Generating artistic paintings from photographs

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“ The object of art is not to reproduce reality, but to create a reality of the same intensity. ”

Problem Statement

- It has been found that redrawing an image in a particular form of art requires a well-trained artist and much time, and reasonably so.
- However, AI now being capable of creativity beyond human imagination, our project aims to **transfer the painting style and features of an artist** to an image. This could help art enthusiasts visualize how some of their photographs would look if painted by their favourite artists by emulating renowned painters to recreate their images.

Thus, our problem statement is to *turn photo-realistic images into synthetic artworks without human intervention.*

Literature Review - Paper 1

Title: DualGAN: Unsupervised Dual Learning for Image-to-Image Translation

Year: 2017

Model: DualGAN

Summary: Inspired by dual learning from natural language translation, they aimed to provide a general-purpose solution for image-to-image conversion through a novel unsupervised dual learning framework.

Compared to GAN, in almost all cases, DualGAN produced results that were less blurry, and better captured features (e.g., texture, color, and/or style) of the target domain

Literature Review - Paper 2

Title: Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks

Year: 2020

Model: CycleGAN

Summary: An approach for learning to translate an image from a source domain X to a target domain Y in the absence of paired examples while preserving the color composition between the two, using cycleGANS. They used it for object transfiguration, season transfer, photo generation from paintings & more.

Literature Review - Paper 3

Title: APDrawingGAN: Generating Artistic Portrait Drawings from Face Photos with Hierarchical GANs

Year: 2019

Model: Hierarchical GANs

Summary: This work makes use of a hierarchical GAN by combining both a global network (for images as a whole) and local networks (for individual facial regions) which allows dedicated drawing strategies to be learned for different facial features.

A novel loss function is developed to measure similarity between generated and artists' drawings based on distance transforms, leading to improved strokes in portrait drawing.

Literature Review - Paper 4

Title: Artgan: Artwork Synthesis with Conditional Category GANS

Year: 2017

Model: Conditional GANS

Summary: This paper solves the problem of synthetically generating complex images such as artwork that have abstract characteristics

The key innovation of this work is to allow backpropagation of the loss function w.r.t. the labels to the generator from the discriminator. With the feedback from the label information, the generator is able to learn faster and achieve better generated image quality.

Literature Review - Paper 5

Title: StarGAN: Unified Generative Adversarial Networks for Multi-domain Image-to-Image Translation

Year: 2018

Model: StarGAN

Summary: This paper makes use of StarGAN, which can perform image-to-image transformations for multiple domains using only a single model.

This allows for training of multiple datasets with different domains within one network, as well as added flexibility in translating an input image to the desired target domain.

Scope and Feasibility study

Input

A dataset of photographs, and a dataset of the paintings of the certain painter we wish to emulate

Train a GAN model to learn the style from the paintings and then transfer it over to the images.

