



Introduction to Artificial Intelligence (EE 482)

Semester Project (Smoker detector model)

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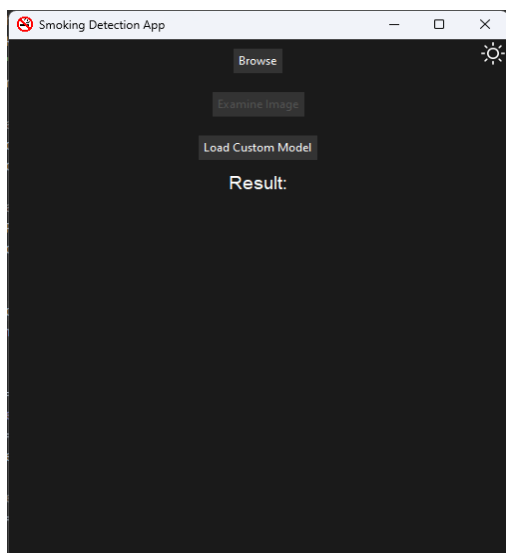
Instructor:Dr. Muhammad Bilal

Introduction

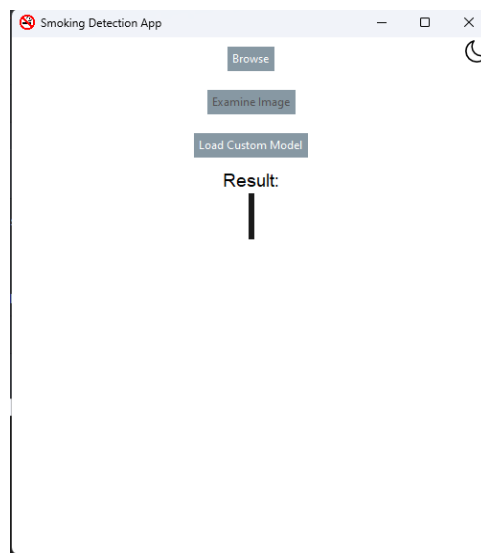
Artificial intelligence has changed the way things work in the last few years as it helps in many fields and it made our lives easier. This is a project report for the course Introduction to Artificial Intelligence (EE 482), for this project we will be choosing an idea and building an AI model for it. since we are more familiar with Artificial Intelligence and machine learning concepts we will put our knowledge to the test as we want to do a project that applies what we have learned in the course. We will be listing the project idea, talking about the model, and testing the results that we got.

More about the project

The project idea is to build a model for detecting a person if he or she is a smoker by seeing images of smokers. The data set that we used for training the model was from Kaggle which is a famous website for machine learning projects and datasets. The training data was split into two labels which are smoker and non-smoker. We split the dataset according to the labels to train them. We also did something extra just for the display, we built a graphical user interface to examine the picture, so it will make it easier to examine as seen in Figure[1] and Figure[2]. We also added an extra option to choose a pre-made model to test.



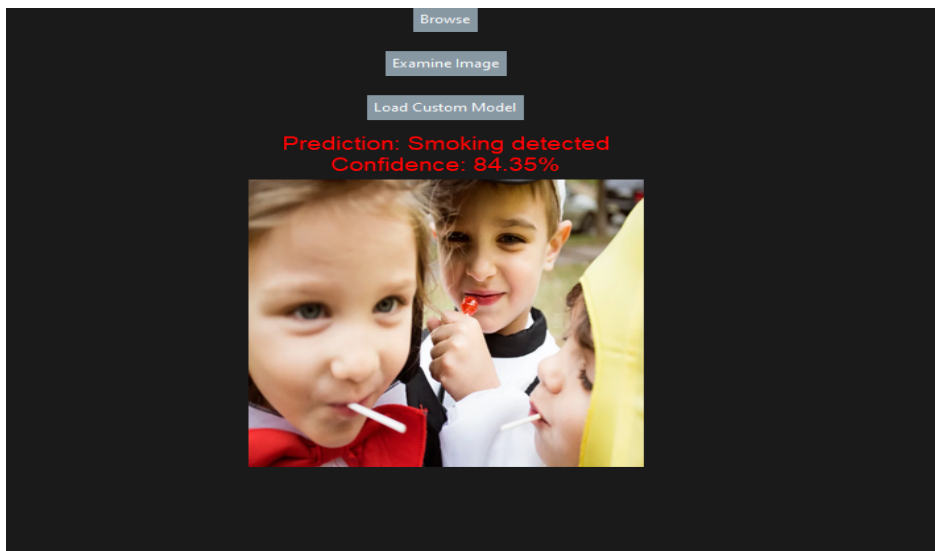
Figure[1] GUI dark mode.



Figure[2] GUI light mode.

