3D Photo Stylization - Learning to Generate Stylized Novel Views from a Single Image
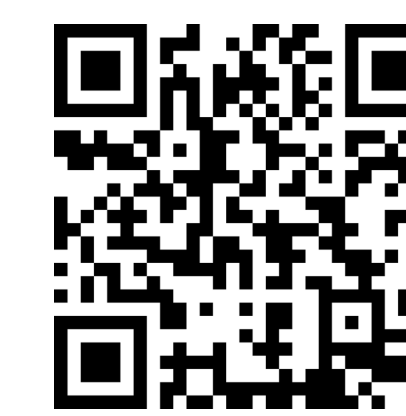
Fangzhou Mu[1], Jian Wang[2 †], Yicheng Wu[2 †], Yin Li[1 †]

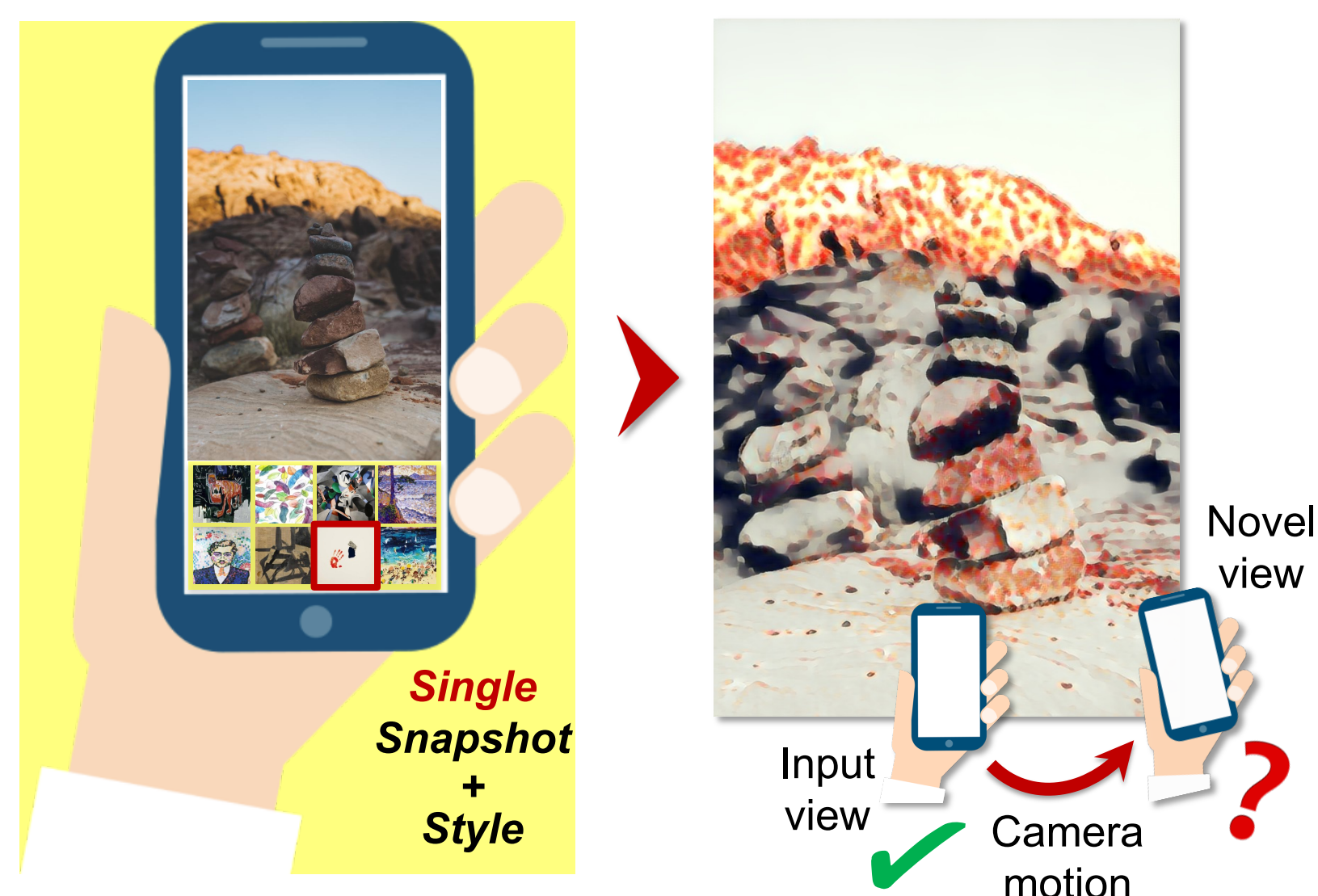[1]University of Wisconsin-Madison, [2]Snap Research (†co-corresponding authors)

Video Demo

Motivation

Artistic Style Transfer as digital lens

Single Snapshot + Style

Input view ✓ Camera motion

Novel view

Can we generate *stylized novel views* from *a single snapshot* for *interactive 3D browsing*?

