SSIP 2022 | University of Szeged | Hungary

Image processing

SMILE!

Team members:

Kristina Host

Faculty of Informatics and Digital Technologies, University od Rijeka, Coratia

kristinahost@gmail.com

Cristian Pal

Faculty of Mathematics and Computer Science, West University of Timisoara

palcristi01@gmail.com

Csenge Mihályi

Faculty of Technical Sciences, University of Novi Sad, Serbia

csange2905@gmail.com

Jan Madejek

Faculty of Mechanical Engineering, Poznan University of Technology, Poland

jan.madejek.legit@gmail.com

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1. Introduction

Nowadays, human face detection is used in different field, for example you can find application such as “Instagram" or "Snapchat" that can detect faces and then apply various filters or recognize the age of a person. Here we present an application of image capturing in real-time, but only if everybody in the screen is smiling.

2. The problem description

The main task is to design a software tool that takes a photo, only when everyone smiles in front of the camera. The program has to read an image with up to 5 people’s faces visible to the camera in front of a diverse background. Also the program should detects faces and determines the number of smiling faces. If everyone smiles, give a special „message”. Furthermore, you can do an advanced solution and control a webcam to take a real-life still images, if everyone smiles. Building a database of required photos is a part of the task.

3. The methodology and results

The workflow is based on three main pillars, the first is being Data preperation, the next one is the Smile detection and the last is called Real-time image capturing. A detailed diagram is shown in Figure 1.

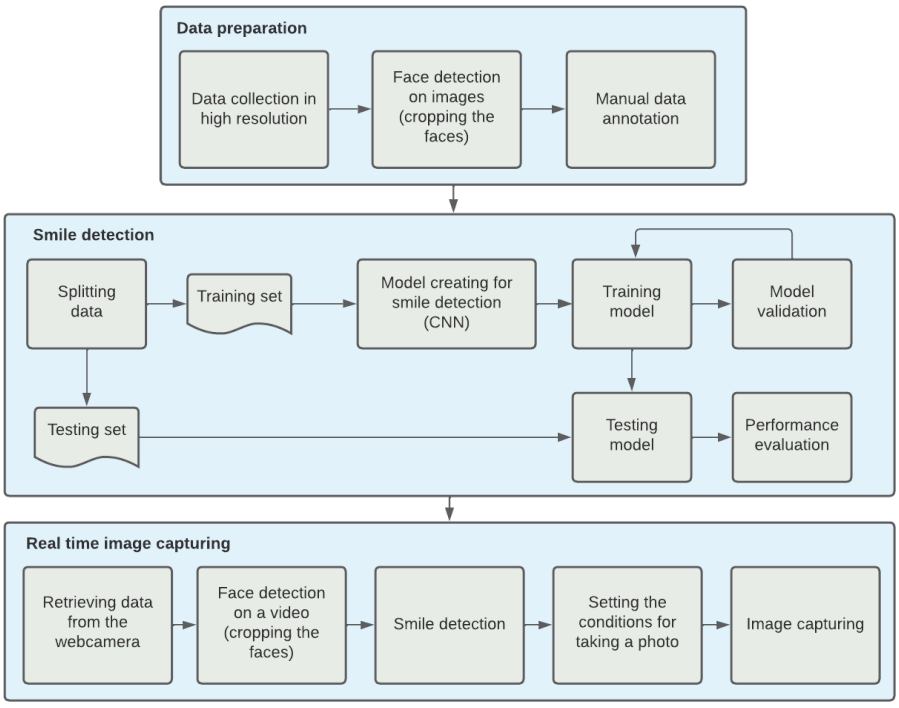
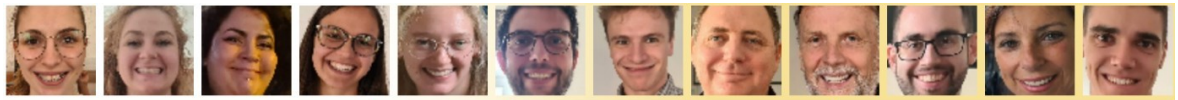


