

To,
IITD-AIA Foundation of Smart Manufacturing

Subject: Weekly Progress Report for Week 3

Dear sir,

Following is the required progress report to the best of my knowledge considering relevant topics and project objectives covered.

What happened last week - W2:

- Studying Dataset
- Experimentation with **group00041** dataset
- Exploratory Data Analysis (Primitive draft)
- Dataset size reduction for faster computation
- Working with Pillow (or PIL) library for image manipulation
- Working on the algorithm and implementation sequentially
- Extracting Defects using OpenCV
- Defect extraction by cropping the particular segment mentioned in notation files

What's happening this week - W3:

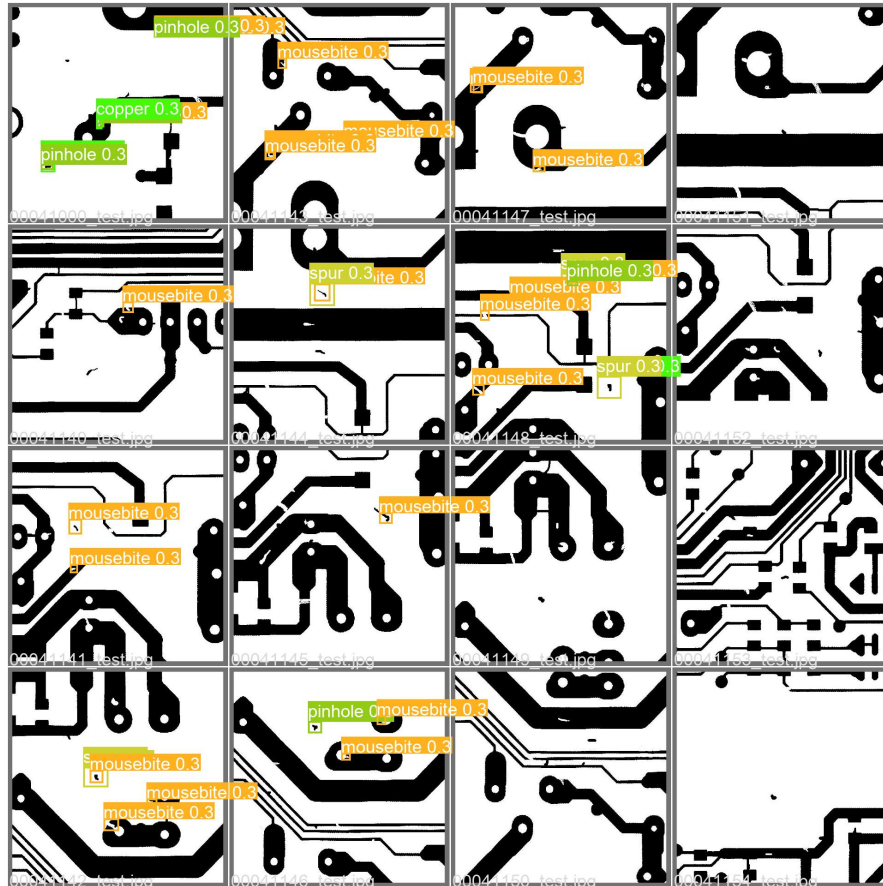
- Built the first primitive draft of the deep learning model.
- Optimized constraints and algorithms.
- Tuned hyperparameters.
- Achieved the desired accuracy.
- Explored Flask framework.
- Started with deployment (partially, very initial stages)

Weekly Progress:

June 13:

(Monday) Trained the model with about 100 images and came up with an innovative architecture that can indeed provide a good validation and cross-validation (or test) result.

