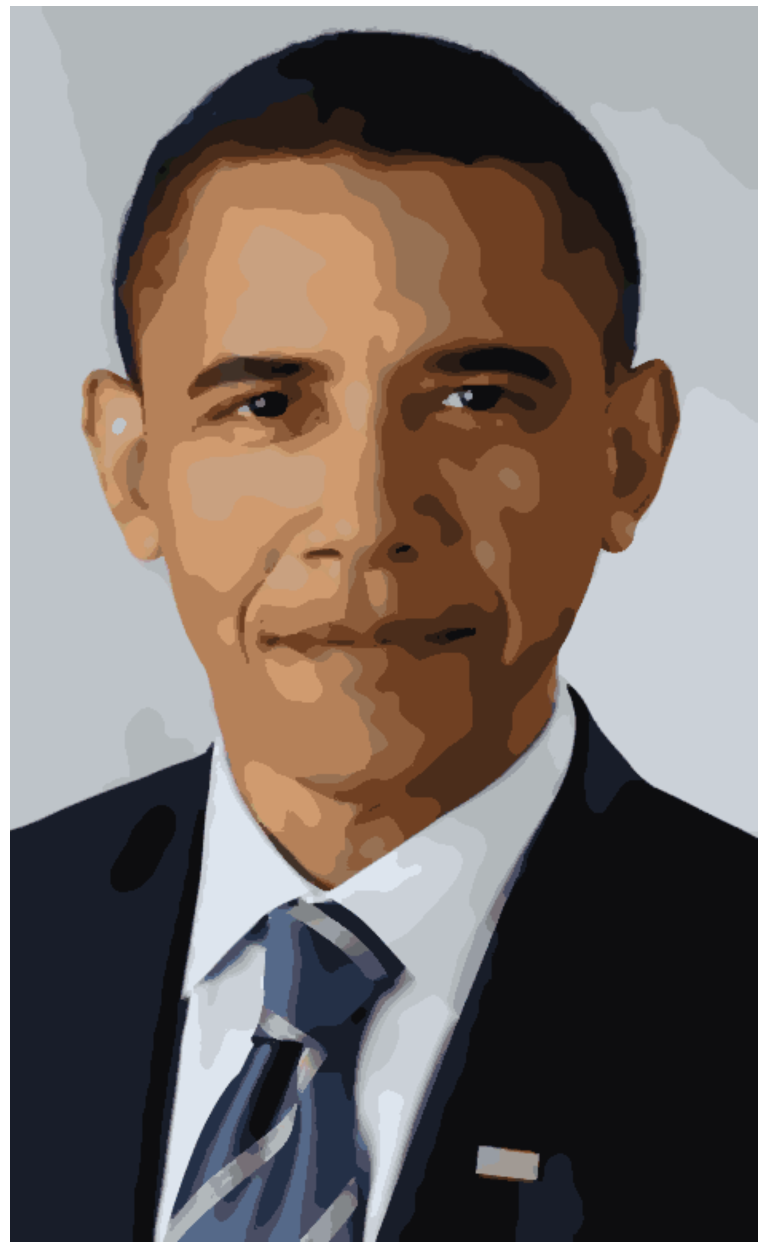
Input



$d = 0$



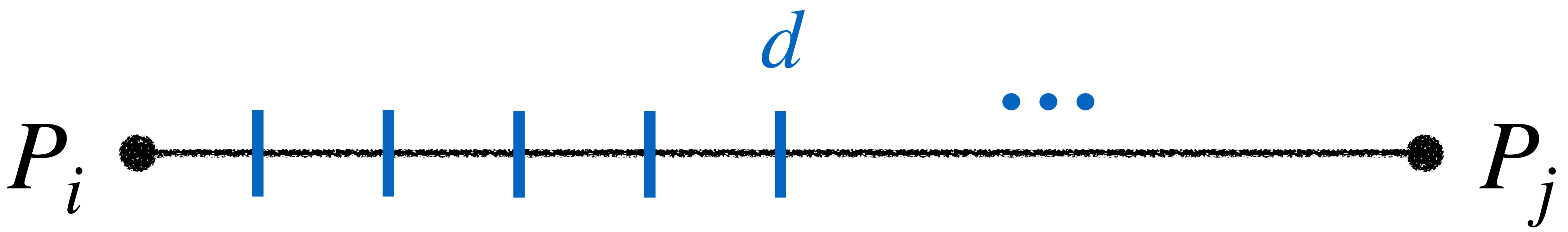
$d = 1$

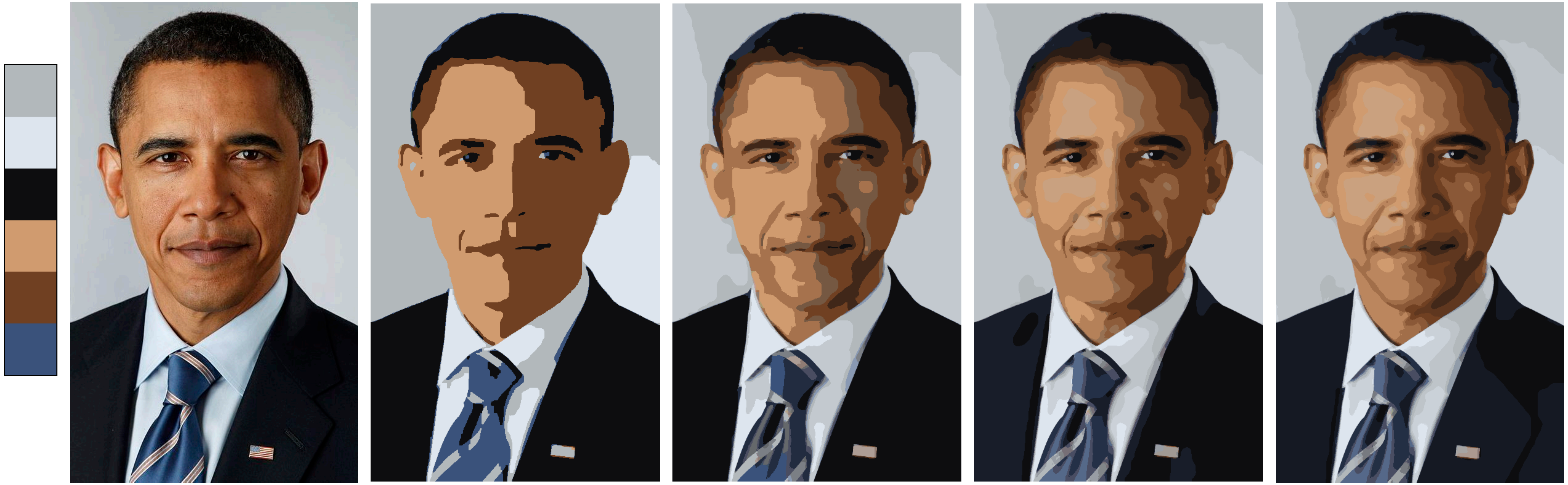


$d = 2$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.

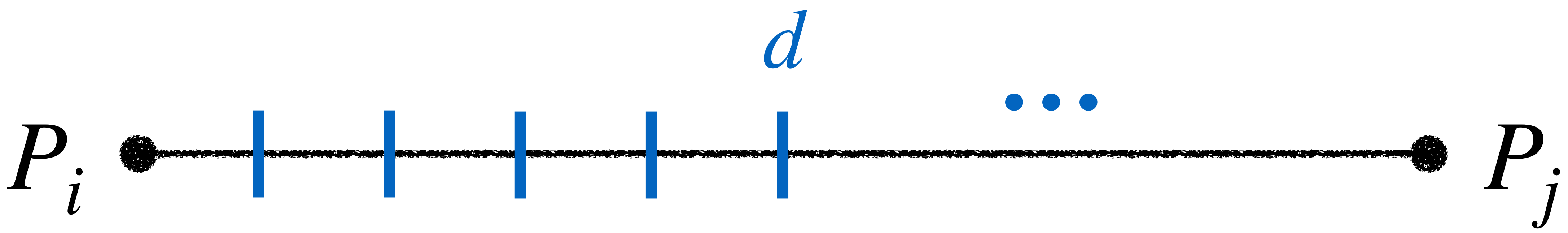


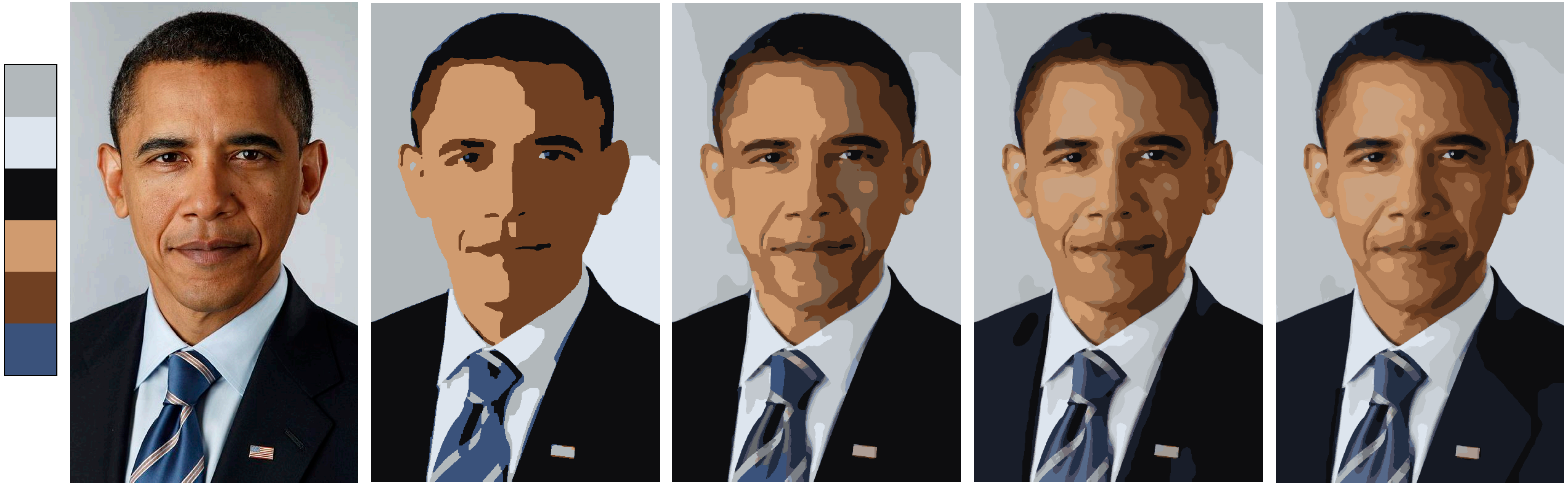


Input $d = 0$ $d = 1$ $d = 2$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.

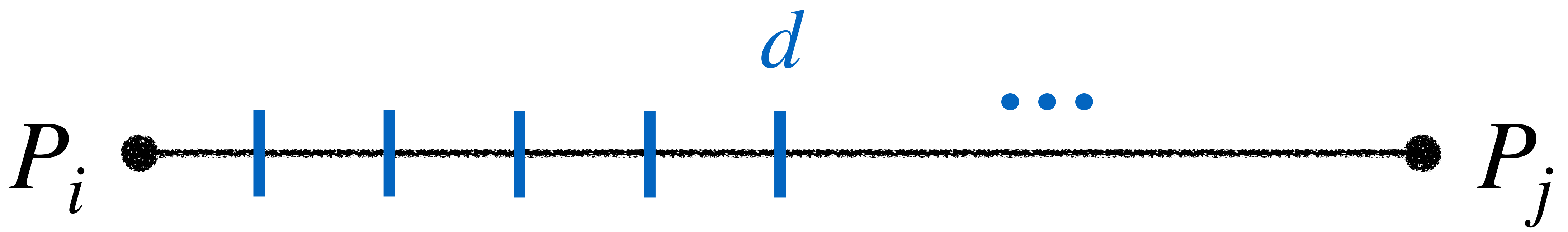


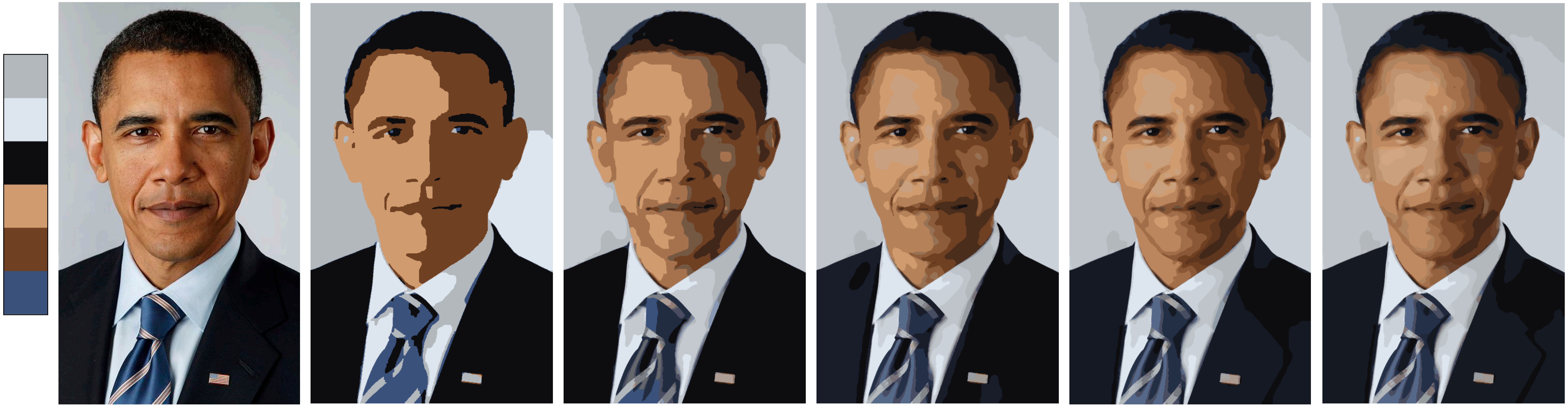


Input $d = 0$ $d = 1$ $d = 2$ $d = 3$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.

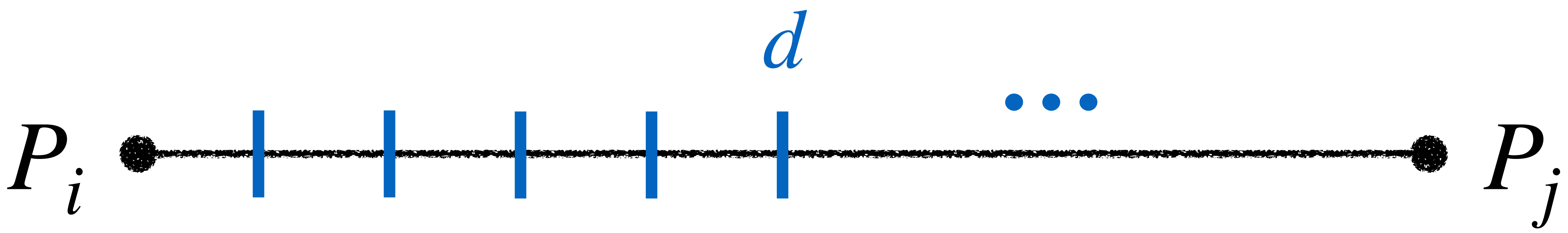


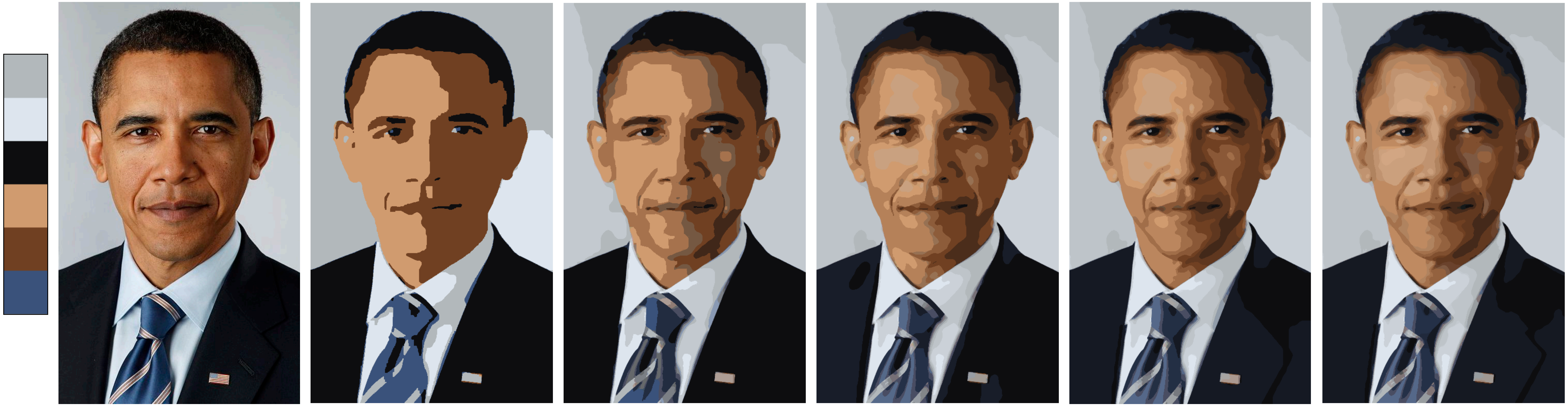


Input $d = 0$ $d = 1$ $d = 2$ $d = 3$

Step 2: Rough region and color assignment

- Palette colors P from palette extraction in step 1.
- Pairwise blends from palette colors P with weights.





Input $d = 0$ $d = 1$ $d = 2$ $d = 3$ $d = 4$

Step 3&4: Region Refinement

- Step 3: Assign each region a continuous rather than discrete blend.
- Step 4: Smooth region boundaries with a frequency-guided median filter.
- See our paper for details.

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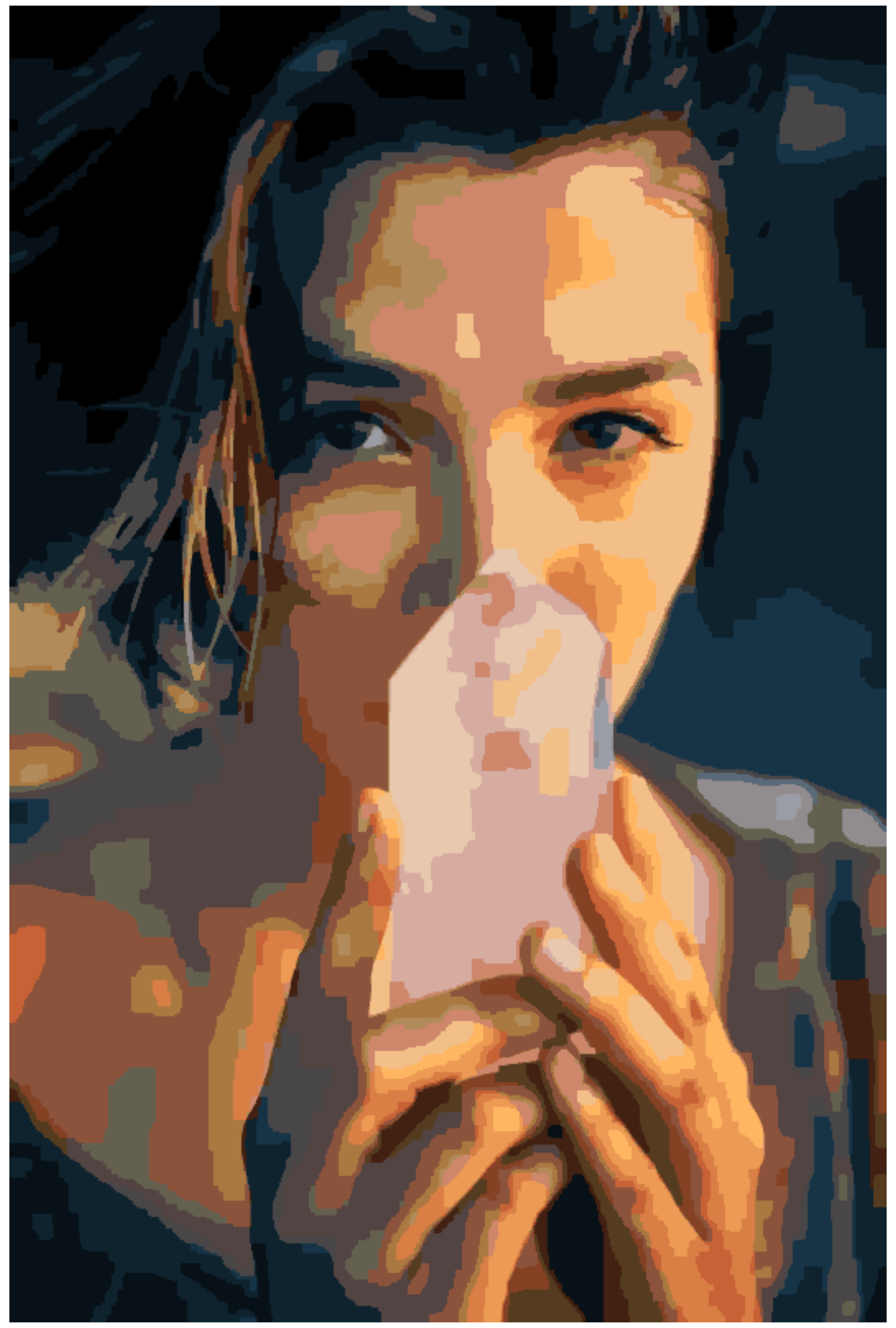

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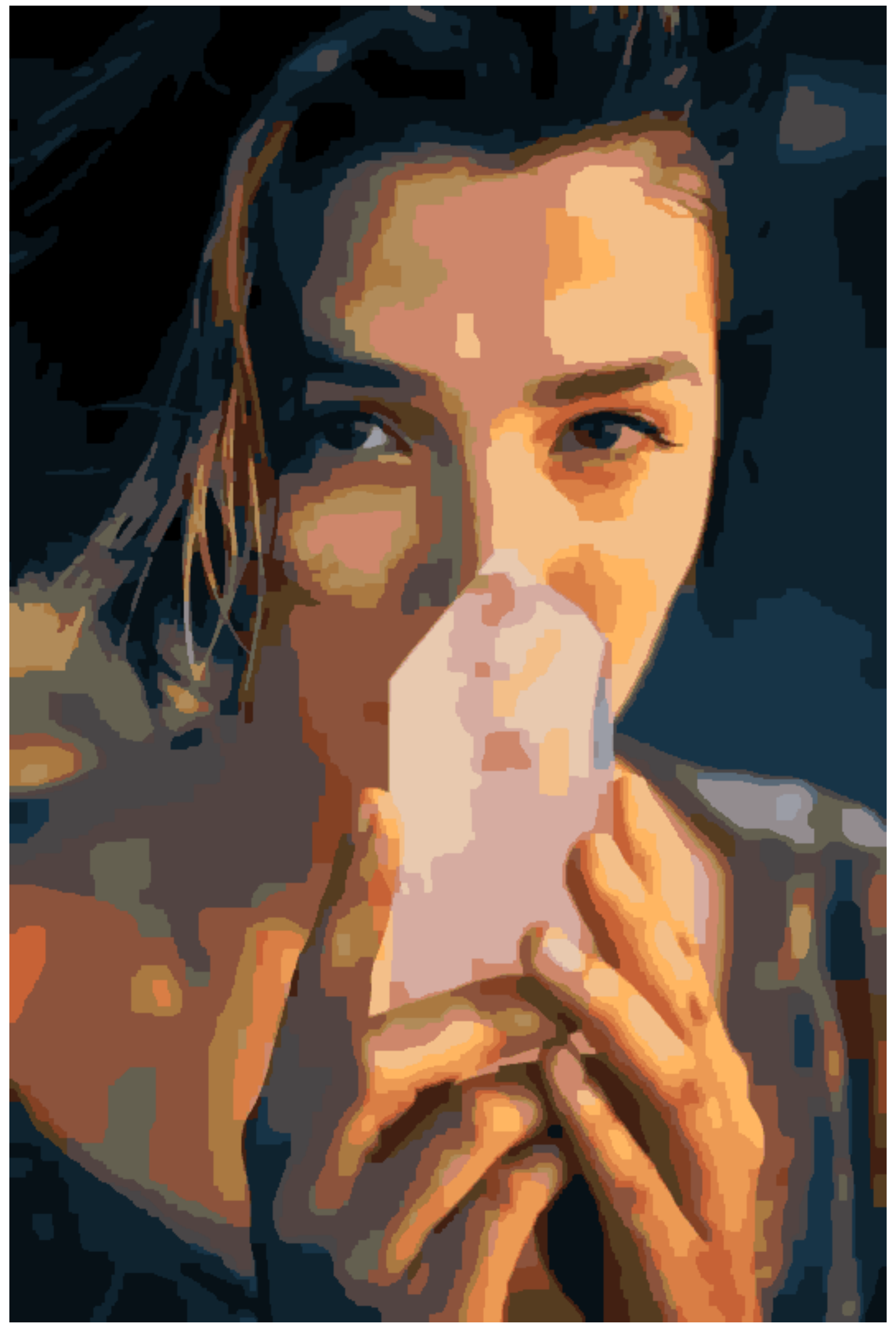

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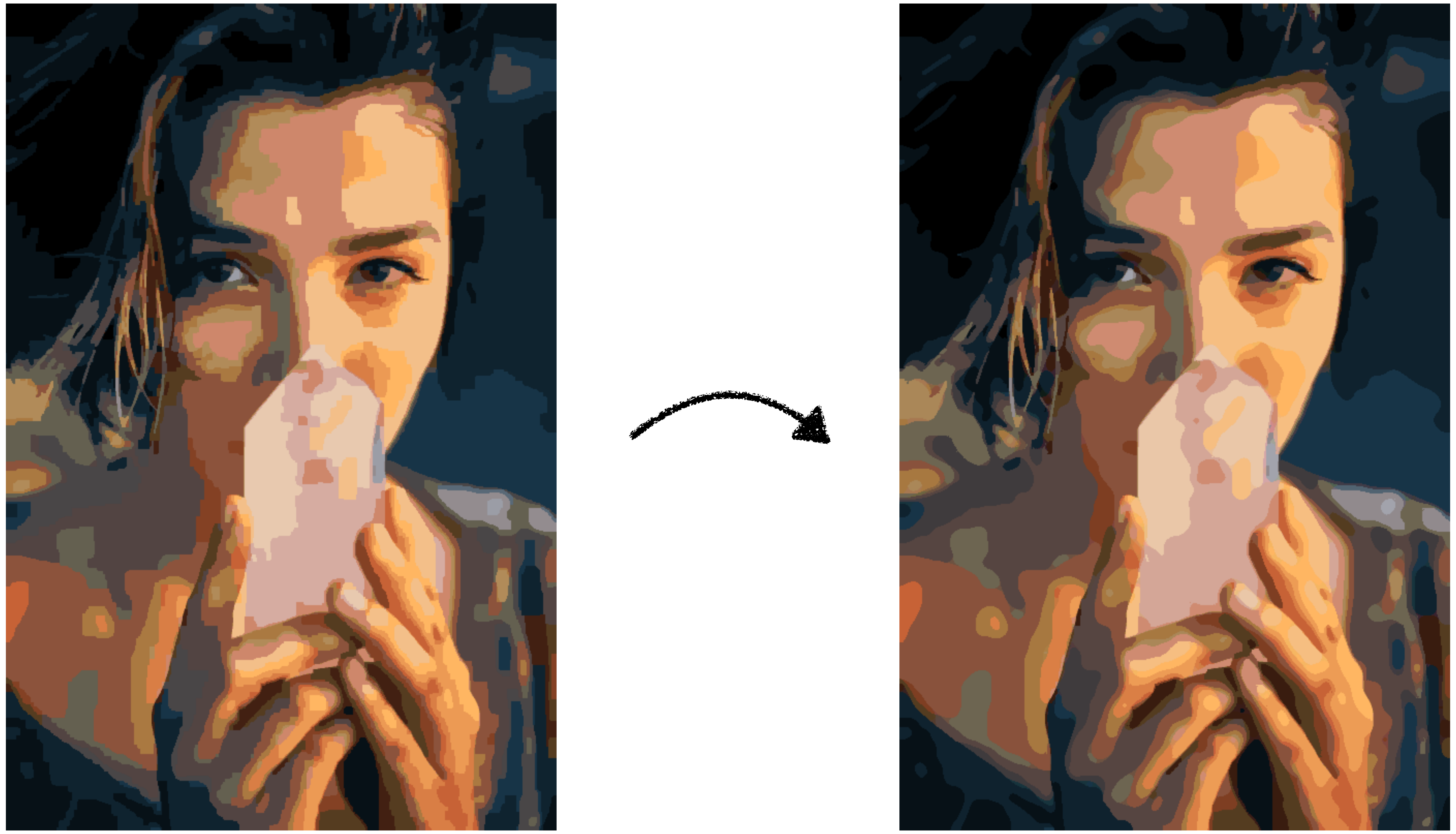

