

kaggle- Severstal: Steel Defect Detection

Peixi Zhao, Xushan Hu, Danny Trinh

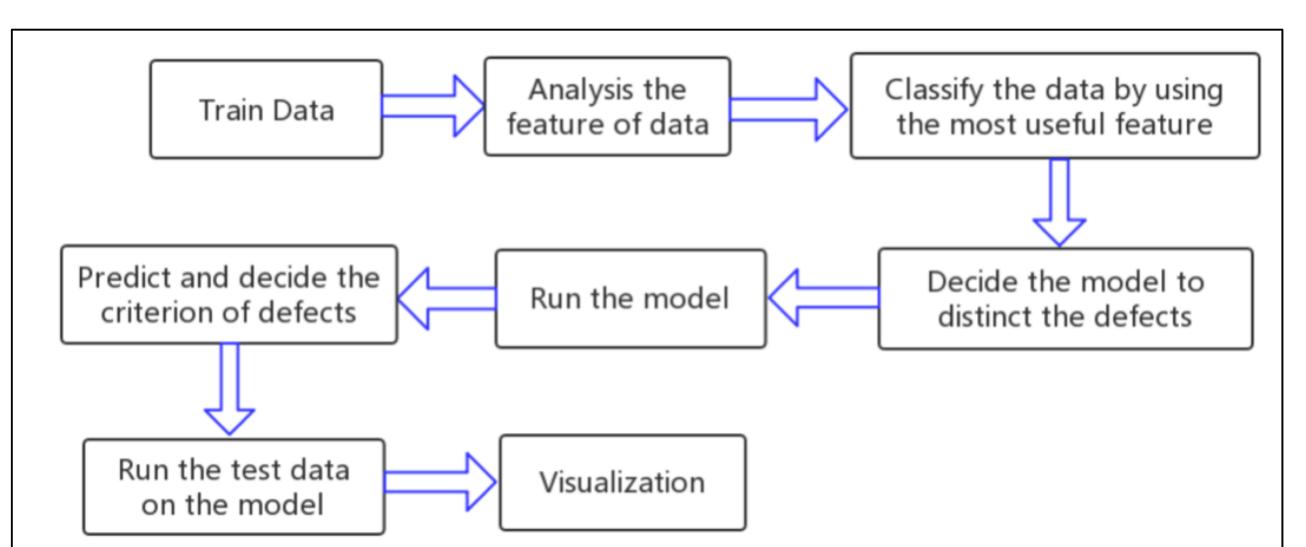
BOSTON
UNIVERSITY

Product Definition

This product is to be able to detect defects in steel during manufacturing with a machine learning algorithm. Steel is used in a variety of ways such as in buildings, railways, roads, and other infrastructures. Skyscrapers, airports, bridges, and stadiums are just some of the examples of buildings that occupy a large amount of people. Defects in steel used in the construction of these buildings could result in a catastrophic event if the steel were to fail. The goal of our project is divided to 2 parts: first, localizing the defects' areas and locations. Second, classifying the defects.

System Design

Firstly, we use the dataset to train the model we initial select. After comparing each model's accuracy. We finally chose MASK_RCNN model.



Through MASK_RCNN model, it will firstly mask the defect location then give the prediction of which type is the defect.(There are 4 types of defect)

Model Selection

MASK_RCNN: Mask RCNN is a deep neural network aimed to solve instance segmentation problem in machine learning or computer vision.

Mask R-CNN Hyperparameters:

ResNet101 backbone

~82% classification rate

Epoch 9

Steps per epoch = 4500

Learning Rate .001

Learning Momentum 0.9

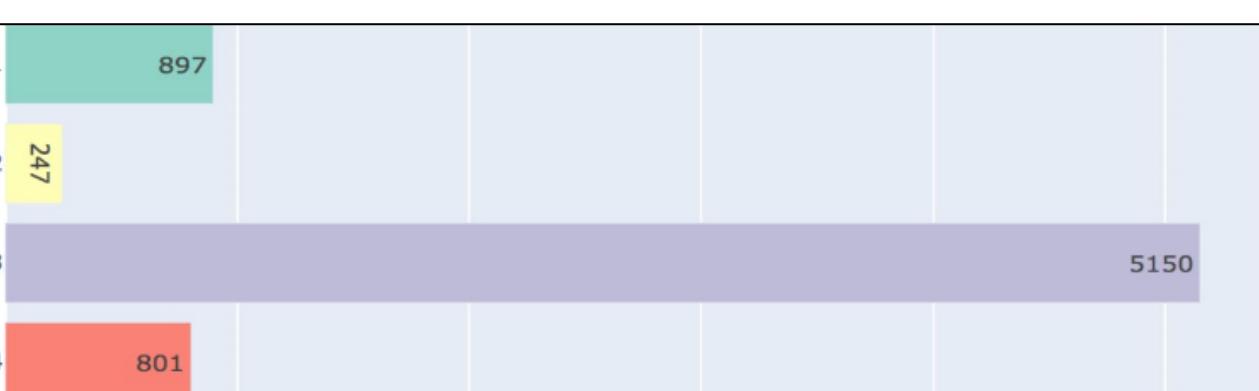
Dataset and Training

Base on the analysis of csv files and image files of our dataset, here is some details of the dataset. We have 5982 images with no defects and 6666 images with defects. The defects can be divided into 4 different classes. As the results shown, class 3 is most popular defects, which is easier to be classified. In addition, there also some multi-label defects.

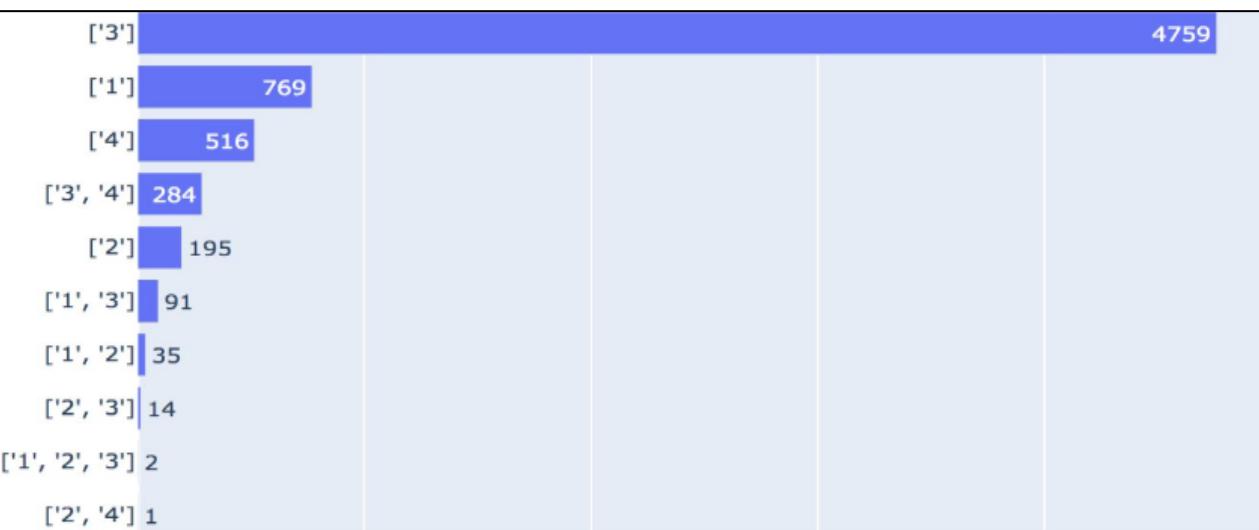
Dataset Details:

the number of images with no defects: 5982
the number of images with defects: 6666

