

EE 267 TERM PROJECT

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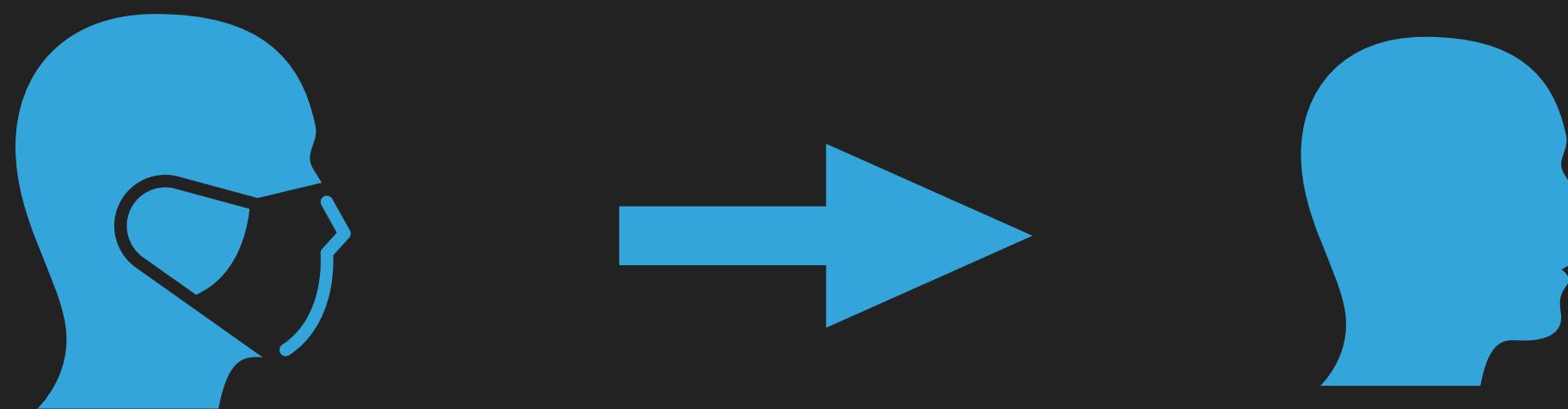
UNMASKING FACE MASKS USING GAN -

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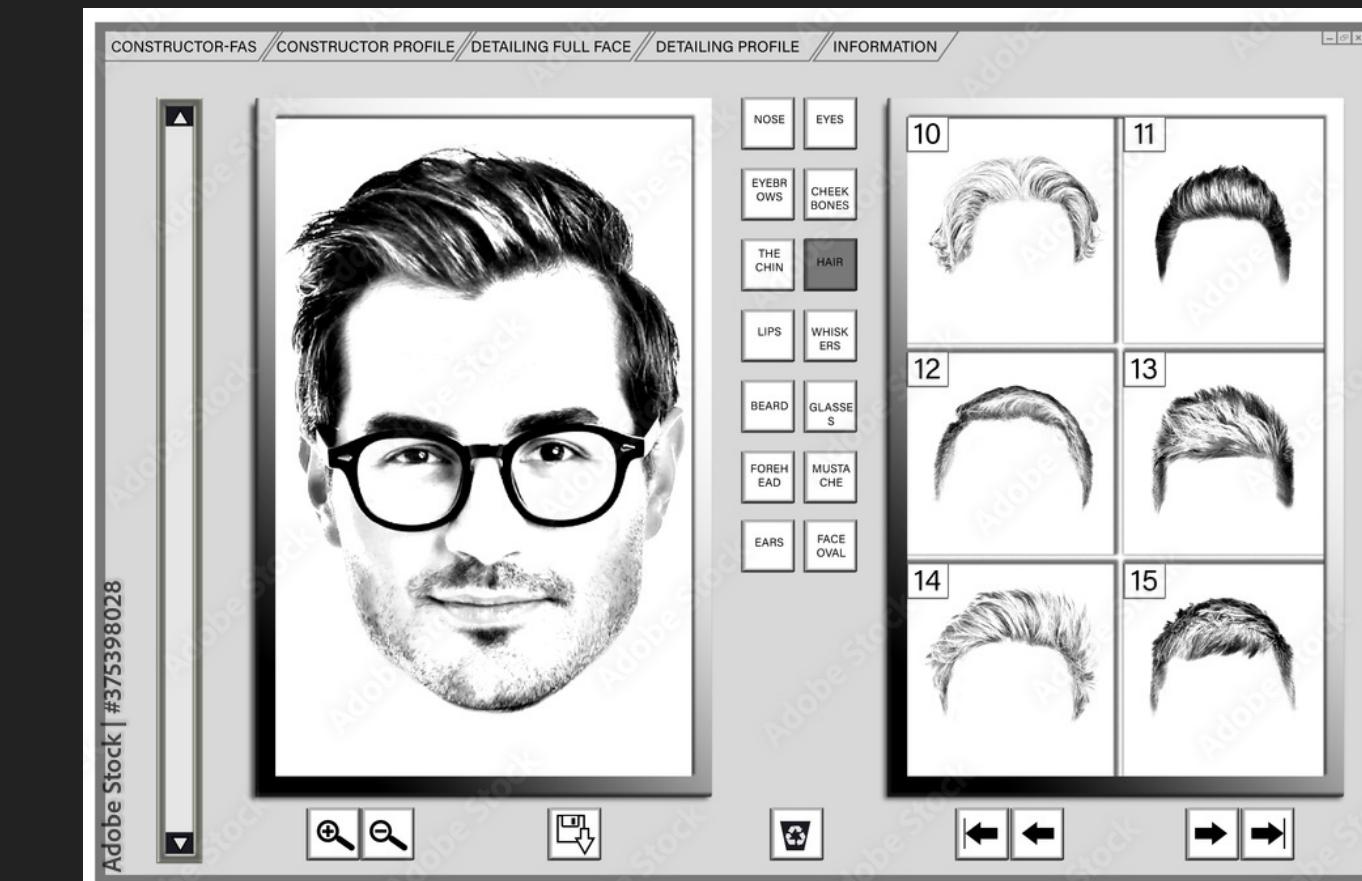
## WHAT?