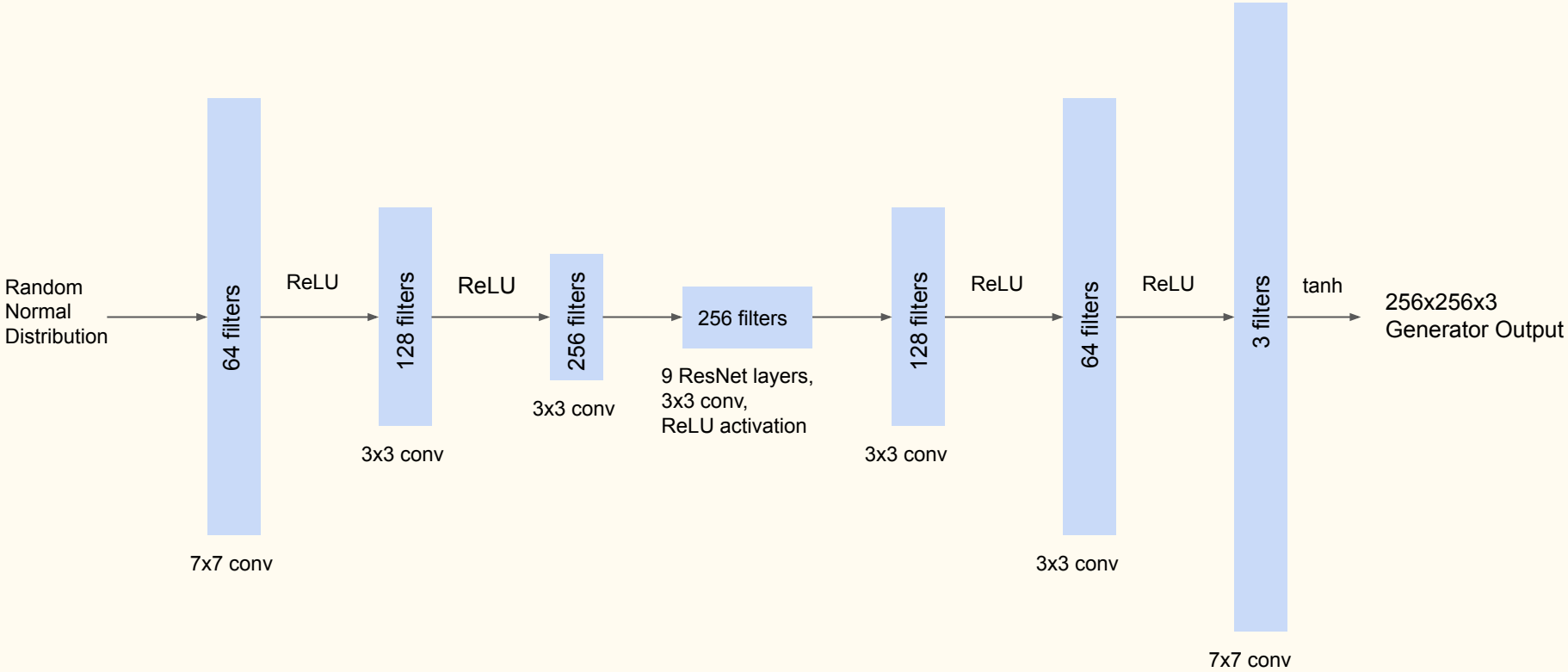
It contains *two* main objectives:

1. **artistic style transfer** which involves translating the input image to the desired artistic style, such as that of Monet or van Gogh;
2. **photo-realistic style transfer** which must clearly maintain the original edge structure when transferring a style.