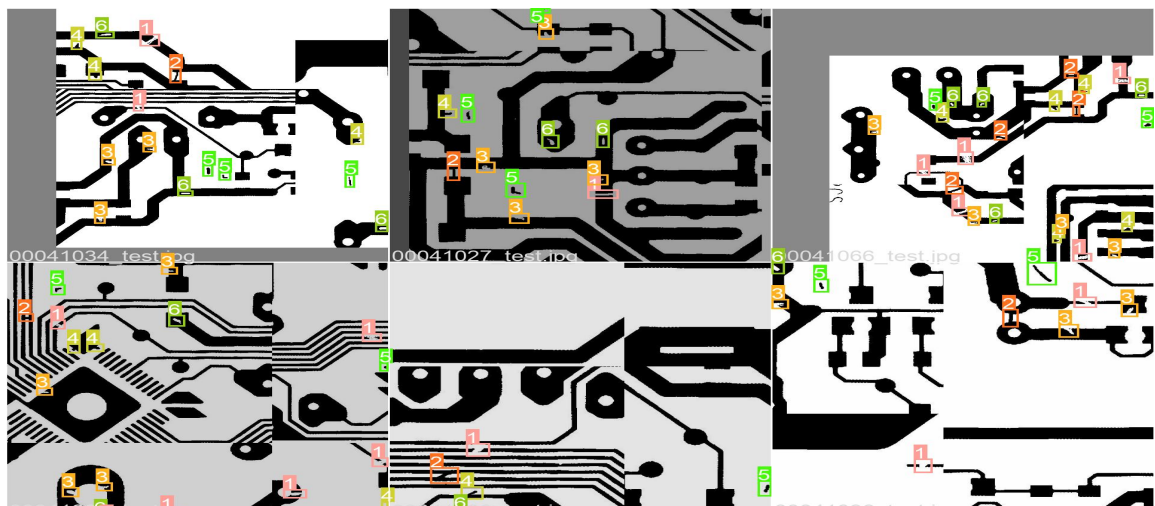
- Learnt to work with YOLOv5 and how it can be minimalistically applied to any annotated dataset.
- I converted simple annotations into YOLO readable format using my own python script.
- Implemented a simple neural network algorithm over the image dataset. Results have been mentioned below.
- A total of 8 experiments were carried out, out of which 2 were successfully finished, and 6 were truncated due to lack of resources.



June 14:

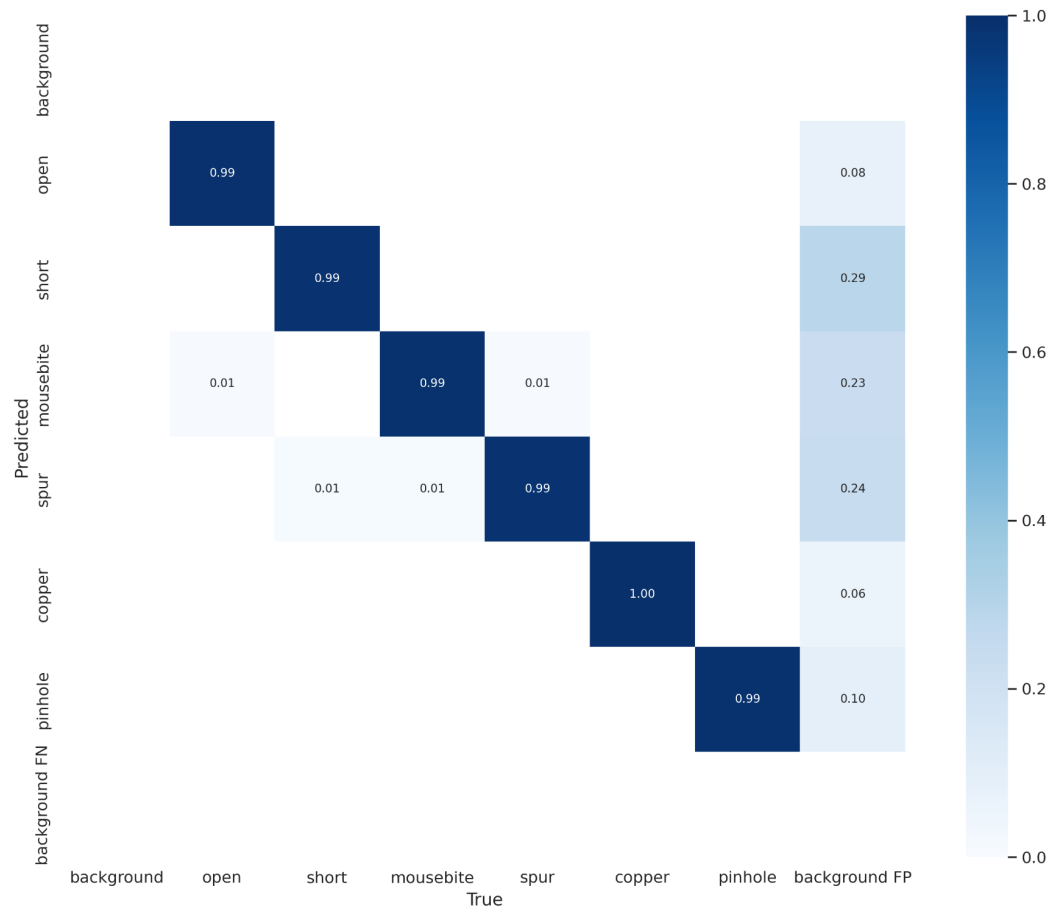
(Tuesday) I tried building a few models with certain variations in parameters and layers. Trained the model with over a thousand images and came up with an innovative architecture that can indeed provide a good validation and cross-validation (or test) result.