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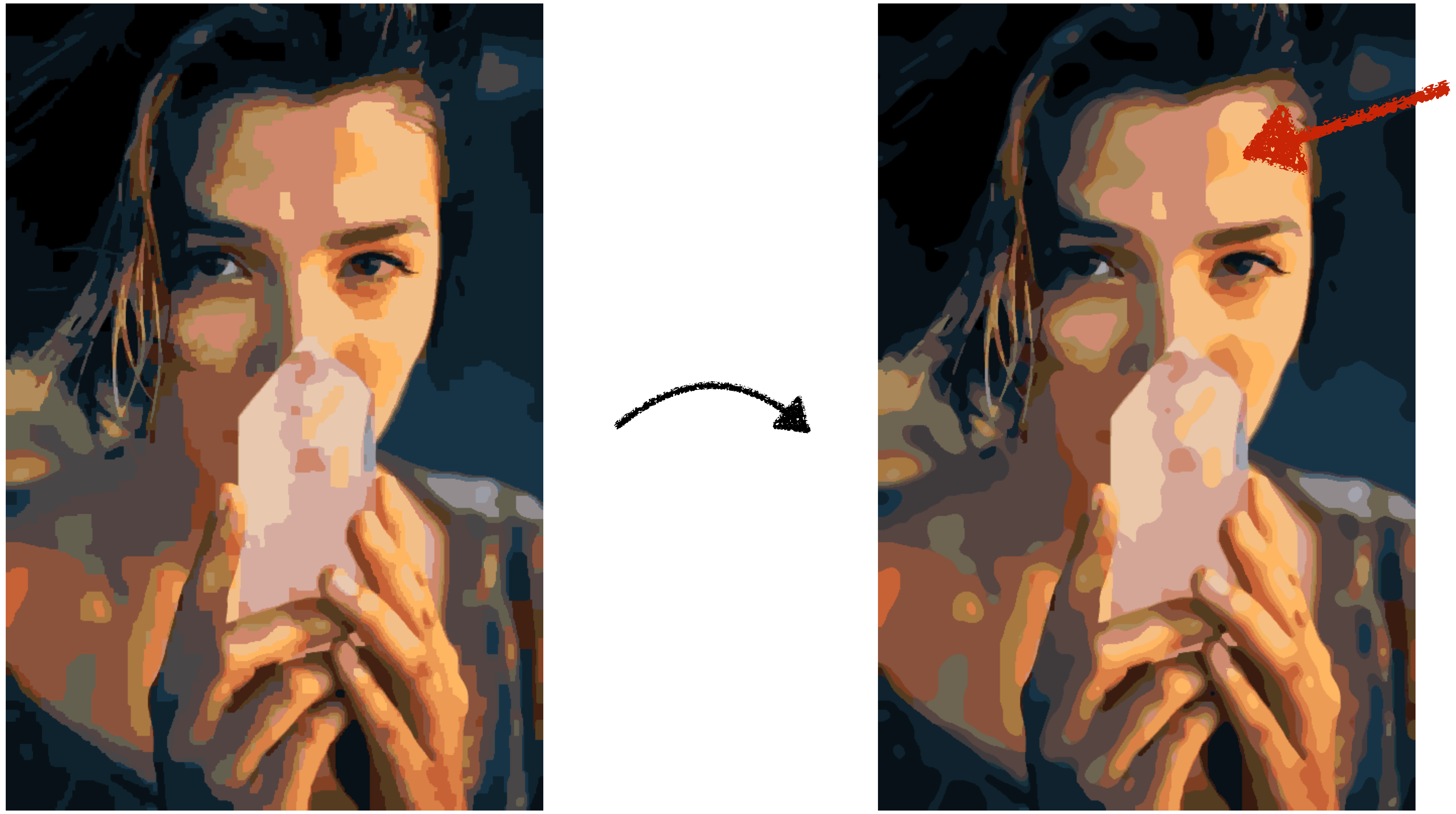
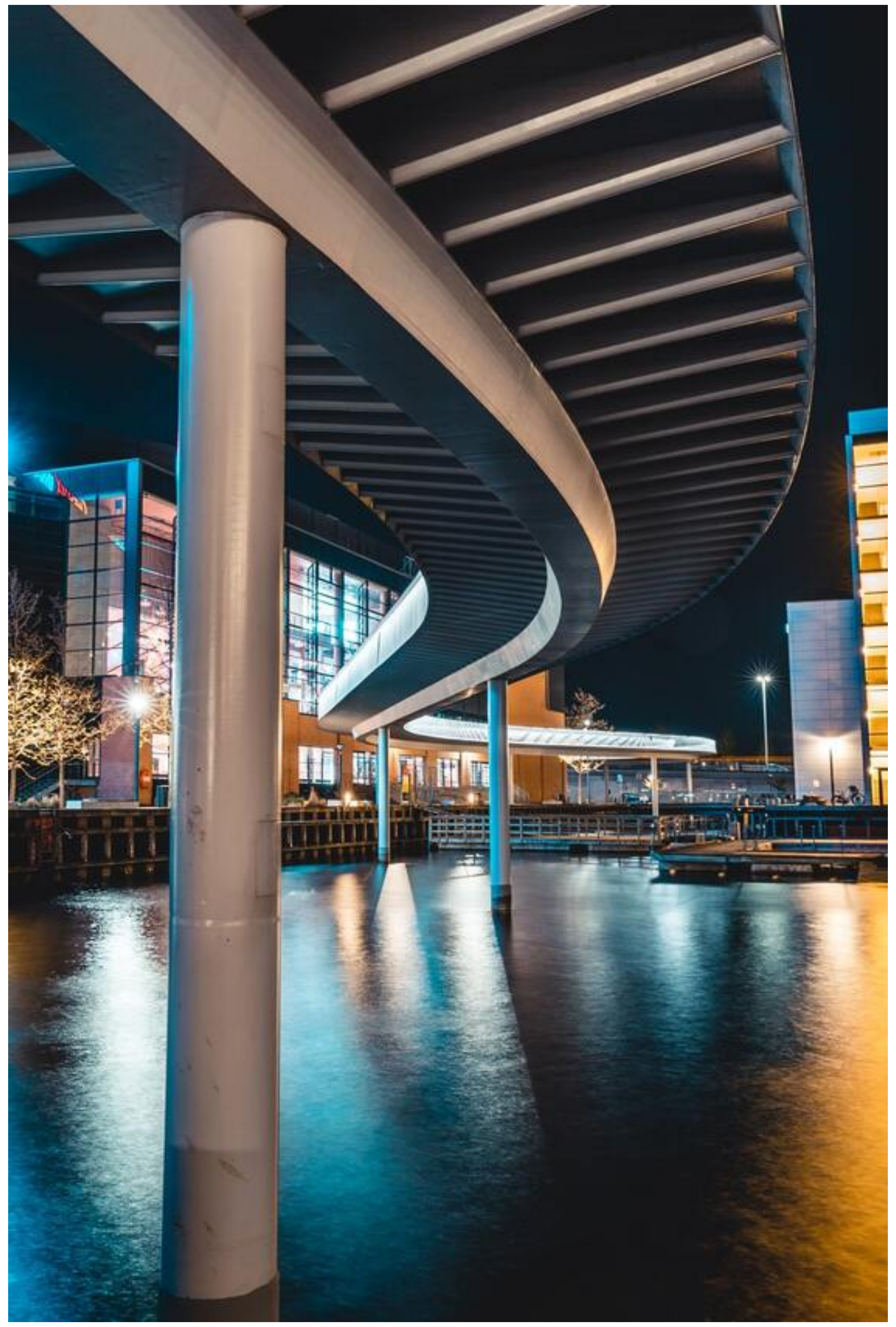
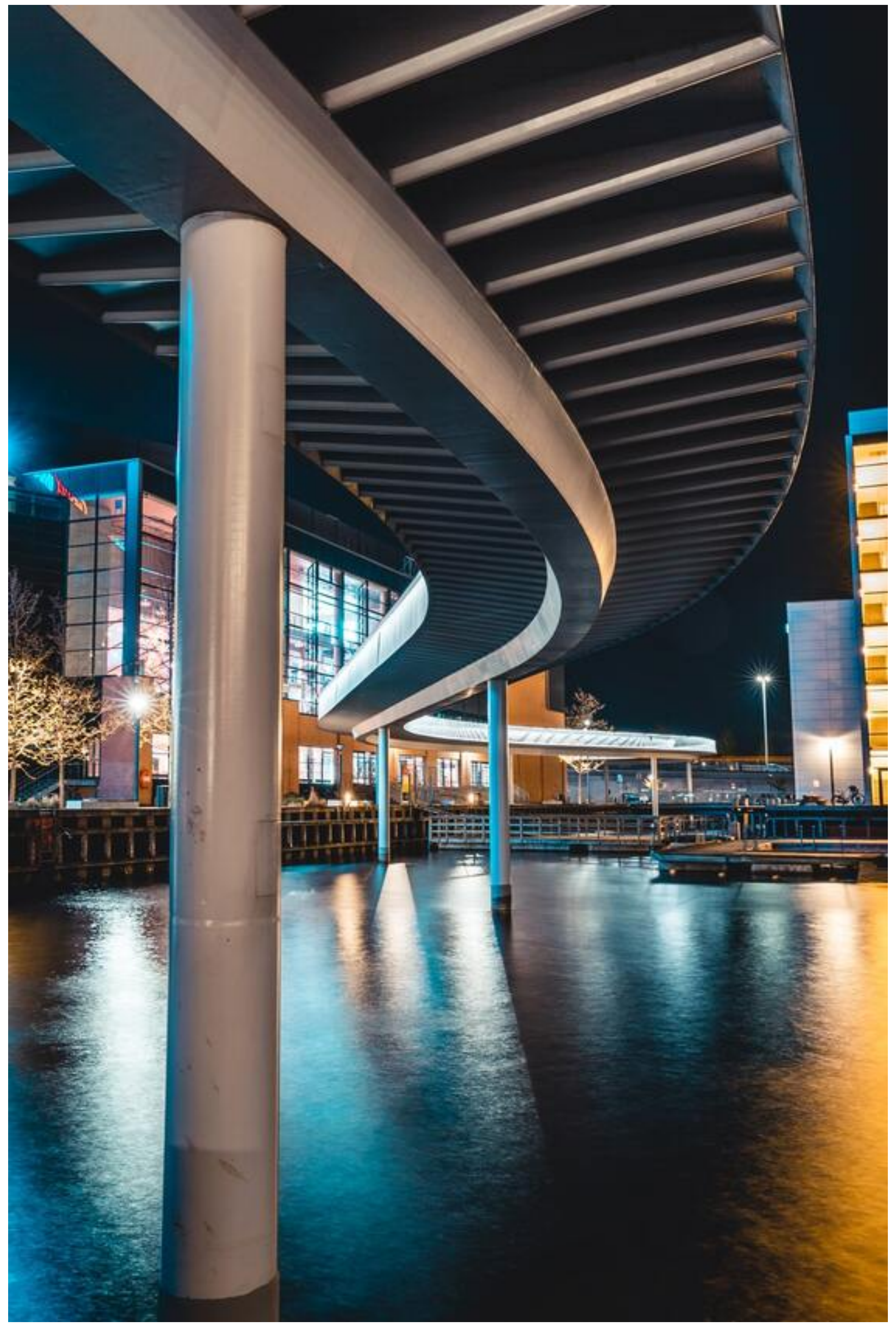


