

BAD THINGS HAPPEN



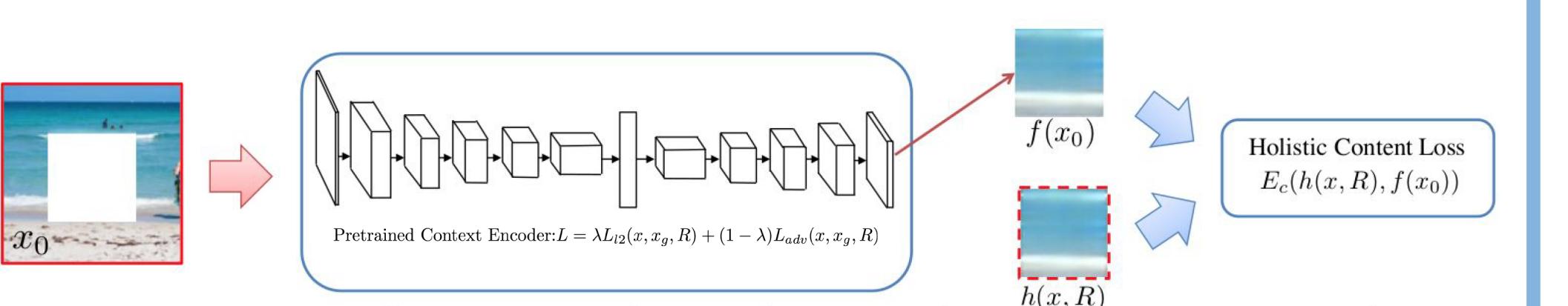
Imaging you would like to edit a photo after breaking up, or restore an old picture from damages, we designed a MULTI-SCALE DEEP LEARNING algorithm to help you! We

- proposed a joint optimization framework that can hallucinate missing image regions by modeling a global content constraint and local texture constraint with convolutional neural networks.
- further introduced a multi-scale neural patch synthesis algorithm for high-resolution image inpainting based on the joint optimization framework.

ALGORITHM

test

THE CONTENT NETWORK

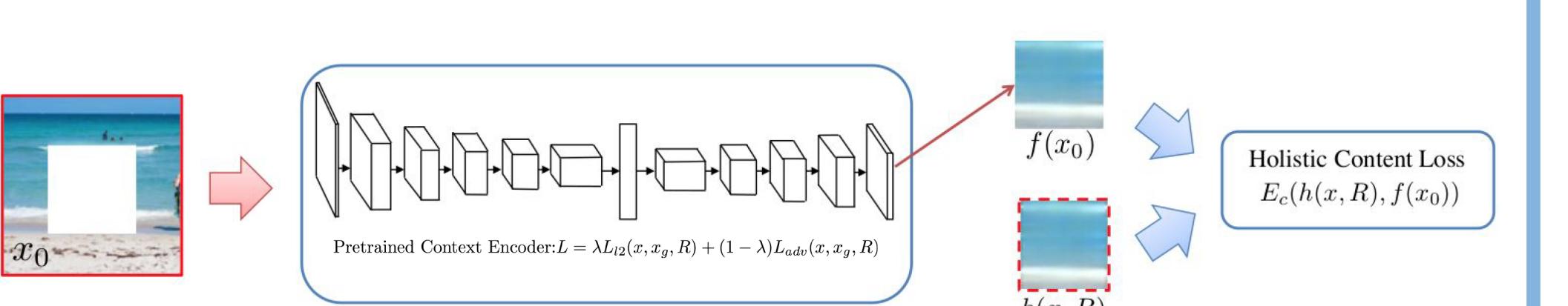


Context Encoder Predicts the Low-Res Content

The content constraint:

$$E_c(h(x, R), h(x_i, R)) = \| h(x, R) - h(x_i, R) \|_2^2 \quad (1)$$

THE TEXTURE NETWORK



Pre-trained VGG Optimizes the High-Res Texture

The texture constraint:

$$E_t(\phi_t(x), R) = \frac{1}{|R^\phi|} \sum_{i \in R^\phi} \| h(\phi_t(x), P_i) - h(\phi_t(x), P_{nn(i)}) \|_2^2 \quad (2)$$

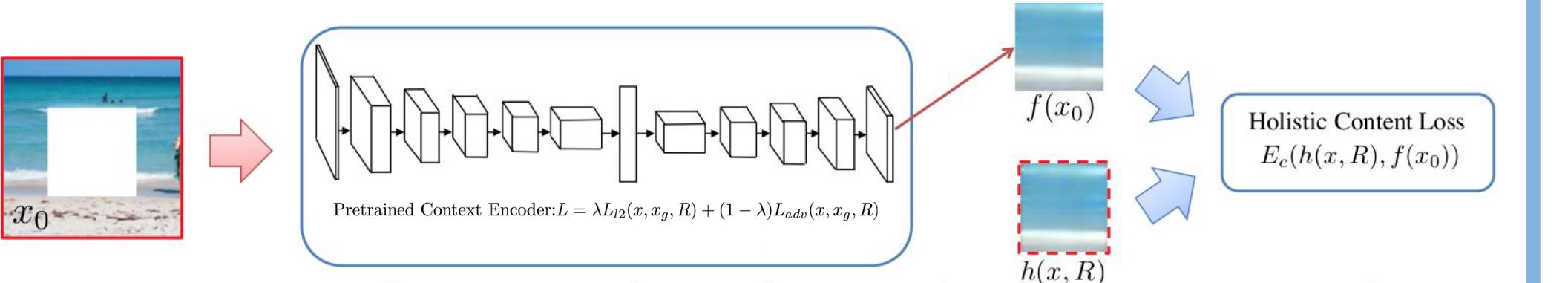
THE JOINT LOSS FUNCTION

At each iteration, we minimize:

$$\tilde{x}_{i+1} = \arg \min_x E_c(h(x, R), h(x_i, R)) + \alpha E_t(\phi_t(x), R^\phi) + \beta \Upsilon(x)$$

MULTI-SCALE OPTIMIZATION

We optimize at three scales: 128, 256 and 512:



Pre-trained VGG: Optimizing the high-res texture

CHANGING THE WEIGHT α

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

DROPPING THE CONTENT CONSTRAINT

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

DROPPING THE ADVERSARIAL LOSS

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

COMPARISON

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

RESULT ON IMAGENET

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

RESULT ON PARIS STREETVIEW

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

RESULT ON ARBITRARY SHAPE

The weight α measures the contribution of the texture constraint relative to the content constraint. It is a trade off between the sharpness of the texture and coherence of the structure:

CODE AND SUPPLEMENTARY MATERIAL

Code is available at www.harryyang.org/inpainting