- ▶ Goal - To generate fake imaginary faces for masked faces
- ▶ Input - Masked Face
- ▶ Output - Face generated by the neural network.



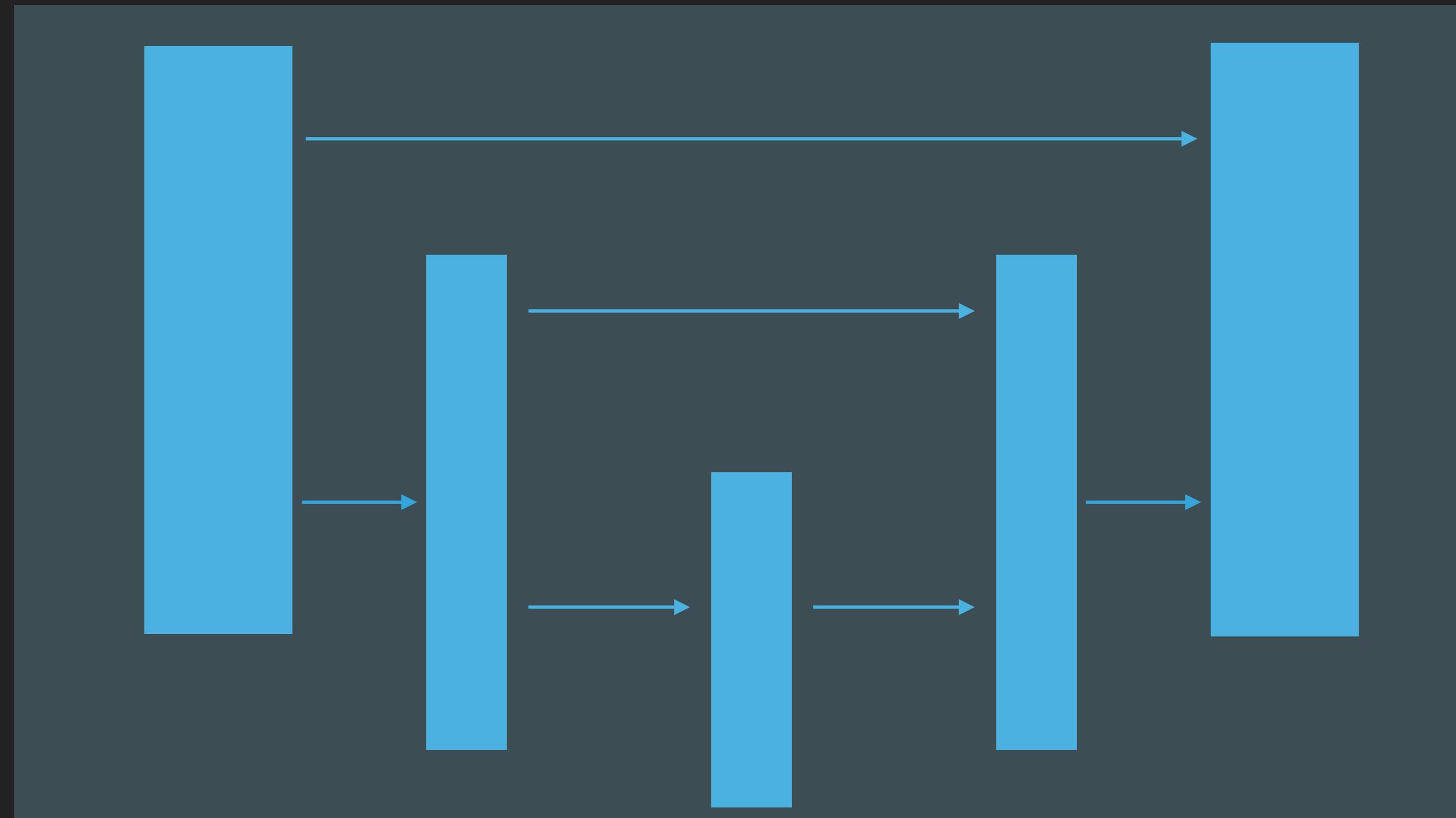
## WHY?