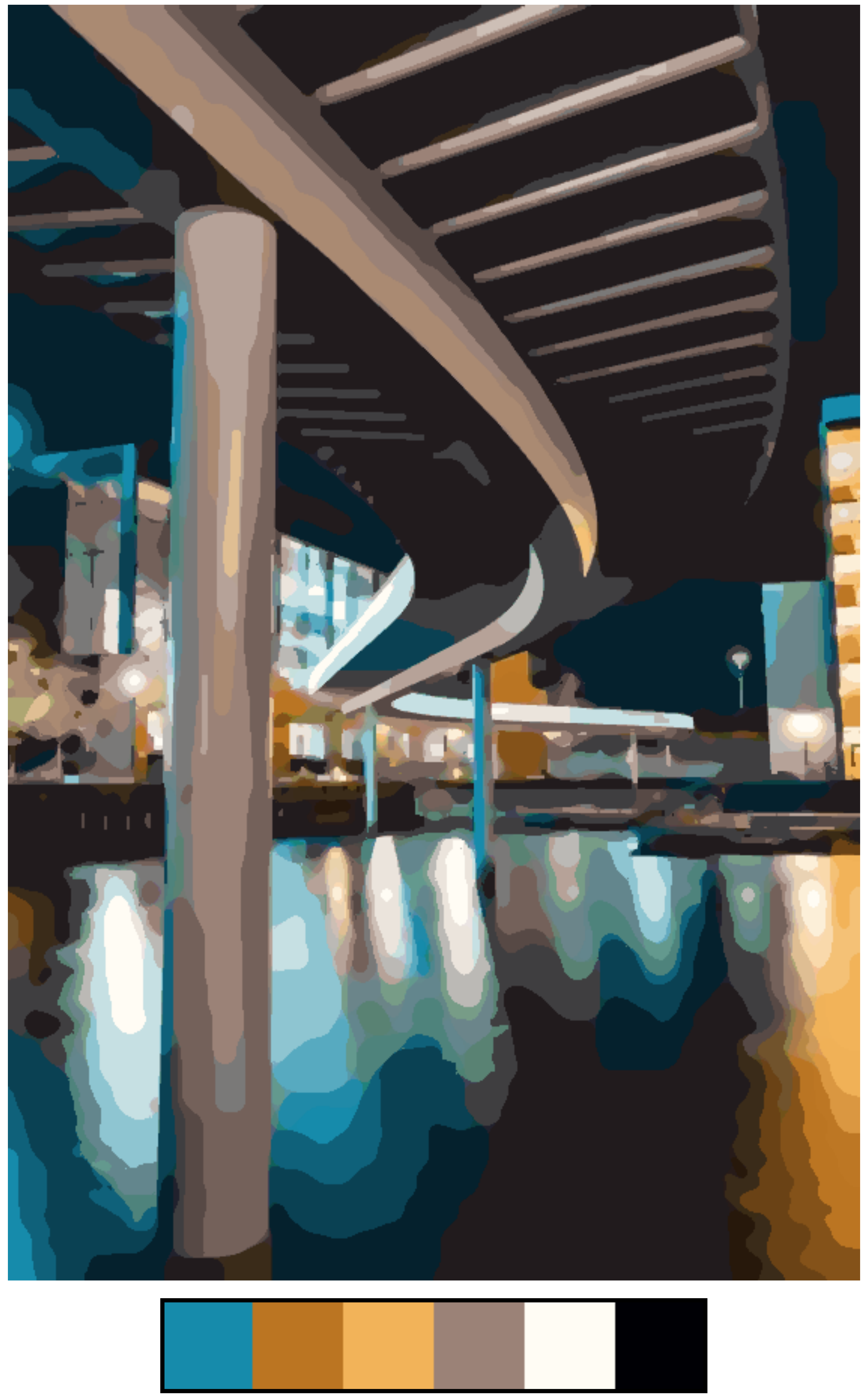
Results

Results

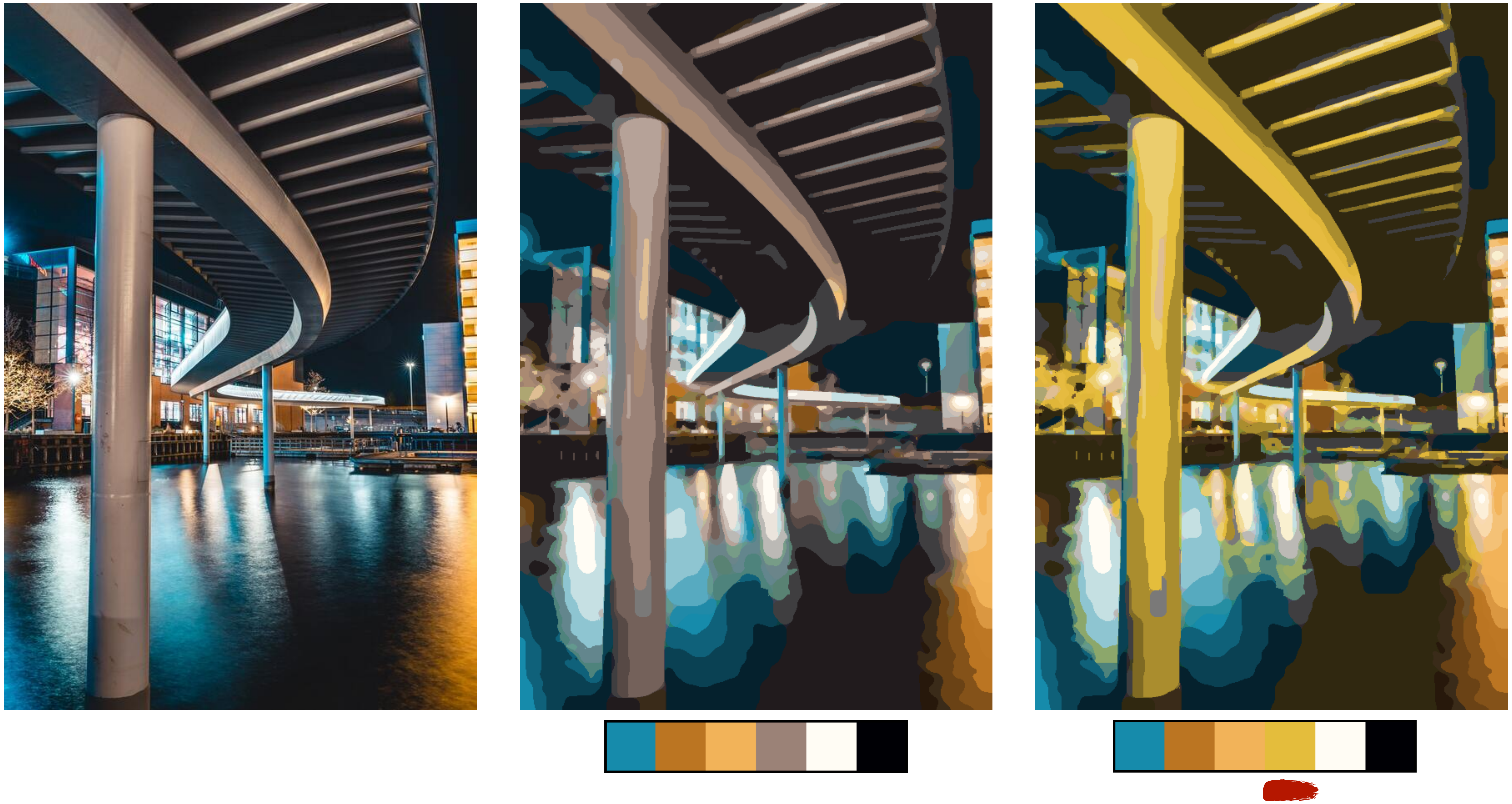


Results

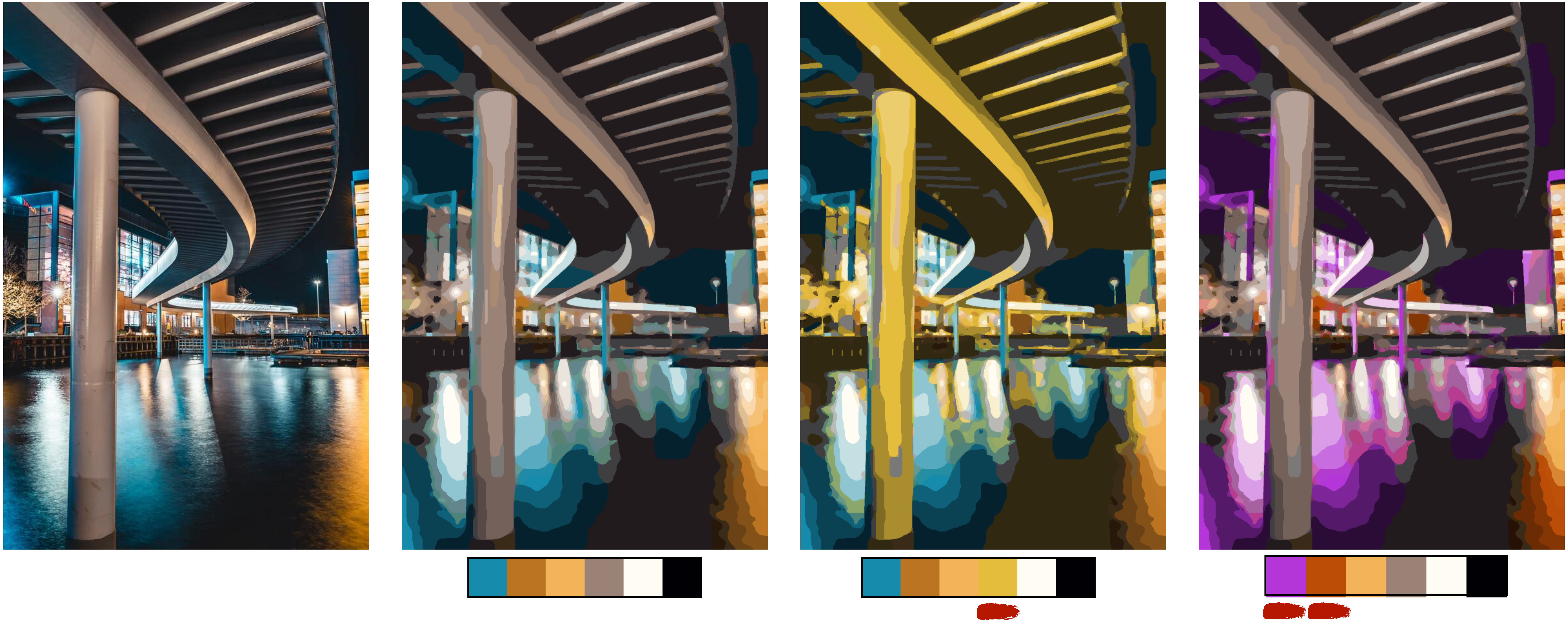


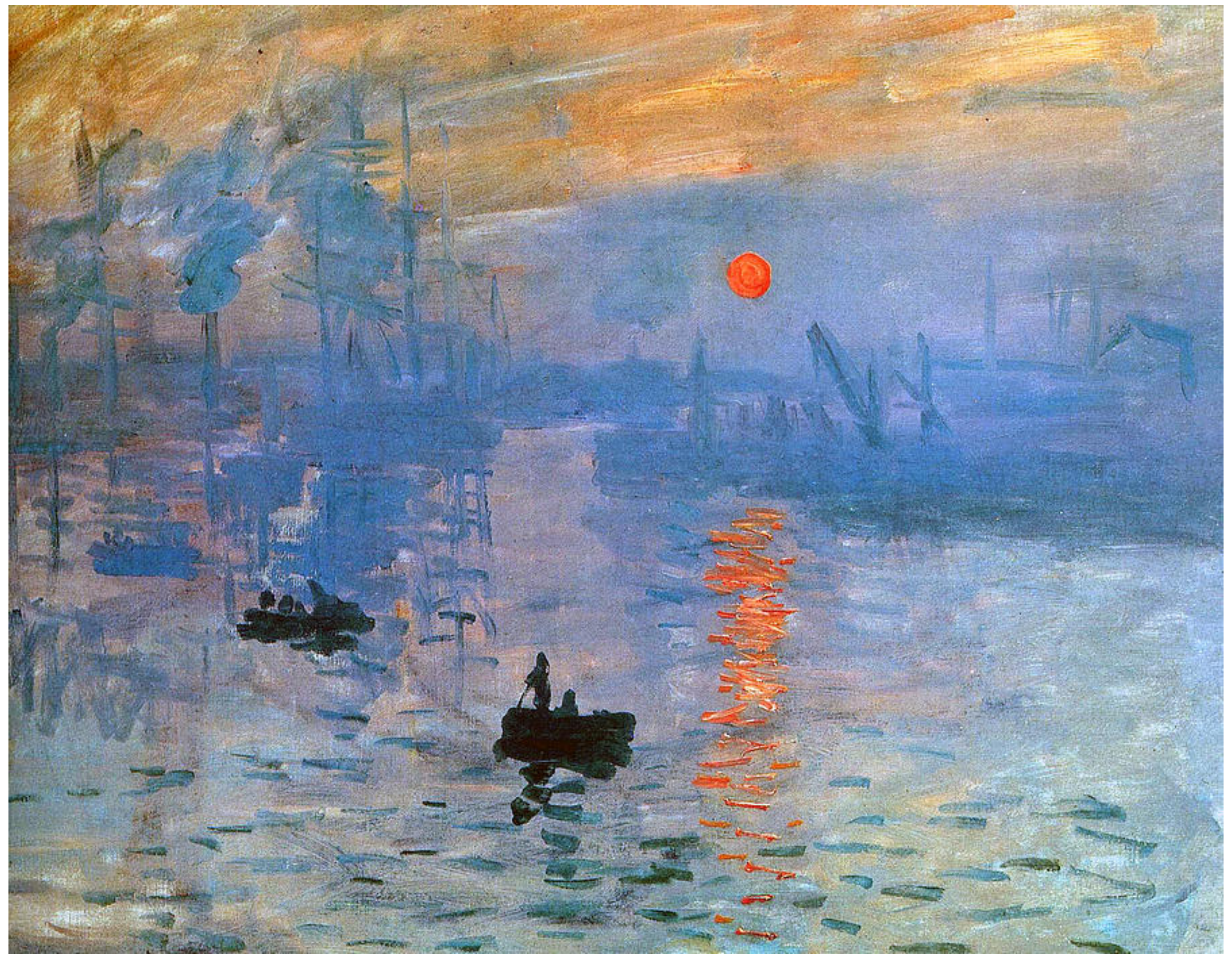


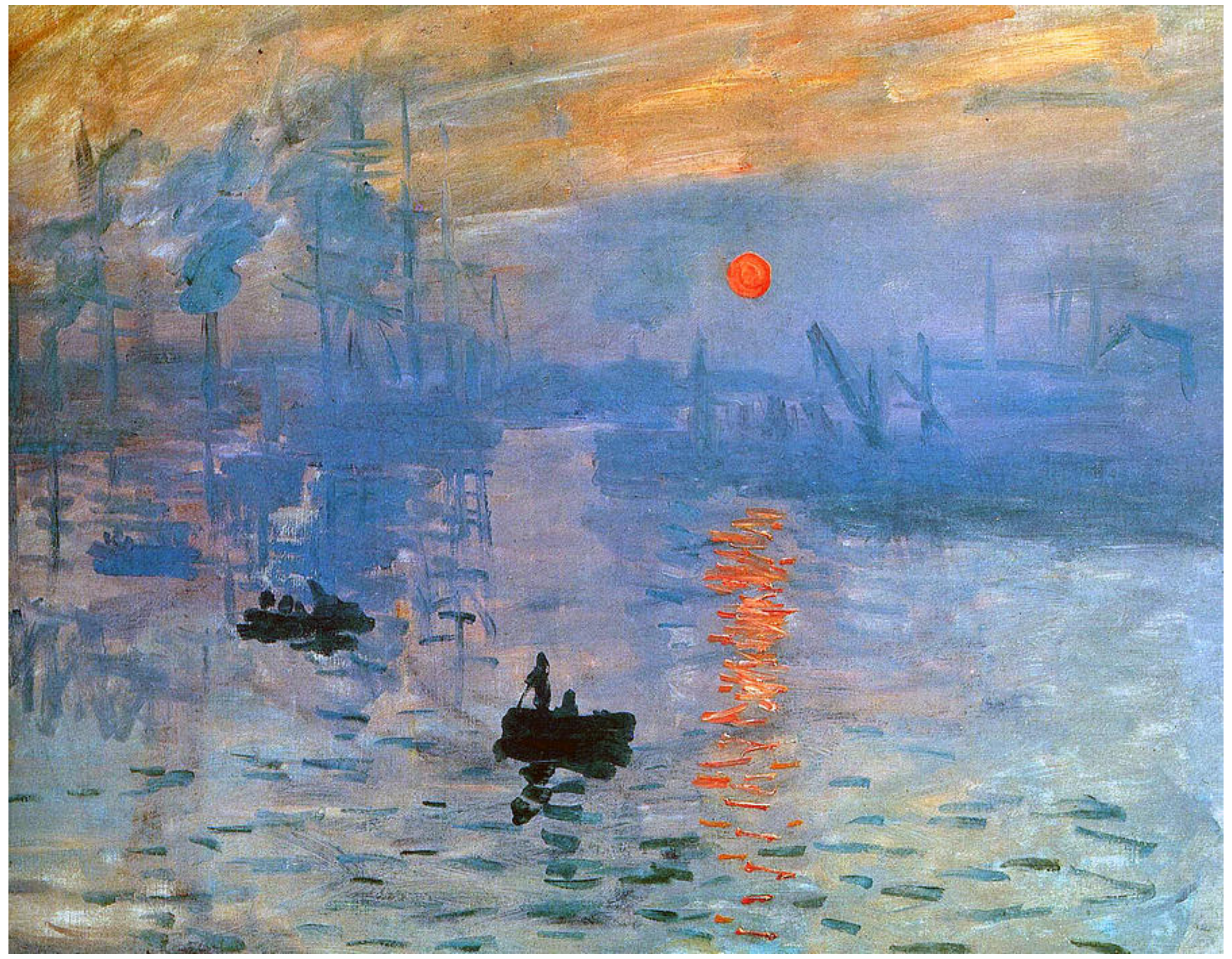
Results

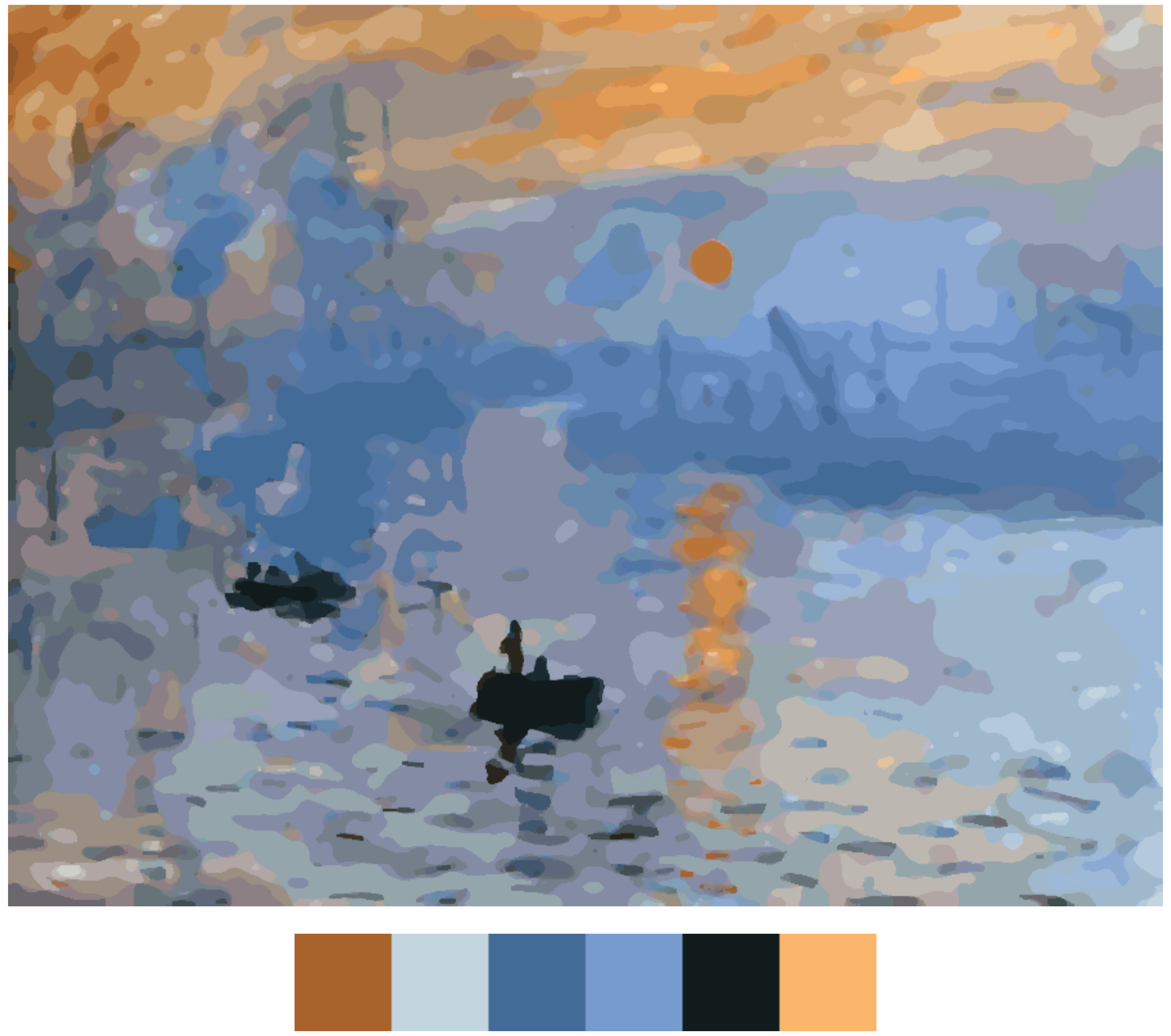


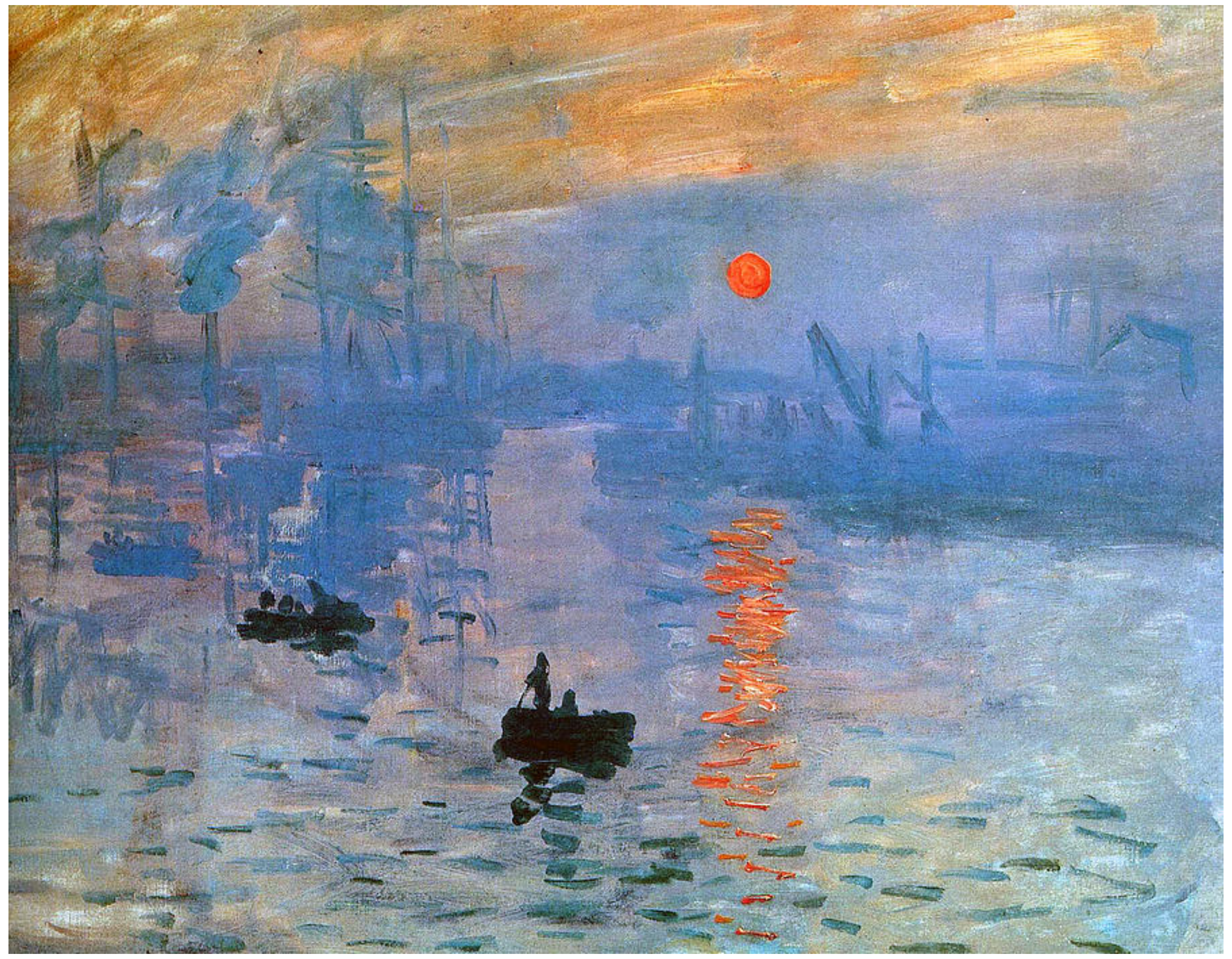
Results

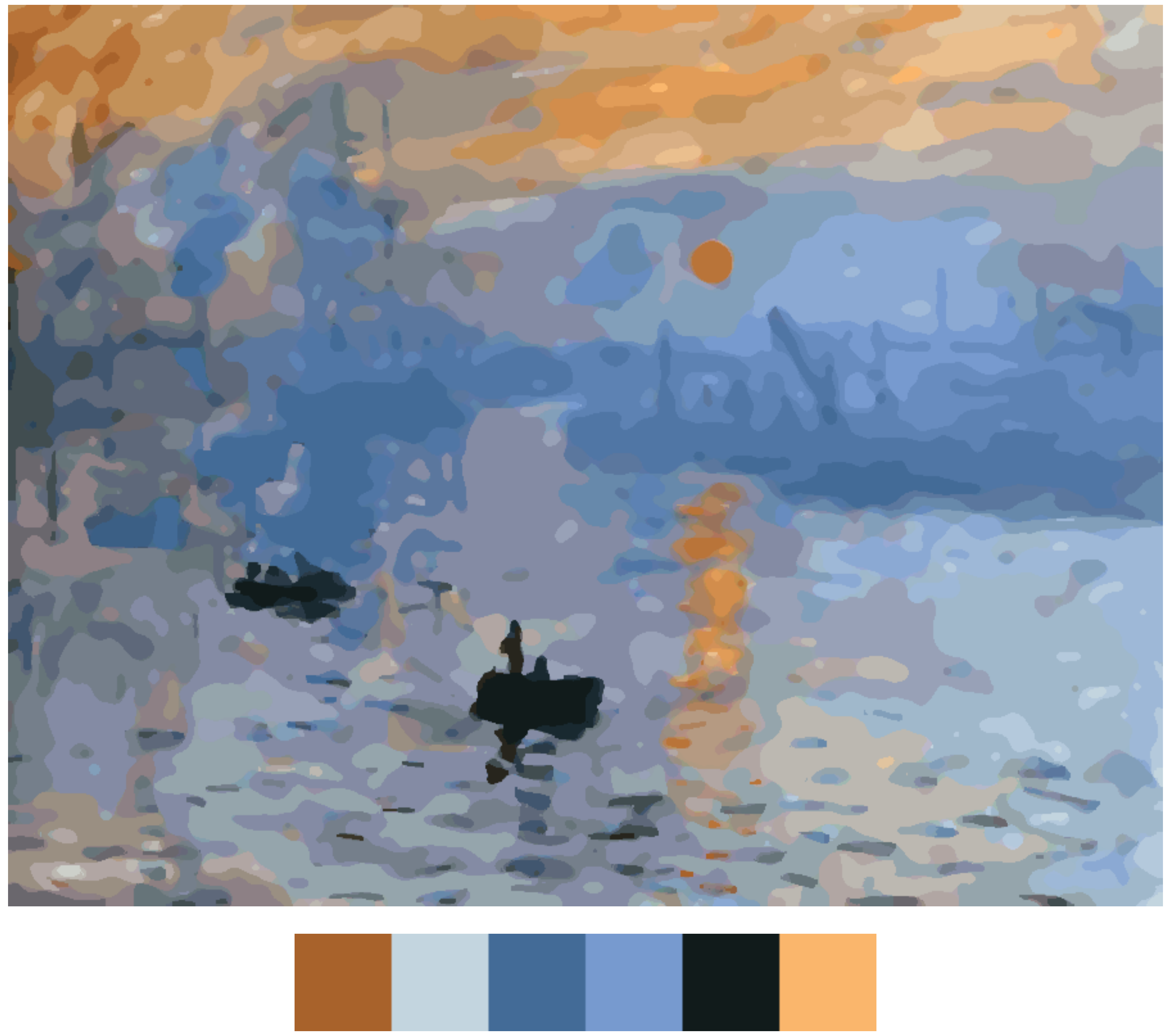


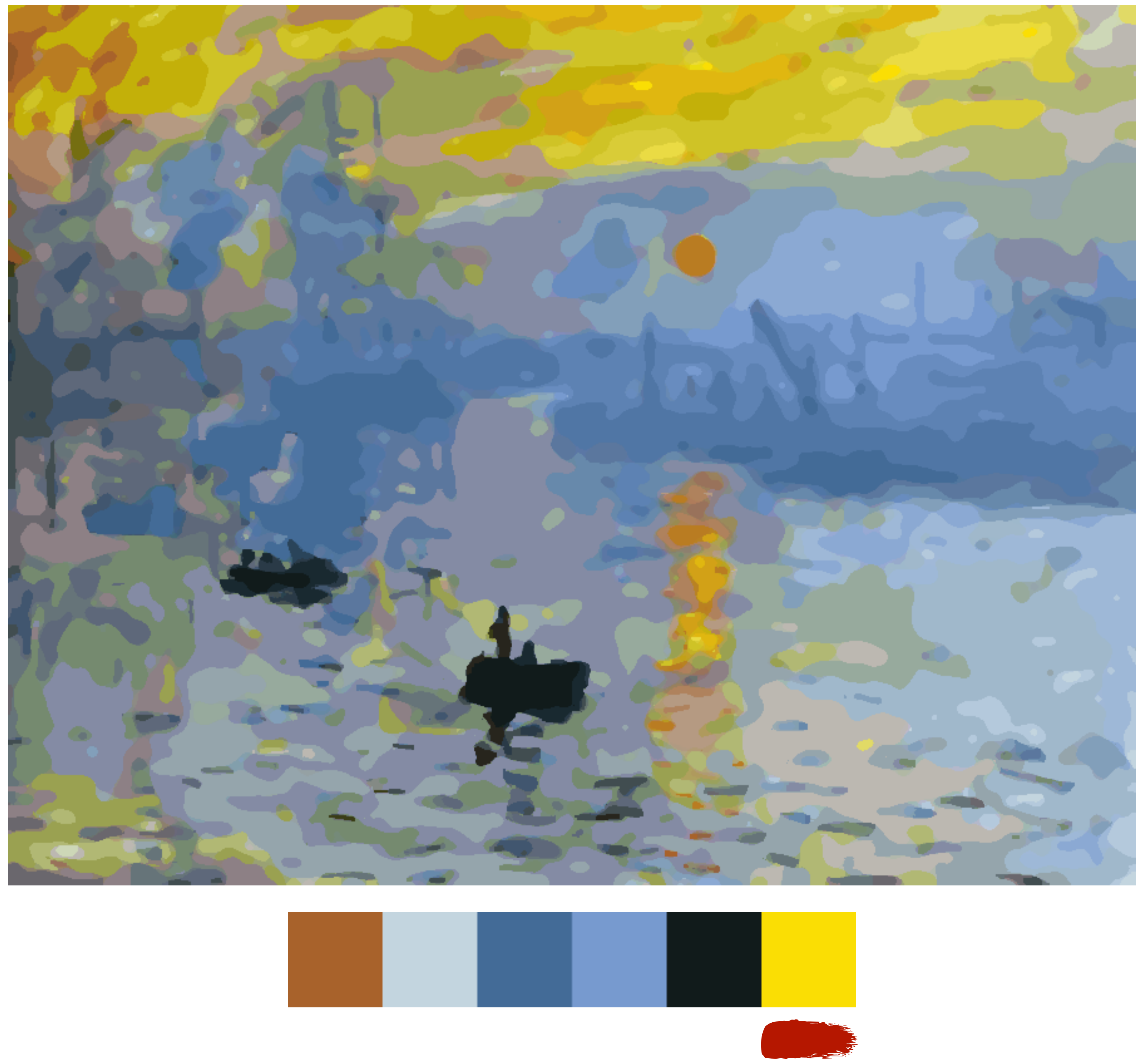


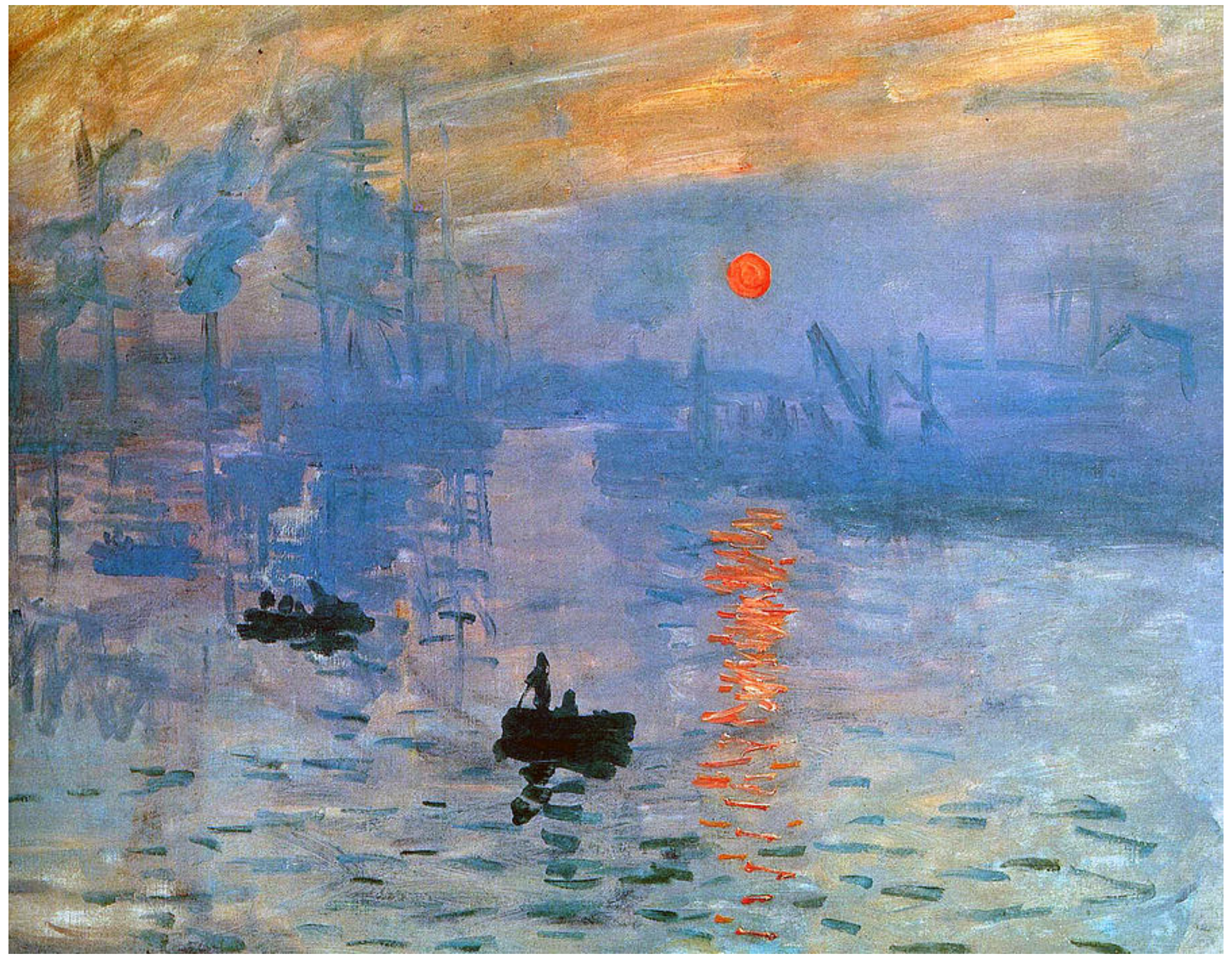


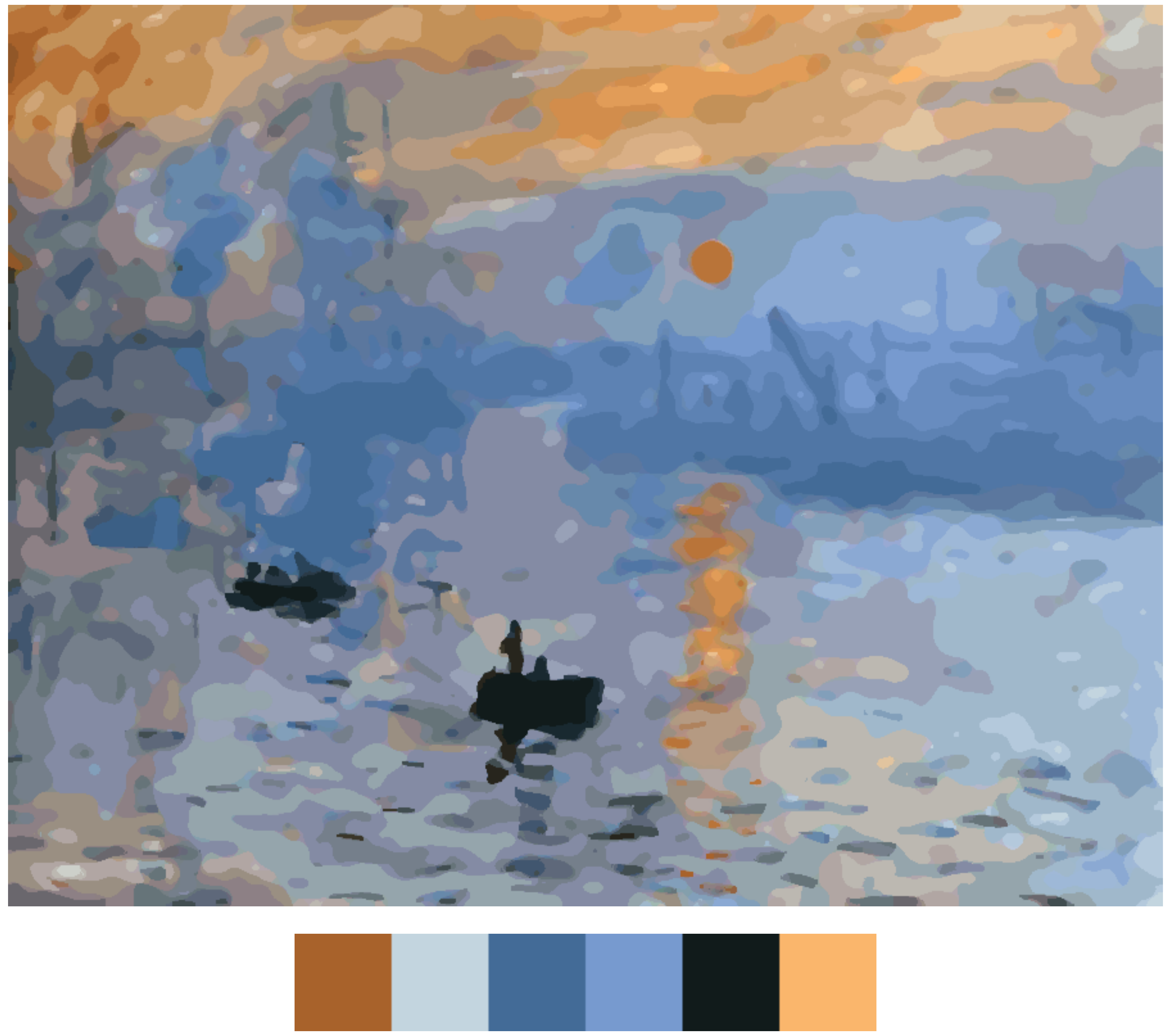


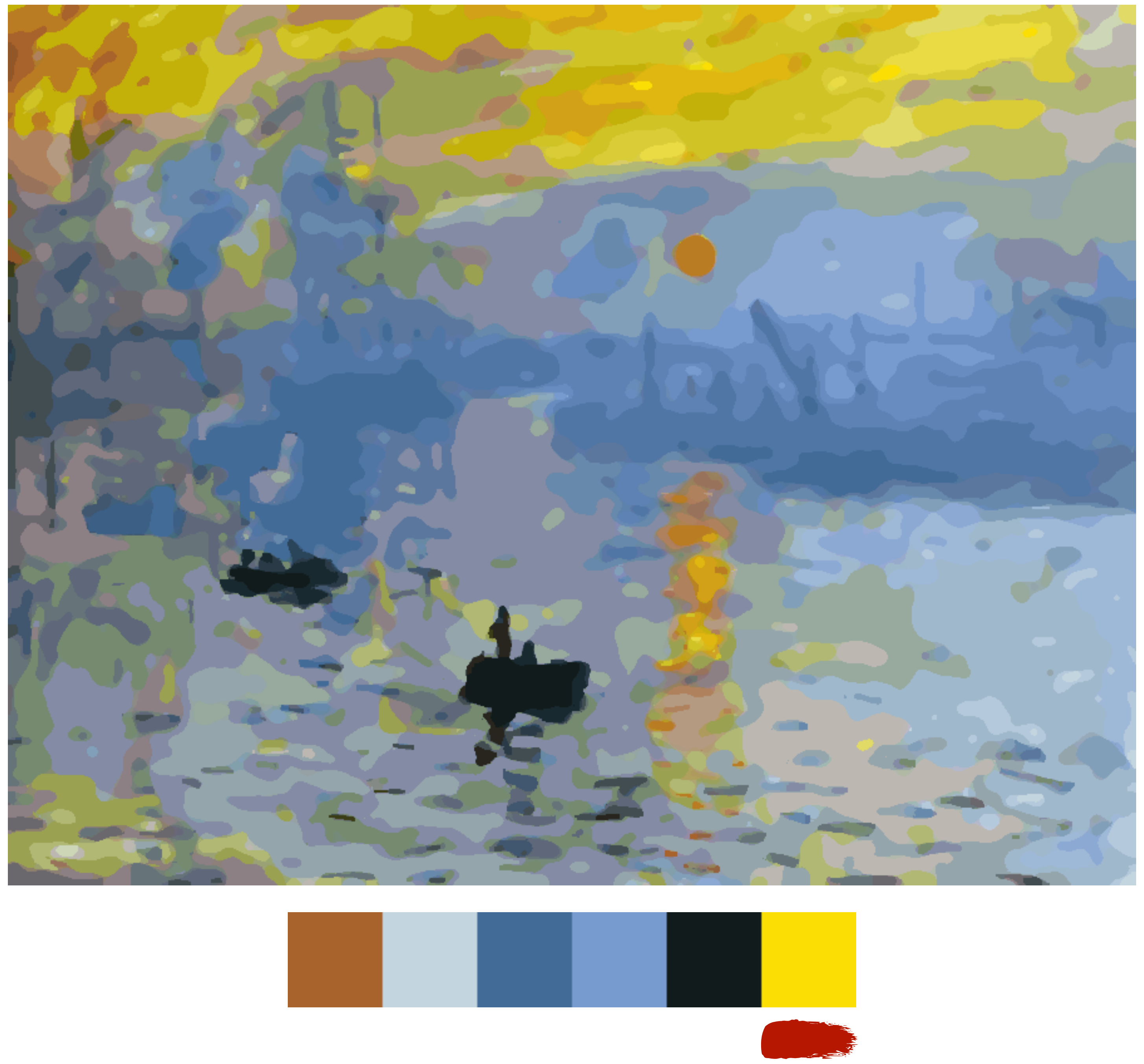


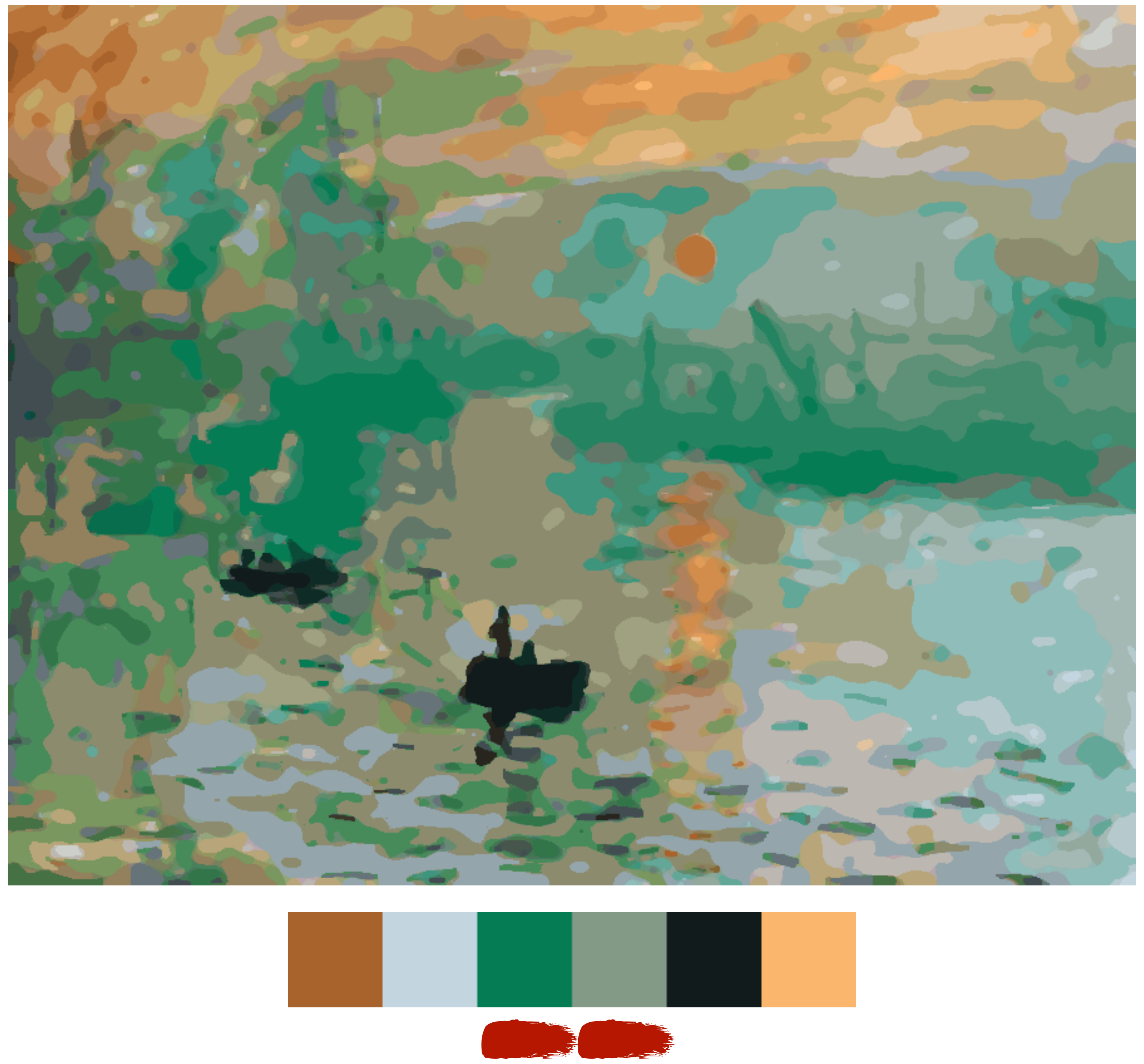












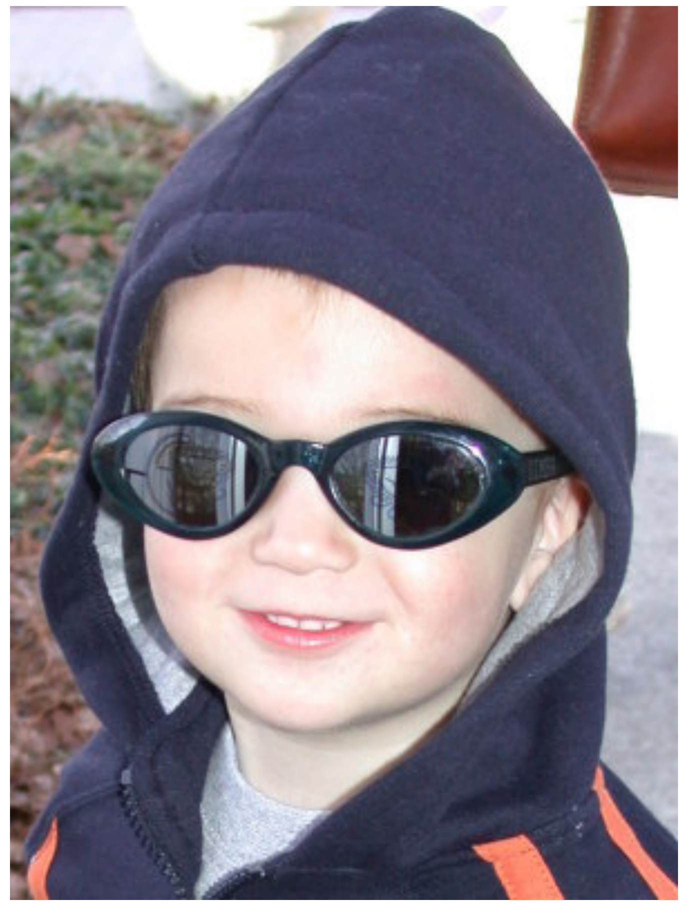
Evaluation

Evaluation

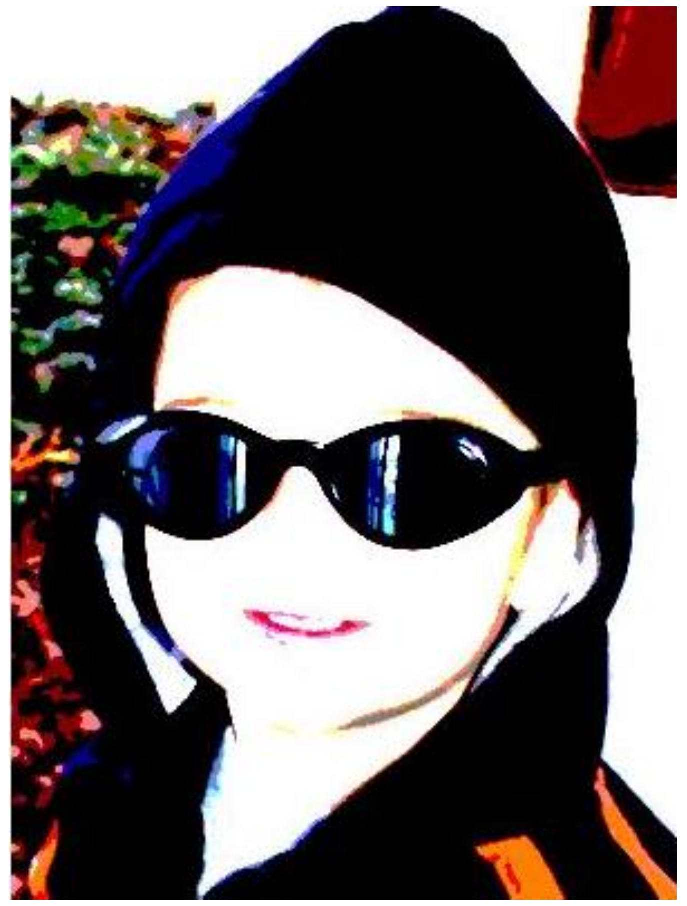
- Comparison to related approaches.

