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Image-based virtual restoration of archeological objects

Rémi Orveau[1], Éric Desjardins[2], Nicolas Courilleau[1], Daniel Meneveaux[1]

[1]Univeriversité de Poitiers, CNRS, XLIM
[2]Université de Reims Champagne Ardenne, CNRS, CRESTIC

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Context

A painting of Elias Garcia Martinez , 1930.

The original painting

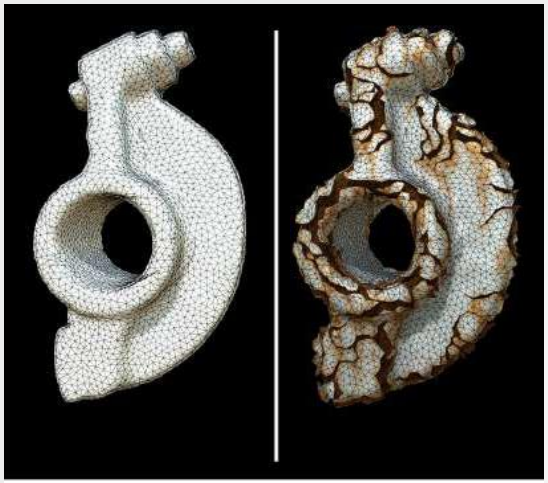
The painting restored by an expert

The painting restored by an amateur

A work on complex paintings

Fresco from the abbey of Saint Savin

State of the art



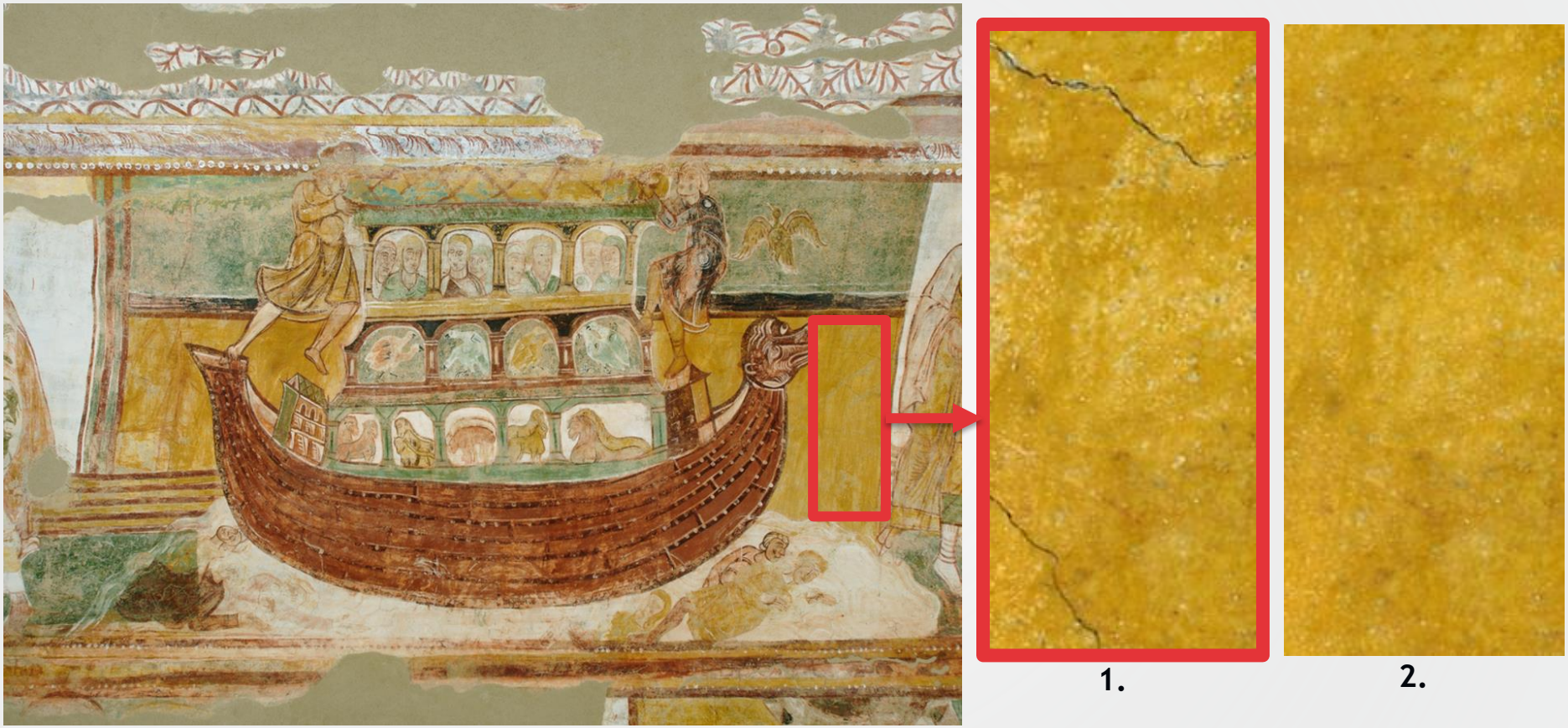
Phisycally-based weathering [1]