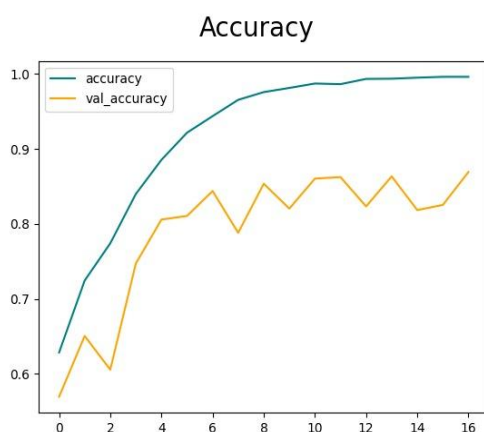
Early model tests

We used the libraries in Python to help build the model, During the early test we faced some problems when we showed the results one of the problems was related to a data set that was not diversified enough when we tried to test images like seen in Figure[3] some kids holding a lollipop the model has seen them as a smoker as it detects the lollipop as a cigarette. We tried to fix this problem by increasing the dataset, especially label 1 which is the non-smokers we implemented different types of images not only faces of people not holding a cigarette but still the problem exists.

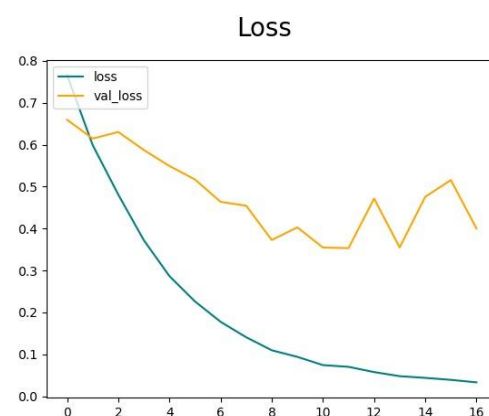


Figure[3] image from the training dataset.

Another problem that we faced was that our model was overfitting as the validation loss was high and the validation accuracy was low unlike the training loss was low and the training accuracy was high as shown in Figure[4] and Figure[5]. We solved the problem by adjusting the model like we reduced the model complexity, for example: the number of convolutional layers, its size and the deep neural networks. Also, we also increased the dataset to around 2000 images.



Figure[4] Training and validation accuracy.

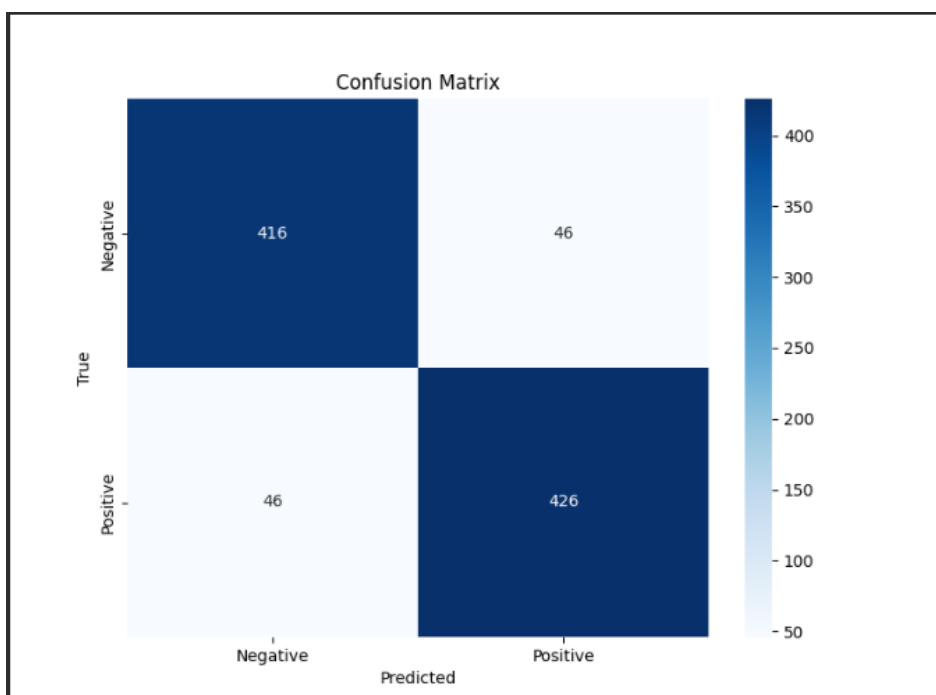


Figure[5] Training and validation loss.