Evaluation

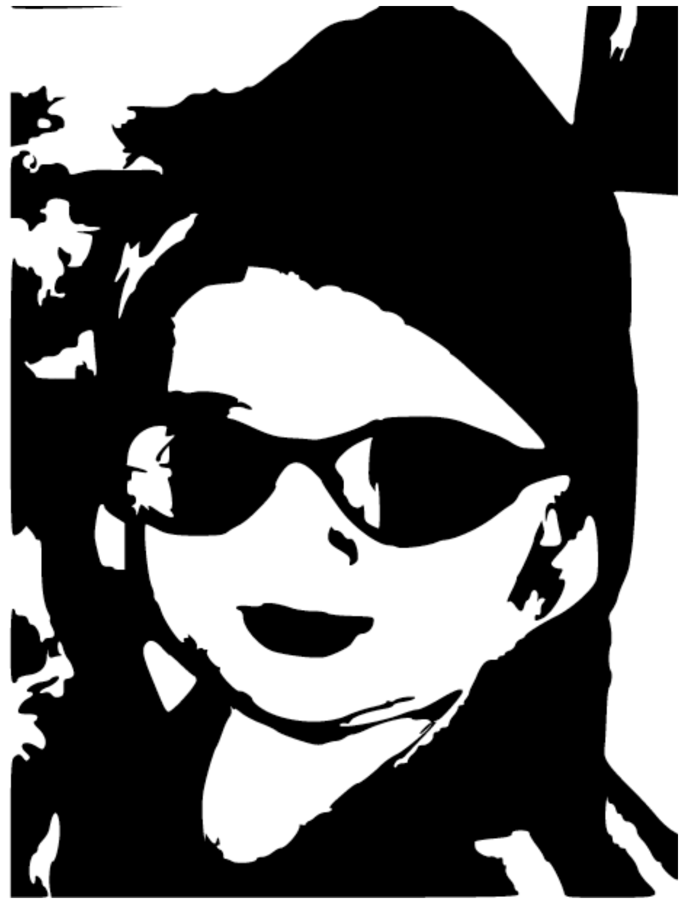
- Comparison to related approaches.



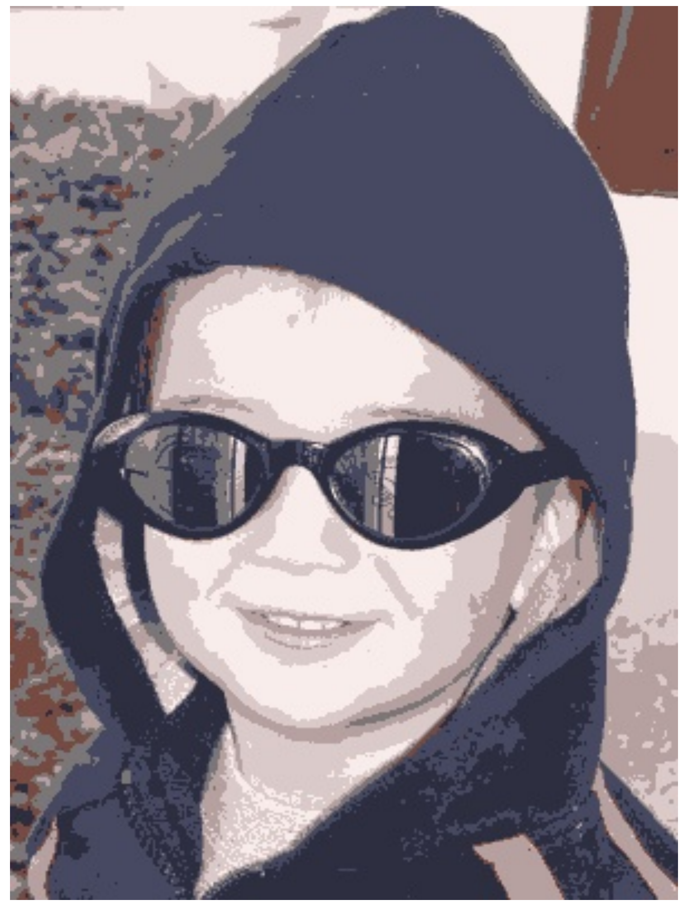
Input



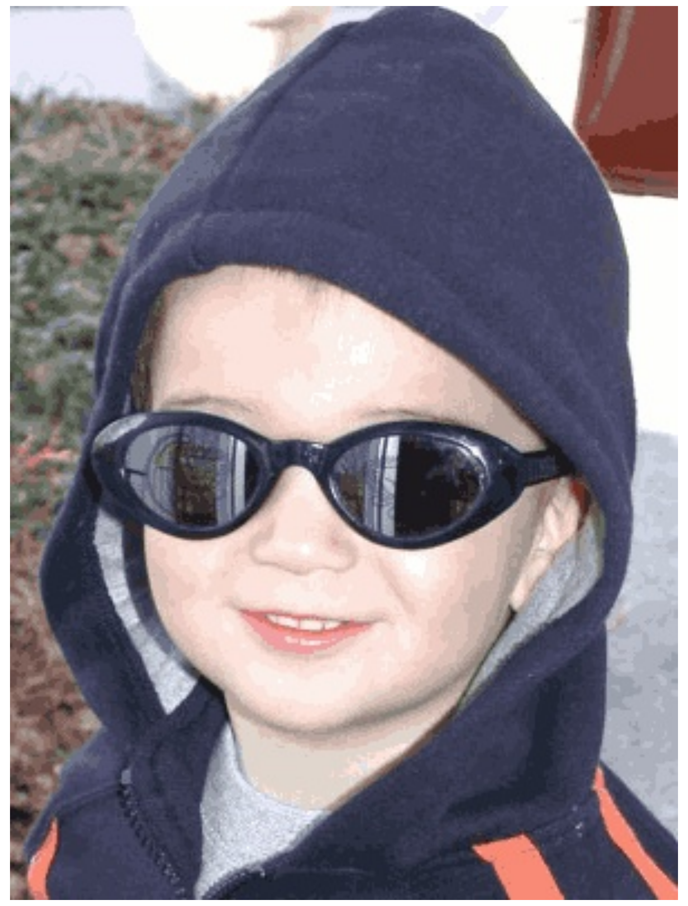
[Afifi 2018]



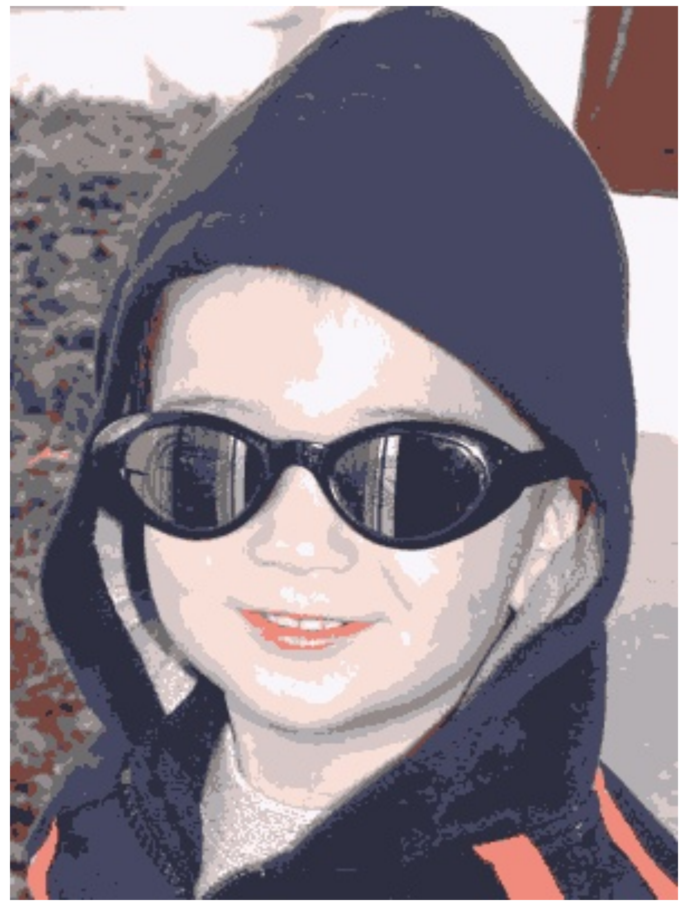
[Xu and Kaplan 2008]



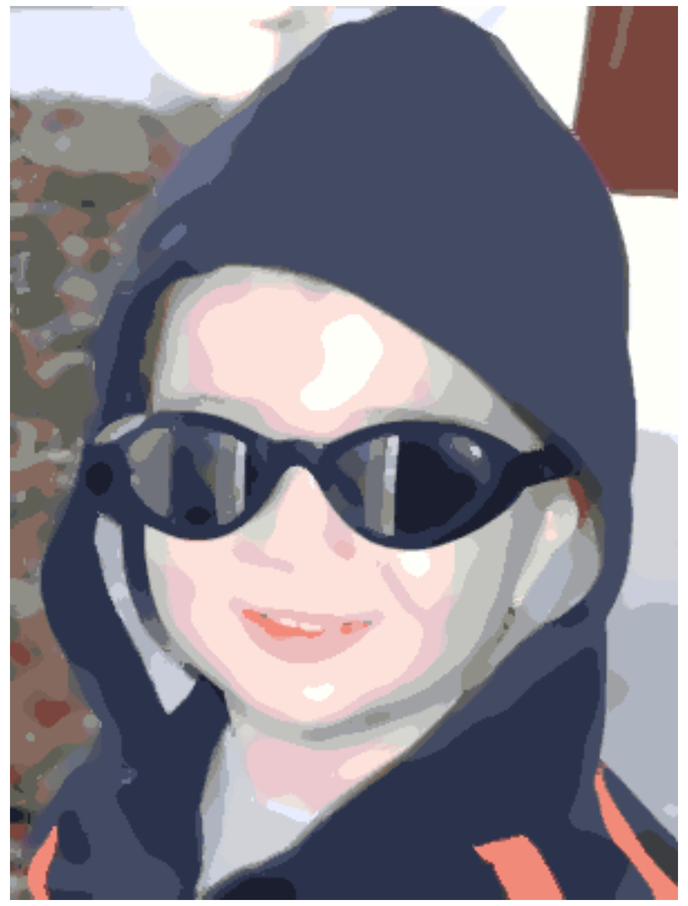
Direct K-means
(*K*=*7* in RGB-space)



Direct K-means
(*K*=*44* in RGB-space)



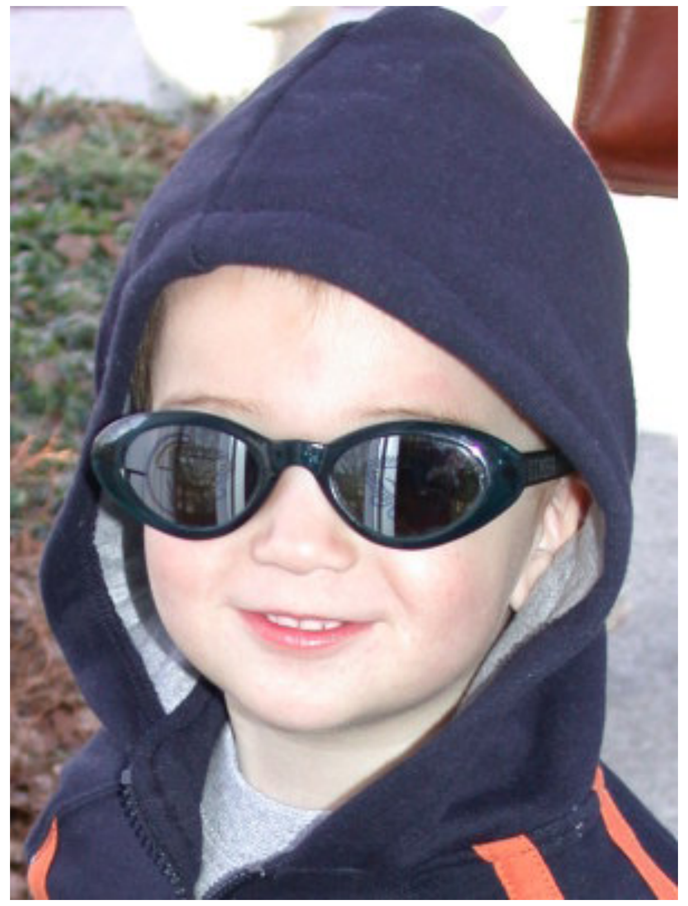
Direct K-means
(*K*=*10* in RGBXY-space)



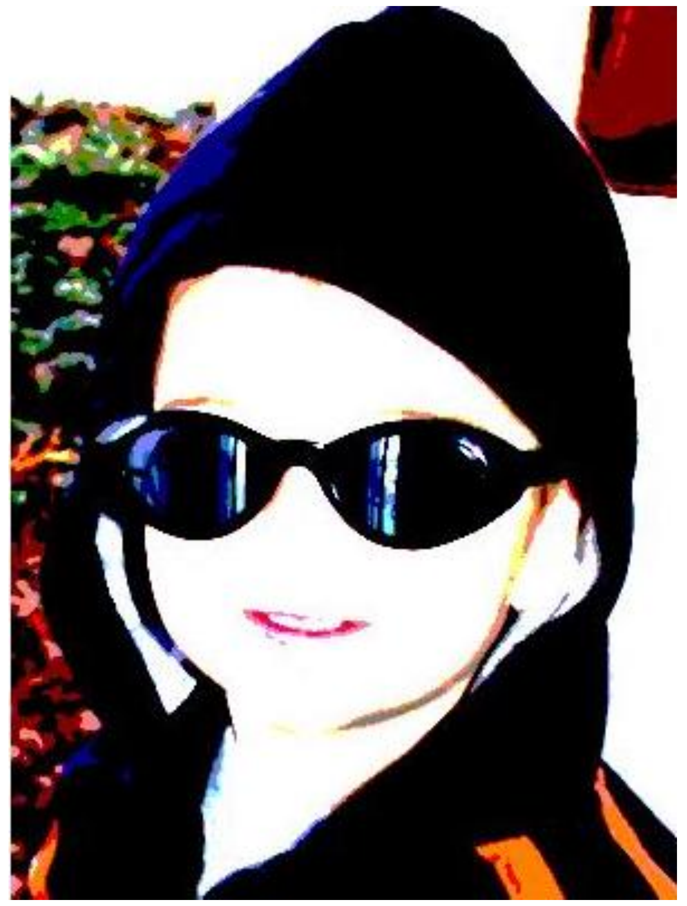
Ours

Evaluation

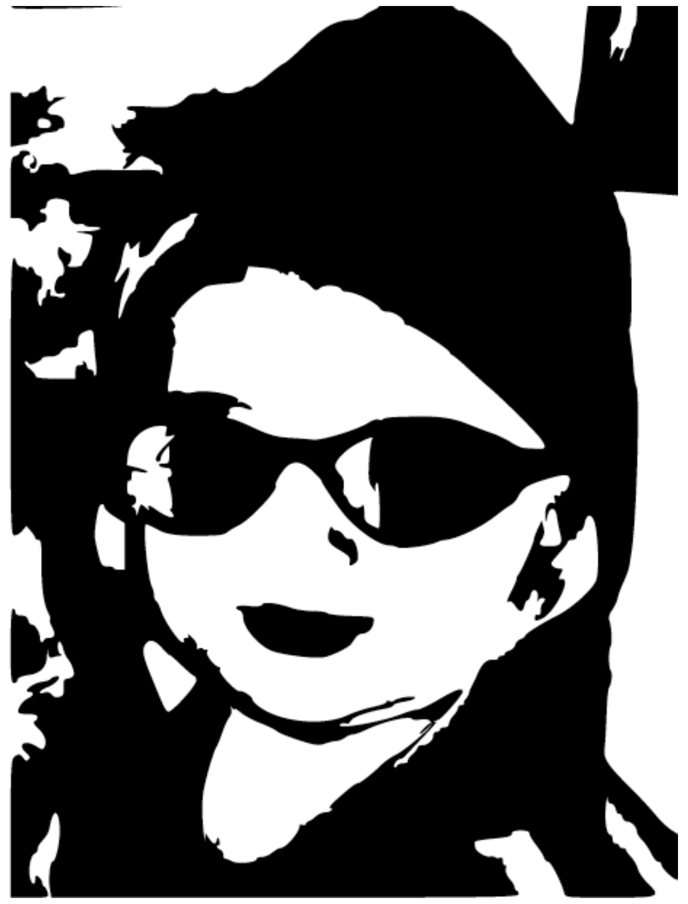
- Comparison to related approaches.



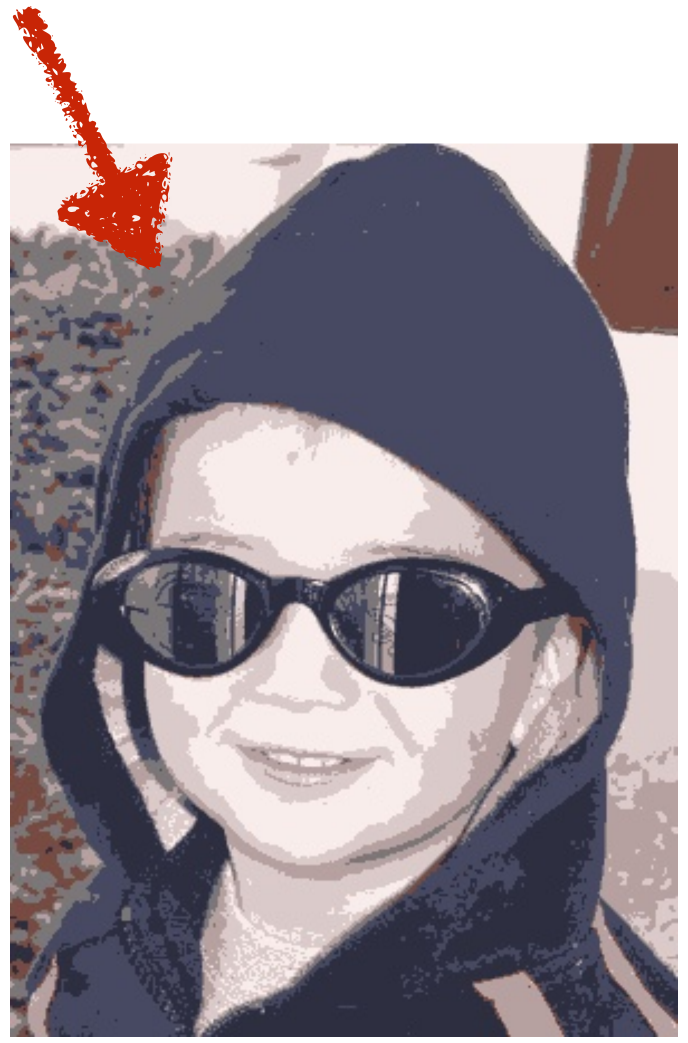
Input



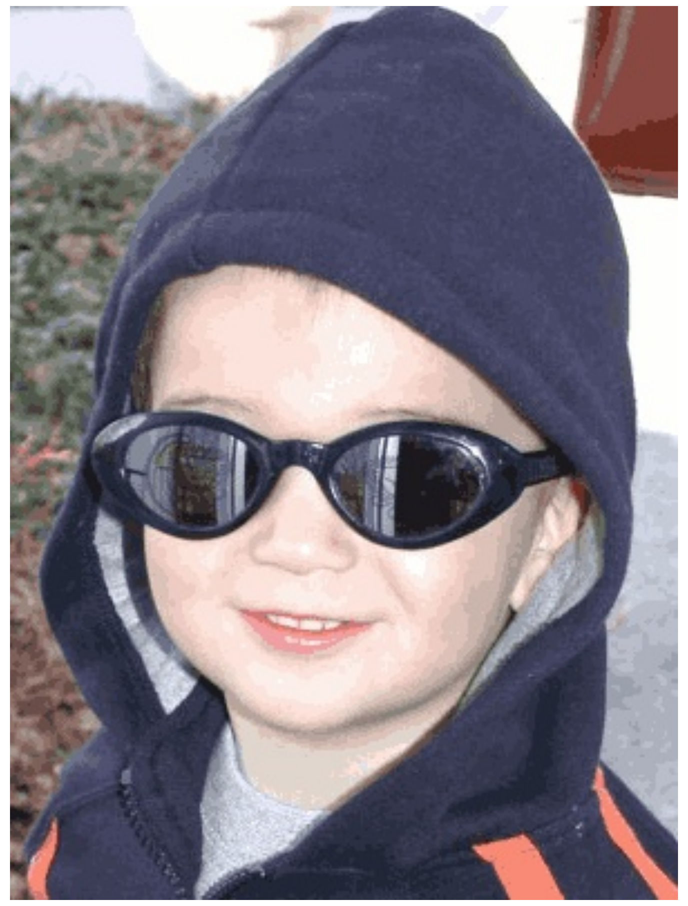
[Afifi 2018]



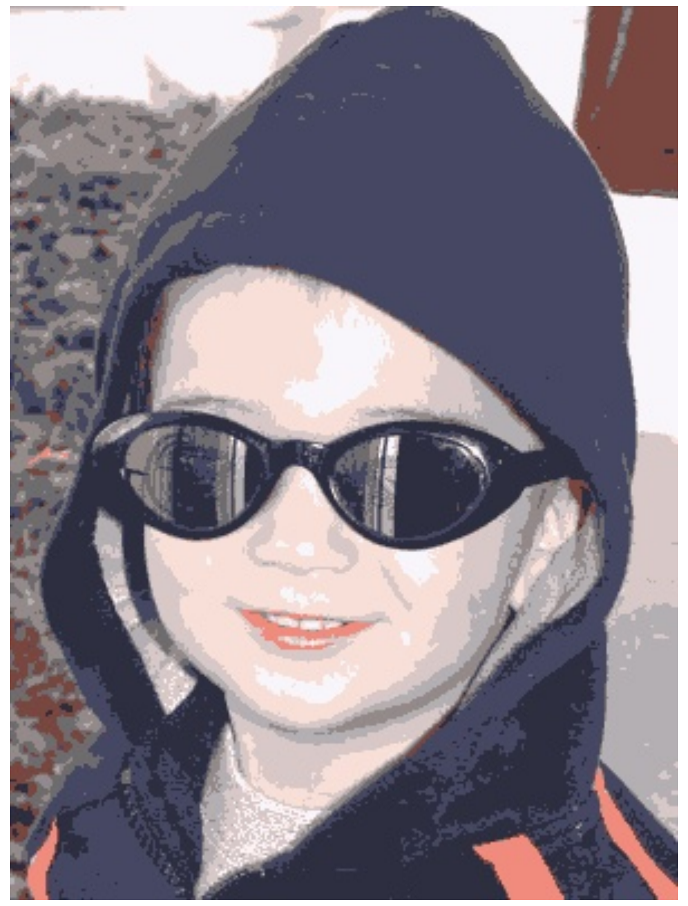
[Xu and Kaplan 2008]



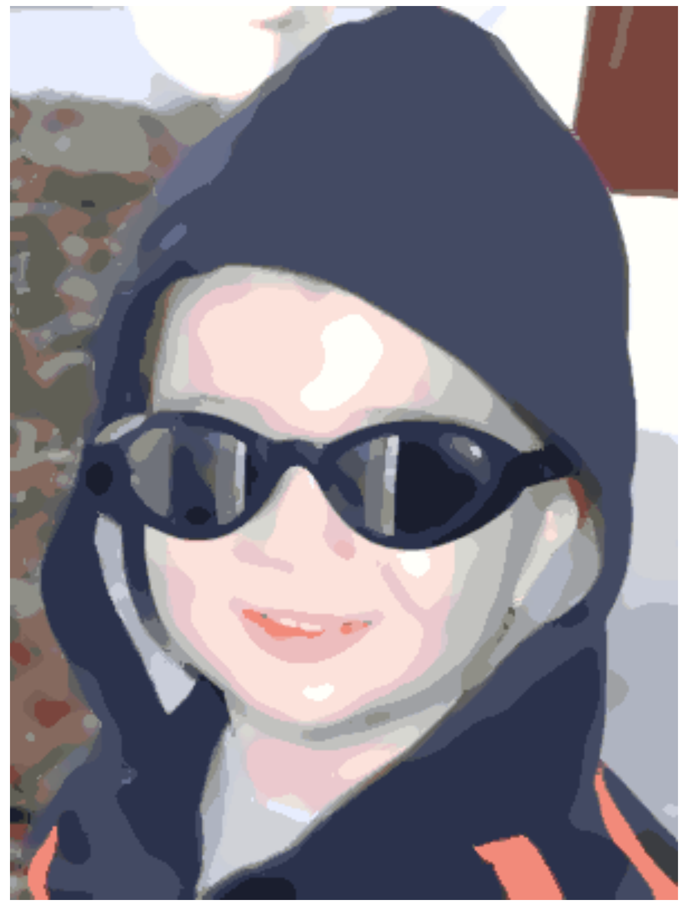
Direct K-means
(*K=7* in RGB-space)



Direct K-means
(*K=44* in RGB-space)



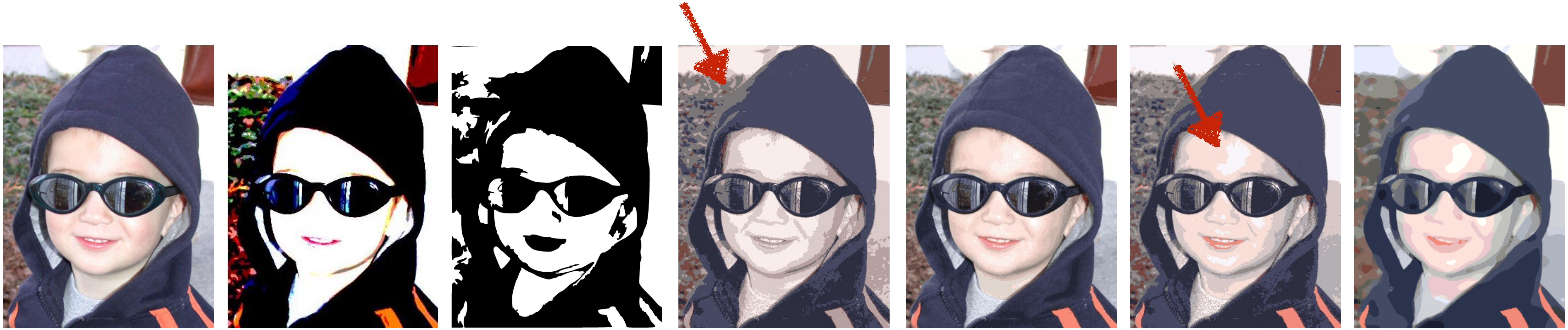
Direct K-means
(*K=10* in RGBXY-space)



Ours

Evaluation

- Comparison to related approaches.



Input

[Afifi 2018]

[Xu and Kaplan 2008]

Direct K-means
(*K=7* in RGB-space)

Direct K-means
(*K=44* in RGB-space)

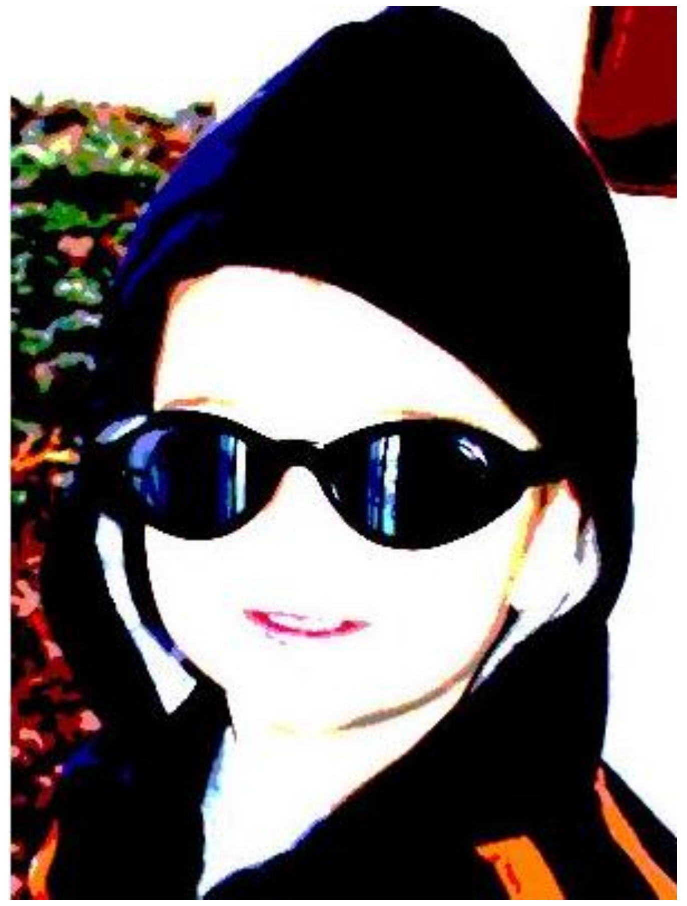
Direct K-means
(*K=10* in RGBXY-space)

Ours

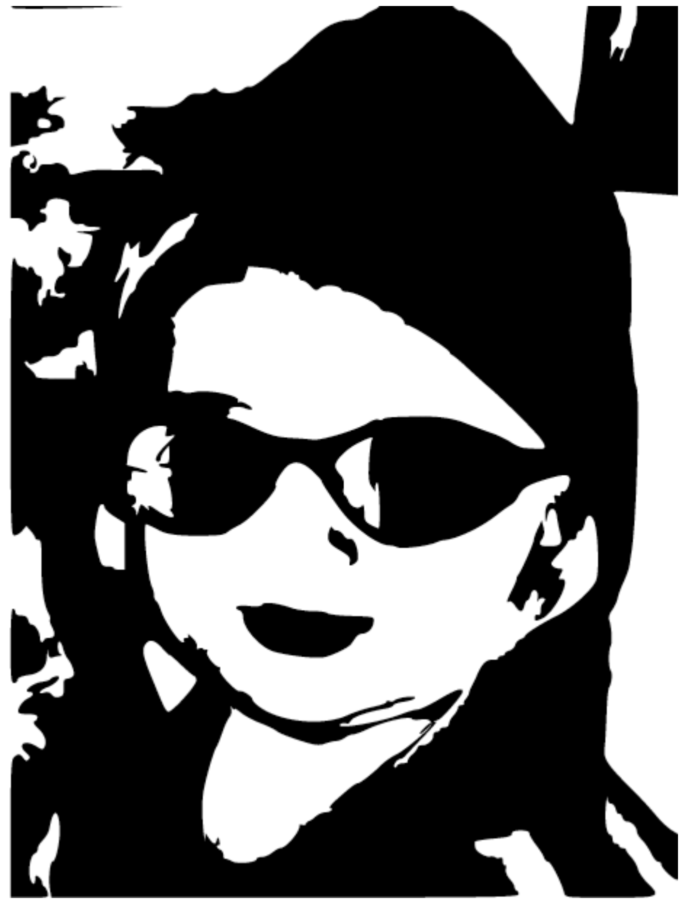
Evaluation

- Comparison to related approaches.