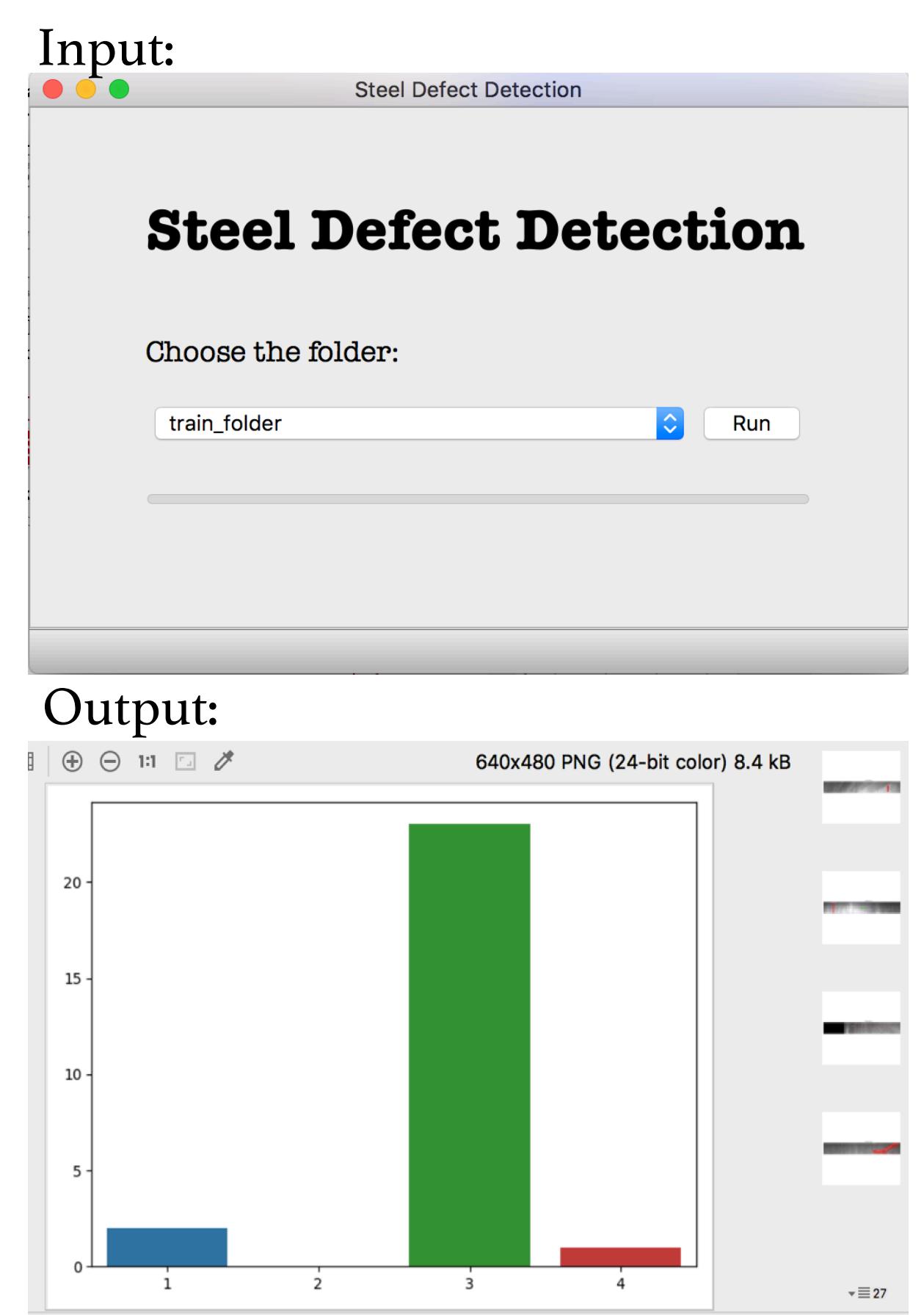
Count for 4 defects class:



Defect combination in images:

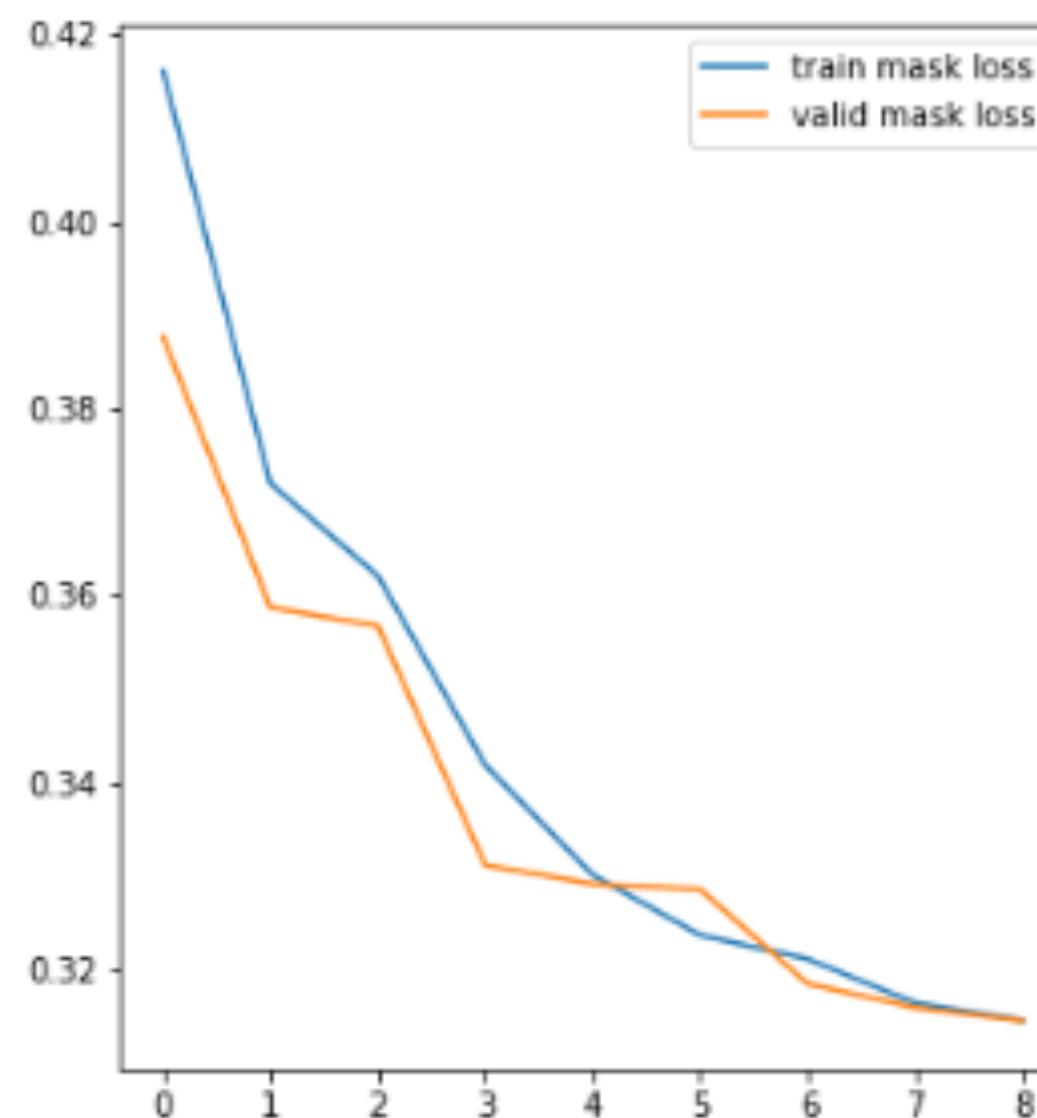


User Interface

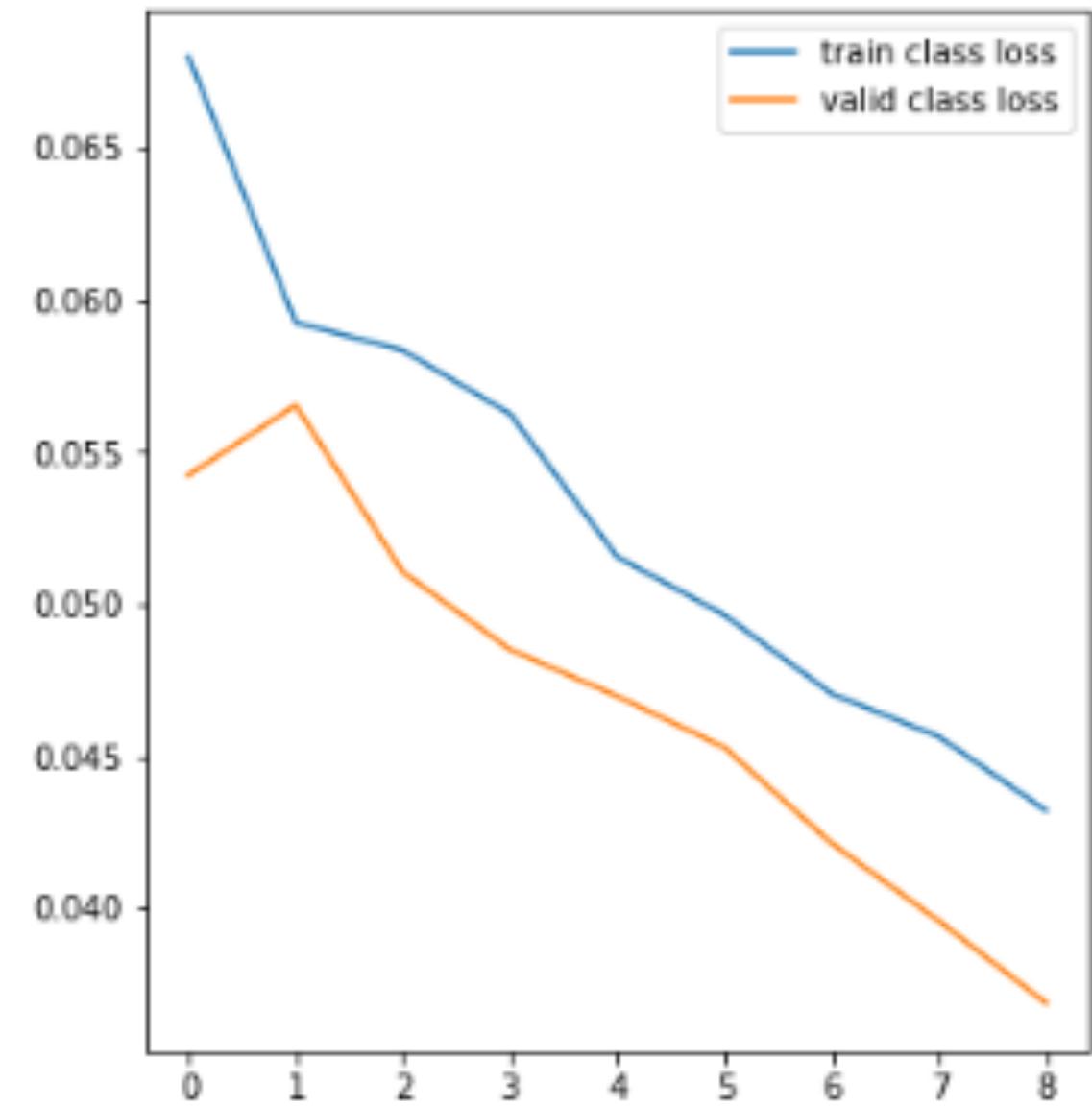


Result

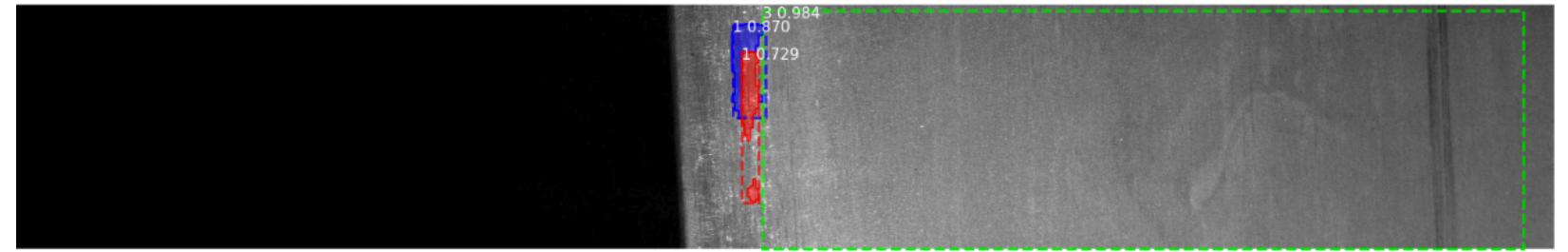