Method Outline

Point cloud based scene representation

Content

DPT [1]

Depth

3DPhoto [2]

RGB point cloud

Encode

Style

Feature point cloud

Stylize

Stylized feature point cloud

Render

View 1

View N

Point cloud encoder

dim = 3
RGB point cloud

MRConv ×1
dim = 64

MRConv ×2
dim = 128

MRConv ×2
dim = 256
Feature point cloud

Stylizer
AdaAttN [3]
Style features

Neural renderer

Up
dim = 256
Feature point cloud

Project
1×1 Conv
1×1 Conv
2D feature maps
Output

Key Features

Novel Problem Setting

3D effect in artistic style transfer
Practical snapshot photography

Innovative Model Design

Joint model of view synthesis / stylization
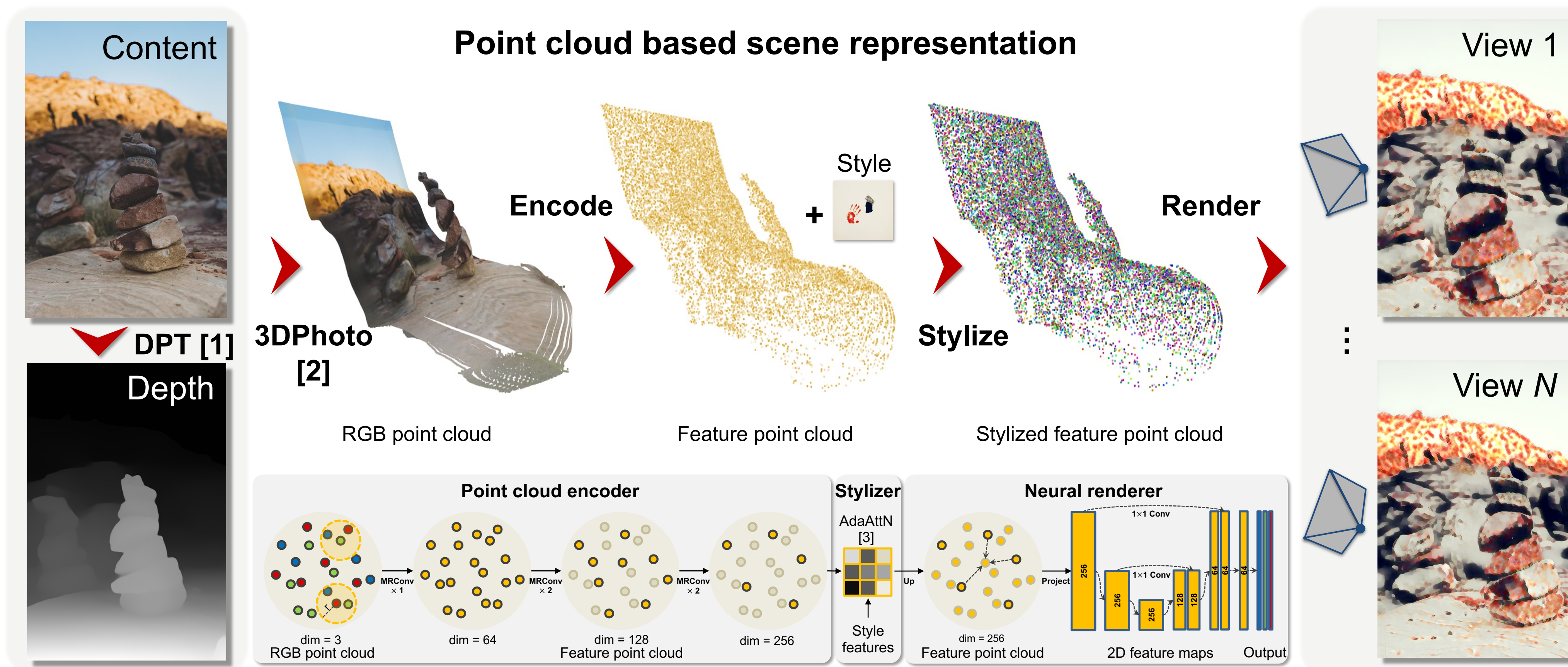Efficient point cloud processing