- ▶ The model could potentially help law enforcement to visualize how a masked person might look in real life.
- ▶ When trained with a larger dataset with all kinds of faces, the model could generate faces more similar to real faces.
- ▶ Face Composite ->



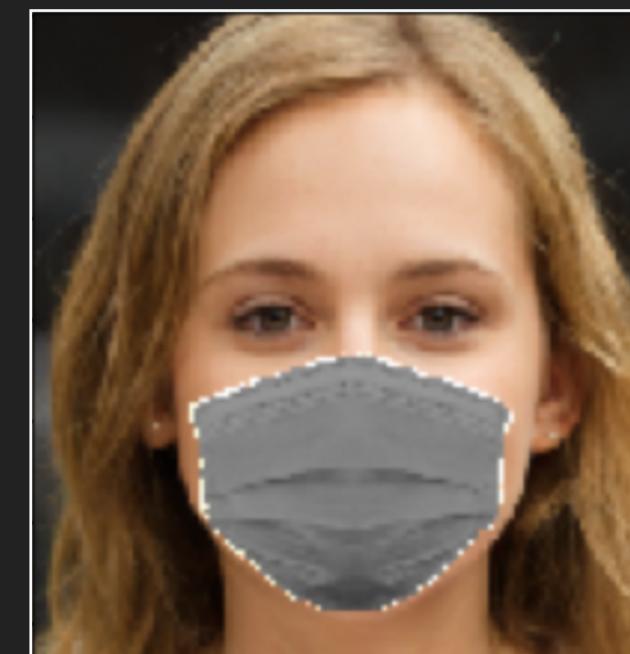
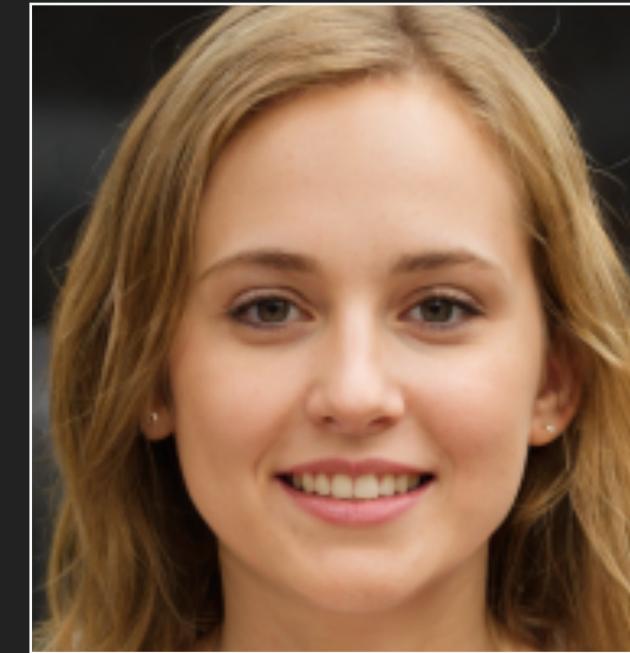
# HOW?