MaskRCNN Class Loss



MaskRCNN Mask Loss



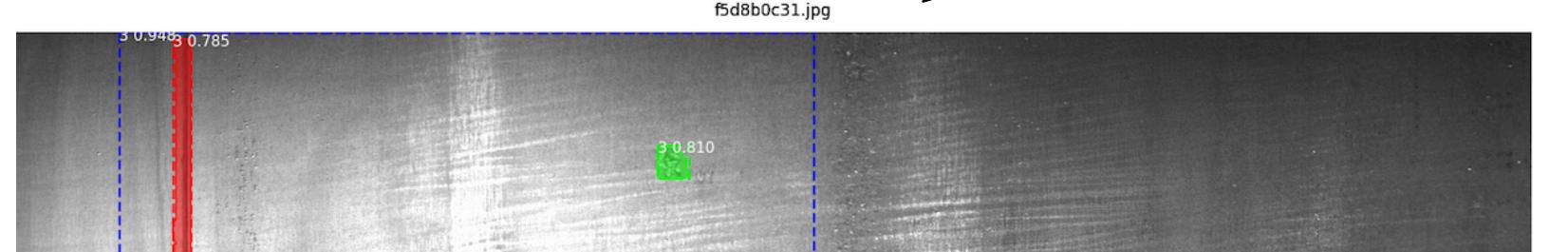
Defect Class 1



Defect Class 2



Defect Class 3



Defect Class 4

