**Portrait Image Lens Blur**

# **GitLab:**

# <https://cci-git.uncc.edu/itcs-4152-5152/fall-2021/project-16-portrait-image-lense-blurResearch>

## **Academic Literature Review**

* **What academic work is relevant to your project topic? Pick 3 papers, ask us for help if you need it.**

We searched the newly-published literatures related to fruit identification in several important academic databases: Web of Science, Elsevier, Springerlink, IEEE, Engineering Village, etc.

1. ***U-Net: Convolutional Networks for Biomedical Image Segmentation - by Olaf Ronneberger, Philipp Fischer, and Thomas Brox***: This explains how U-Net approach works for segmentation of the foreground and background of an image. This approach uses less no. of images in data set to train the model providing same accuracy as the approach that need huge data set. It is suggested to use U-Net than Sliding window networks for their better error rate and speed in training.
2. ***BGGAN: Bokeh-Glass Generative Adversarial Network for Rendering Realistic Bokeh - by Ming Qian, Congyu Qiao, Jiamin Lin, Zhenyu Guo, Chenghua Li, Cong Leng and Jian Cheng:***

This paper explains how GAN networks can be used to show bokeh effect on images. This approach generates the realistic images those can fool people in perception. For this we use pairs of narrow-aperture images and shallow depth-of-field images as data set to trian trian the model.

1. ***Learning to Understand Image Blur – by Shanghang Zhang, Xiaohui Shen, Zhe Lin, Radomir Mech, Joao P. Costeira, Jose M. F. Moura:*** This paper explains how to identify a blur in the image. With help of this we can understand the properties/characteristics of blur in an image.

* **What makes these papers important/relevant?**

These papers help in comparing different approaches those achieve the background blur. Neural Networks helps in segmentation/classification concepts and in the project, we are trying to identify the background of an image. These papers explain U-Net, GAN architectures (Neural Network Architectures) those help in identifying the background in images. Also, these papers help in gathering the Datasets for training the model, which includes wide range portrait images with different categories like gender, color, ...

* **What are their results and how did they achieve these results?**

The results are as follows, when a competition was held for some of the teams to solve a problem, team who used U-Net architecture has got better metrics compared to GAN architecture. This survey has been conducted and published in research paper ‘*AIM 2019 Challenge on Bokeh Effect Synthesis: Methods and Results*’. Below is the table of comparison. The higher the PSNR the better the image quality.

|  |  |  |
| --- | --- | --- |
| Method used | PSNR (peak signal-to-noise ratio) | SSIM (Structural Similarity Index) |
| U-Net | **23.93** | **0.89** |
| GAN | 22.25 | 0.85 |

* **What's different/unique about these approaches?**

The U-Net follows approach i.e., is based on the layer segmentation. The problem is initially divided into layers and then they are merged to form the output. GAN is an approach where discriminator is used and when you train with images the machine tries to generate the similar images and it tries to fool the discriminator with the generated set of images.

## **Business/Customers**

* **What problem will your Computer Vision solution solve, and for whom?**

This problem is for Virtual video calls, photo editors. In this new covid norm, due to increase in more virtual calls, people are attending calls from their comfortable places like home, café, library where the background of each person is different and sometimes might be distracting. So, to deal with such issues we are trying to solve it by blurring the background. Also, for pictures that has unwanted background can also be blurred making the subject as main focus.

* **What value will it provide them? What are their pain points?**

This project helps them in maintaining the professionality in the calls, it makes the image more attractive in case of pictures that spoils the subject visibility.

* **How big is the potential market?**

The project has huge market, as virtual calls have become the new norm in this pandemic. This will be helpful for most of the people who would like to hide their distracting background to look more professional.

## **Open Source**

* **What open-source code is available that is relevant to your topic?**

No Open-Source projects are been found until now for this type of requirement with specific to the approach(U-Net) we choose to follow. There are some projects in GitHub that can be used by citing them in our work. By taking the reference of their approach we try to build the model for this project, and later to customize it to fit for our problem statement.

* **How active are the communities around this code?**

Plenty of research has undergone for this problem and there are lot of contributions that can guide us to achieve the solution. We have got research papers those are published in 2020 for GAN and 2015 for U-Net. The projects that we referred to are of 1-3 years old and the contributions to those projects are less.

* **What data is available for testing and/or training algorithms?**

There are plenty of data sets available for this kind of projects, of which we have chosen the data set being provided by the flicker. This data set contains 70k images which are of high quality and also is of vivid range of categories. **Link**: <https://github.com/NVlabs/ffhq-dataset>

Also, we have data set from university of central Florida, Selfie dataset contains 46k selfie images annotated with 36 different attributes divided into several categories as follows. Gender: is female. Age: baby, child, teenage etc. **Link**: <https://www.crcv.ucf.edu/data/Selfie/>

## **Industry Solutions**

● **What companies are solving similar problems to yours?**

Companies like Microsoft, Google achieved this for their video call tools like teams, google meet. We as a team would like to put in our efforts to apply our knowledge and develop this to see how best we could perform with the computer vision concepts.