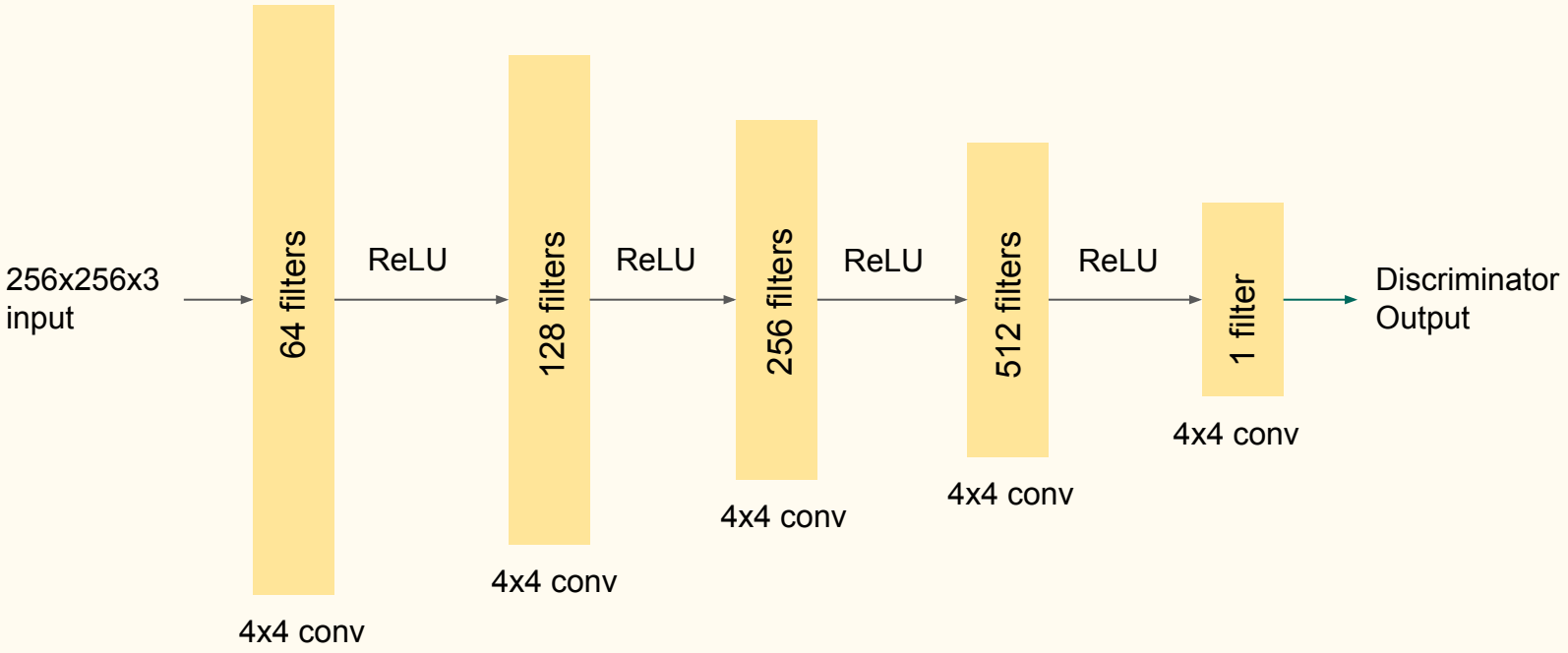
Output

A dataset of style transferred images which closely resemble the artistic style of that artist