Model results

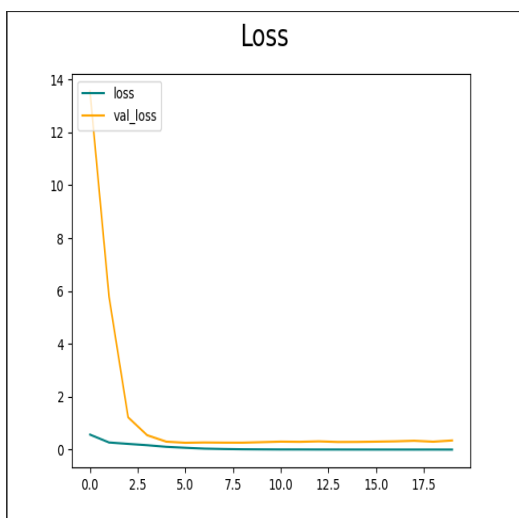
As we mentioned in the introduction we used Python to build our model, with the help of sklearn library we were able to show the confusion matrix as shown in Figure[6]. Some of the model results calculations are shown below.

- Precision:0.9025
- Recall:0.9025
- Accuracy:0.9015
- F1 Score:0.9025

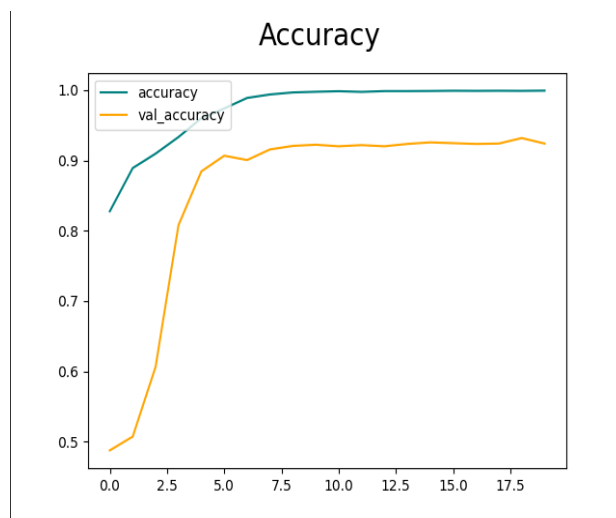


Figure[6] Confusion matrix.

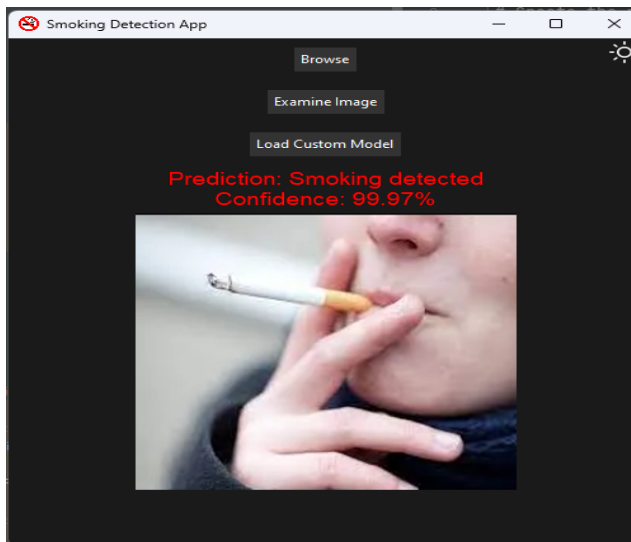
The model performance got better after we add batchNormalization layers and increased the information of the images by flip, change contrast, change brightness the early test, the loss of validation and training is shown in Figure[7], and the accuracy is shown in Figure[8]



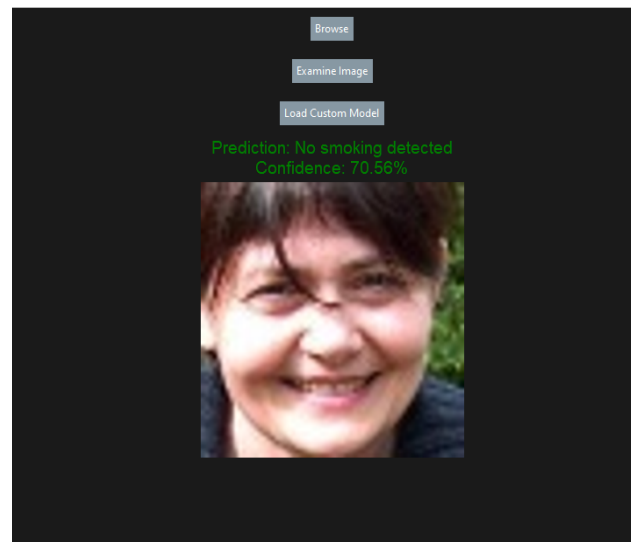
Figure[9] Training and validation loss.



Figure[10] Training and validation accuracy.



Figure[11] Model test smoker.



Figure[11] Model test non-smoker.

Conclusion

After finishing this project, we became more familiar with the implementation of the course concepts and techniques. As with any project, we faced some problems regarding the model's performance, after searching the internet there are many sources that helped us overcome this problem. Our model is not perfect but we learned from it and we enjoyed building it. We will continue our journey the the artificial intelligence world to learn more about it.