- ▶ Using Generative Adversarial Networks!
- ▶ For a given input and output, GANs learn the differences and similarities to generate a new output using a UNET architecture.



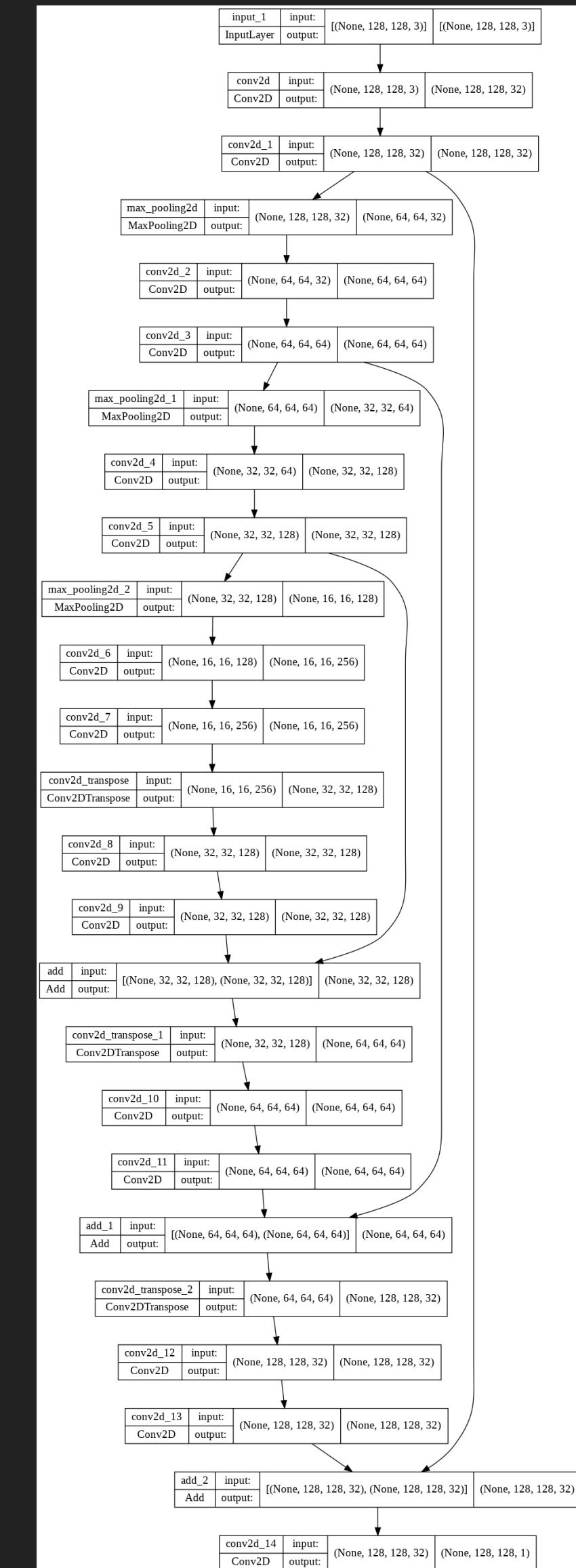
# IMAGE PREPROCESSING

- ▶ Original Dataset Size: 25GB
- ▶ Reducing Image dimensions to 128\*128.
- ▶ Generating masked faces using [\[3\]](#).
- ▶ Splitting train and test set.
- ▶ Saving the preprocessed data.
- ▶ Other techniques used: Generating sketch using kernel sharpening, BGR2GRAY, inversion, gaussian blur.



# MODEL BUILDING AND TRAINING

- ▶ Tools used: TensorFlow, Keras.
- ▶ Training images - 4000
- ▶ Test images - 400
- ▶ Epochs - 100
- ▶ Optimizer - Adam
- ▶ LOR on Plateau - lr = 0.01, min = 0.0001.
- ▶ Activation Function - Sigmoid



## RGB2RGB MODEL:

- ▶ Generates an RGB image for an RGB input with mask.