Data-driven weathering simulation [2]

Manifold weathering simulation [3, 4]

2D weathering simulation [5, 6, 7]

Restoration of simple textures



1. The original weathered area from the painting
2. Restoration with an artificial intelligence model specialized in inpainting

Restorer guided restoration

Small square of texture extracted

Single point of color extracted

Restoration guided restoration -- Segmentation

Segmentation of a fresco with segment anything 2 [8]

Restoration guided restoration – color restoration

Restoration of the color

Restoration guided restoration – Combination and errors

Texture generation by example with [9]

Restoration guided restoration – Combination and errors

Restoration guided restoration – Second segmentation

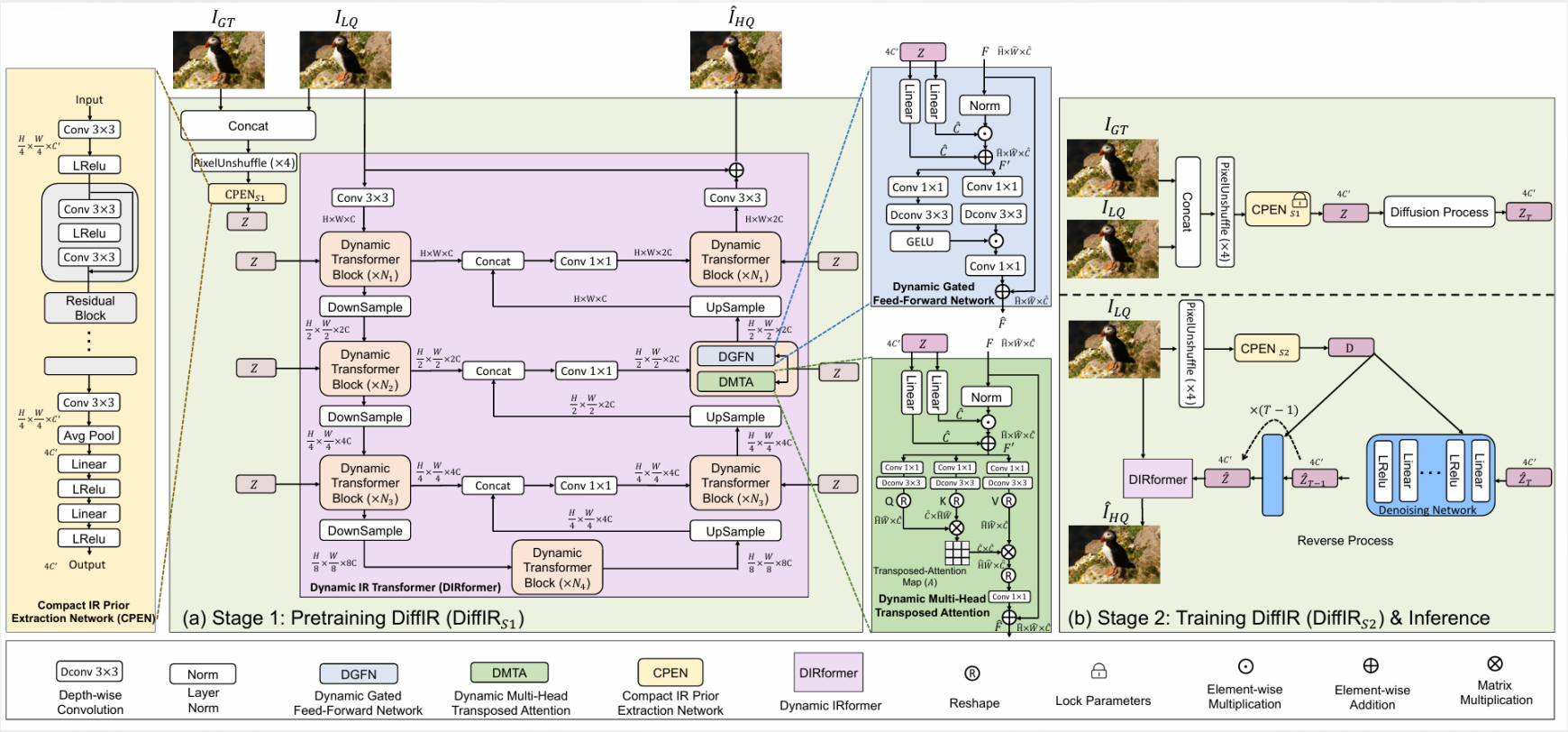
Second segmentation of the fine details

Restoration guided restoration – Overlay

Computation of an overlay between the original and the restored imaged

Highlight of the difference between

Artificial intelligence - Diffusion model for image restoration



DiffIR: Efficient Diffusion Model for Image Restoration [10]