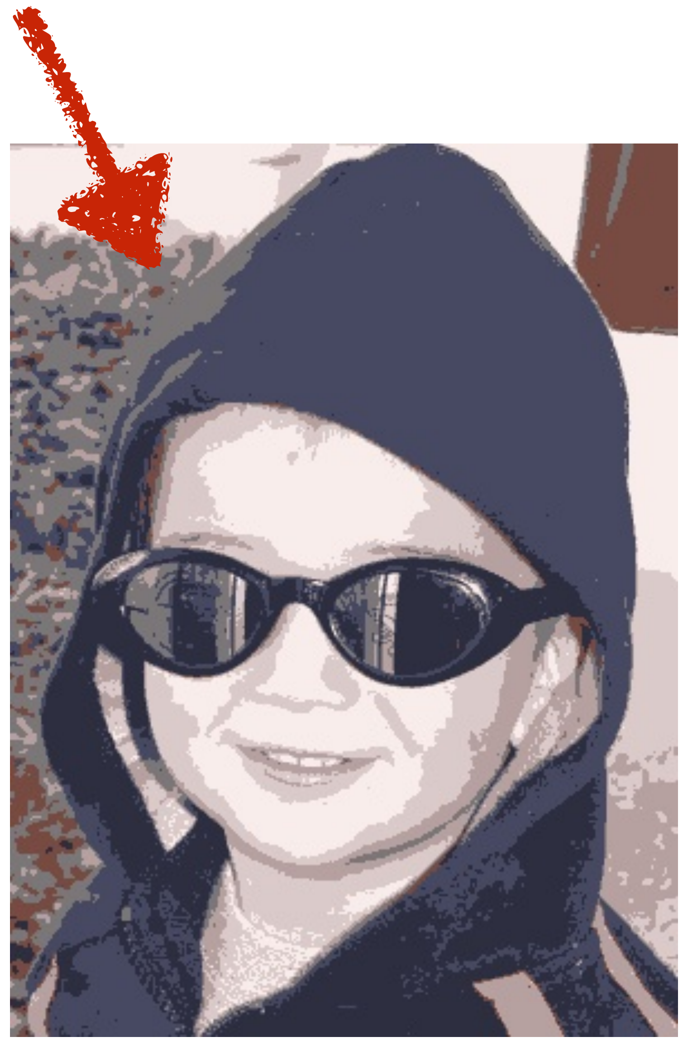
Input



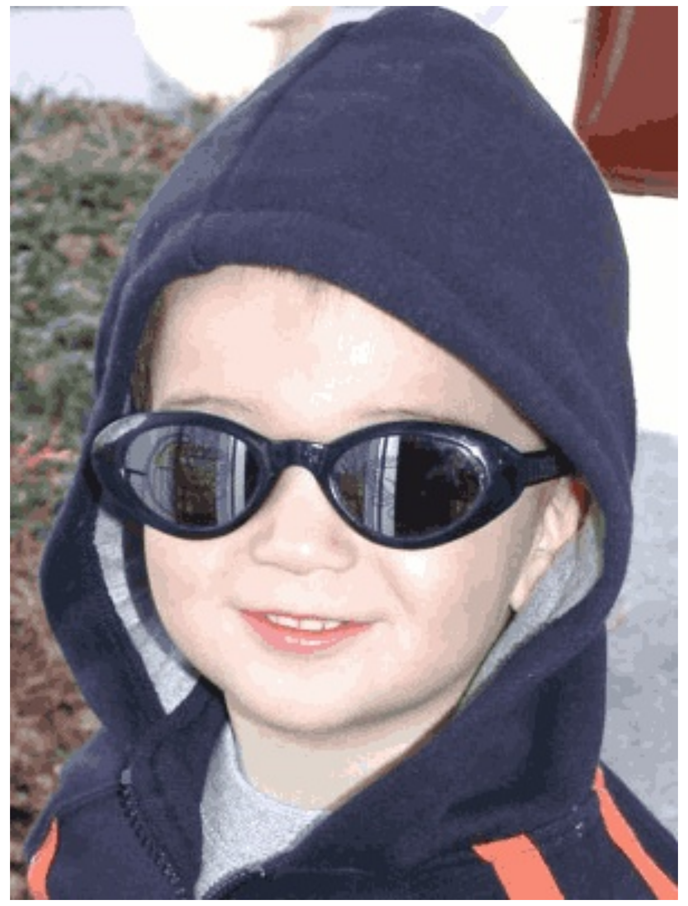
[Afifi 2018]



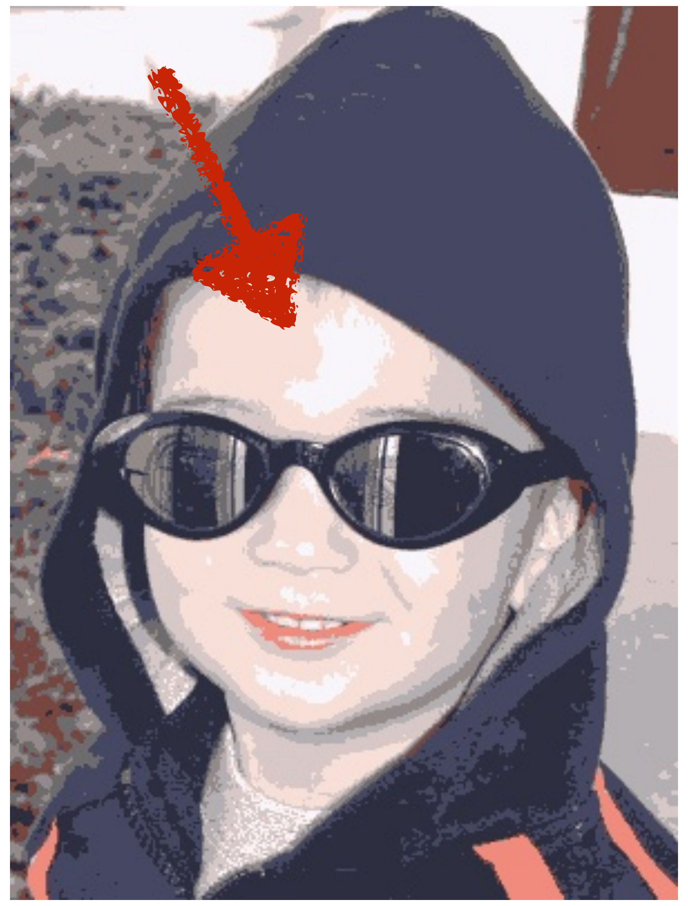
[Xu and Kaplan 2008]



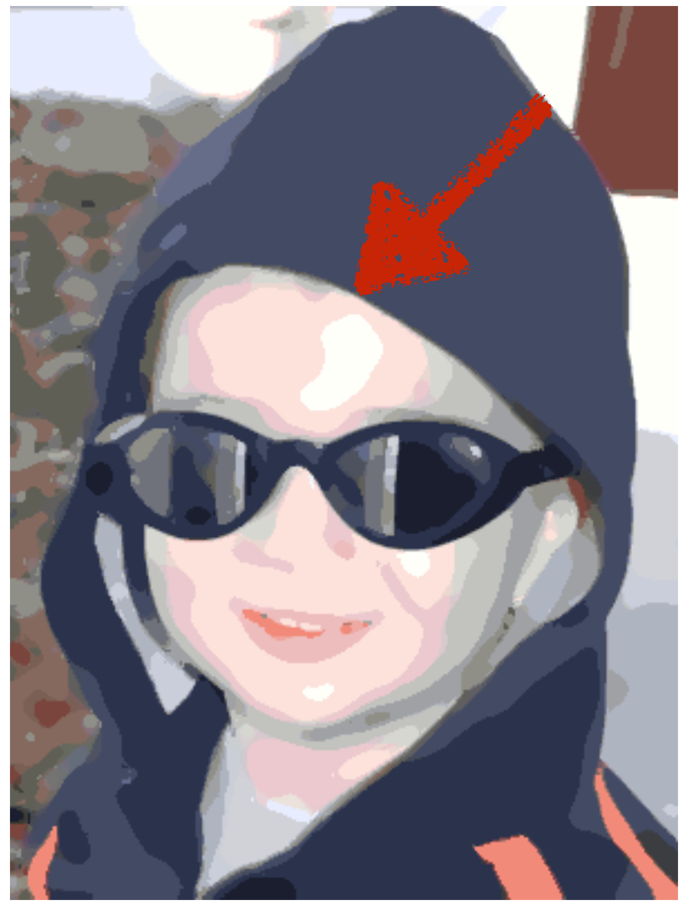
Direct K-means
(*K=7* in RGB-space)



Direct K-means
(*K=44* in RGB-space)



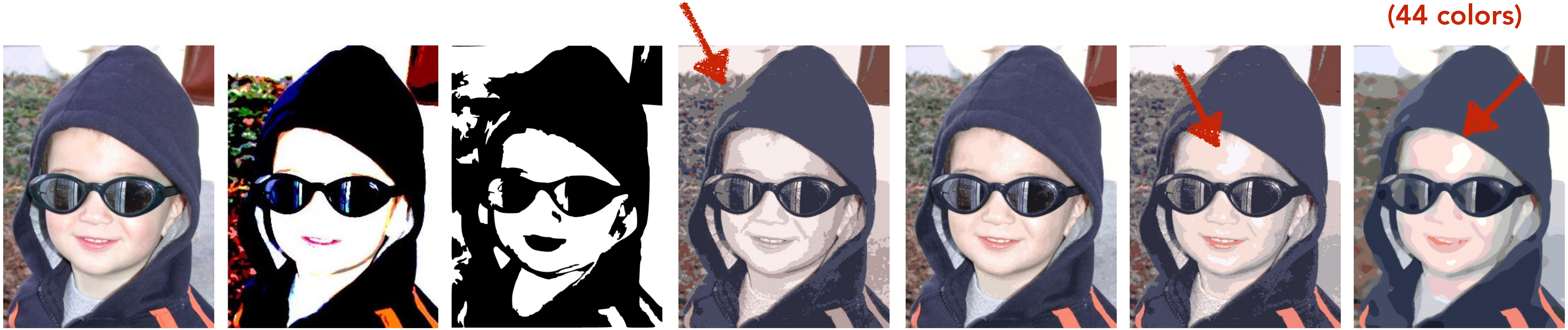
Direct K-means
(*K=10* in RGBXY-space)



Ours

Evaluation

- Comparison to related approaches.



(44 colors)

Input

[Afifi 2018]

[Xu and Kaplan 2008]

Direct K-means
(*K=7* in RGB-space)

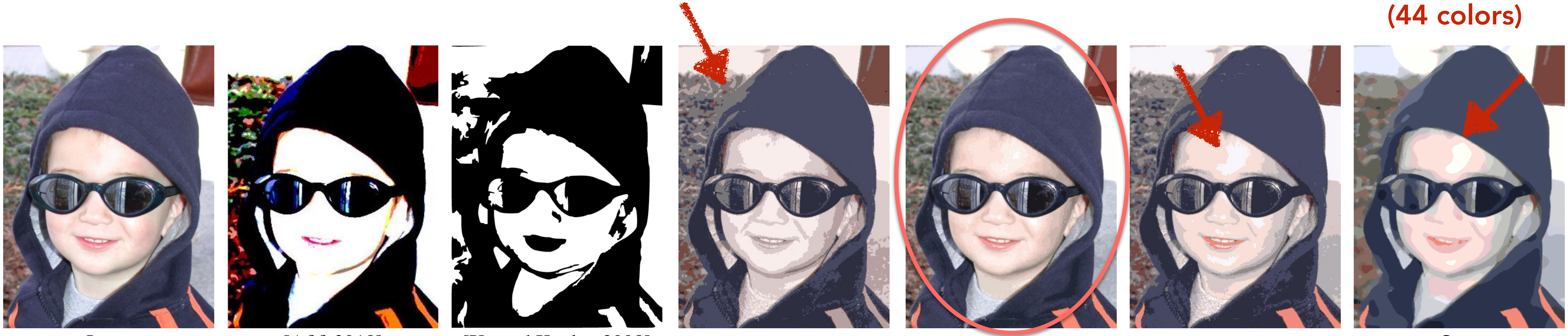
Direct K-means
(*K=44* in RGB-space)

Direct K-means
(*K=10* in RGBXY-space)

Ours

Evaluation

- Comparison to related approaches.



(44 colors)

Input

[Afifi 2018]

[Xu and Kaplan 2008]

Direct K-means
(*K=7* in RGB-space)

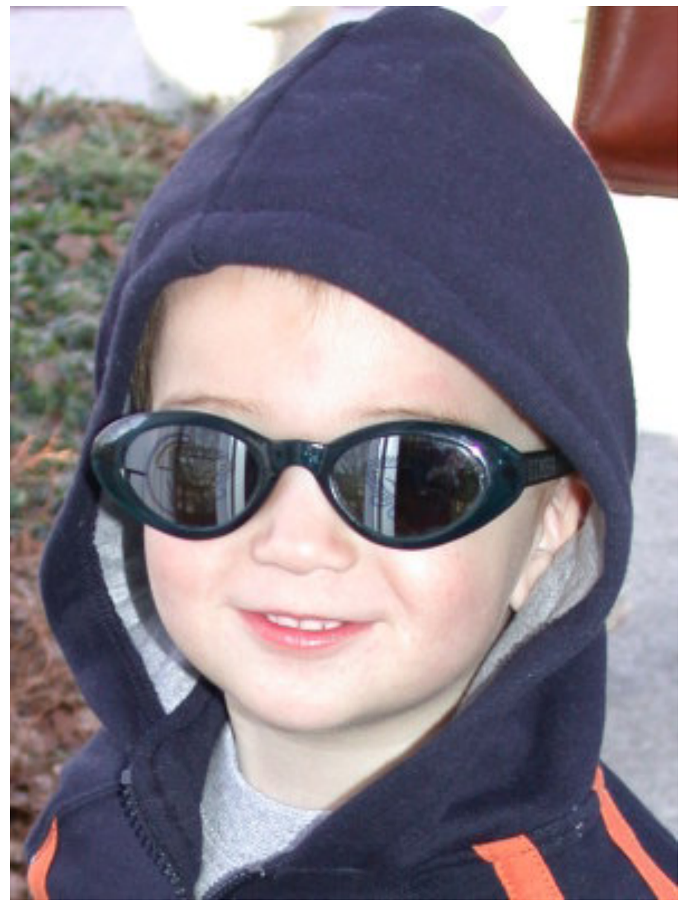
Direct K-means
(*K=44* in RGB-space)

Direct K-means
(*K=10* in RGBXY-space)

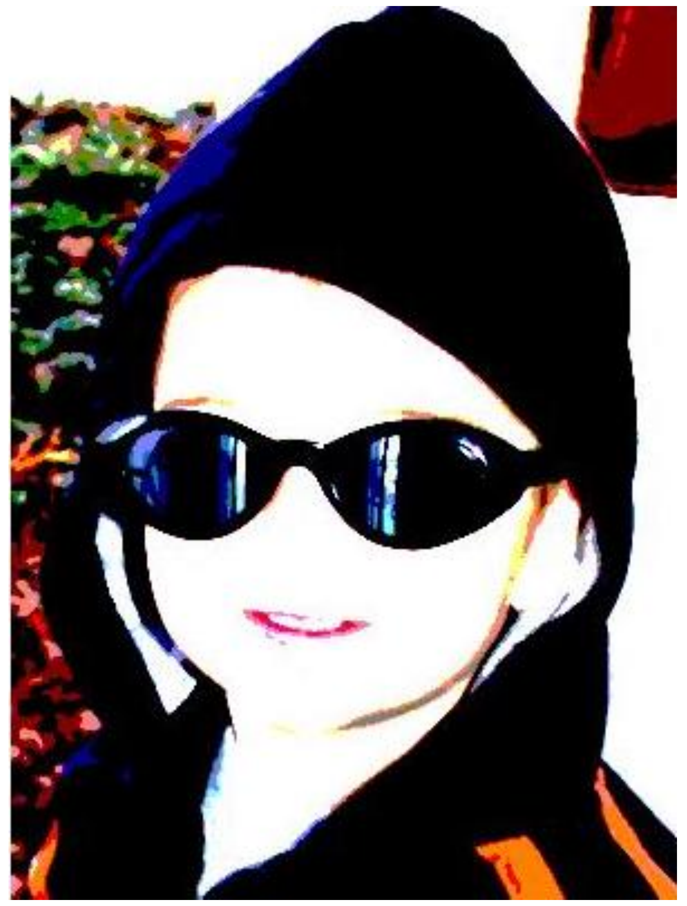
Ours

Evaluation

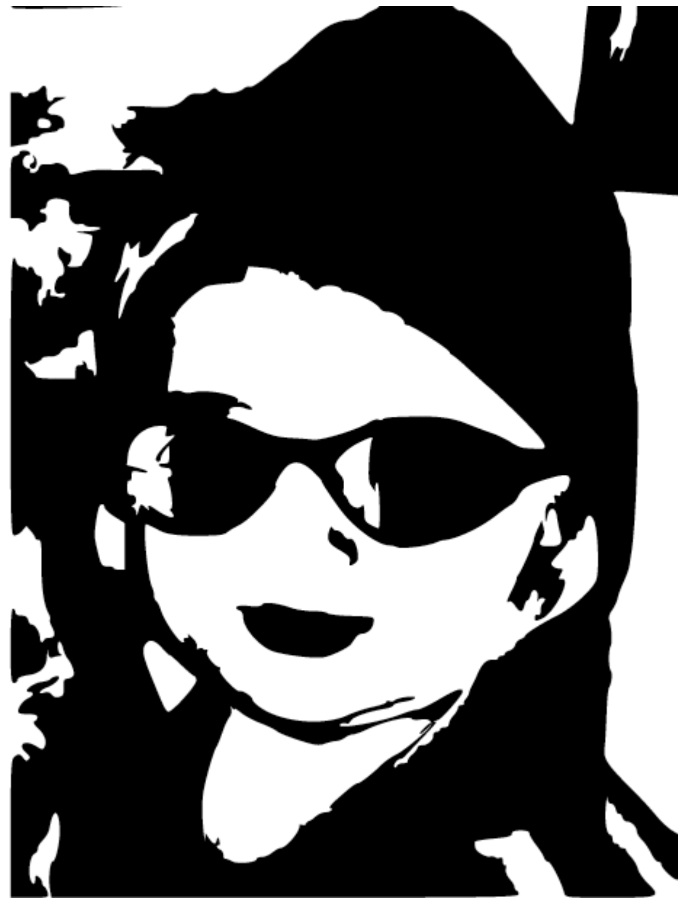
- Comparison to related approaches.
- Expert study with professional artists.



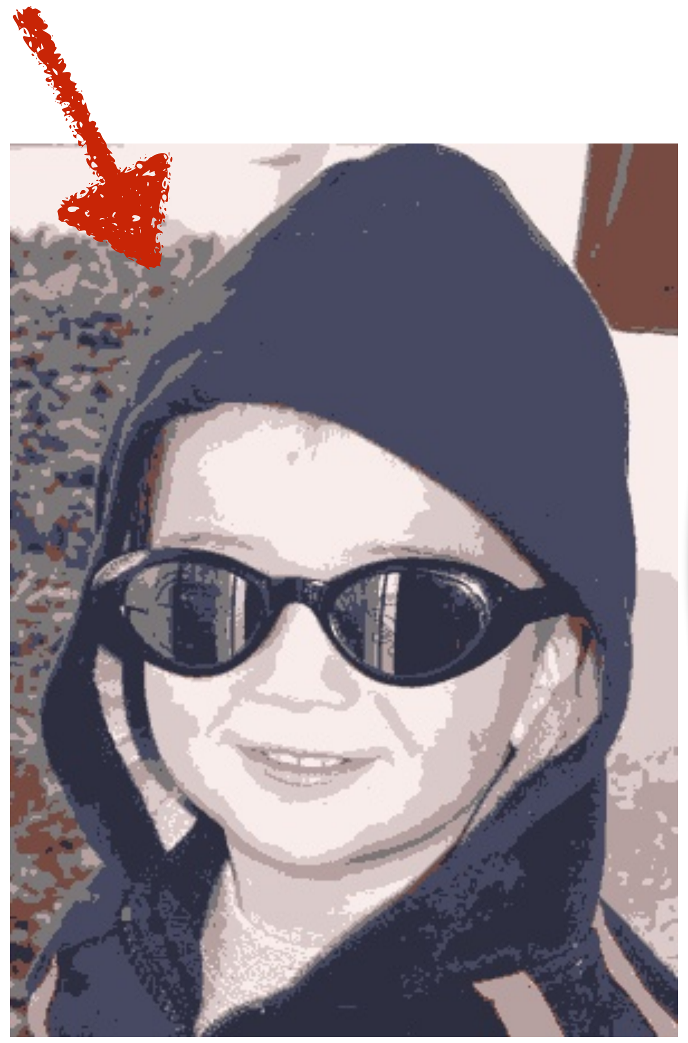
Input



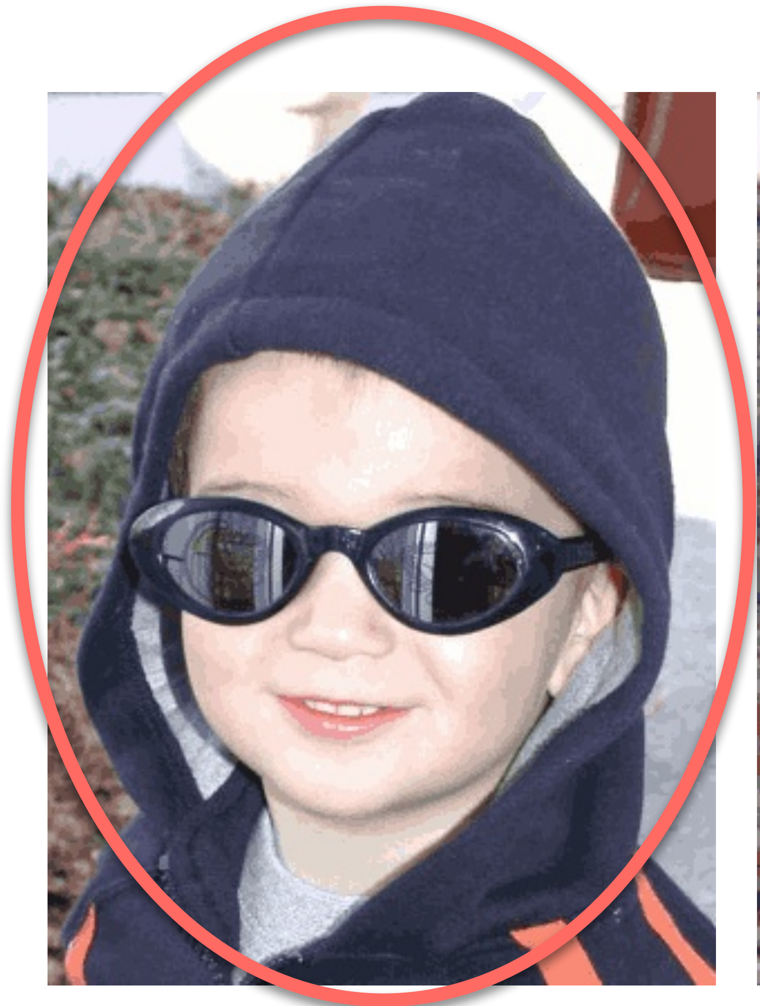
[Afifi 2018]



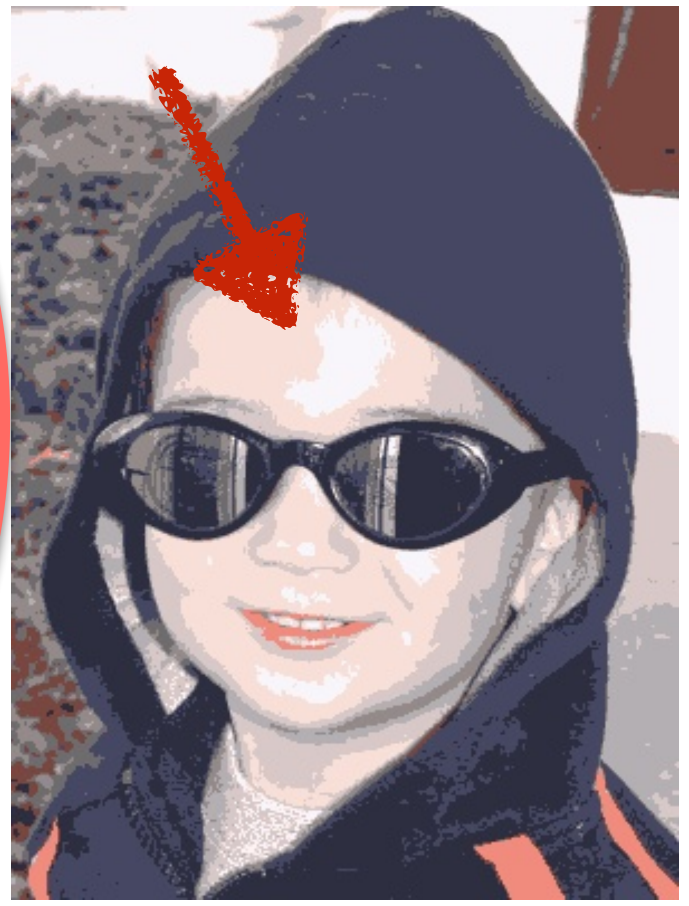
[Xu and Kaplan 2008]



Direct K-means
(*K*=*7* in RGB-space)

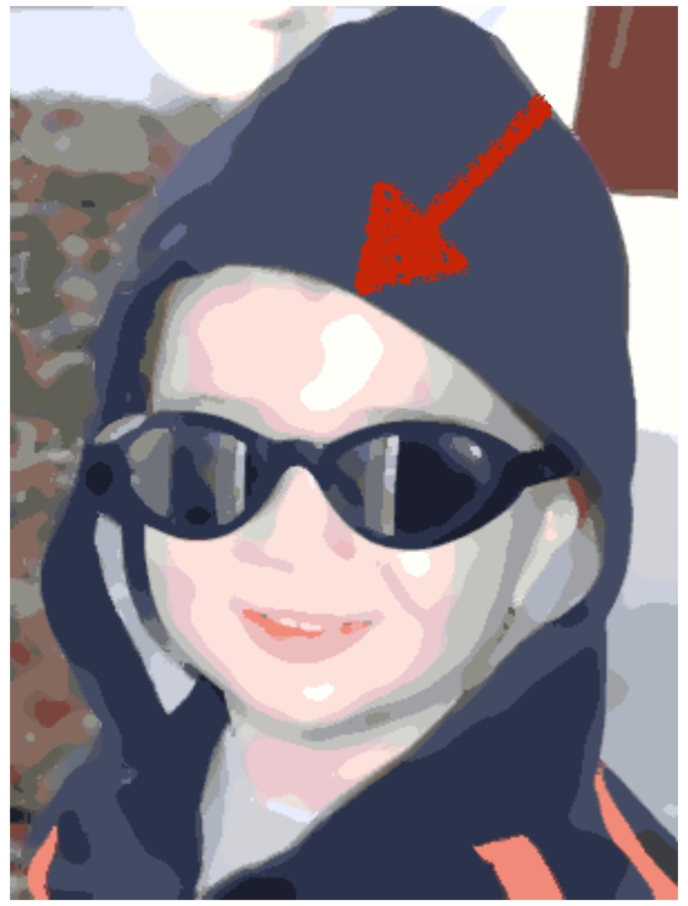


Direct K-means
(*K*=*44* in RGB-space)



Direct K-means
(*K*=*10* in RGBXY-space)

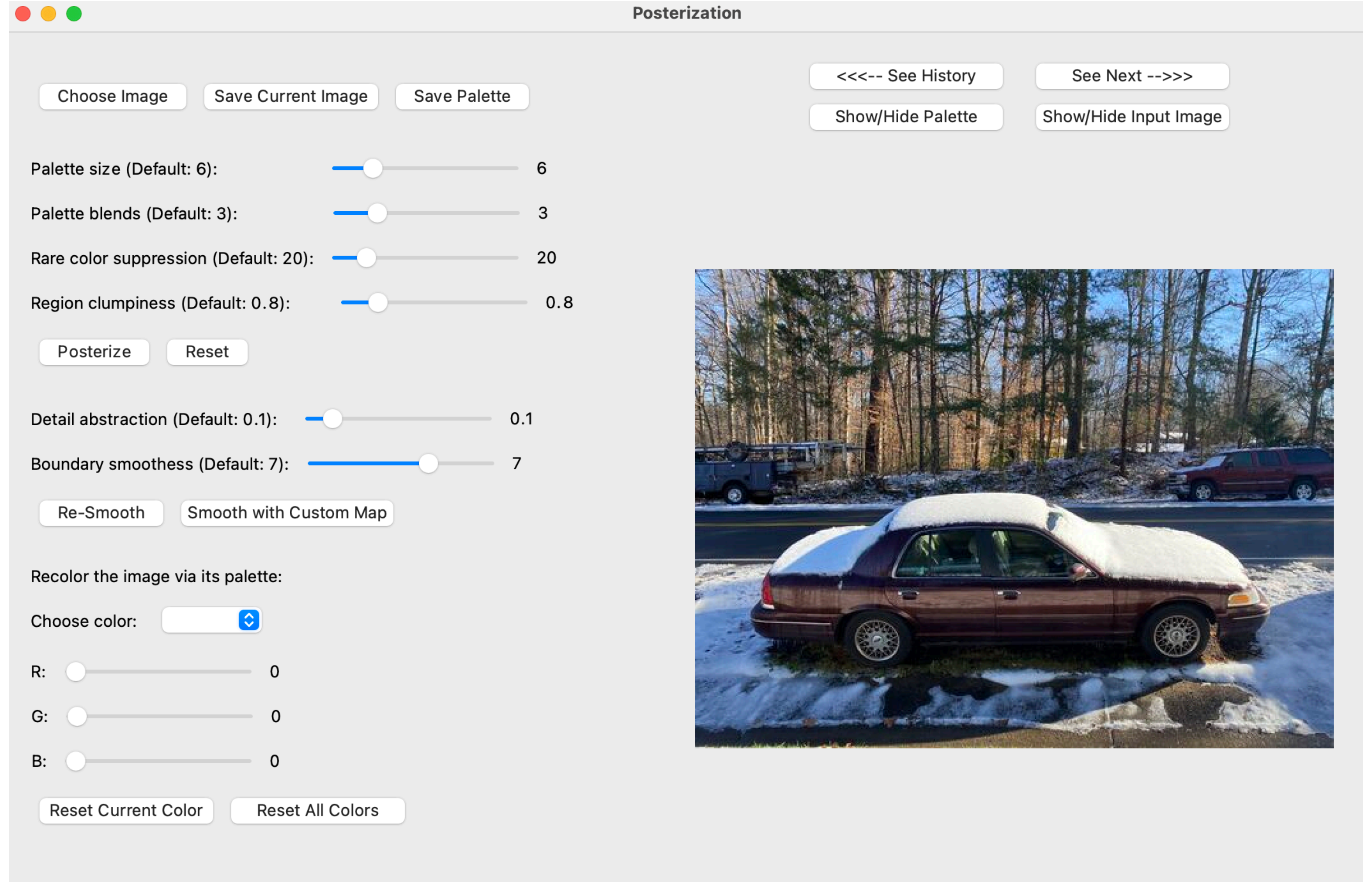
(44 colors)



Ours

Evaluation

- Comparison to related approaches.
- Expert study with professional artists.