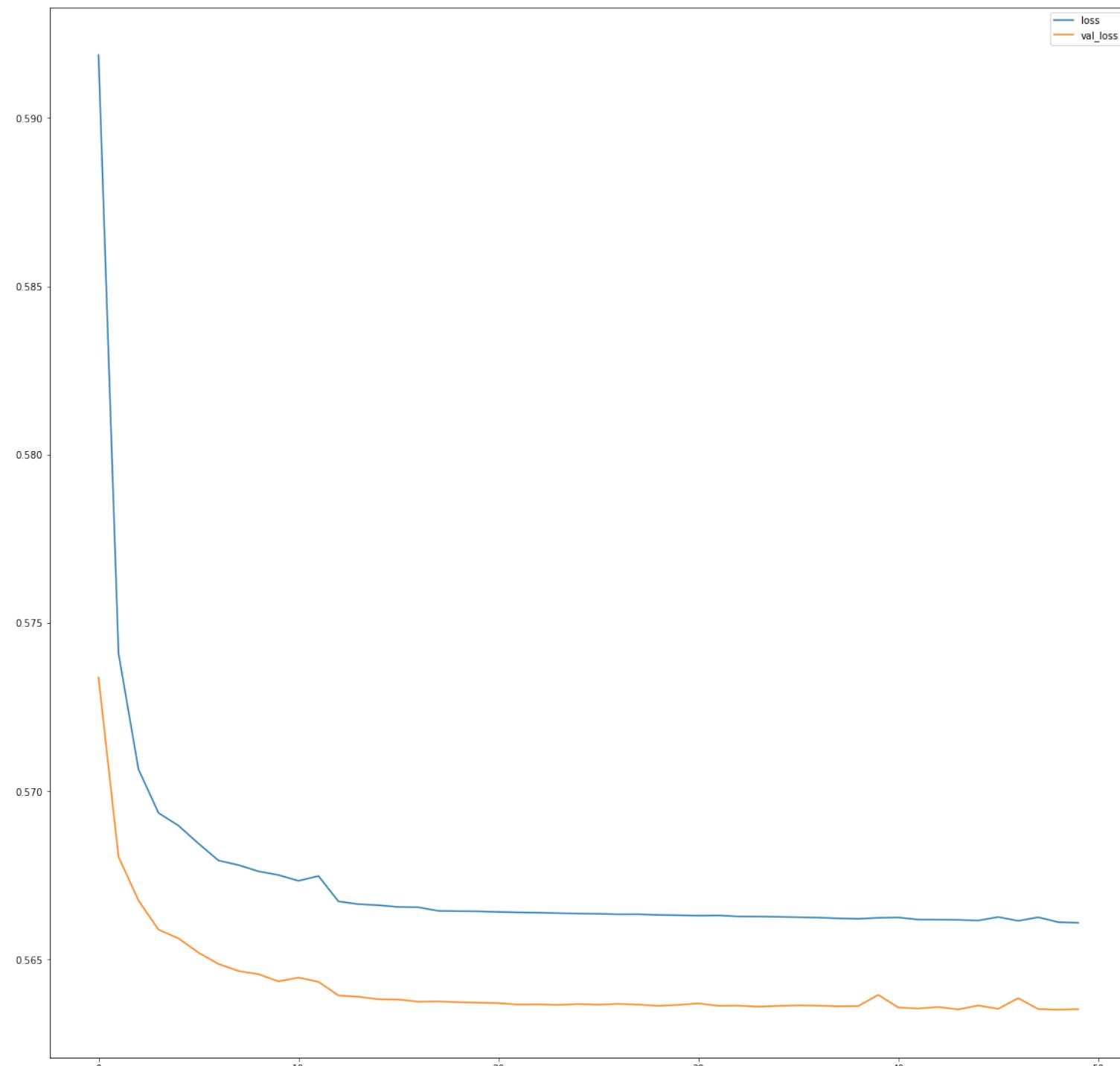
## RGB2SKETCH MODEL:

- ▶ Generates a sketch for an RGB input with a mask.