Artificial intelligence – Diffusion model for painting restoration

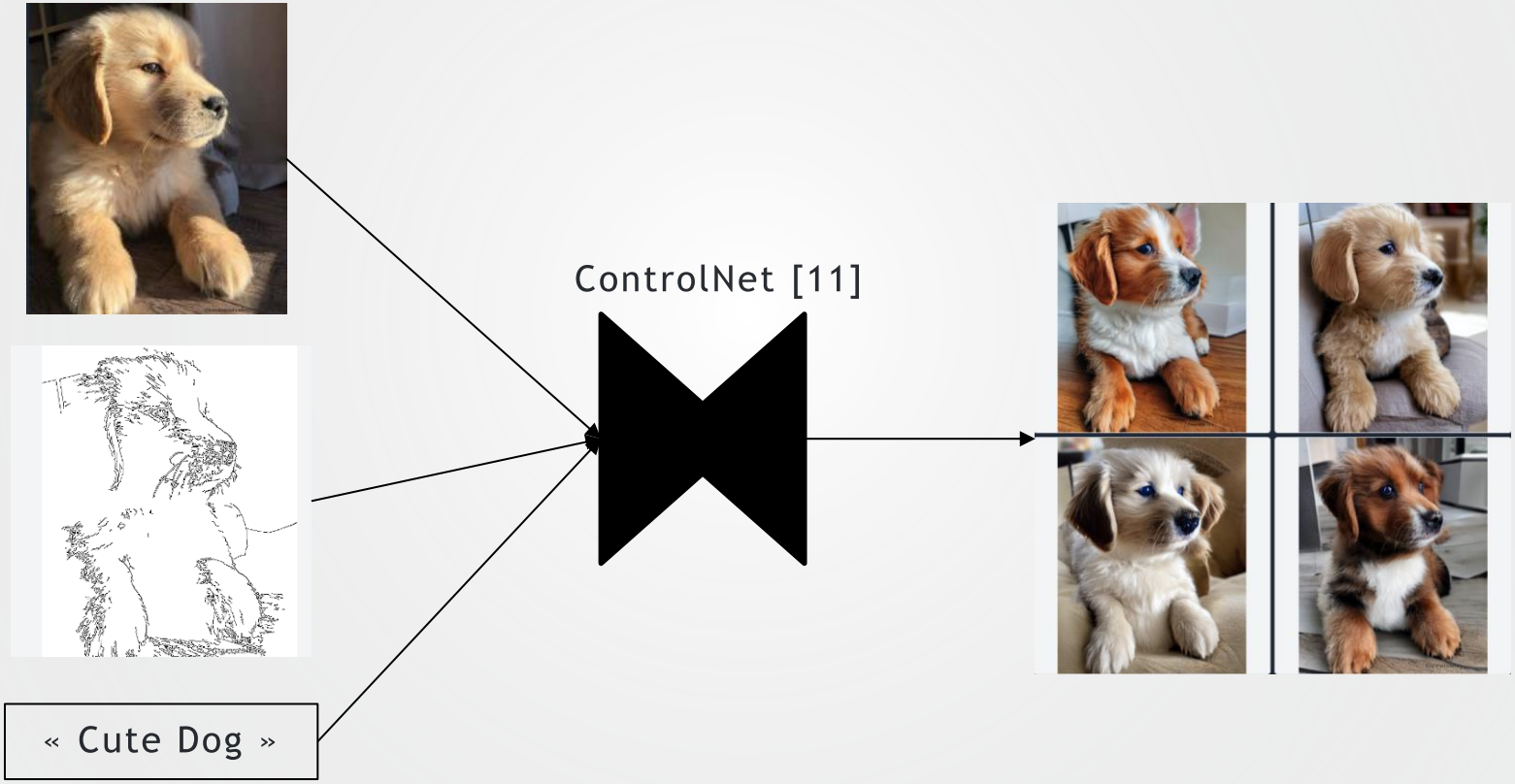
Original

Input

Output

Difference
Input/output

Artificial intelligence - Conditioning



Artificial intelligence – Conditioning painting restoration

Restoration of a fresco of the Abbey of Saint with Stable Diffusion

Conclusion

Synthesis

- A method of inpainting of simple texture
- A pipeline of restoration by texture generation and color propagation
- A reimplementation of a method of weathering with a user input
- An artificial intelligence to restore paintings

Perspective

- A conditioned diffusion model to restore the paintings
- An amelioration of the restorer guided restoration method

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