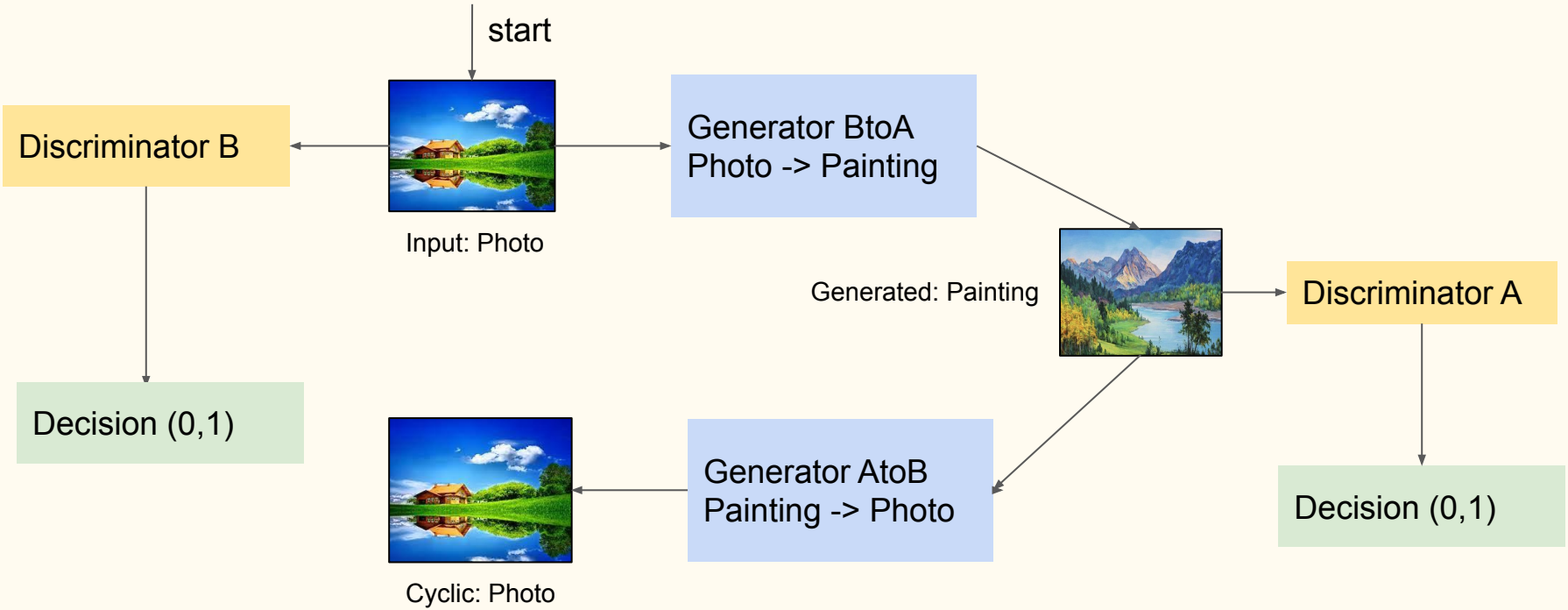
Architecture - Generator



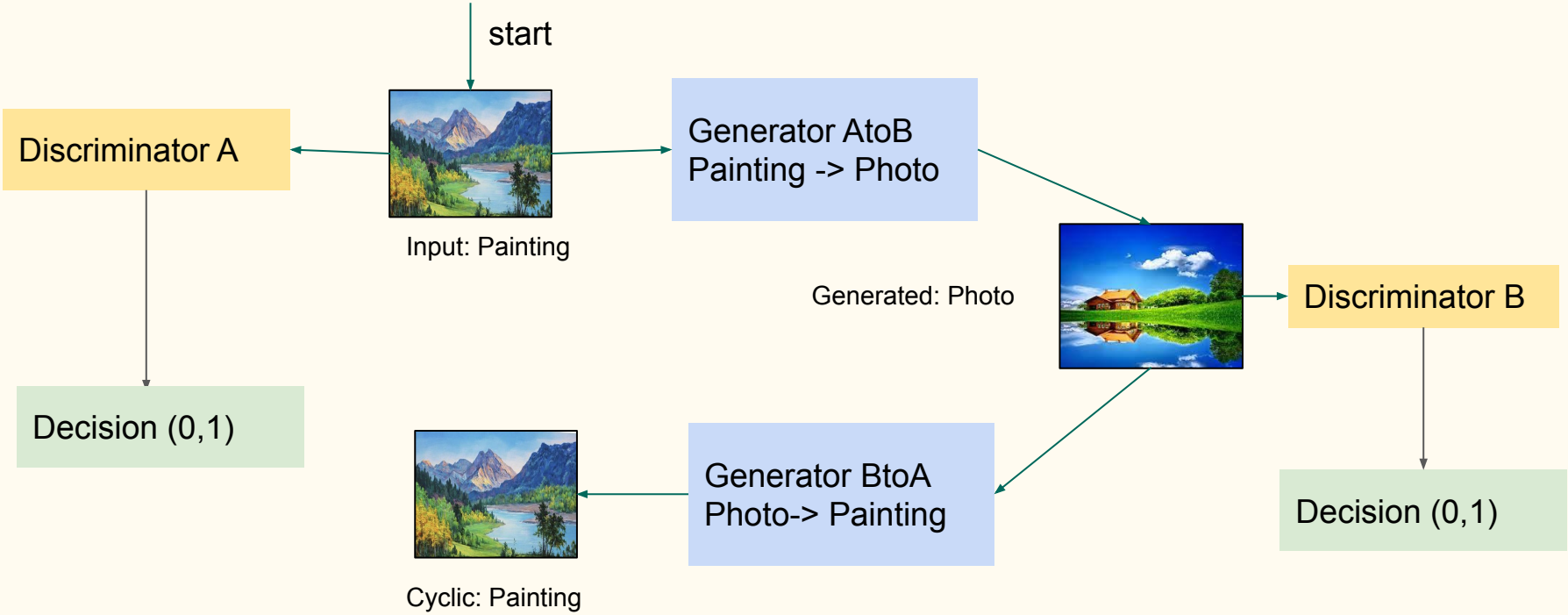
Architecture - Discriminator



Architecture - CycleGAN (Forward)