Figure 1: The workflow for smile captureing

The first step in our project was to collect the data. The database is based on photographs taken of SSIP2022 participants. The pictures were taken with SM-G980F mobile device with triple cameras in high resolution (12MB+64MB+12MB). The photos are of different sizes, and every picture contain between 1 and 33 people on images with a serious expression on their face and while smiling. In the second step, we used Open CV and the cascade classifier to develop a face detection algorithm on the created dataset. When we have found the face, we have labeled it with the bounding box and have cropped the faces out to use them for training a smile recognition model. We obtained a dataset called SSIP Participants with 456 cropped images (we also used data augmentation). Then we created, trained and tested a CNN model to classify smiling and not smiling faces. For training we used 70% of the data and for testing 30%. We obtained satisfying results on the tasting set, with the accuracy of 84%, but we wanted to have better results and then we enlarged our dataset with one find on Kaggle called GENKI4K. With the combined dataset we obtained 91% accuracy. The dataset can be seen on Figure 2, the architecture of the CNN on Figure 3, the result of training on the SSIP Participants datase can be found on Figure 4, and the results of training on the combination called SSIP Participants + GENKI4K on Figure 5.



Dataset	Smiling	Not smiling	Total	
SSIP Participants Original			299	• SM-G980F • Triple camera- high resolution (12MB+64MB+12MB) • Different image sizes • Between 1 and 33 people on images
SSIP Participants	254	202	456	• 64x64px • Data augmentation (vertical flip)
GENKI4K	2035	1753	3788	• 64x64px
SSIP Participants + GENKI4K	**2289**	**1955**	**4244**	• **64x64px**

