Style Transfer for Headshot Portraits
Report - Mid Evaluations

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Progress

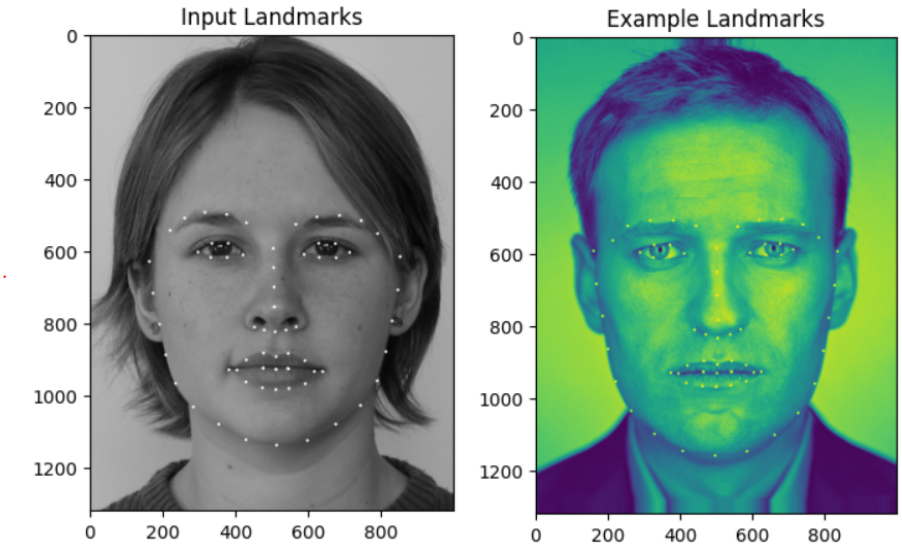
Our goal in the project is to match the appearance of the input subject to the example. Here, we first establish a dense correspondence between the input and the model, that is, each input pixel is put in correspondence with a pixel of the model. Then, we transfer the local statistics of the model onto the input, which is multiscale local transfer.

The below images are the example and input images respectively for which we'll be transferring the example image's style features onto the input example: -

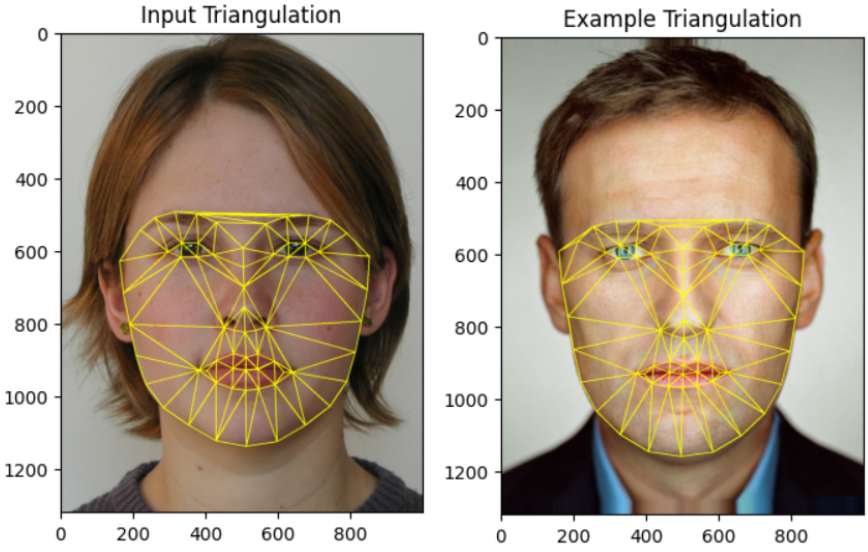

The below image is the input image onto which we'll be transferring the example image's styles: -

Outputs

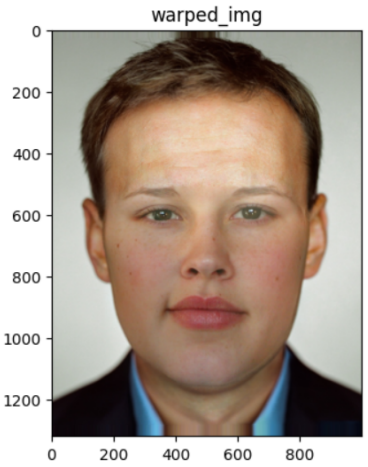
- **Dense Correspondence**
  So, first, we found the input and example landmarks: -