Palette size (Default: 6): 6

Palette blends (Default: 3): 3

Rare color suppression (Default: 20): 20

Region clumpiness (Default: 0.8): 0.8

Detail abstraction (Default: 0.1): 0.1

Boundary smoothess (Default: 7): 7

Recolor the image via its palette:

Choose color:

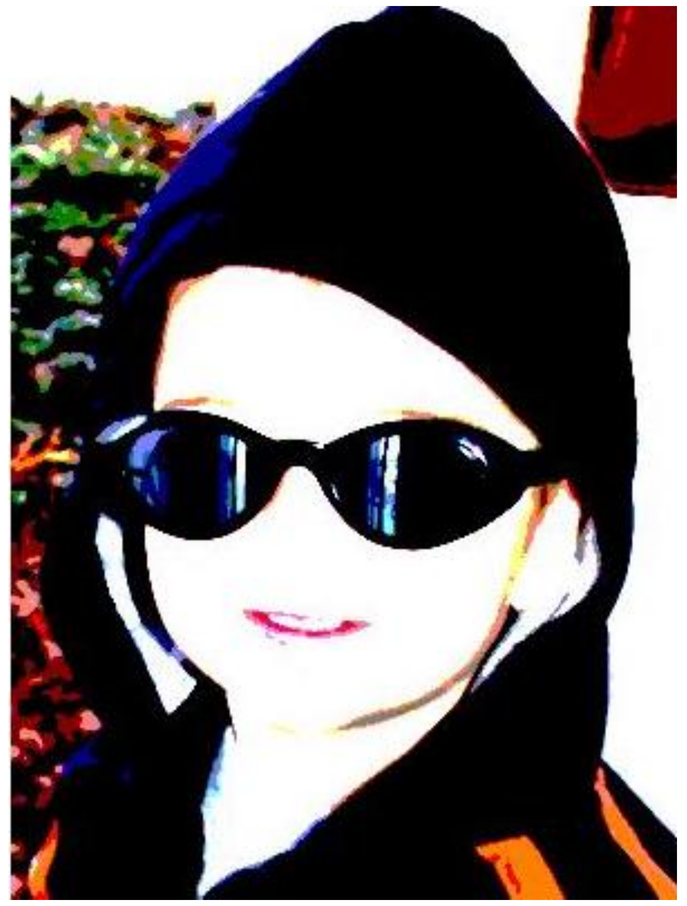
R: 0

G: 0

B: 0

(44 colors)

Input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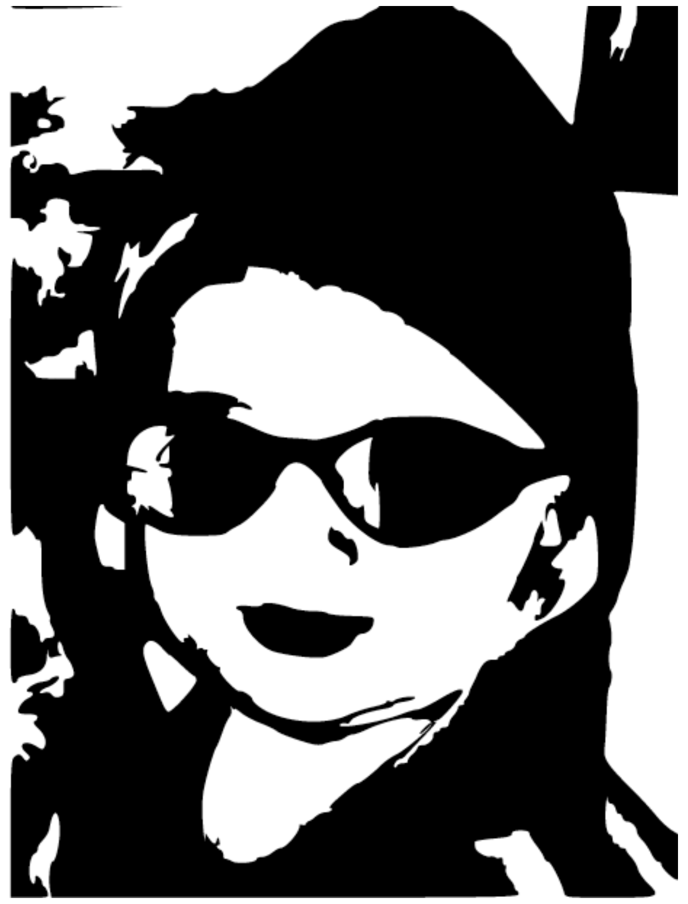
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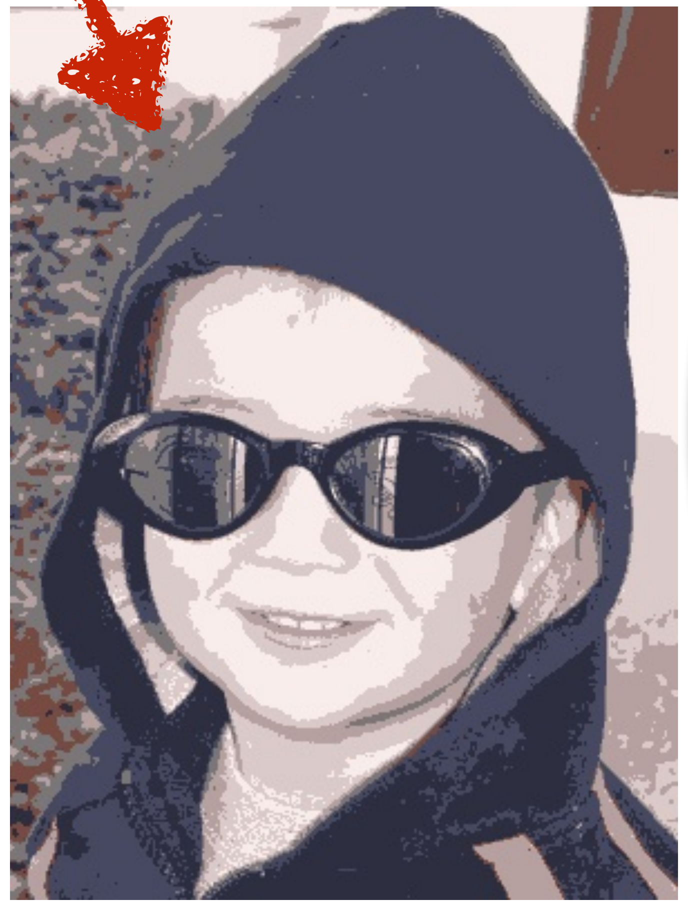
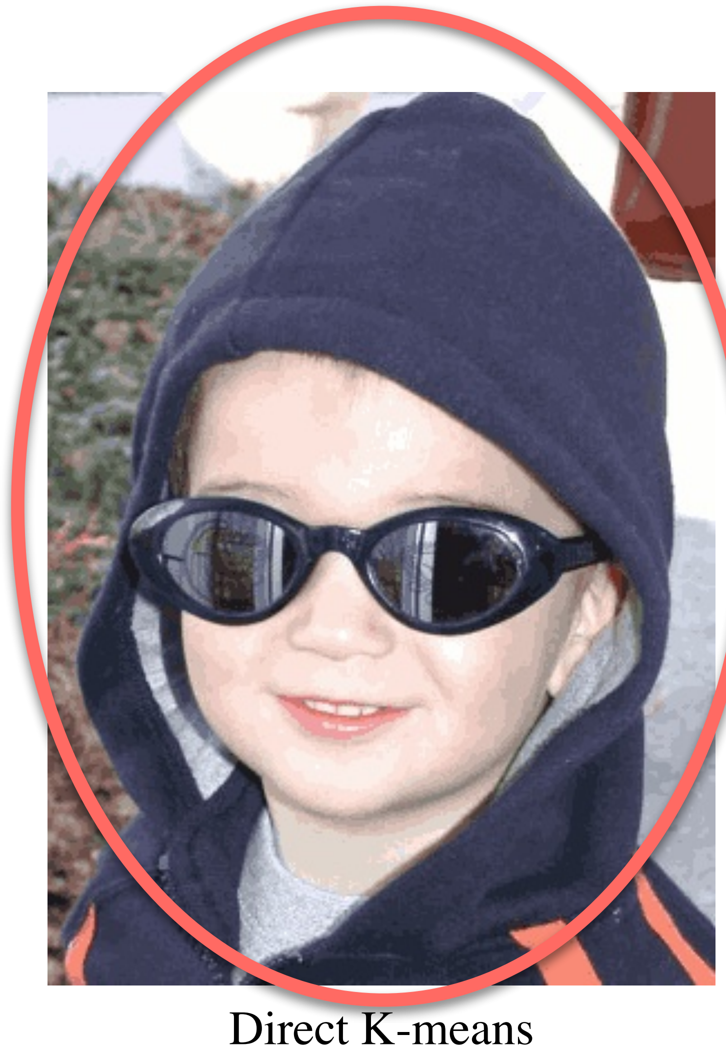

Direct K-means
(*K=7* in RGB-space)


Direct K-means
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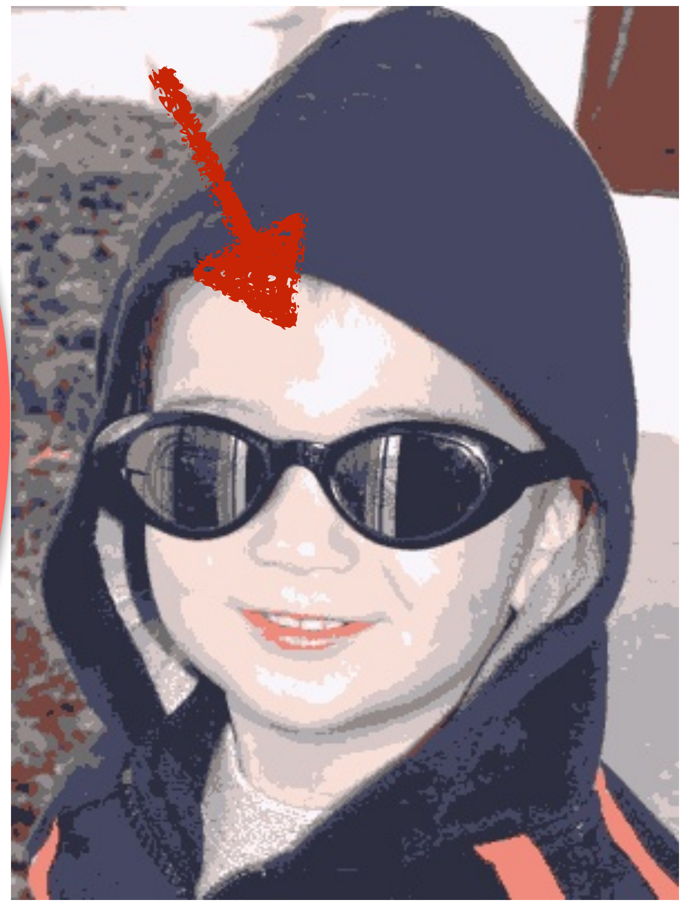
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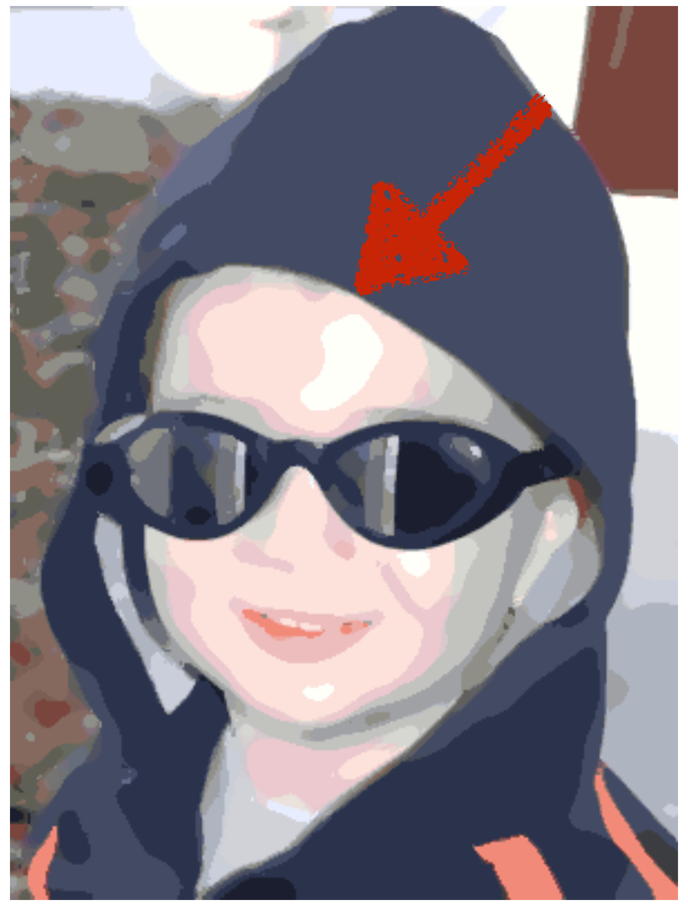
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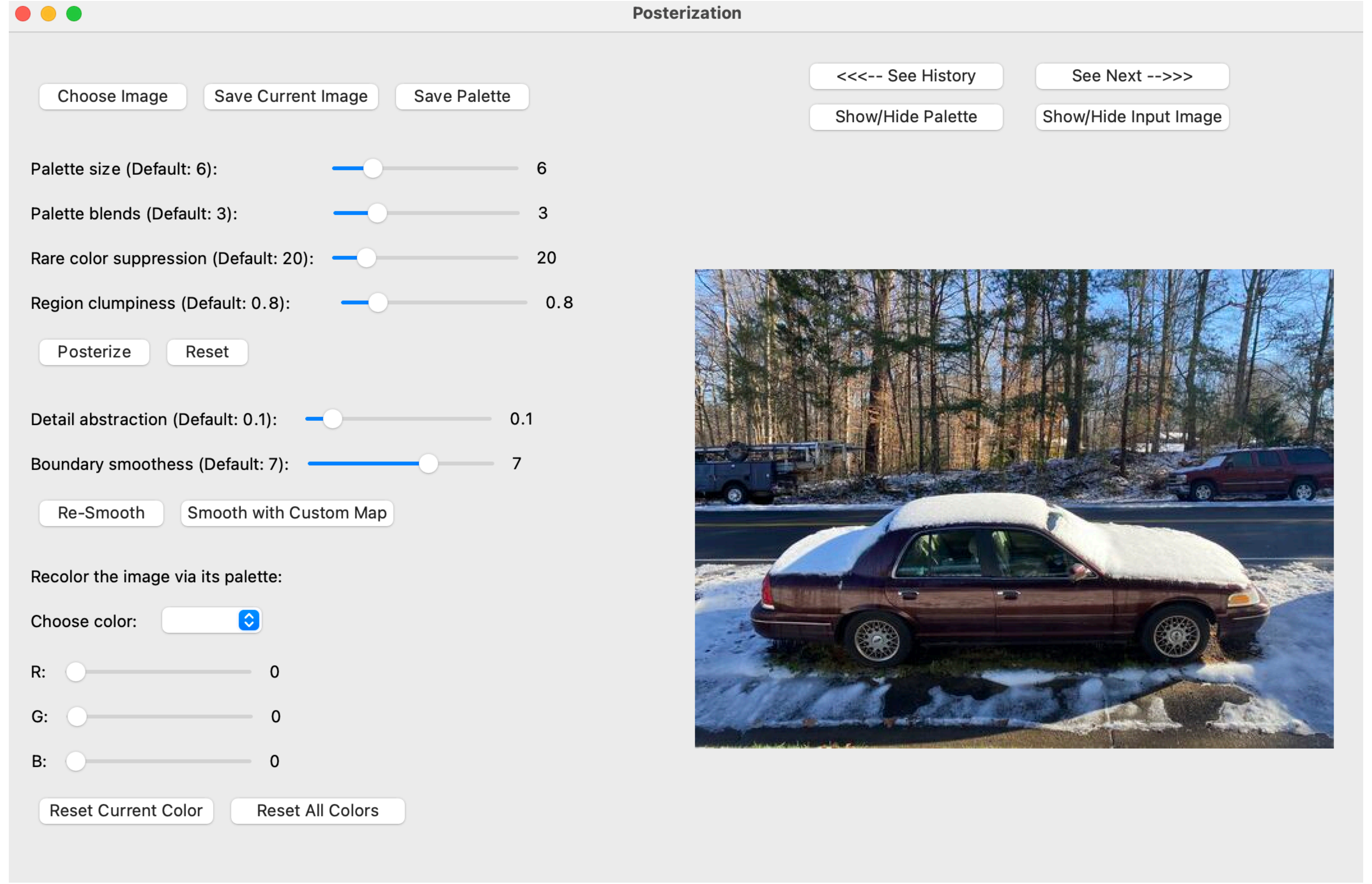

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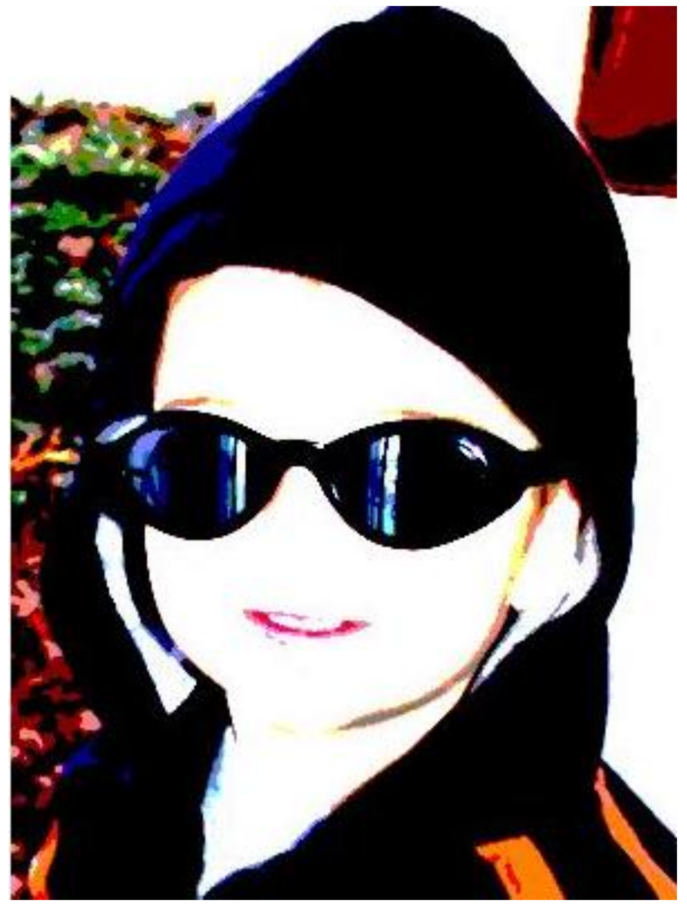
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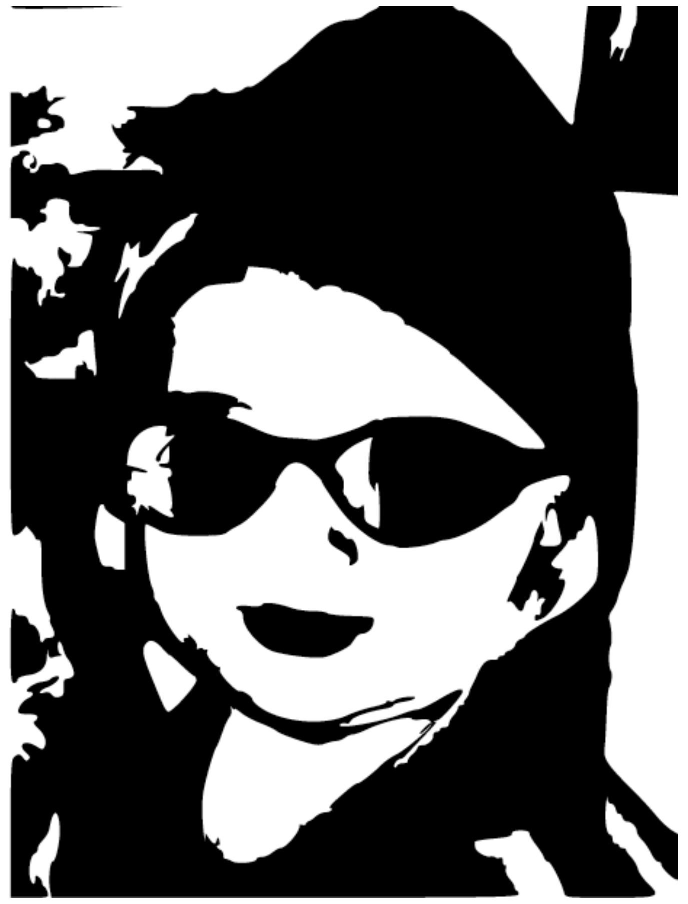
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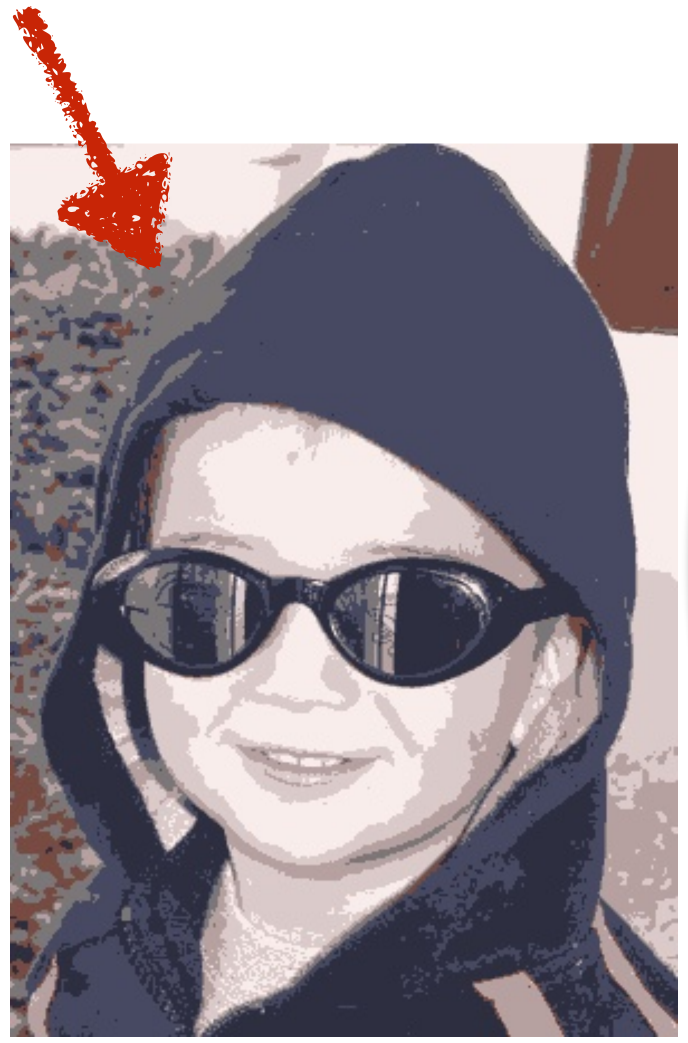
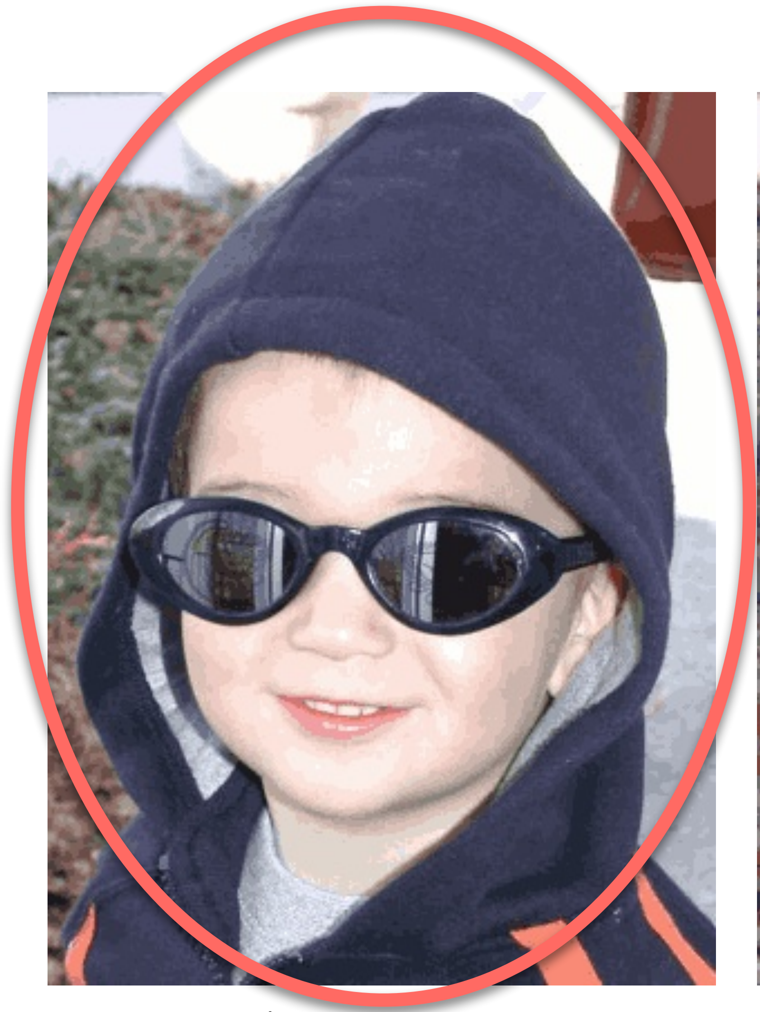

Direct K-means
(K=7 in RGB-space)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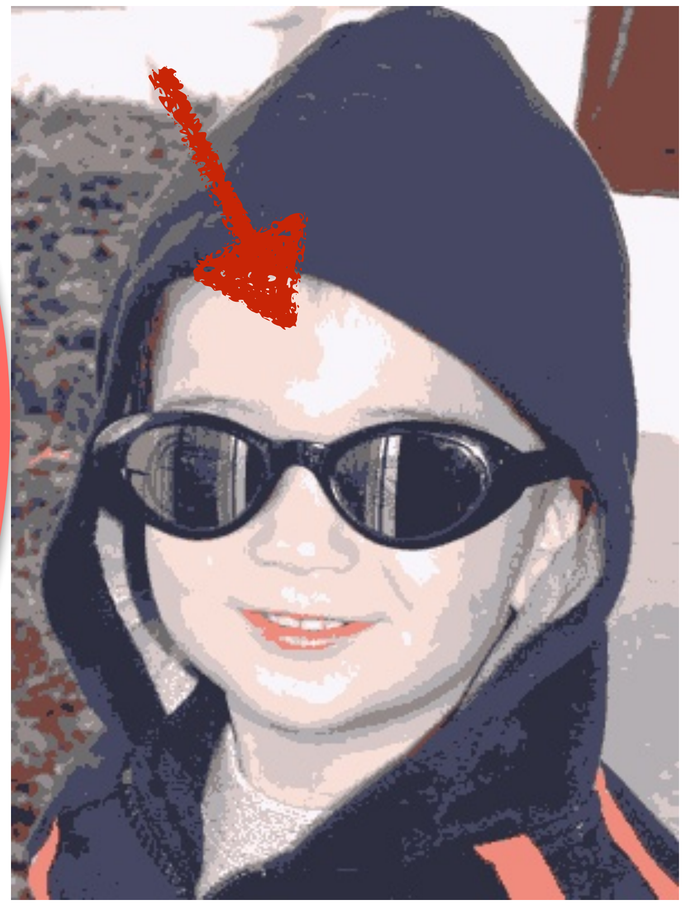
Direct K-means
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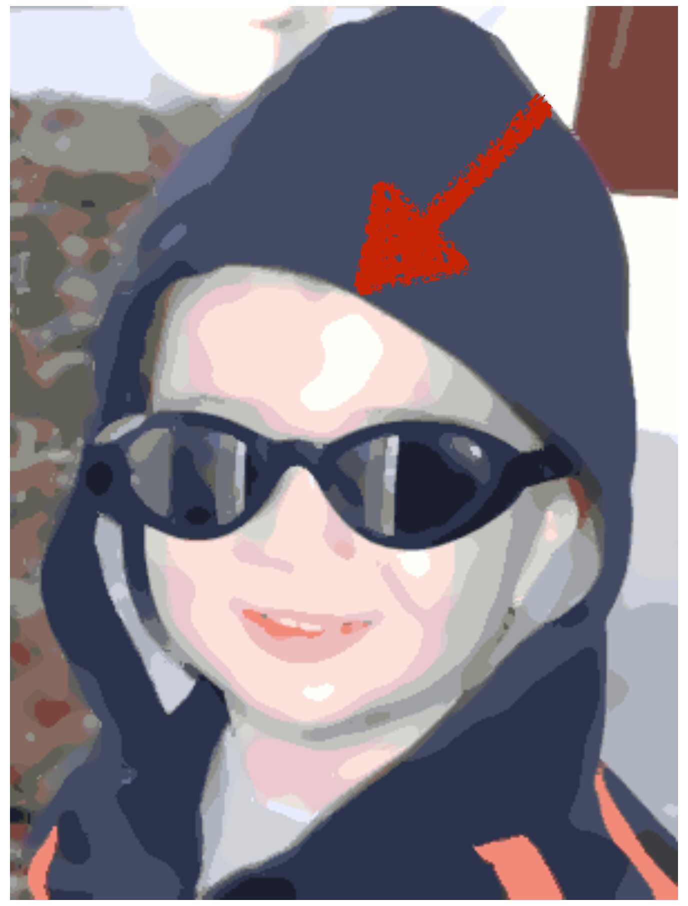
(44 colors)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Conclusion