Strong Synthesis Quality

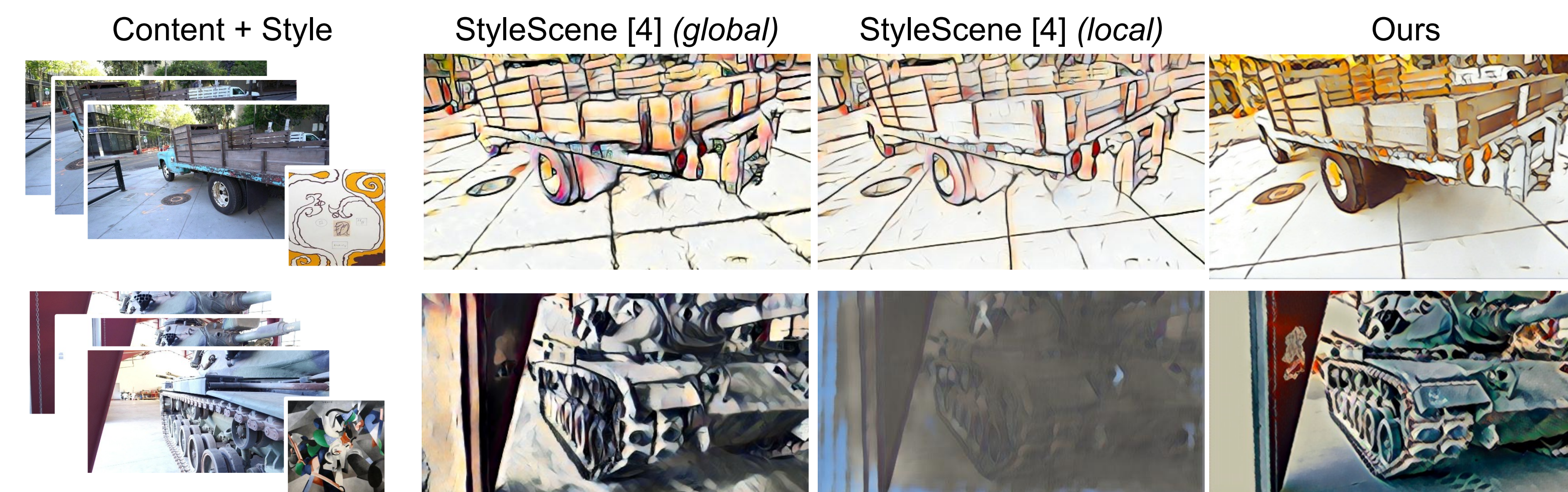Consistent stylization across views
Strong user preference