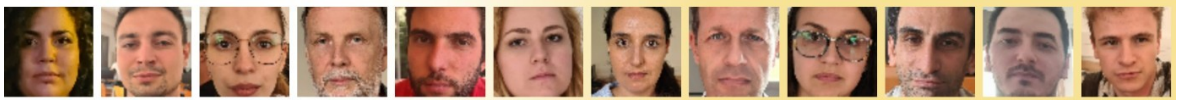


Figure 2: The datasets

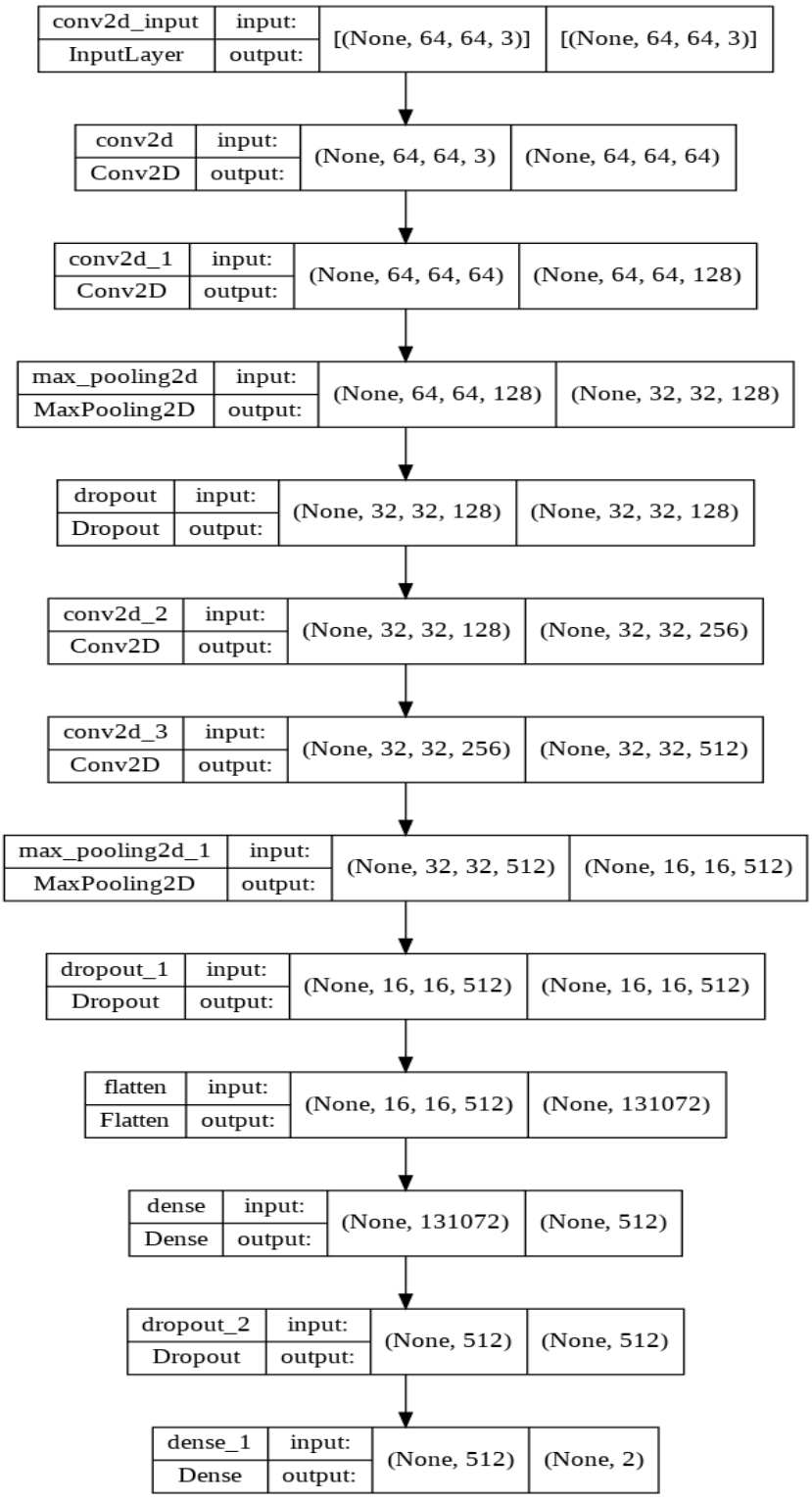


Figure 3: The CNN model for smile classification

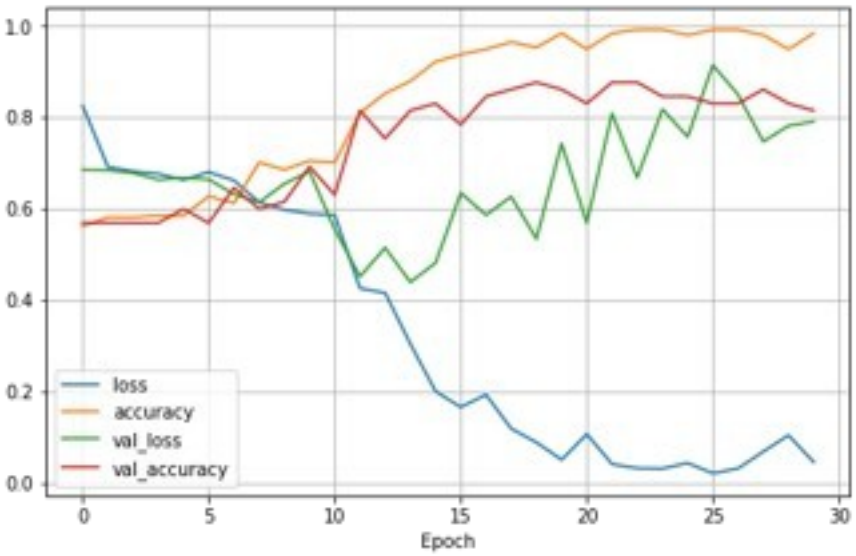


Figure 4: History of the model for training on the dataset SSIP Participants

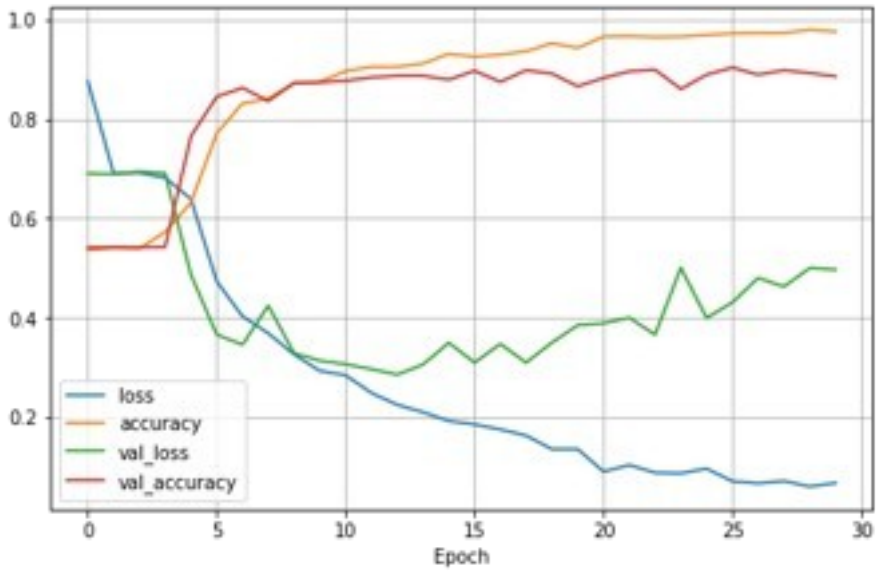


Figure 5: History of the model for training on the dataset SSIP Participants + GENKI4K