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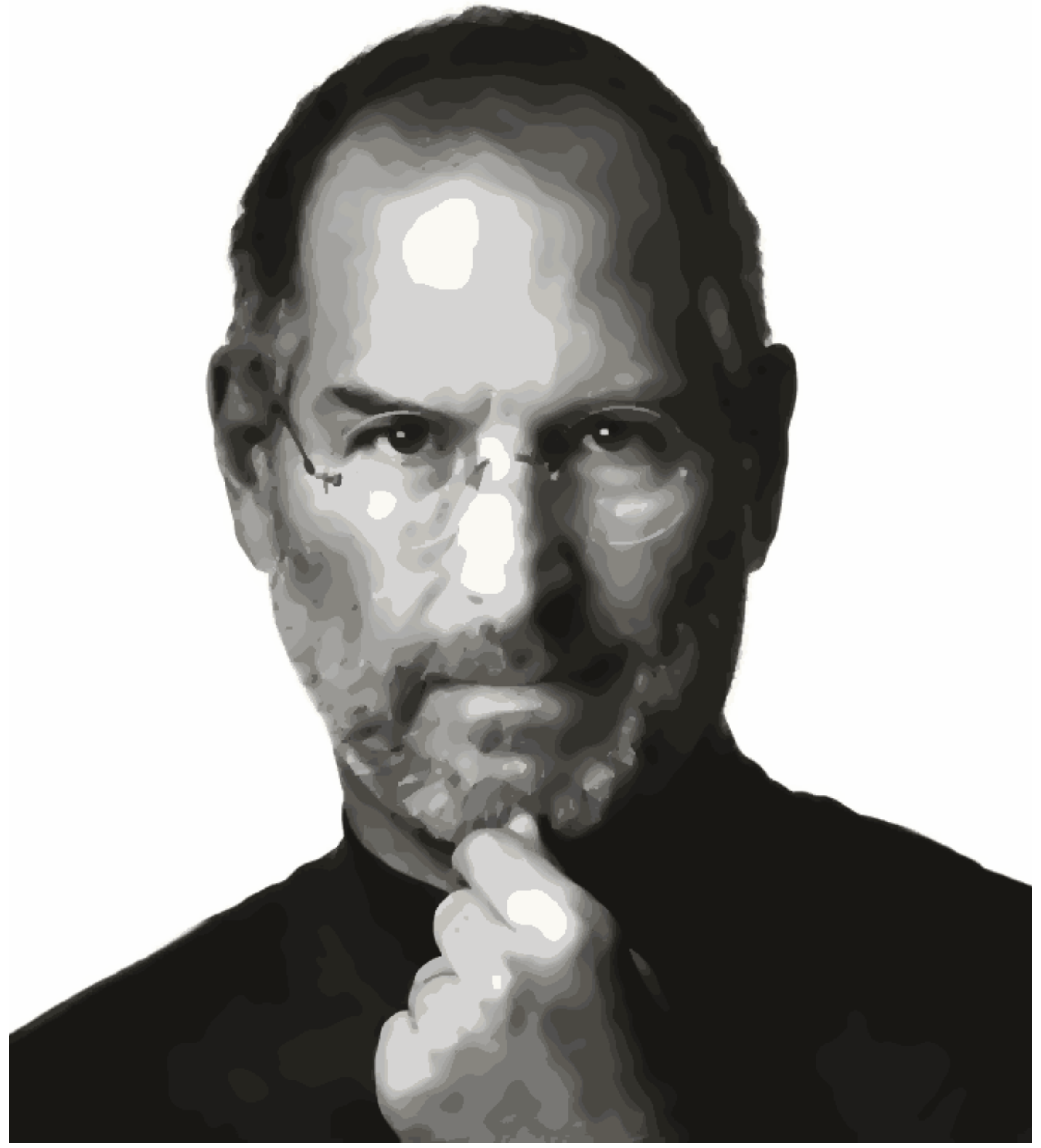

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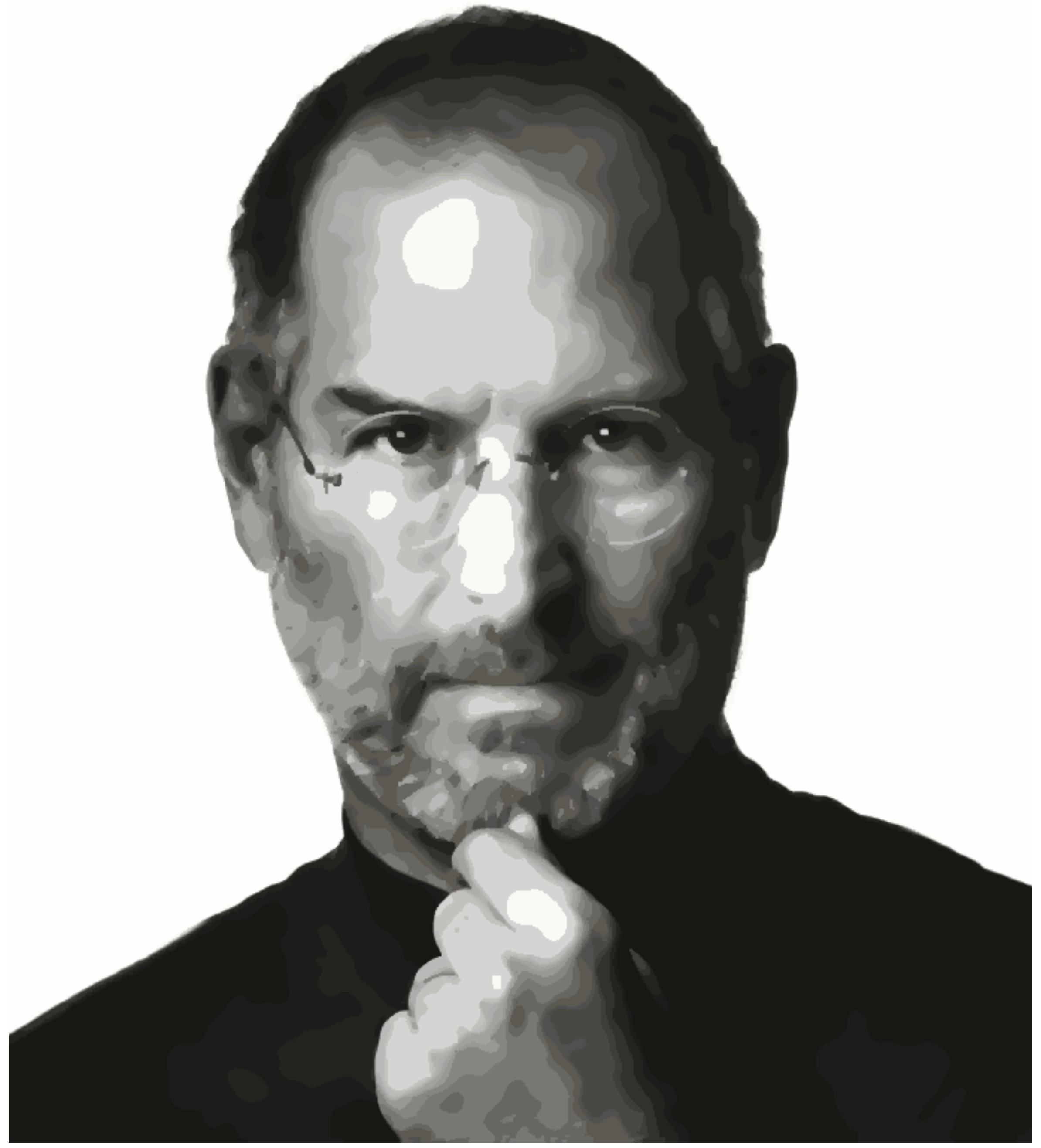

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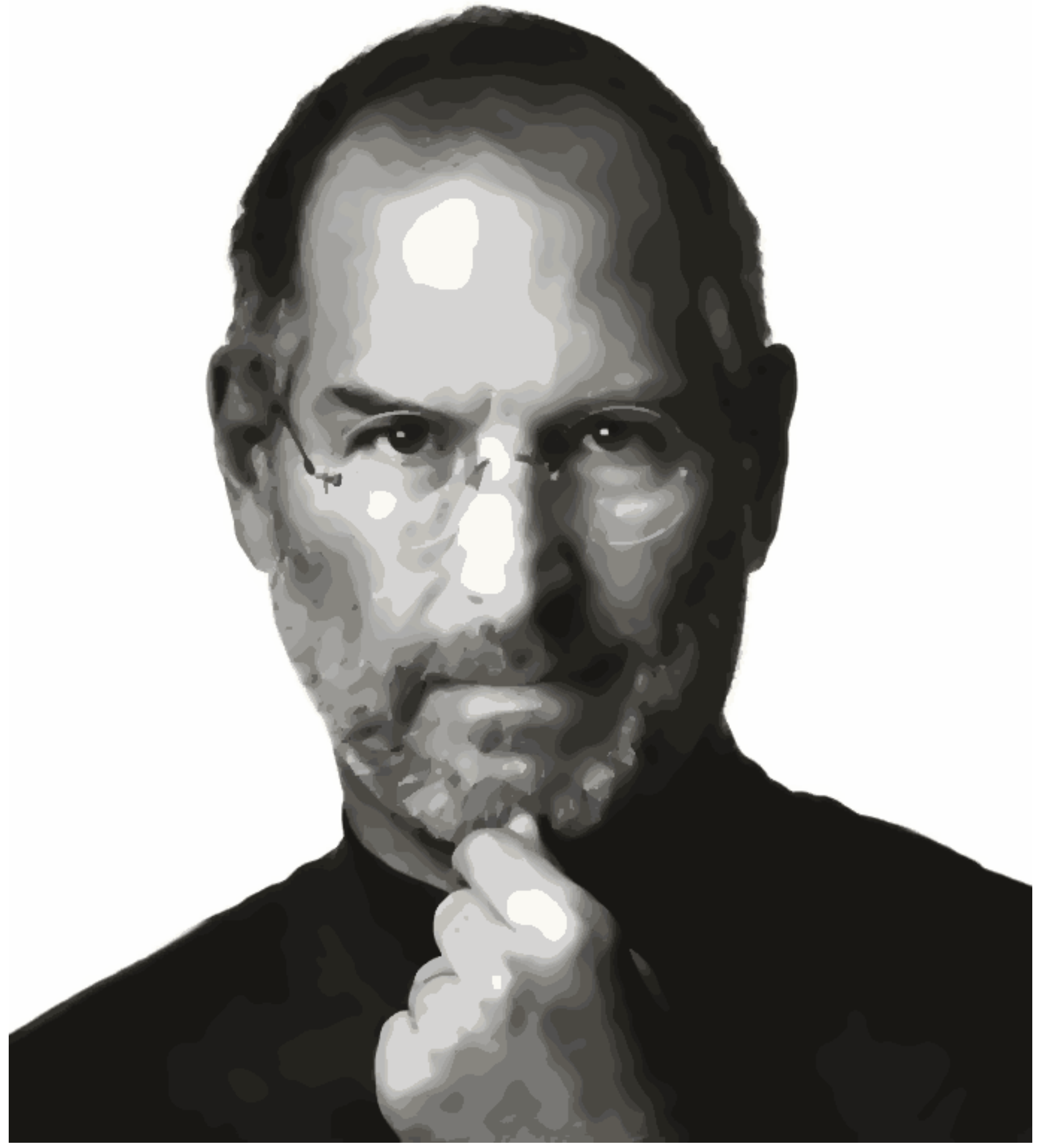

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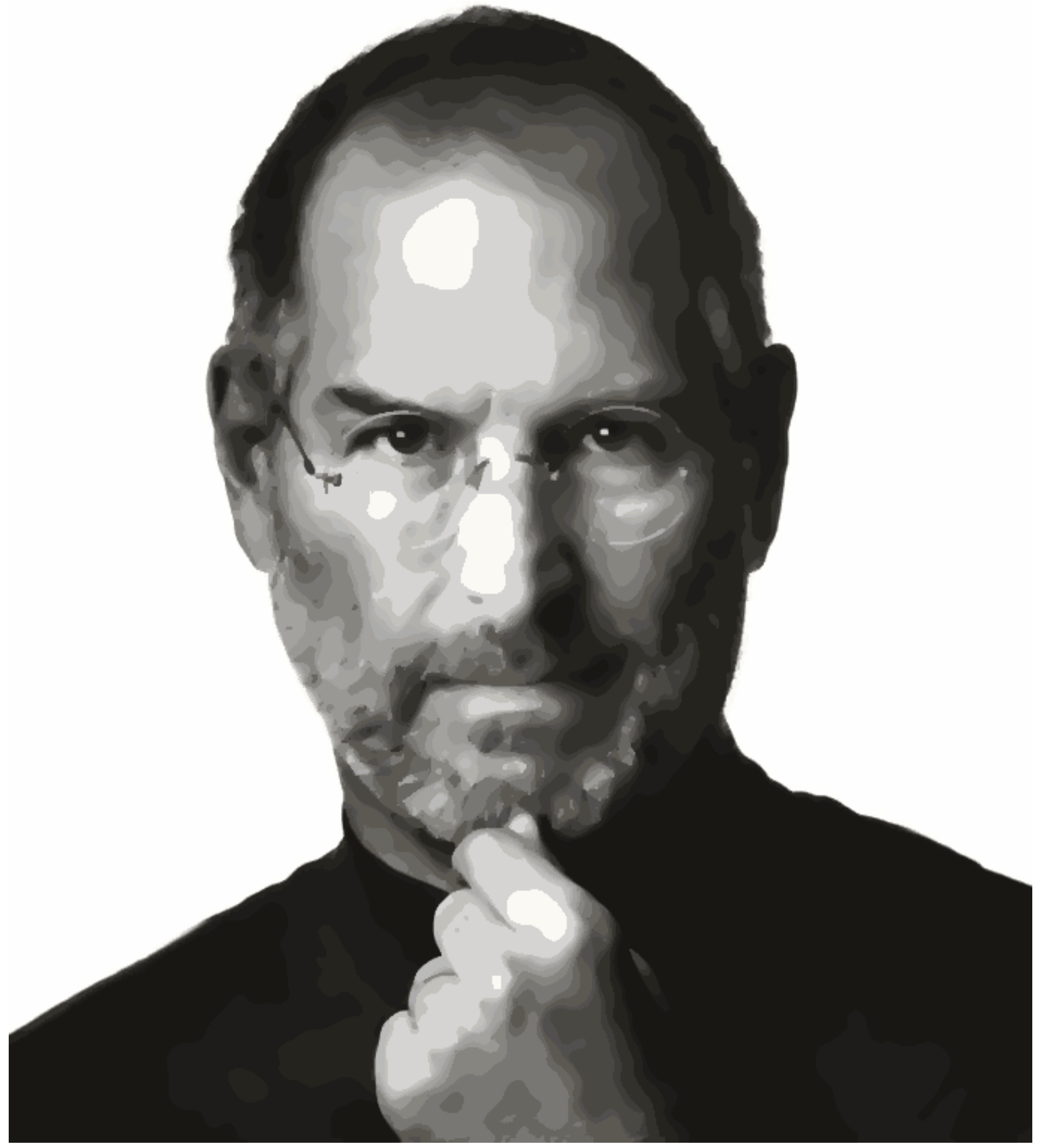

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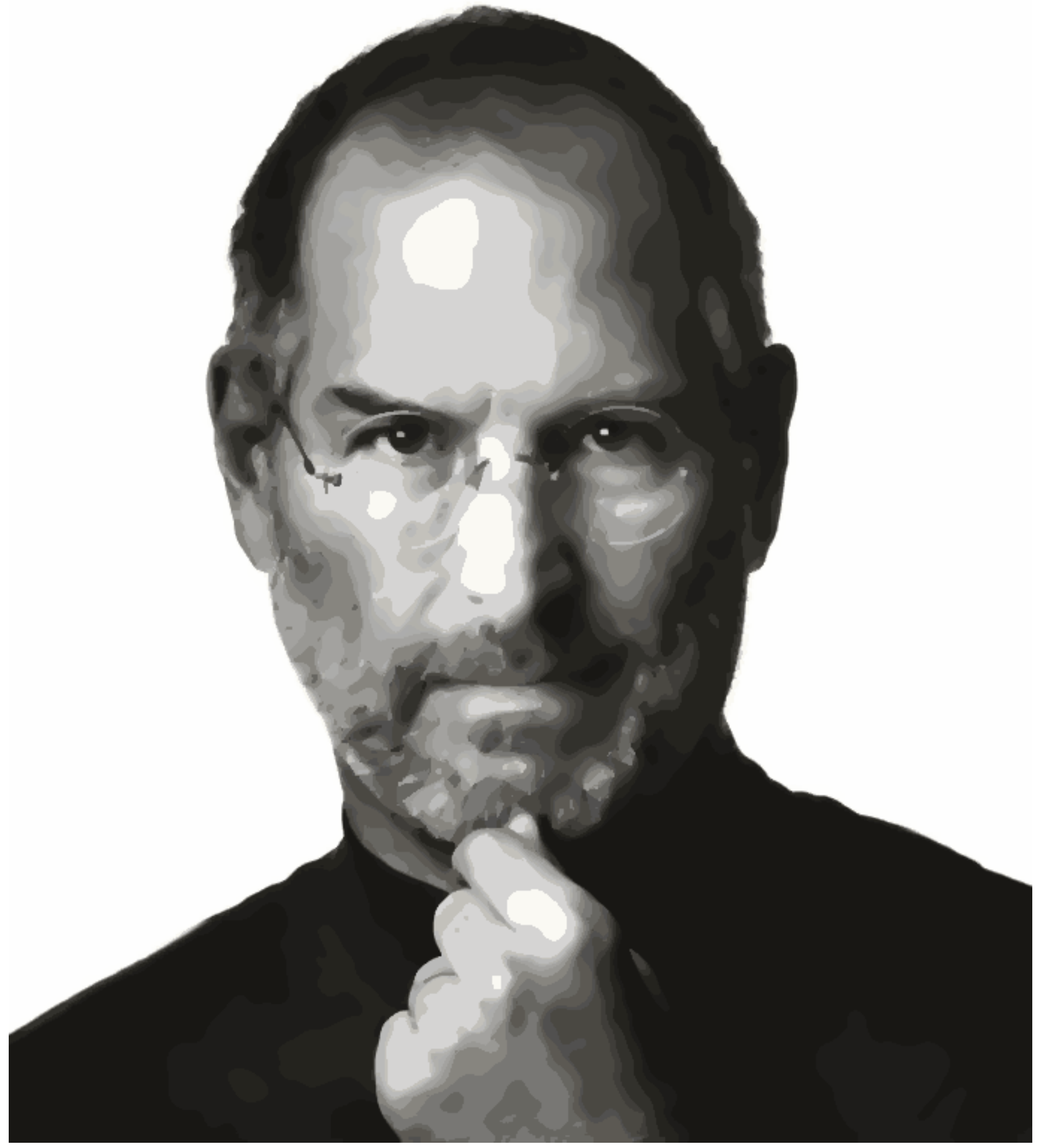

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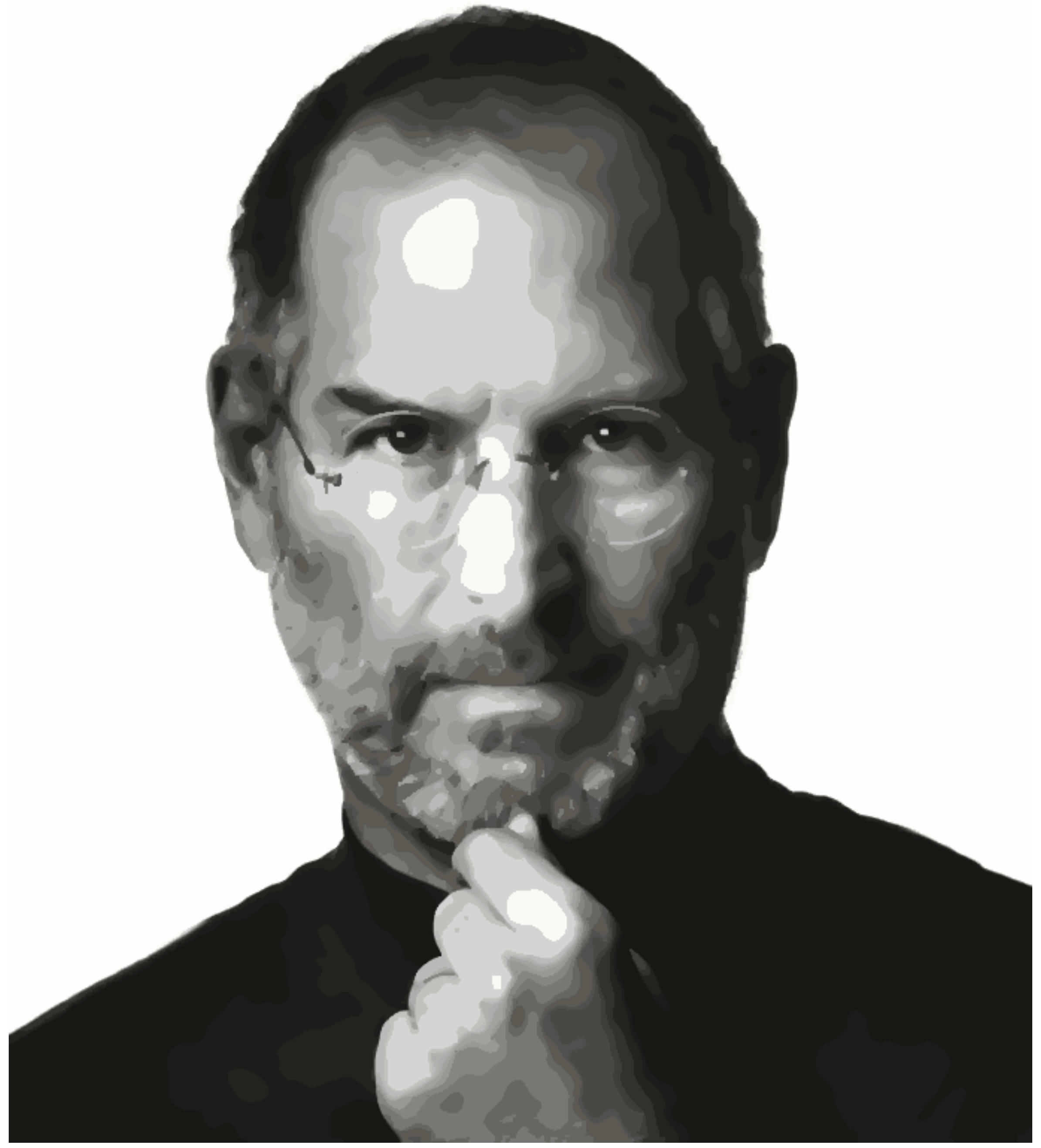

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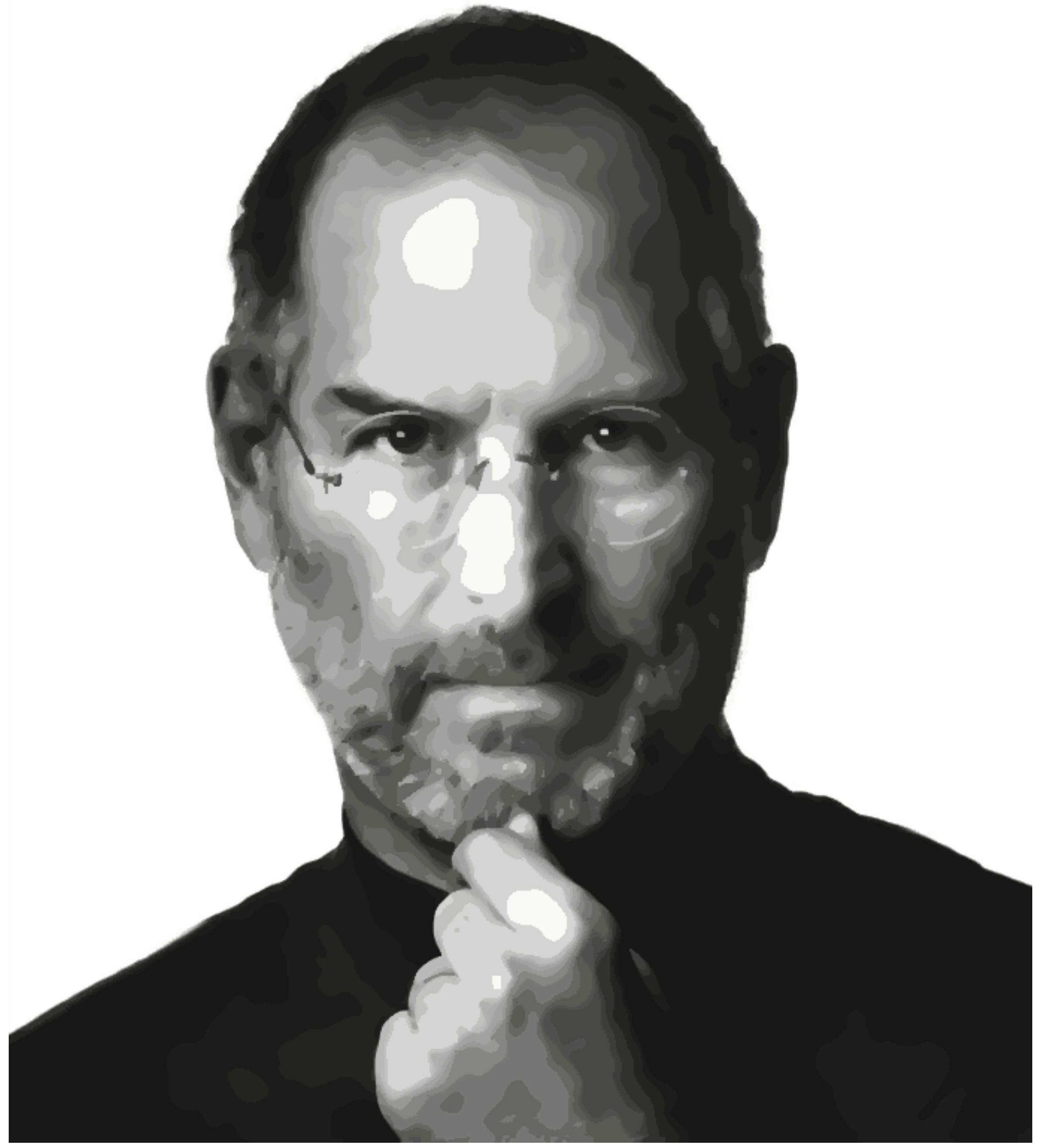
  - Does not recognize the semantics of input images.



