

Introduction

The **F.D** is a web application that detects, extracts and deblurs faces in blurry images using artificial intelligence

Abstract

F.D'S main purpose is blind motion deblurring using conditional adversarial networks. F.D was developed using Keras, written in Python and capable of running on top of TensorFlow.

YOLO FACE RECOGNITION

YOLO is a real-time object detection system. We used it to train the model in order to detect the faces.

Training sample was made of 32,203 pictures and 393,703 face labels.

The model is convolutional neural network. During training, we used sum of squared error loss.

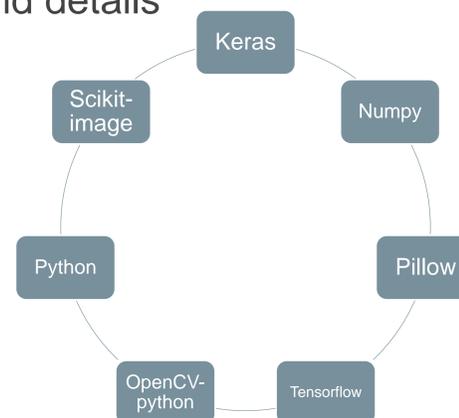
Backbone	Top-1	Top-5
Darknet-19 [15]	74.1	91.8
ResNet-101[5]	77.1	93.7
ResNet-152 [5]	77.6	93.8
Darknet-53	77.2	93.8

Accuracy of different backbones



Deblurring Images

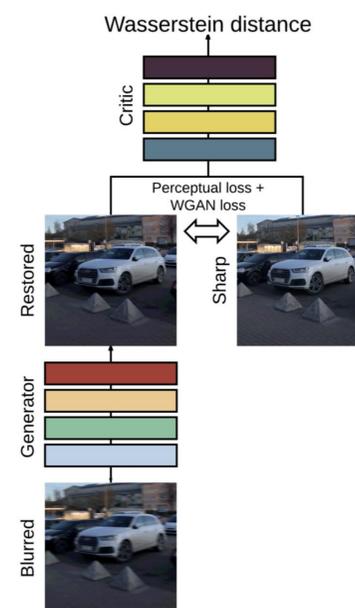
Given a motion- or focal-blurred image, caused by camera shake, object motion or out-of-focus, the goal of deblurring is to recover a sharp latent image with necessary edge structures and details



The goal is to recover a sharp image given only a blurred image as an input, so no information about the blur kernel is provided.

Deblurring is done by the trained CNN. For each blurred image, it estimates corresponding sharp image.

During the training phase, we introduce critic to the network and train both networks in an adversarial manner



Loss Function

The critic network takes the restored and sharp images and outputs a distance between them.

We formulate the loss function as a combination of content and adversarial loss:

$$\mathcal{L} = \underbrace{\mathcal{L}_{GAN}}_{adv\ loss} + \underbrace{\lambda \cdot \mathcal{L}_X}_{content\ loss} = total\ loss$$

Peak Signal-to-noise ratio	28.7
Structural symmetry index	0.958
Precision	0.764
Recall	0.742
F1-measure	0.704

Dataset

We trained and validated the model using a dataset of 122,598 and 80,001 cropped images of celebrity faces respectively and used a motion blur function and an out of focus blurring program to blur all the images.

Results

The web application takes as an input a blurred image and displays the cropped blurred and unblurred faces. The website is developed using Flask Framework.