Then, we found the input and output triangulation: -



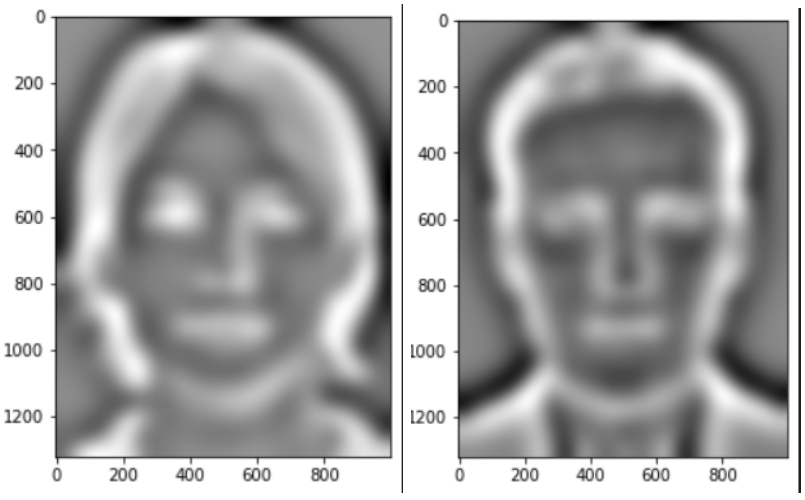
After triangulation, we performed warping on the image, [currently we aren't getting the correct outputs]



- **Multiscale Transfer of Local Contrast**
    - Now, we want the output to represent the same person as the input with the same pose and expression, but with the color and texture distribution and overall lighting matching the example image.
    - We perform this operation at multiple scales to deal with the wide range of appearances that a face exhibits, from the fine-grain skin texture to the larger signal variations induced by the eyes, lips, and nose.
- **Multiscale Decomposition:** Our first step involves the decomposition of input and output images into multiple Laplacian stacks, using a 2D normalized Gaussian kernel, G(**σ**). And then, further on, we find the residual for different levels, *R(I)*, using the following formulae: -

$$L_\ell[I] = \begin{cases} I - I \otimes G(2) & \text{if } \ell = 0 \\ I \otimes G(2^\ell) - I \otimes G(2^{\ell+1}) & \text{if } \ell > 0 \end{cases} \qquad R[I] = I \otimes G(2^n)$$

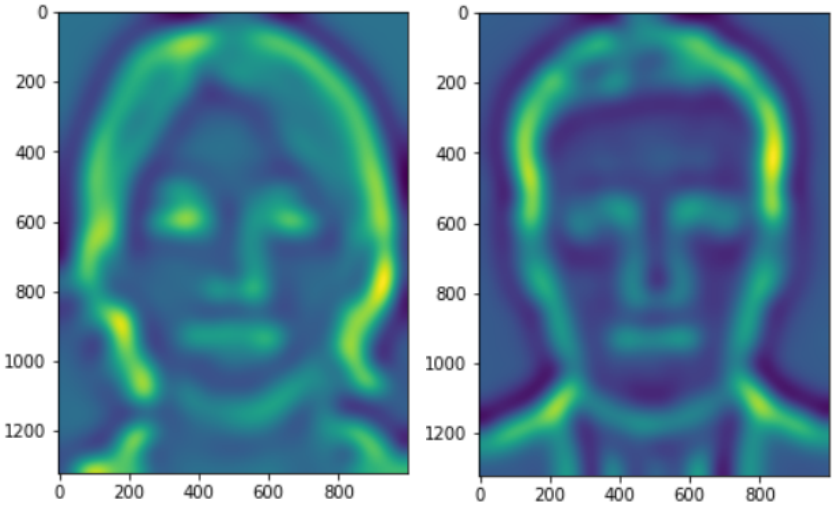
-
- Below images are the input and example residuals: -



- **Local Energy:** Our next step is to find the local energy, *S*, in each subband by the local average of the square of subband coefficients.

$$S_\ell[I] = L_\ell^2[I] \otimes G(2^{\ell+1})$$

- Below are one of the outputs for local energy for input and example images: -



Further Work

Our further work is improving on the outputs of gain maps (local energy) and multiscale decomposition, and work on the robust energy part of the process. Then comes the post-processing parts which involve working on the eye highlights and background extraction from example images to input images.