NIR Iris Challenge Evaluation in Noncooperative Environments: Segmentation and Localization (NIR-ISL 2021)

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Figure1 shows the modified version of Deep Convolution Neural Network i.e., Mask Regional Convolutional Neural Network (Mask-RCNN) with ResNet-101 model as a backbone. The model based on Feature Pyramid Network (FPN) which helps to generate bounding boxes and segmentation masks for each instance of an Iris region in the NIR dataset. Firstly, the Iris images are passed through the pre-processing step to ameliorate the quality of images using de-noising filtering and sharpening techniques. The model generates the region proposals and predicts the class of objects in the Iris images. Once the model successfully trained on NIR Iris, then the frozen graph is applied on testing dataset. The model output becomes the resultant of segmented masks with three regions like hollow portion of Iris (Iris - Pupil), pupil region, and solid region of Iris. At last, the boundary detection algorithm such as HoughCircle and blob have been applied on the result for getting the submission outcome named as Inner boundary and Outer boundary along with some post cleaning steps on result images.

All experiments have been performed on a workstation with the following specifications: Intel Core i7 7700K processor, 32 GB RAM with NVIDIA GeForce GTX 1070 8GB GPU. The main model codebase is implemented on Tensorflow and Keras libraries, pre-processing and post-processing on images implemented using OpenCV and scikit-learn. The proposed network is trained on 120 epochs with a learning rate of 0.0001 and total parameters are 63,733,406 (trainable Params: 63,621,918 and non-trainable: 111,488).
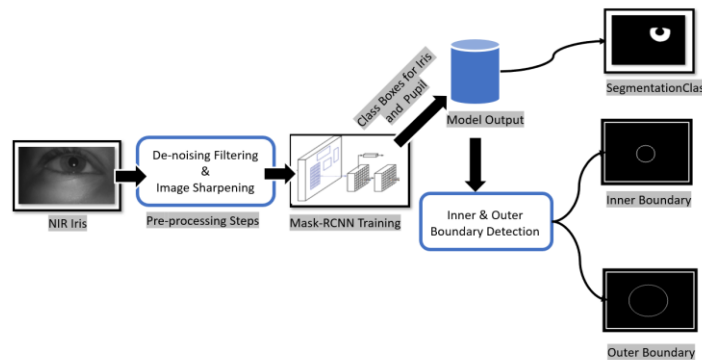

Figure1. Detailed Deep Learning pipeline for segmenting the Periocular region by leveraging the Mask-RCNN.