Define your product mission

Restore low resolution images to high resolution ones.

Define your users

People who want to recover images or improve their images’ resolution.

Comprehensive literature review (build on project 1)

Description of this problem

For image SR, the LR image is obtained by applying a specific degradation process to its HR counterpart. Variations in this process can introduce different types of noise, blurring, or other artifacts, ultimately resulting in the loss of high-frequency information. The primary objective of image SR methods is to recover as much high-frequency information as possible. There are many kinds of problems for image SR that depend on the degradation process or model. For most testing, the most commonly used degradation process is bicubic down-sampling, which involves different downscaling factors. This classical degradation model makes an easy comparison for different image SR methods directly. In practice, a model performing pretty well under Bicubic degradation can also obtain consistent performance in other degradations or even other related applications. Therefore, we are going to use this degradation model to test our product’s validation.

Methods to solve this problem:

Traditional methods to solve this problem are mainly based on interpolation, like Bilinear and Bicubic, and example learning method such as sparse coding based methods. But SR problem is actually an underdetermined problem, which means the number of equations is less than the number of unknowns. These methods are not good at recovering high-frequency, detailed information of images. In recent times, methods based on neural networks (e.g. CNN and Transformer) have exhibited impressive performance for image restoration, especially image superresolution (SR). SRCNN first utilizes a three-layer convolutional neural network (CNN), achieving noteworthy enhancements over conventional SR methods (e.g., sparse coding based methods). However, the SR method based on CNN processes all channel features equally. Low resolution inputs contain a large amount of low-frequency information, which, along with high-frequency information, is treated equally and hinders the representation ability of CNN. So, numerous spatial and channel attention mechanisms are proposed to improve the reconstruction quality by assigning weight to different parts(features from different layers) of features. Apart from the development of large CNN models with high performance, Transformer proposed in the natural language processing (NLP) field is introduced to alternate CNN. The core component of the Transformer is the self-attention (SA) mechanism, which can directly model long-range dependencies for an accurate restoration. One advantage of this model is that the Transformer model has high parallelism and can simultaneously process multiple parts of input data without the need for sequential processing. This leads to significant acceleration in training and inference compared to sequence models such as recurrent neural networks (RNNs).

The meaning of such research:

Define User Stories

出发点：怀旧的人想把旧照片变成高清的

People have

调研发现：在图像传输过程中，为了减少传输成本/云空间存储成本，将图片压缩后进行传输。用户接收图片/从云端下载图片后，需要将照片复原

Define MVP and MVP user stories

Technologies to evaluate and reasons for choosing them

Deep learning:

Attention mechanism:

Transformer:

Setup of development environment

Pytorch

Next Sprint goals

Research to see if any other state-of-art method can help improve our product

Build our own neural networks

Our research is basicly about single image super resolution, what about a multiple one?

Hello everyone. We are team 12 High-Resolution Images. I am Aowei Zhao and here is my teammate Shuyuan Dong.

I believe that some of you have encountered these problems. You have several favorite old photos. Even though you take great care of them, they inevitably become blurry. Or you take an amazing photo with your iPhone and want to use it as your wallpaper on your laptop. Unfortunately, it is distorted after magnifying and not as beautiful as before. How to solve this kind of problem? That’s what Single Image Super-Resolution, our team project, wants to realize.

What is Single image super-resolution (SISR)? It’s a field of research that focuses on the recovery of high-resolution (HR) images from their low-resolution (LR) counterparts that have undergone a certain degradation process. This technology is mainly used for cloud storage and transmission to reduce costs. Therefore, most related products are ToB. We found that there are very limited ToC products and most of them do not work too well. Nobody wants to pay for that, right?

So, we’d like to build a simple, free product for People who want to recover images or improve their images’ resolution. With our product, they can input low-resolution images and get high-resolution ones. Our MVP can be an API. Users upload images, wait and then they can download results.