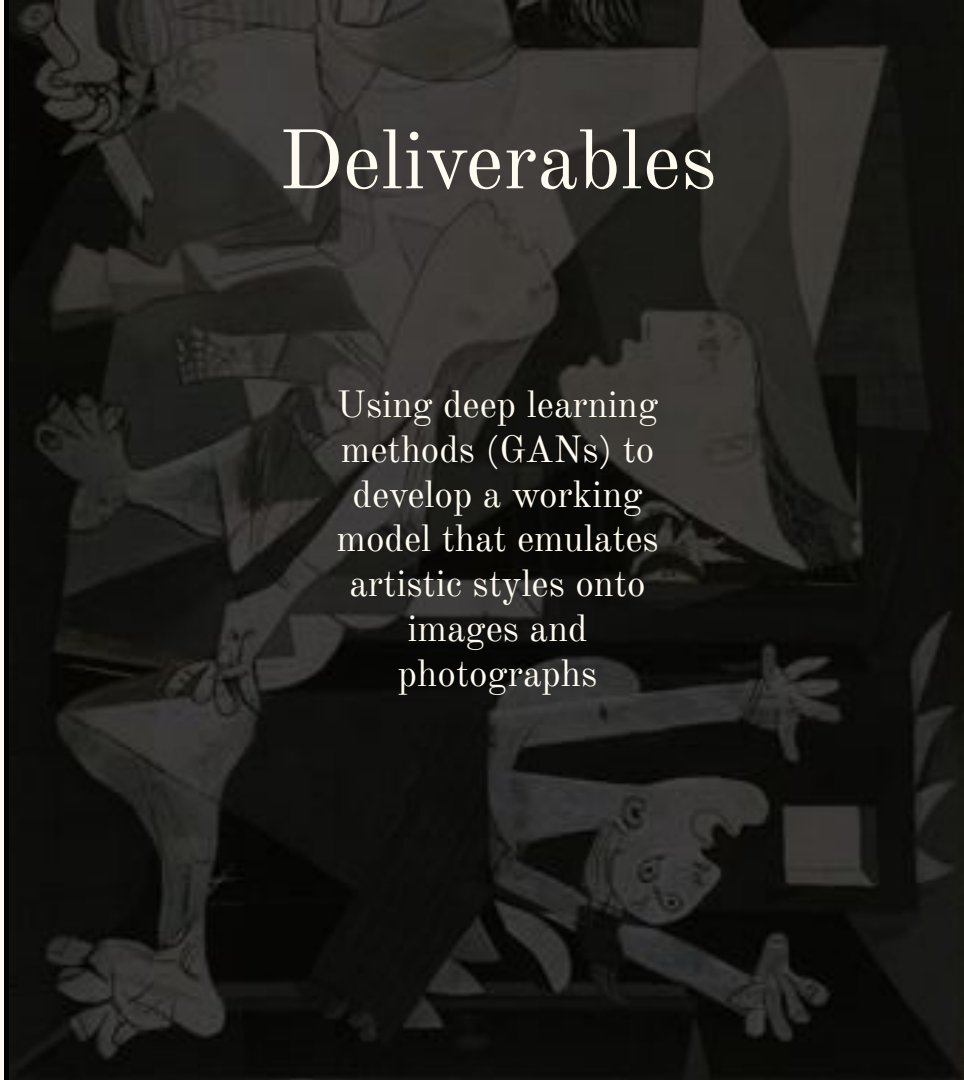


Architecture - CycleGAN (Backward)



Applications

- *Photoshop Neural Filter* uses Style Transfer for editing images
- By varying the training data for image style transfer, it can be used to *generate sketches* from photos too
- Using image to image translation methods for artistic creation can directly translate real-world photographic works into *illustrations in children's books, cartoon images, comics or a multi-chirography* of Chinese characters.
- Turn photo-realistic images into *synthetic artworks* without human intervention



Deliverables

Using deep learning methods (GANs) to develop a working model that emulates artistic styles onto images and photographs