Once we get the model weights, we used OpenCV to retrieve information from the web camera and we detected the faces in real time. If the detected face is smiling, then a green bounding box appears, if not is red. If every detected face is smiling (one of the software's primary tasks is to detect the number of faces and return the sum) then the program capture an image.On Figure 6. you can find examples of our results.

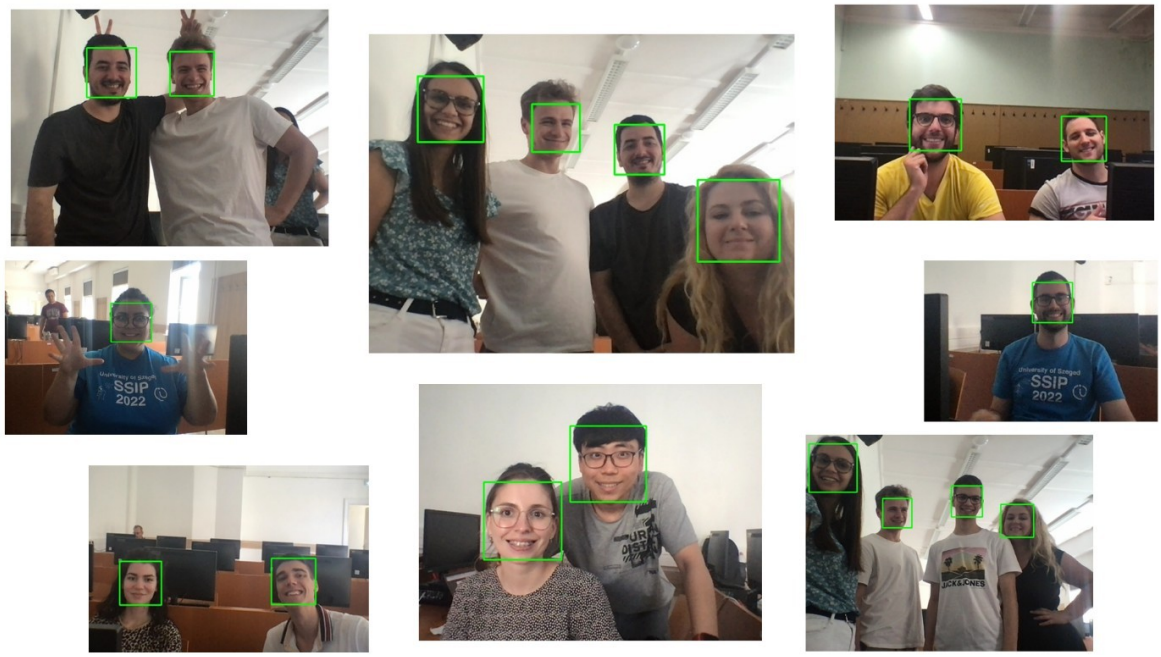


Figure 6: The results