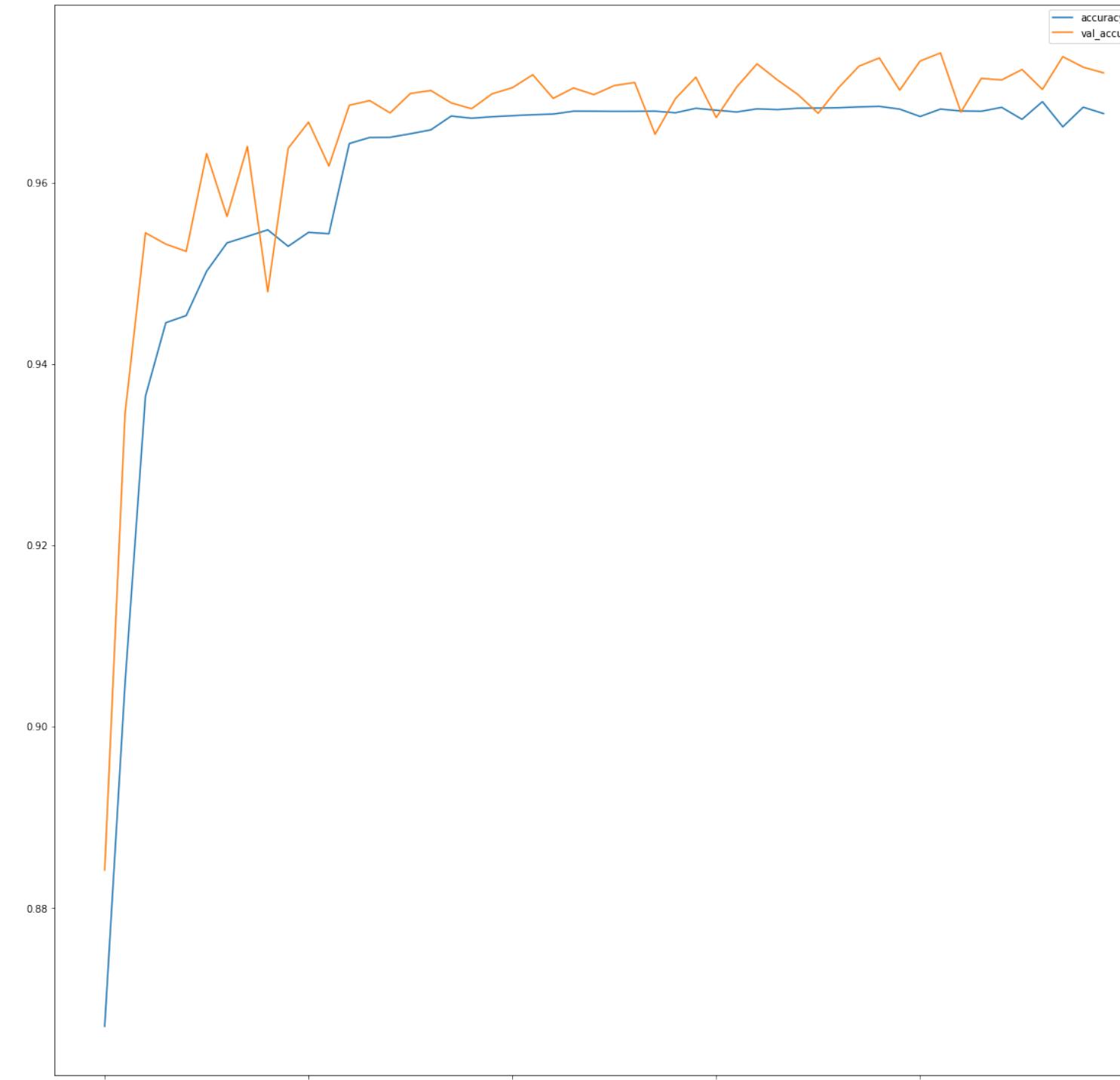


# RGB2RGB MODEL EVALUATION:

TRAIN LOSS - 0.566 VAL LOSS - 0.5635

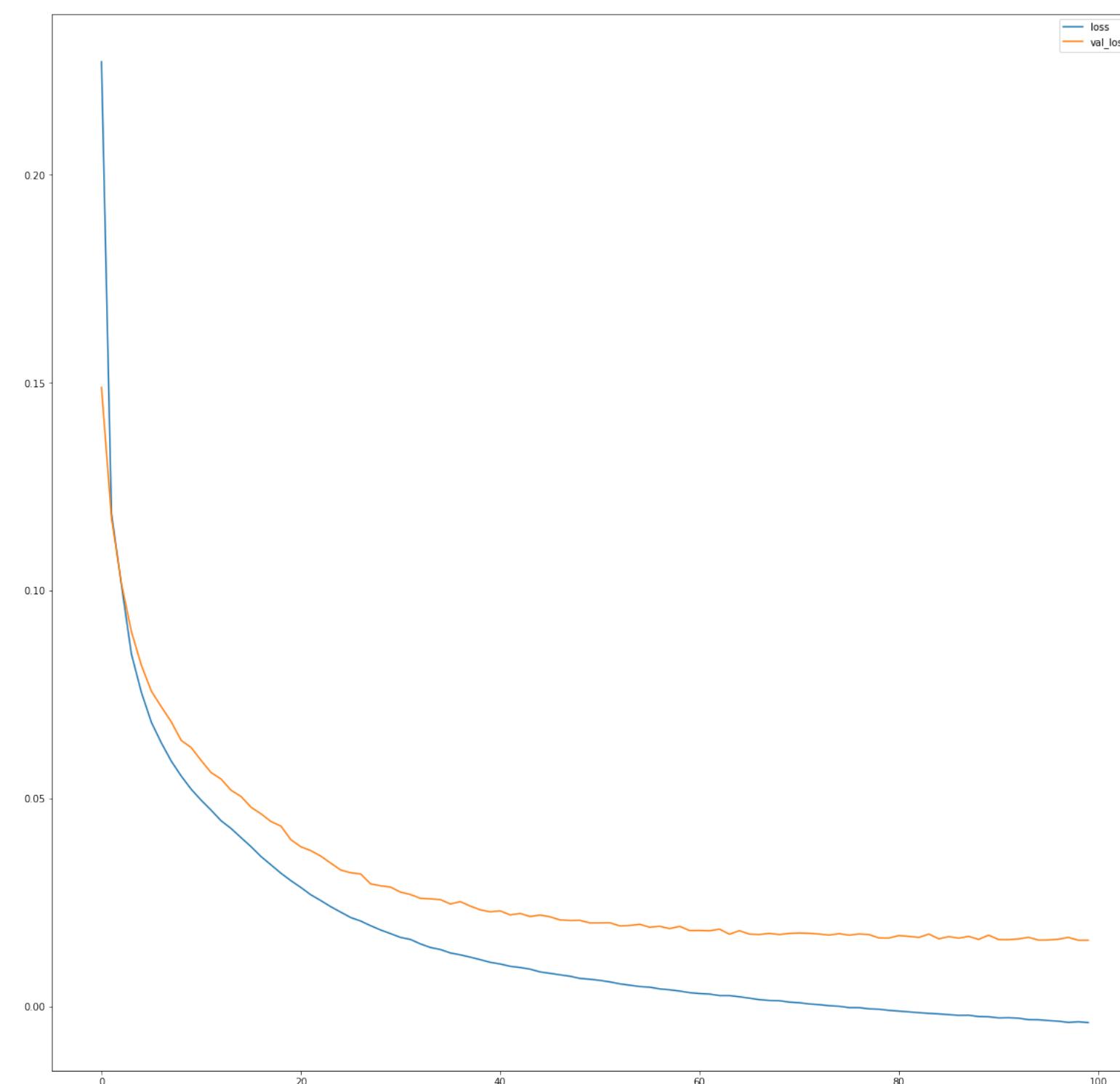


TRAIN ACC - 0.9676 VAL ACC - 0.9721

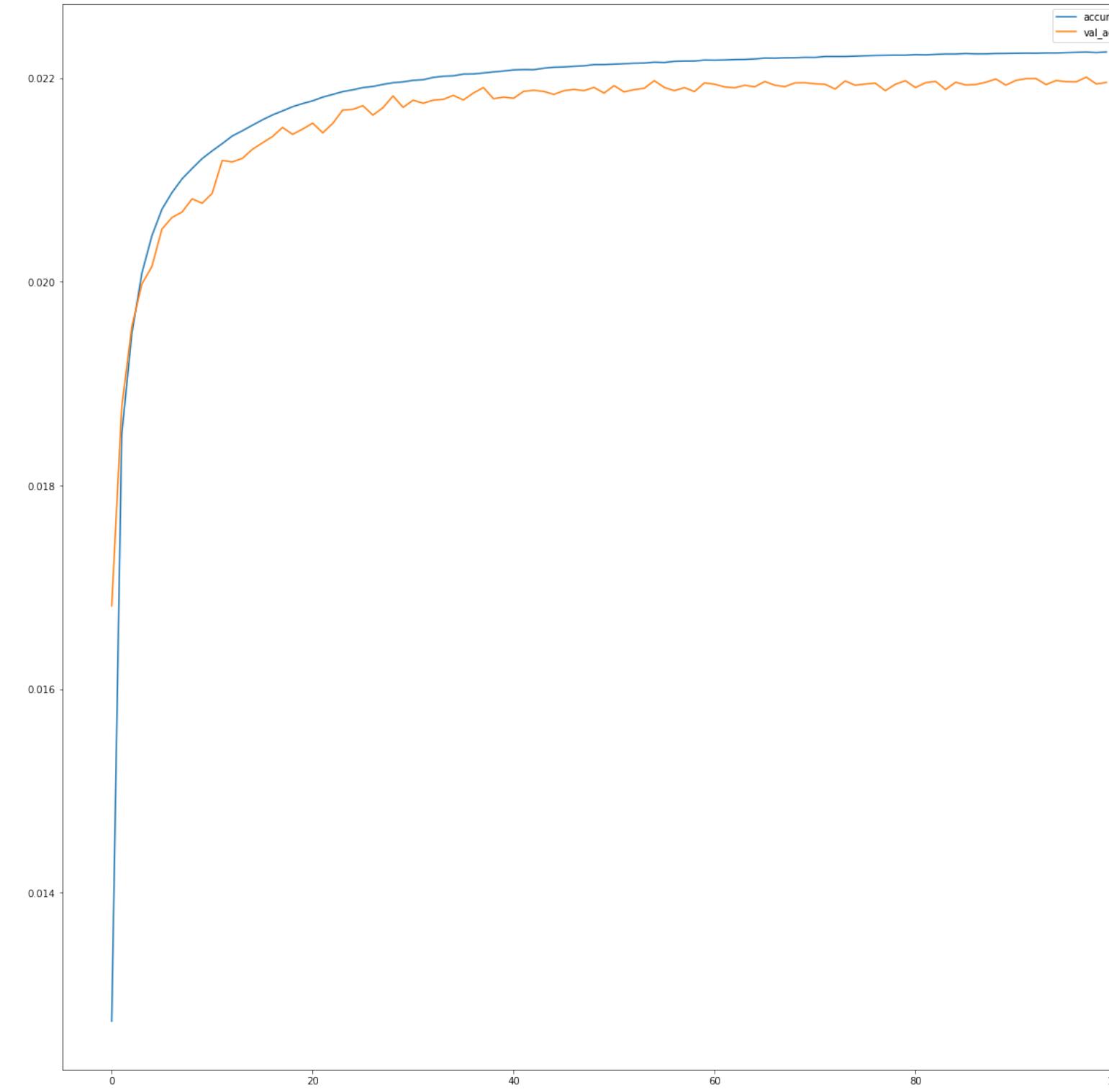


# RGB2SKETCH MODEL EVALUATION:

TRAIN LOSS - -0.001 VAL LOSS - 0.0025



TRAIN ACC - 0.022 VAL ACC - 0.021



## RGB2RGB:



WITH MASK

GENERATED

ORIGINAL

# RGB2SKETCH:



# USING HAAR CASCADE FRONTAL FACE

SAMPLING OUTPUT



## TAKEAWAYS:

- ▶ Need more train samples of people with different facial features.
- ▶ Need further preprocessing for images with masks.
- ▶ With more GPU and training samples, GANs can definitely generate high-quality faces.

## REFERENCES:

- ▶ [1] Prasoon Kottarathil. Face Mask Lite Dataset. <https://www.kaggle.com/prasoonkottarathil/facemask-lite-dataset>
- ▶ [2] <https://machinelearningmastery.com/how-to-implement-pix2pix-gan-models-from-scratch-with-keras/>
- ▶ [3] <https://github.com/aqeelanwar/MaskTheFace>
- ▶ [4] A U-Net Based Discriminator for Generative Adversarial Networks <https://doi.org/10.48550/arXiv.2002.12655>
- ▶ [5] <https://www.tensorflow.org/>