- Same learnings and implementation as the previous day, but with various different parameters.
- The results are as follows:



June 15:

(Wednesday) Achieved 99.6% accuracy.



Confusion Matrix of the final model

Finally, started to train my model with 1500 images, 500 epochs and a batch size of 16, image-size 320 (reduced from 640 to reduce computation cost).

June 16:

(Thursday) Turns out the model needs a lot more than 24hrs to get trained into something meaningful.

- Started with learning Flask from Harvard's CS50 course.
- Basically refining a few backend concepts to their core.

Worked upon deploying some basic things to the flask, like Hello World Application. Stuck with the deployment of the model, however, I worked upon validating my model by using some examples on my own. Human verification feels to be an integral part of validating any model.

June 17:

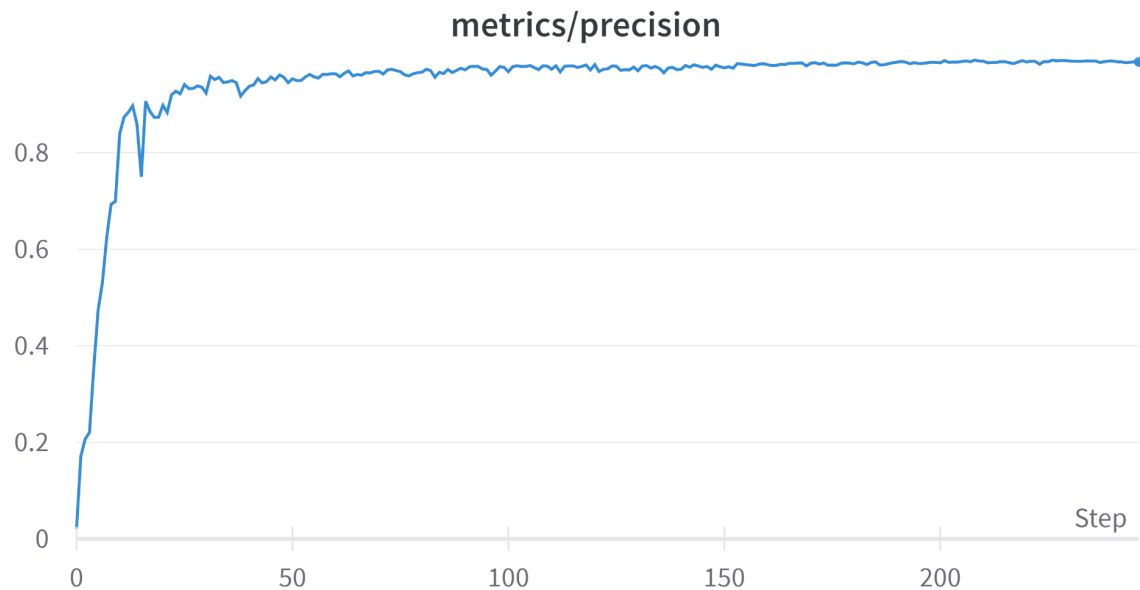
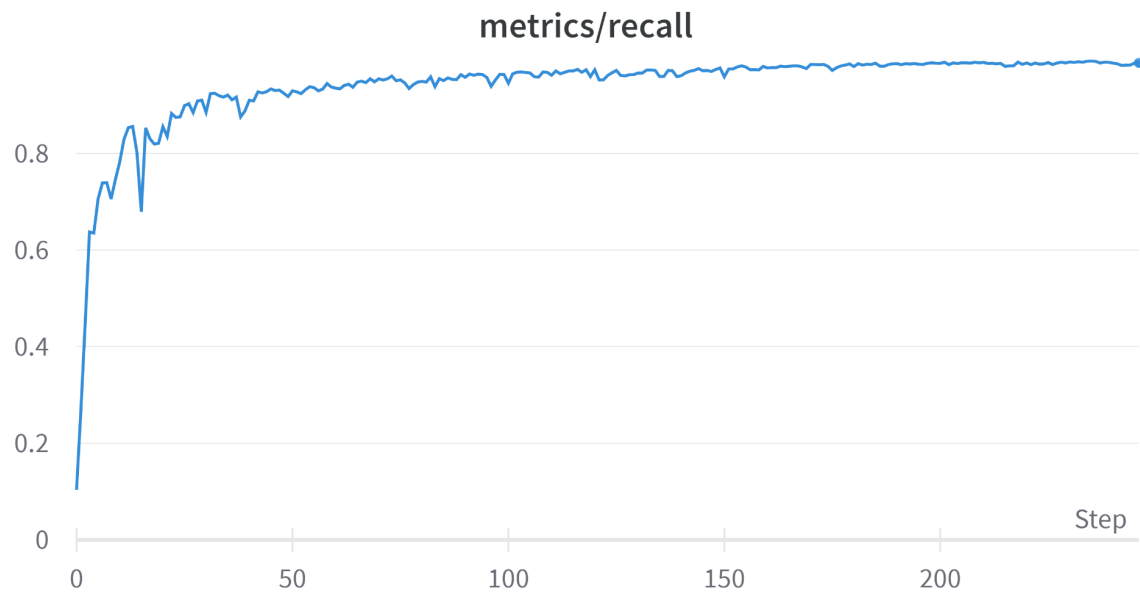
(Friday) made a very minimal model deployment environment using Flask.

