

CS272 Final Project

Fall 2023

November 29, 2023

Acknowledgements

1. Proposal and collaboration registration deadline: **2023/12/6 23:59:59** (week 10). **No late days.**
2. If you choose to propose your personal project,
 - please submit your proposal *and* slides in [Gradescope](#) with [PDF](#) format
 - you are required to give a brief presentation for proposal in about week 11.
3. **Plagiarism or cheat is strictly prohibited.**

The final Project is an opportunity for you to apply what you have learned in class to a problem of your interest in computer vision. Here we offer you two options to build your final project.

You **must** submit your chosen topic and your team members to this online document <https://docs.qq.com/sheet/DQ2JkTkR5V1dYTWFo?tab=BB08J2> before registration deadline.

1 Propose your personal project

You could select a topic in computer vision that you are working on and propose it as your personal project. Personal projects should **only include 1-2 students**. The proposal should be a **1-page PDF** and **slides (about 3min)** that answer the following questions:

- **Project title:** What is the name of your project?
- **Group members:** (if you have a parallel collaborator) What are the names and IDs of the students involved?
- **Problem statement:** What is the problem you are trying to solve? Why is it interesting? What reading will you examine to provide context and background?
- **Approach:** What method or algorithm are you proposing? If there are existing implementations, will you use them, and how? How do you plan to improve or modify such implementations? You don't have to have an exact answer at this point, but you should have a general sense of how you will approach the problem you are working on.
- **Data:** What dataset do you plan to use?
- **Evaluation:** How do you plan to evaluate whether your project is successful? What metric will you use? Is there some simple baseline that you plan to compare your model against?

Please submit your proposal and slides as a PDF on Gradescope. If you have a parallel collaborator, only one person on your team should submit. Please have this person add the rest of the team members to the group submission on Gradescope. Later, you will give a brief presentation for your proposal in class.

2 Suggested Topic: Video Studio

If you have no ideas about your personal project, we have provided several suggestions for you to choose from. You are to leverage arsenals you learned through this course to build a video studio that supports various video editing functions. Each team can be **up to 5 students**.

2.1 Description

Computer vision technologies have revolutionized the video production industry, unlocking a realm of possibilities in video production. You can find the presence of computer vision technologies on everyday video platforms like Bilibili¹ and Douyin².

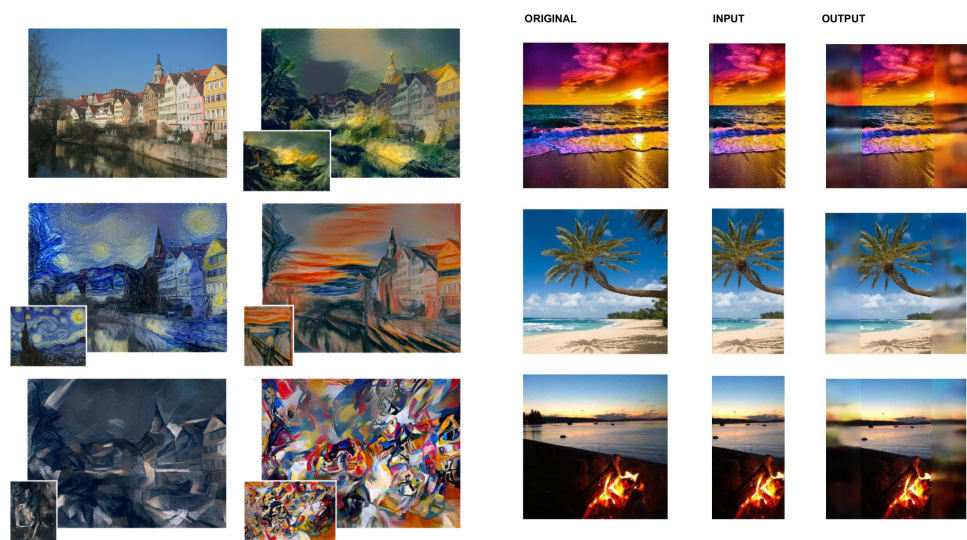
In this project, you are to build a video studio platform that supports at least one function provided by video editing apps on the market, to name a few:

- **Video style transfer** re-renders a video in the stylistic manner of a reference artwork, such as a famous painting, while preserving the original content's motion and structure
- **Super-resolution** is a technique using machine learning algorithms to enhance the resolution of video content, such as from 480p to 1080p
- **Generate sounds from silent videos** uses machine learning models to analyze visual cues in the video, then to synthesize realistic sounds for silent videos
- **Colorize old black and white videos** hallucinates the colored version of a black and white video
- **DeepFake** superimpose one person's face onto another person's body in a video
- **Outpainting** enlarges the view of the video by filling missing regions at the edges of the video

Beyond the functions mentioned above, you are encouraged to develop novel functionalities to enrich your video studio. **You are not allowed to directly use any publicly available code.** In the submitted report, you have to make a clear statement about the modification or extension of your project to the baseline method, including the limitations of the baseline method, the improvement of your method over the baseline, and the novelties of your method (if any).

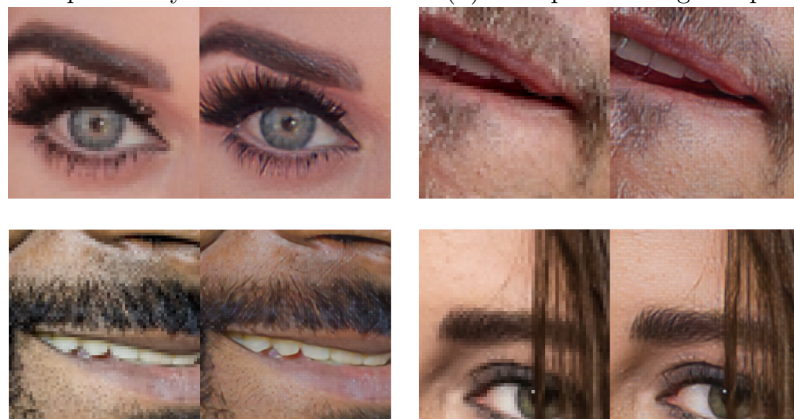
¹<https://www.bilibili.com/>

²<https://www.douyin.com/>



(a) examples of style transfer

(b) examples of image outpainting



(c) examples of super-resolution



Colorado National Park, 1941 Textile Mill, June 1937 Berry Field, June 1909 Hamilton, 1936

(d) examples of colorization of black and white images

References:

- [1] (ICCV 2023) Two Birds, One Stone: A Unified Framework for Joint Learning of Image and Video Style Transfers
- [2] (CVPR 2020) Video Super-resolution with Temporal Group Attention
- [3] (NeurIPS 2020) Implicit neural representations with periodic activation functions
- [4] (NeurIPS 2016) Soundnet: Learning sound representations from unlabeled video
- [5] (CVPR 2018) Visual to Sound: Generating Natural Sound for Videos in the Wild
- [6] (CVPR 2019) Fully Automatic Video Colorization with Self-Regularization and Diversity
- [7] (CVPR 2019) Deep Exemplar-based Video Colorization
- [8] (CVPR 2023) ProPainter: Improving Propagation and Transformer for Video Inpainting