Related Work

- **Artistic Style Transfer**
  "Paint" an image in a reference style

- **One-shot 3D photography**
  Novel View synthesis from a snapshot

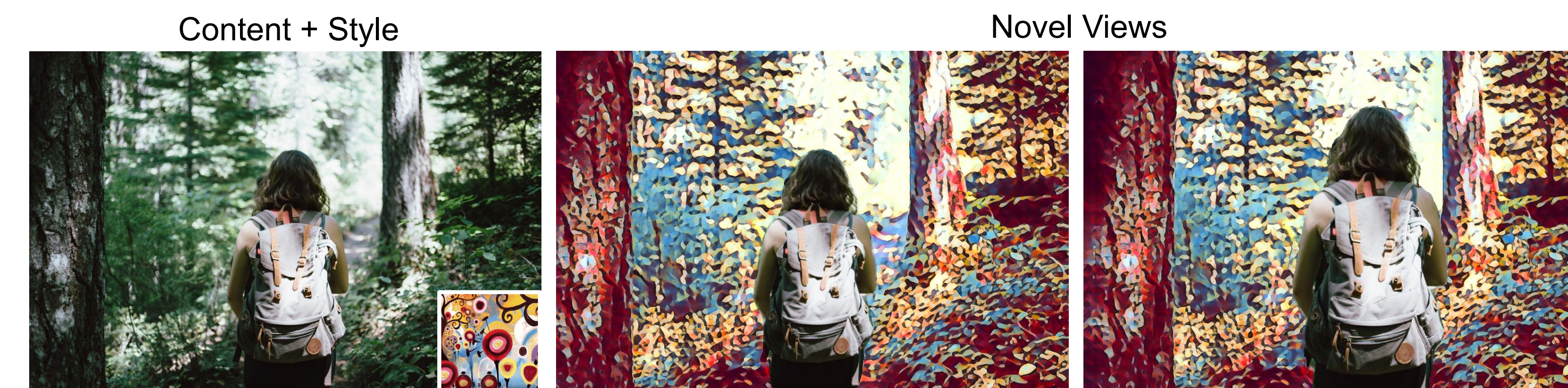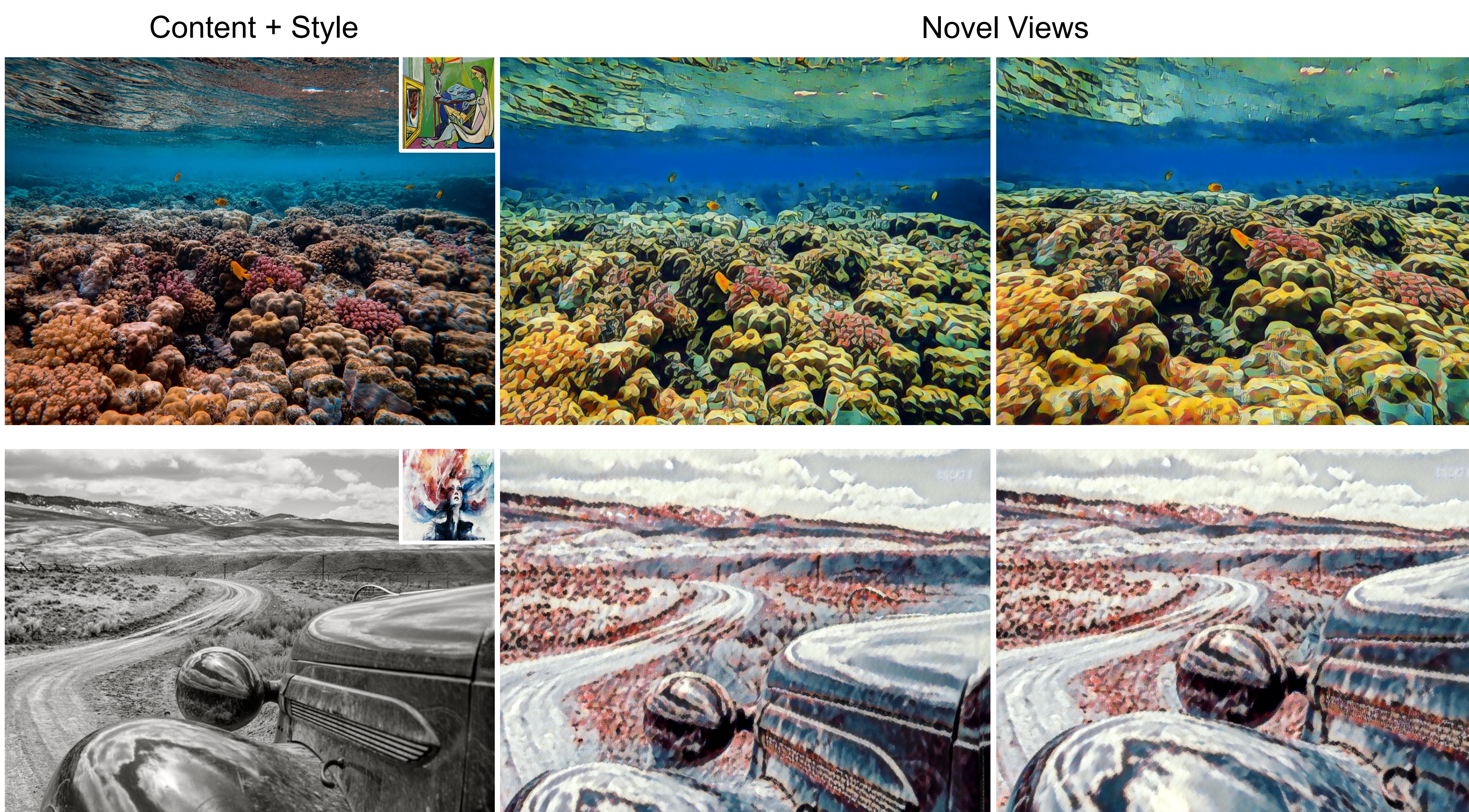## Qualitative Results