- Deployment of a machine learning model using flask can be a little out of the developing world and we enter into the web development part, which I feel, I am a little uncomfortable with.

- I am still learning and observing how people have used this framework. Seems easier than Django hence, I immediately chose it over the latter.

June 18:

(Saturday) Meanwhile, observed the model performance over-time domain and analysed some crucial points.

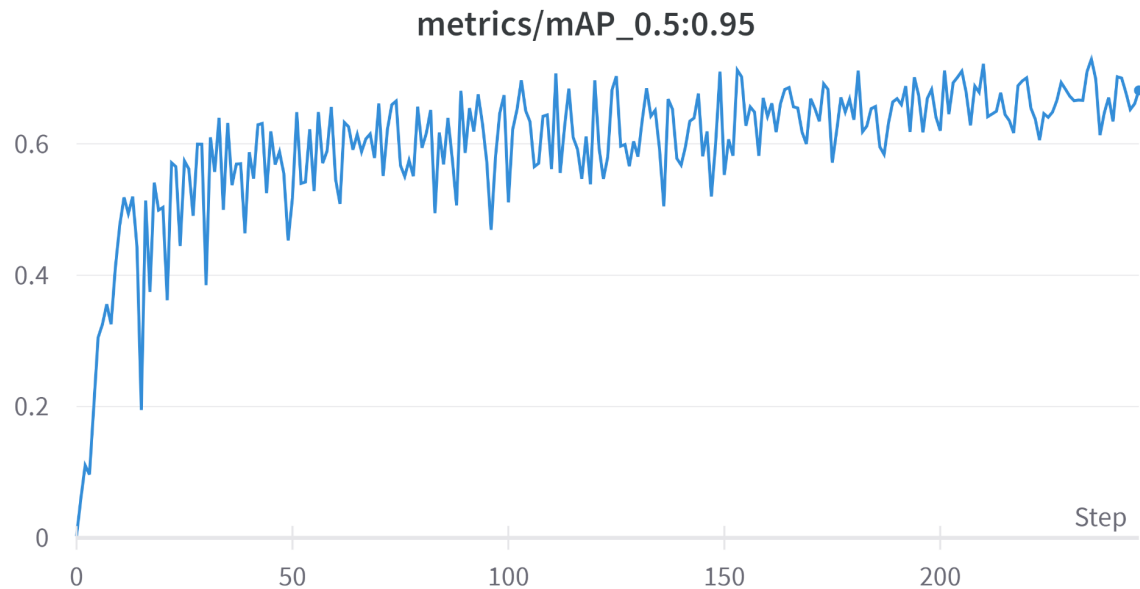


Graphical representation of **precision** and **recall** with respect to **epochs/steps**

June 19:

(Sunday) As I am going a bit ahead of my timeline and using a Linux system now becomes a necessity, because the libraries I need access to aren't available for the Windows system yet. I mostly worked on documenting my project across all the platforms.

I'll be receiving the Linux system's remote access through my institution for research purposes from Monday onwards, 5 days a week.



The above matrices represent variation of ratio **mAP_0.5:0.95** vs **epochs/steps**



The above matrices represent variation in **mAP_0.5** vs **epochs/steps**