Winter in Data Science Report

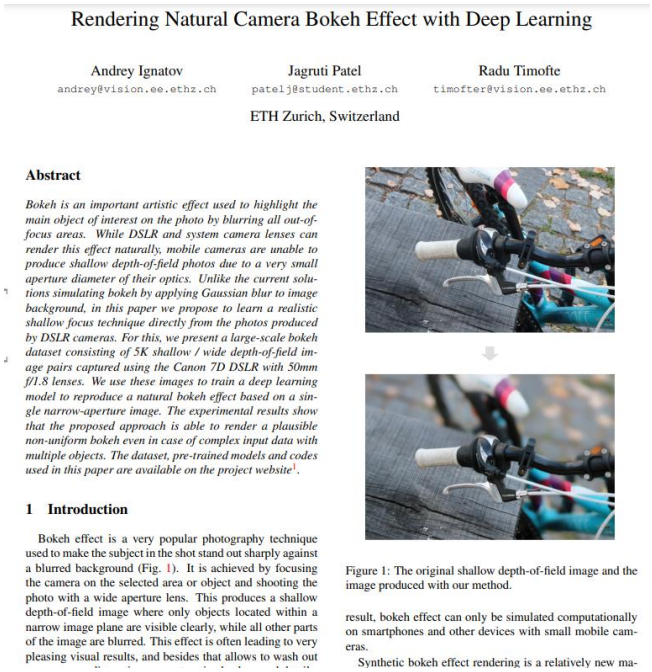
Aryan Bhosale

UID 10: Rendering Natural Camera Bokeh with Deep Learning

Github Repo Link: https://github.com/Hyperion0209/wids_ws

Our project was based on a research paper by ETH Zurich which wanted to bring the entire implementation detail of DSLR Bokeh to other devices.

Paper: https://arxiv.org/abs/2006.05698



Rendering Natural Camera Bokeh Effect with Deep Learning

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Abstract

Bokeh is an important artistic effect used to highlight the main object of interest on the photo by blurring all out-of-focus areas. While DSLR and system camera lenses can render this effect naturally, mobile cameras are unable to produce shallow depth-of-field photos due to a very small aperture diameter of their optics. Unlike the current solutions simulating bokeh by applying Gaussian blur to image background, in this paper we propose to learn a realistic shallow focus technique directly from the photos produced by DSLR cameras. For this, we present a large-scale bokeh dataset consisting of 5K shallow / wide depth-of-field image pairs captured using the Canon 7D DSLR with 50mm f/1.8 lenses. We use these images to train a deep learning model to reproduce a natural bokeh effect based on a single narrow-aperture image. The experimental results show that the proposed approach is able to render a plausible non-uniform bokeh even in case of complex input data with multiple objects. The dataset, pre-trained models and codes used in this paper are available on the project website[1].

1 Introduction

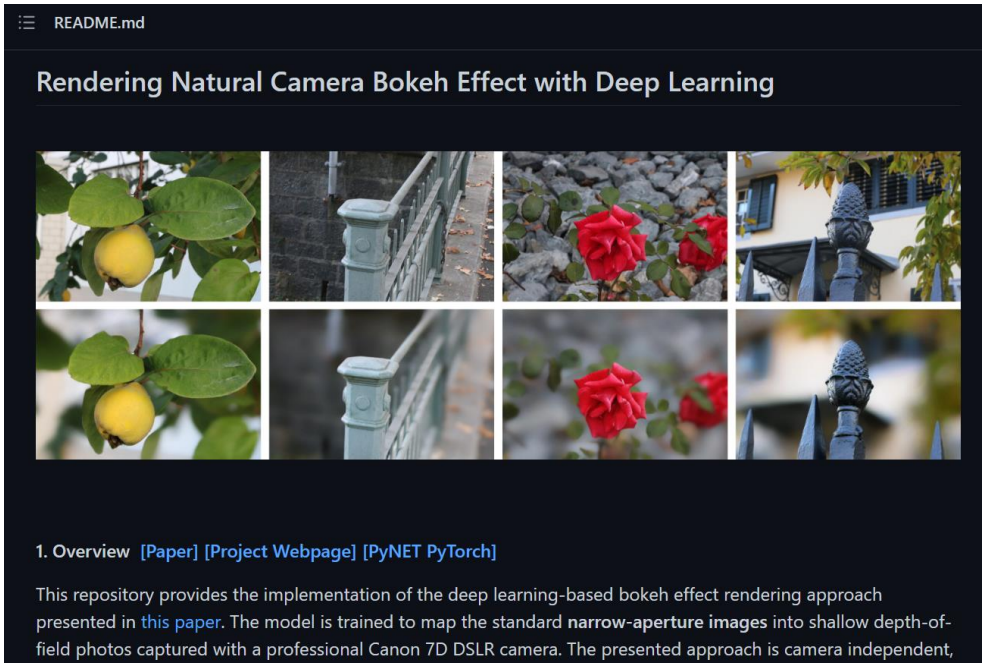
Bokeh effect is a very popular photography technique used to make the subject in the shot stand out sharply against a blurred background (Fig. 1). It is achieved by focusing the camera on the selected area or object and shooting the photo with a wide aperture lens. This produces a shallow depth-of-field image where only objects located within a narrow image plane are visible clearly, while all other parts of the image are blurred. This effect is often leading to very pleasing visual results, and besides that allows to wash out

Figure 1: The original shallow depth-of-field image and the image produced with our method.

result, bokeh effect can only be simulated computationally on smartphones and other devices with small mobile cameras.

Synthetic bokeh effect rendering is a relatively new ma-

Paper's Github Link: https://github.com/aiff22/PyNET-Bokeh.git



README.md

Rendering Natural Camera Bokeh Effect with Deep Learning

1. Overview [Paper] [Project Webpage] [PyNET PyTorch]

This repository provides the implementation of the deep learning-based bokeh effect rendering approach presented in this paper. The model is trained to map the standard **narrow-aperture images** into shallow depth-of-field photos captured with a professional Canon 7D DSLR camera. The presented approach is camera independent,

The dataset was referred to as EBB! Dataset, which stands for Everything Better with Bokeh! And had more than 5K pairs of normal and bokeh pictures which we could train on.

The data was supposed to have a distance map as well to better define the relation between distance and blur but we were unable to access that dataset.

This was an enriching experience because it gave me a chance to learn and implement some advanced DL architecture. I got a chance to delve deeper into Tensorflow and discover the finer details involved in making machine-learning applications. The documentation I referred to was:
https://www.tensorflow.org/tutorials/load_data/images

https://www.tensorflow.org/tutorials/images/data_augmentation

Dealing with a dataset this big required judicious division into test and train sets to economize on training time whilst not compromising on accuracy. It also gave me a chance to interact with machine-learning enthusiasts who share the same passion for learning.