Content + Style

Novel Views

User Study

Stylization

Consistency

Overall

AdaIN ReReVST
LST MCC
AdaAttN (img) AdaAttN (vid) Ours

Applications

Extension to Multi-view Input

Content + Style

StyleScene [4] *(global)*

StyleScene [4] *(local)*

Ours

Layered Stylization for AR

Content + Style

Novel Views
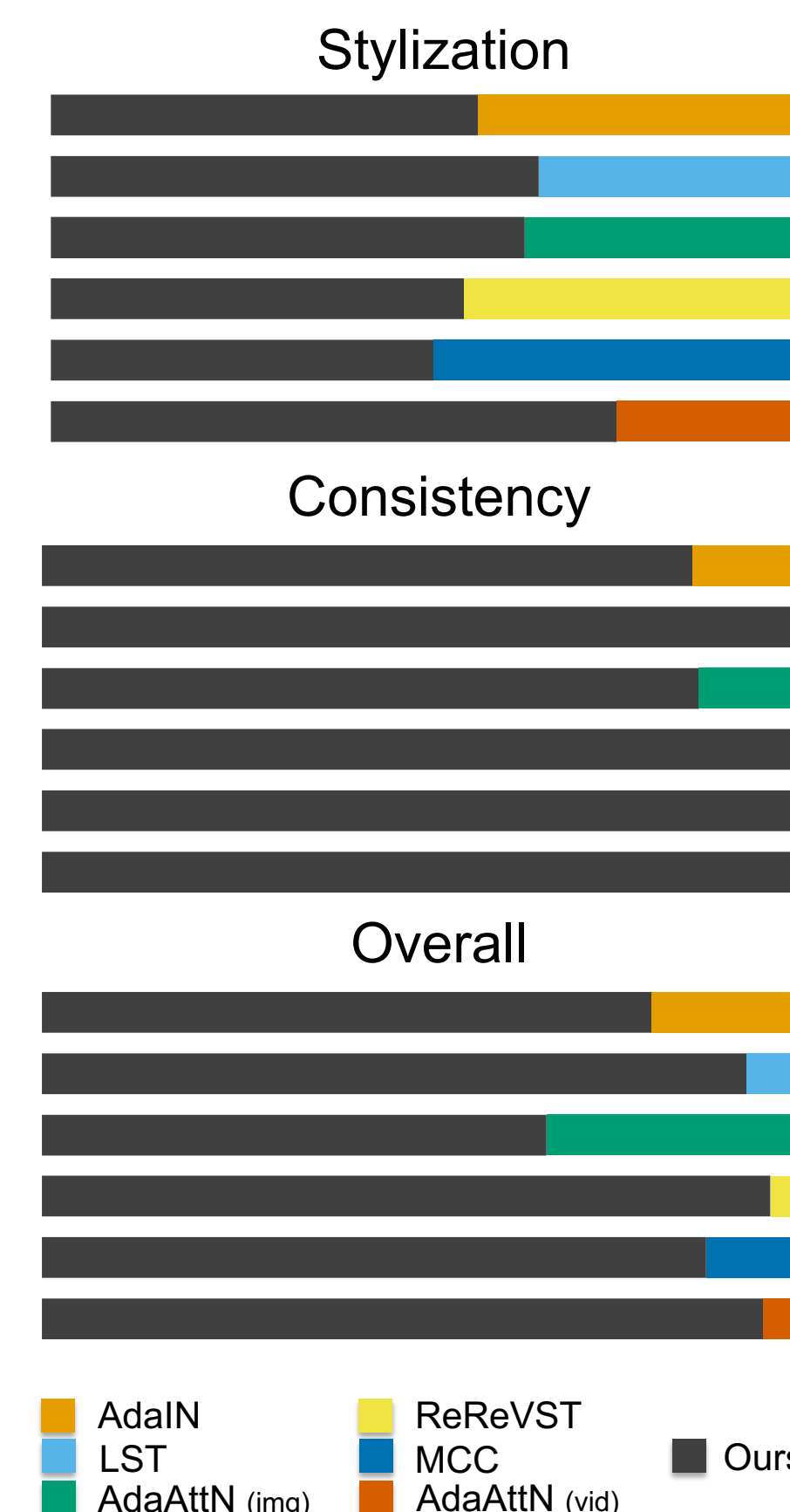
3D Browsing of Stylized Historical Photos

Content + Style

Novel Views

Reference

[1] Ranftl et al., "Vision Transformers for Dense Prediction." *ICCV* 21

[2] Shih et al., "3D Photography using Context-aware Layered Depth Inpainting." *CVPR* 20

[3] Liu et al., "AdaAttN: Revisit Attention Mechanism in Arbitrary Neural Style Transfer." *CVPR* 21

[4] Huang et al., "Learning to Stylize Novel Views." *ICCV* 21

CVPR JUNE 19-24 2022 NEW ORLEANS · LOUISIANA