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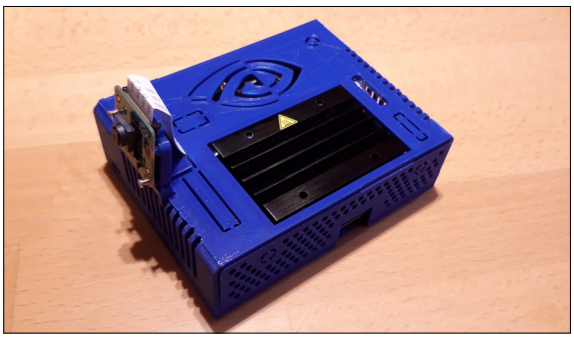
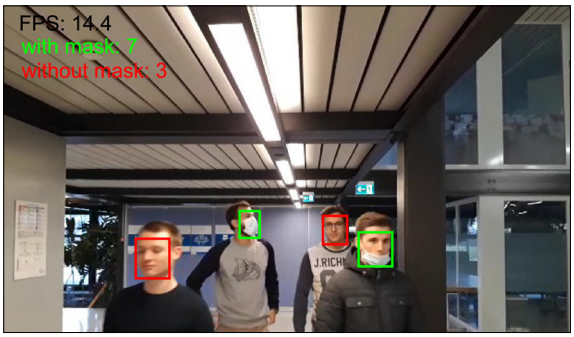
Subject Area	Artificial Intelligence

Face Mask Detection on NVIDIA Jetson Nano

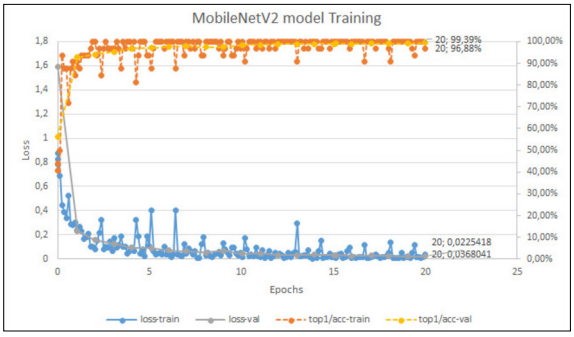
A face mask detector based on real-time capable neural networks



Shows a sample NVIDIA Jetson Nano with the RaspberryPi V2 Cam module mounted.
Own presentment



Example of Face Mask Detection in operation
Own presentment



This is the result of the face mask detection model based on MobileNetV2 architecture. The accuracy rate peaks over 90%.
Own presentment

Objective: The given project is a contribution to the COVID-19 pandemic in order to curb the spread of the virus. Face masks were found to be very effective. However, hiring a mask checker requires manpower and a lot of money. To automate this task, a given artificial intelligence short AI based face mask detector should be used. The solution should enable to be used as independently of location as possible. Therefore, an embedded system was proposed by our supervisor. The challenge of this project is that an AI processes huge amounts of data and the resources of an embedded system are very limited.

Approach: A convolutional neural network short CNN is an AI matrix which is trained on a computer. Like our brain, it's able to make decisions by comparing test- and training-data. The analysis of data is very time- and resource-consuming. NVIDIA launched an AI capable embedded system Jetson Nano. It's used in our college and was our platform. The goal was a software that's capable of handling such huge amounts of image data that it can also work in real time. We trained a model on our PC and used the TensorRT framework provided by NVIDIA, which optimizes a model to make it easier and faster.

Result: Our software solution uses an already trained face detection which cuts out the face and gives it to our mask detection model. The originally given software achieved a very low frame rate of 5 frames per second short fps. The bottleneck was caused by the face detector, which was then replaced by a more efficient one. To figure out whether a self trained model would be faster and more accurate than the given optimized mask detector, we trained our own one which outperforms the given model in terms of accuracy. The final software achieves a frame rate of 12 fps with a delay of less than 0.5 seconds and reaches an accuracy rate of 99%.