Thank You

- Code and GUI will be available at: https://cragl.cs.gmu.edu/
- Financial support
  - NSERC

GEORGE MASON UNIVERSITY CraGL Creativity and Graphics Lab

UNIVERSITY OF TORONTO

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Step 1: Convex-hull based palette extraction

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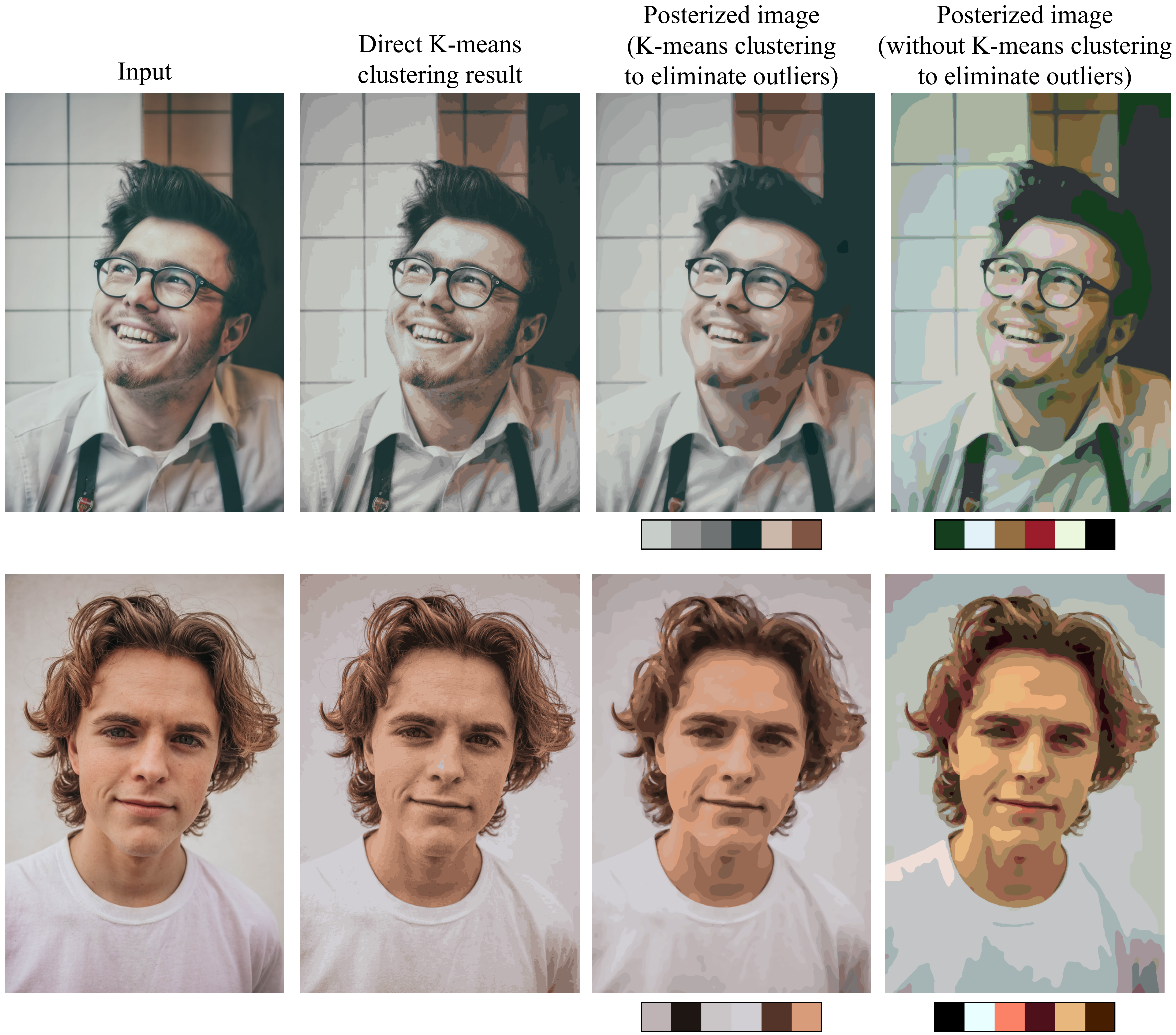
Input
Direct K-means clustering result
Posterized image (K-means clustering to eliminate outliers)
Posterized image (without K-means clustering to eliminate outliers)

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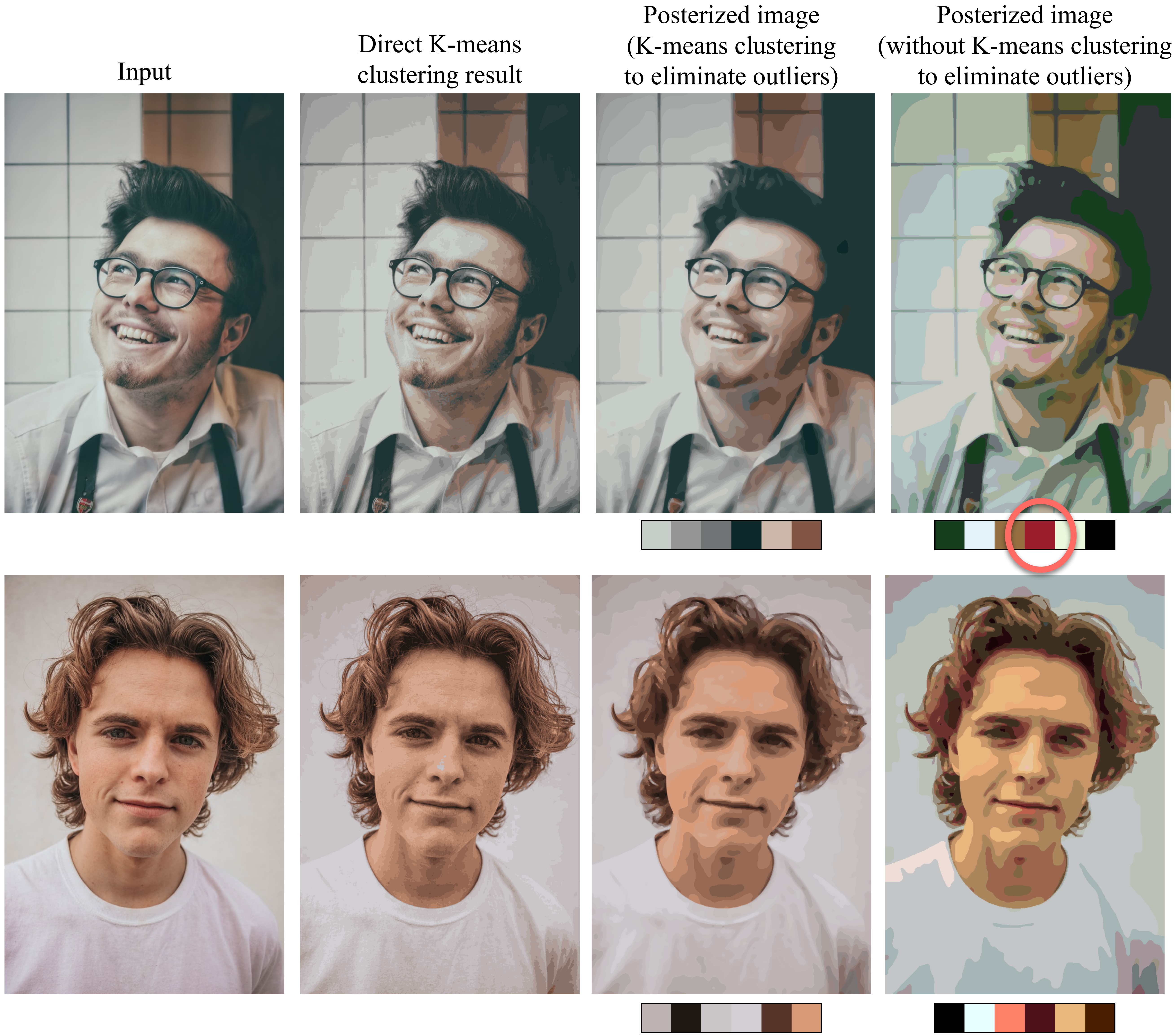

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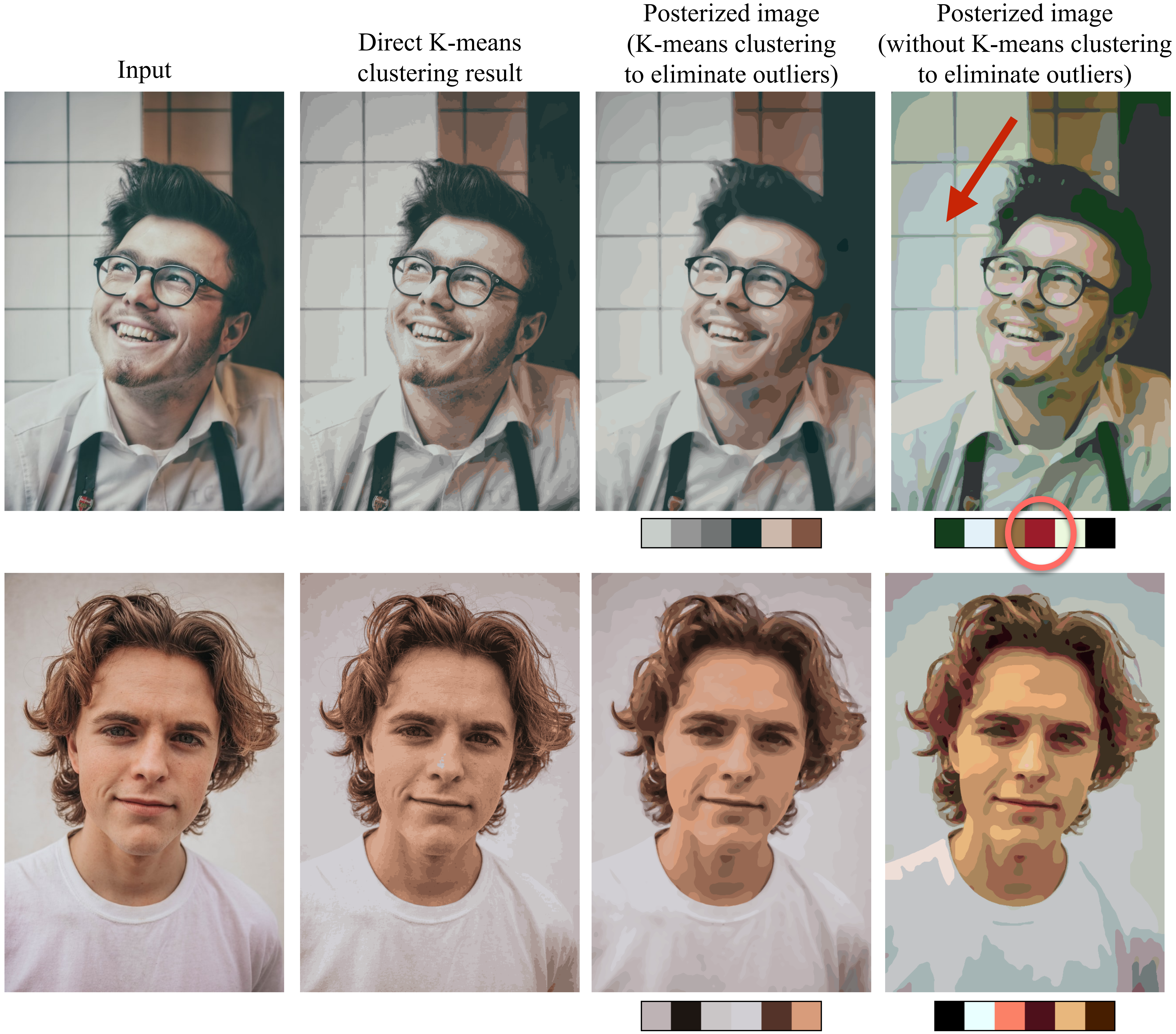
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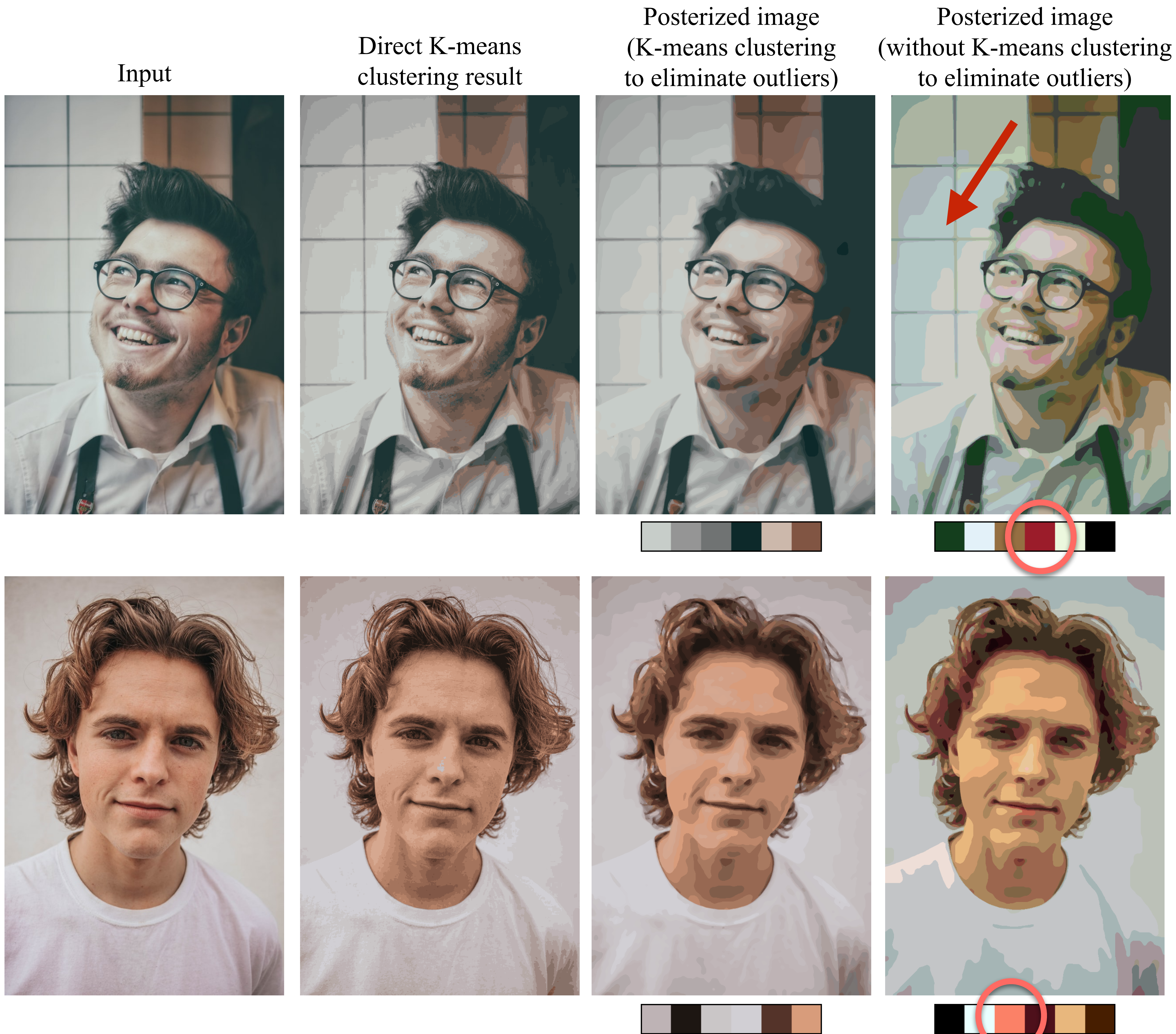

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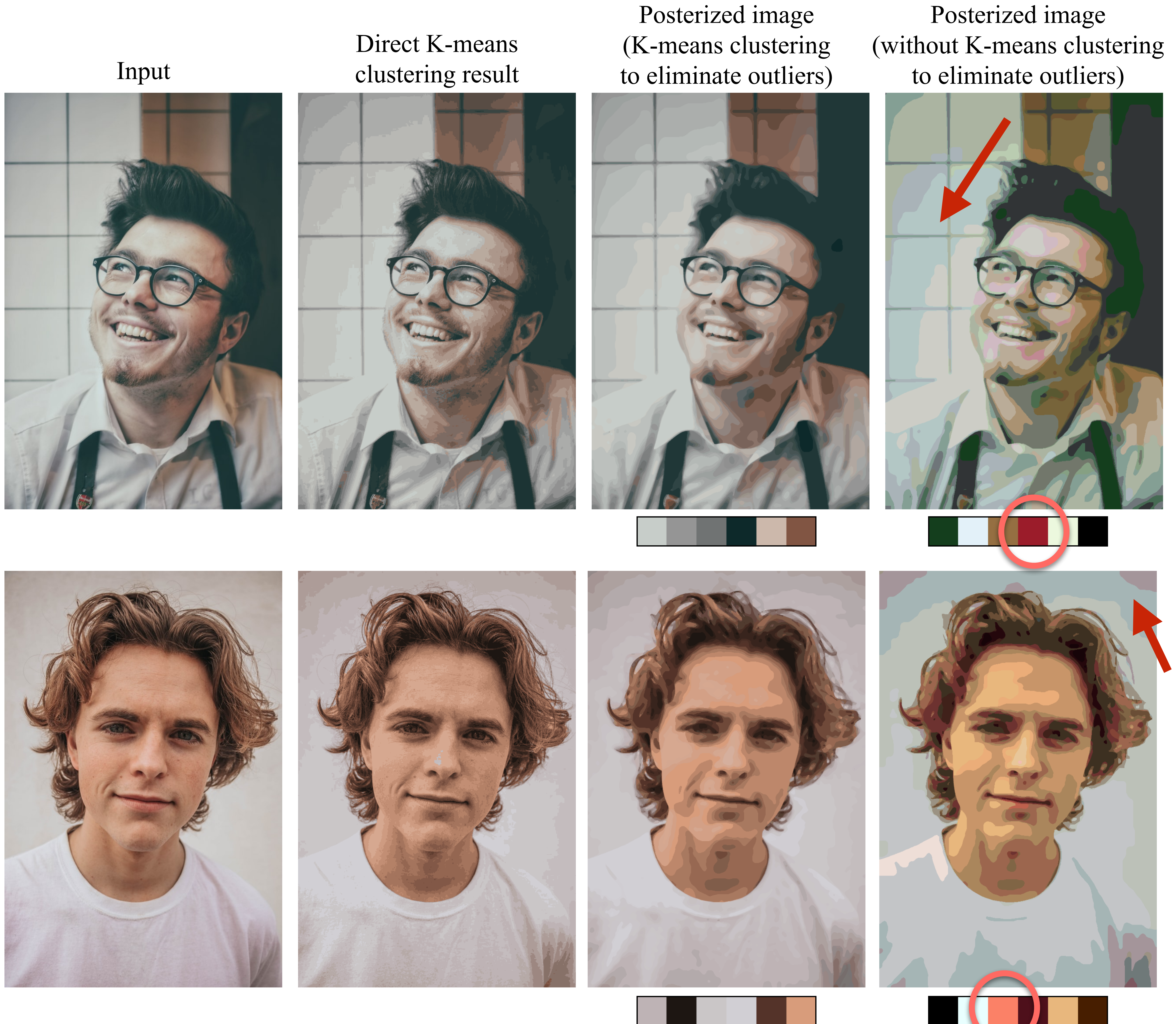
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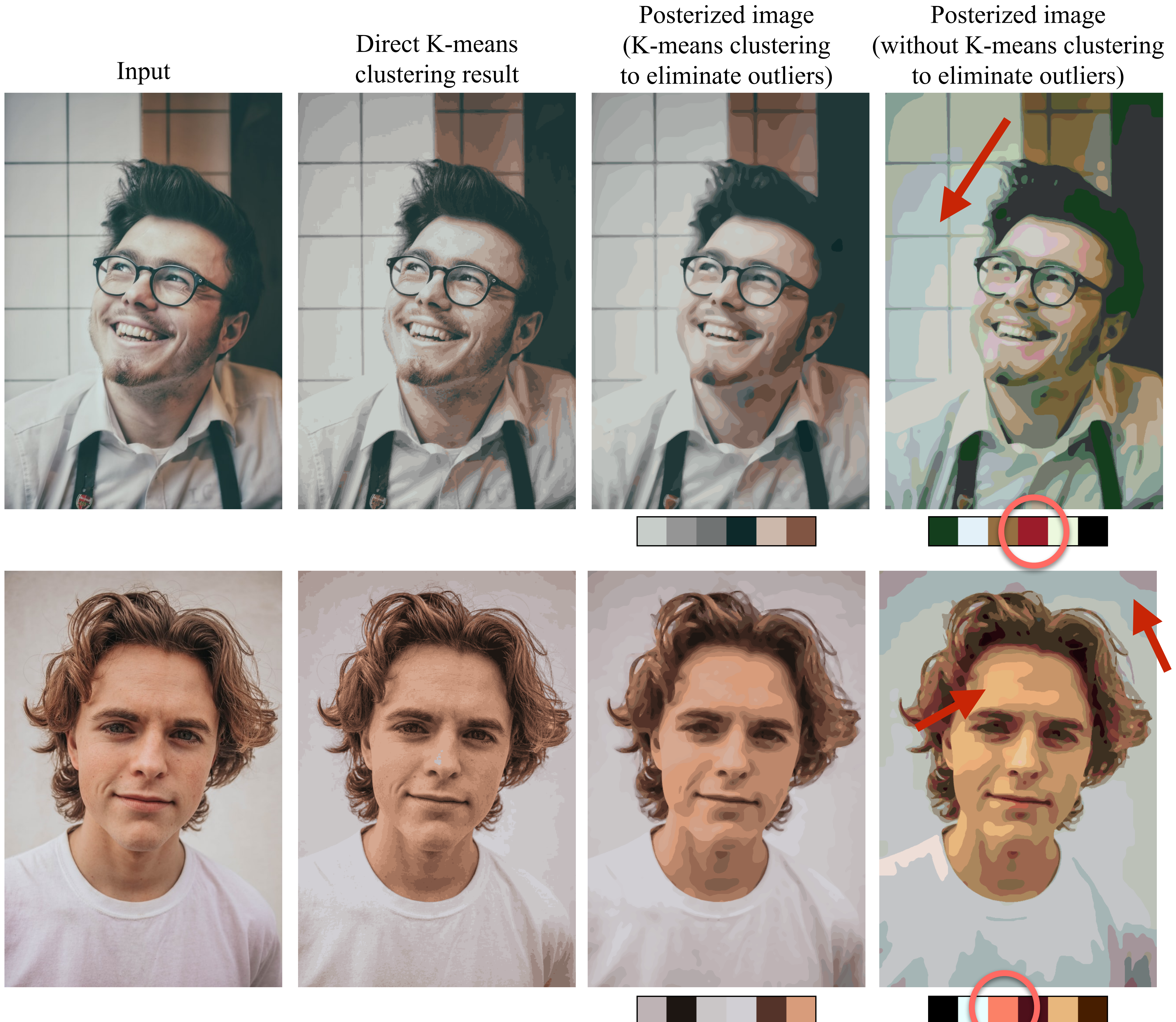
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Step 2: Rough region and color assignment

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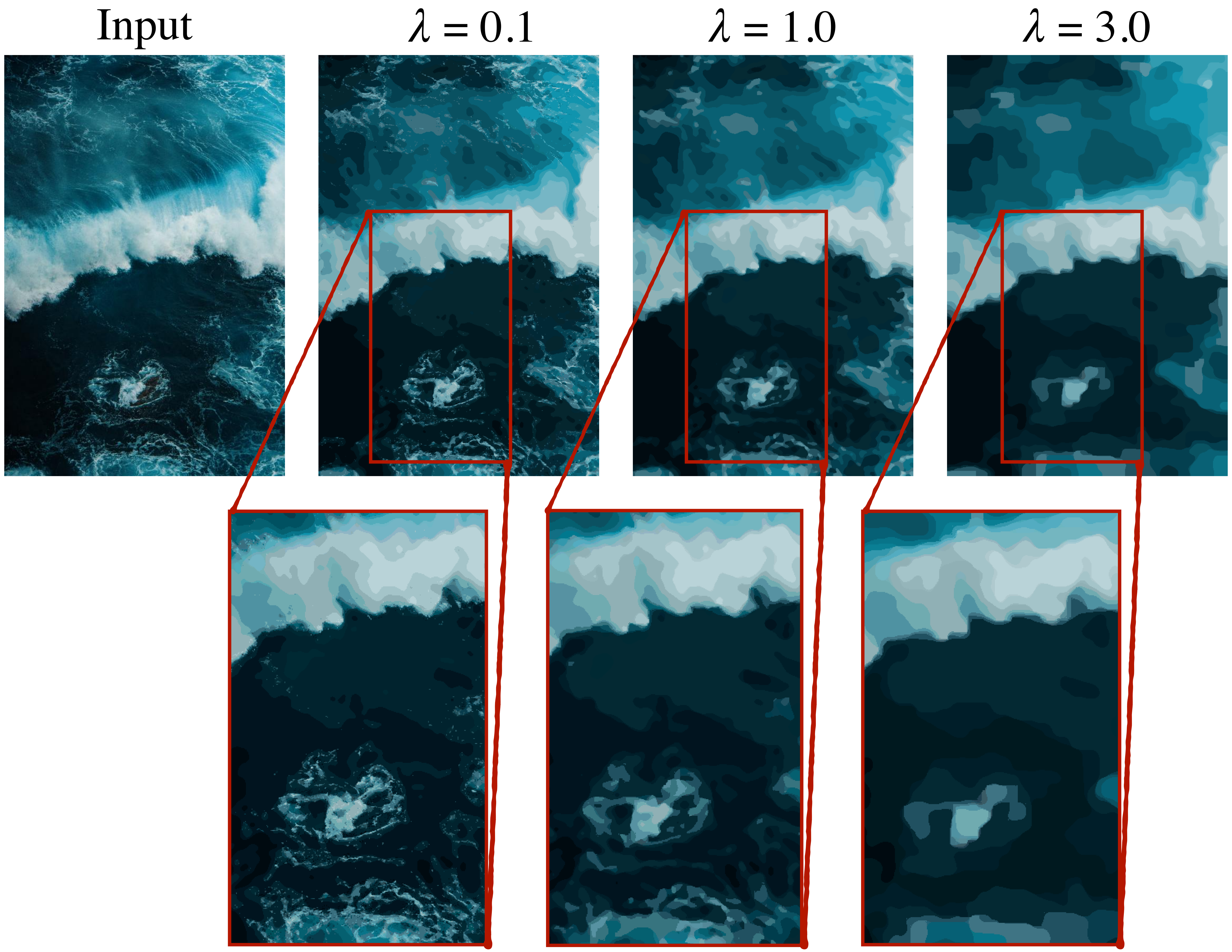

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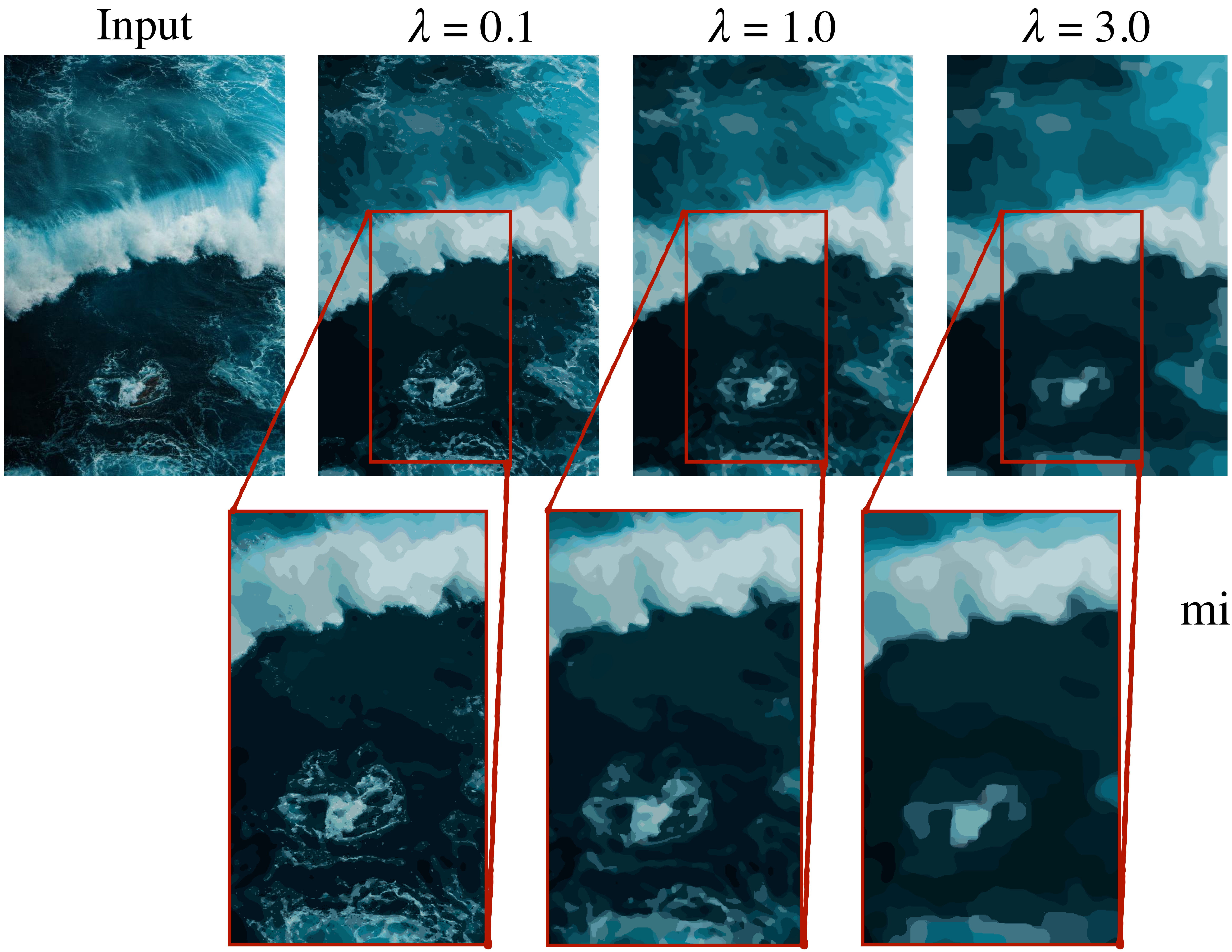

$$\min \sum_{p\in I} ||f_p - I_p||_2 + \lambda \sum_{p,q\in N} ||L_p - L_q||_2$$

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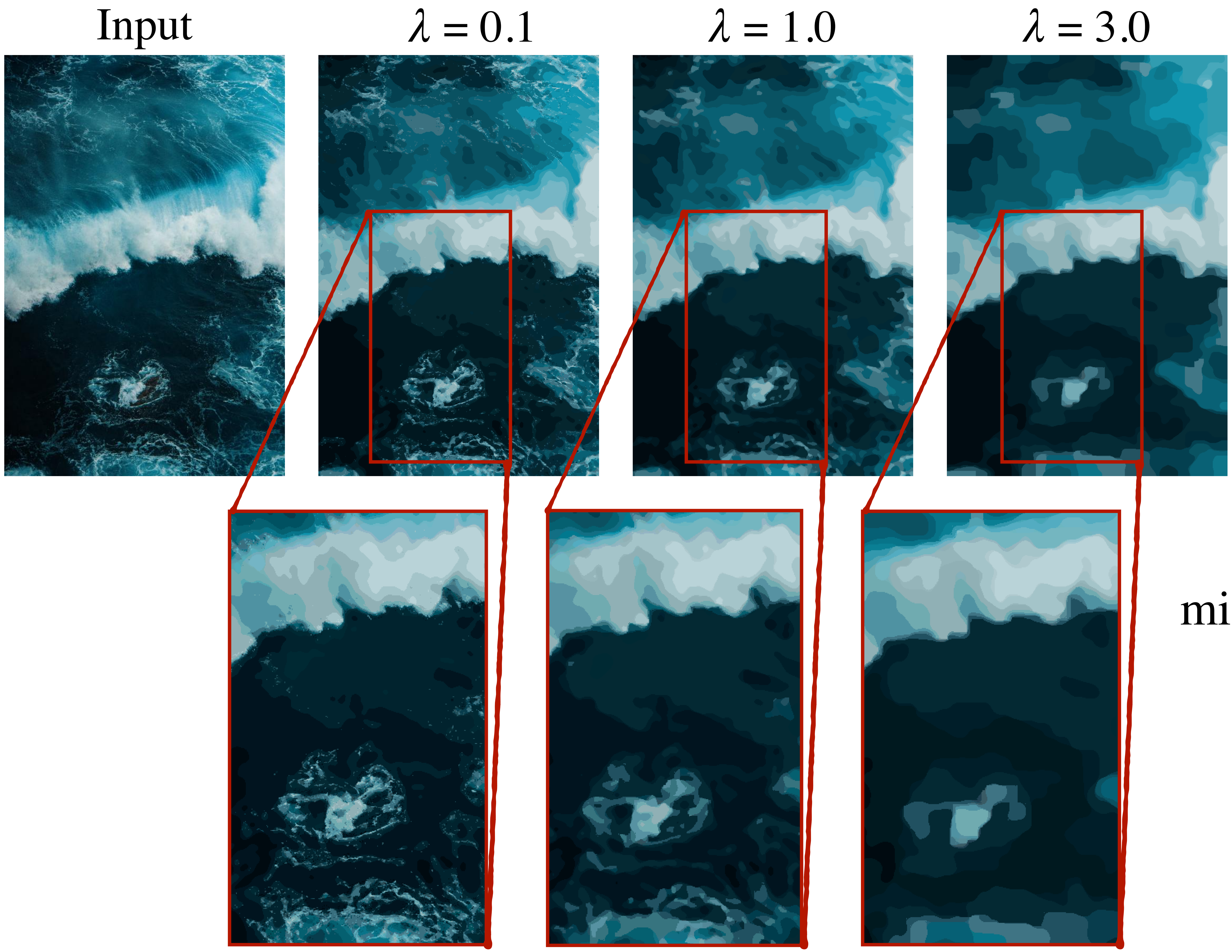

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