Project Report (July 15, 2021)

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ABSTRACT

We discuss the progress on the fovea segmentation project after addition of various **metrics** to determine our performance and compare it to **2 other implementations**. We are also awaiting the **dataset** from Coudray for the lung cancer detection project.

Literature Review on DL papers

1. Paper 1: Tan et al
   - Converted RGB –> **LUV** –> processing on L –> RGB
   - LReLU, softmax, Xavier initialization is used
   - **7-layer** custom network is trained
   - Results are mentioned in **Table** 1
2. Paper 2: Sedai et al
   - 2 stage approach is used: **coarse network** followed by **fine network**
   - ImageNet pre-trained **VGG-16** model is used
   - **Class balanced cross entropy loss** is used to fix the imbalance problem
   - Results are mentioned in **Table** 1

Fovea Segmentation

- We graph and evaluate our results based on the **loss** and the **metrics**: Dice, Jaccard, Sensitivity, Specificity and Accuracy.
- **Figures** [1,2,3,4,5,6] shows our training progress using different learning rates **[1, 1e-2, 1e-4, 1e-6, 1e-8]** on **DeepLabV3+** model with **EfficientNet-B3** as the backbone.
- **Table** 1 shows a comparison between our model and the other methods based on the metrics stated above.

Method	Dice(F1score)	Jaccard(MIoU)	Sensitivity	Specificity	Accuracy
Traditional Method (non-DL)	0.8044	0.6881	0.8162	**0.9984**	**0.996**
Deep Learning(ours)	**0.8987**	**0.8315**	0.8214	0.9978	**0.996**
Deep Learning (Tan et al)	-	-	**0.8853**	0.9914	-
Deep Learning (Sedai et al)	0.81	-	-	-	-

Table 1. Metrics Comparison

Coudray Data Update

- Coudray has successfully transfered the dataset to another student. He is currently on vacation, but we hope to retrive the dataset soon.
- GitHub Issue for the entire discussion

Discussion

- We trained 5 models with **lower range** for learning rates to observe the results.
- We overviewed 2 DL papers and were able to **achieve better metrics** than them.
- We also looked into unsupervised techniques like **Contrastive Predictive Coding V2** by DeepMind and are trying to collect unlabelled data to use these **self-supervised/semi-supervised** approaches that we have explored.
- As soon as we acccess to the coudray dataset, we will start experimenting on the implementation and try to **reproduce the benchmarks** that they have achieved in the paper.

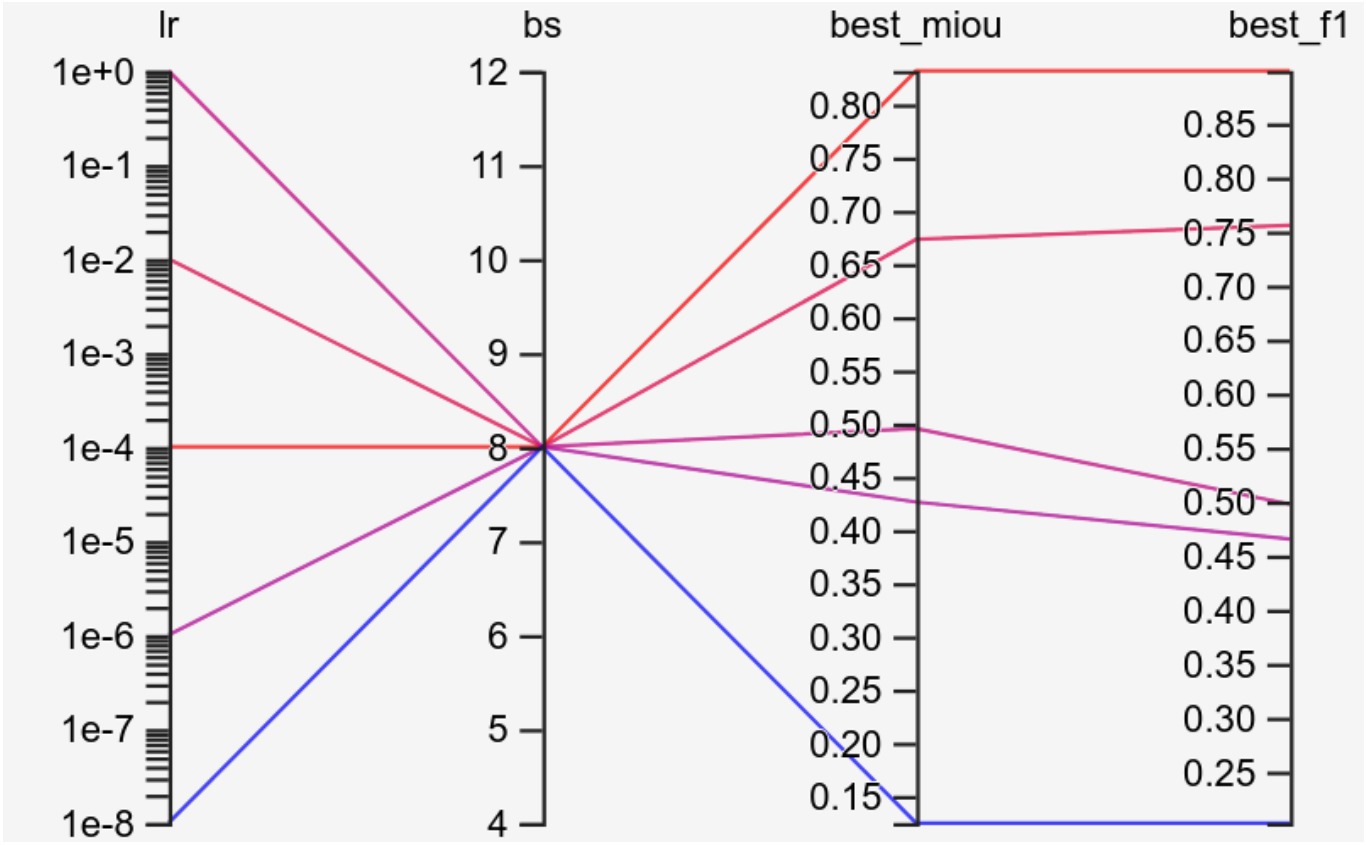

Figure 1. Comparison of all models

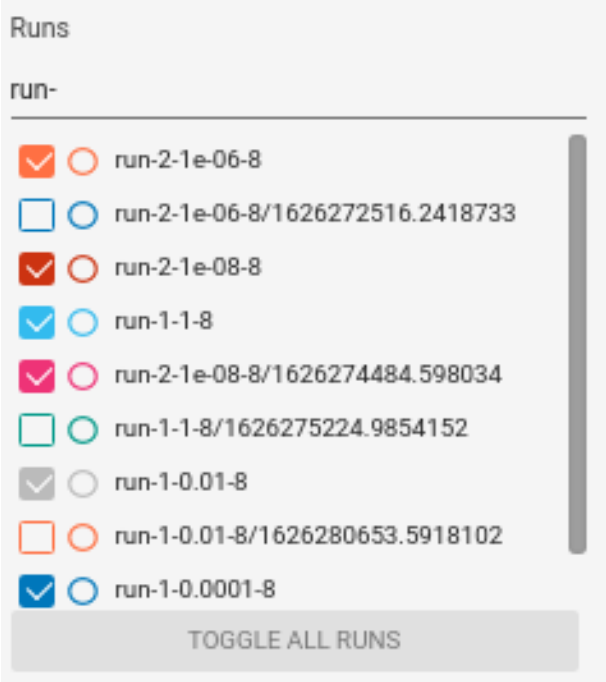

Figure 2. Legend for models

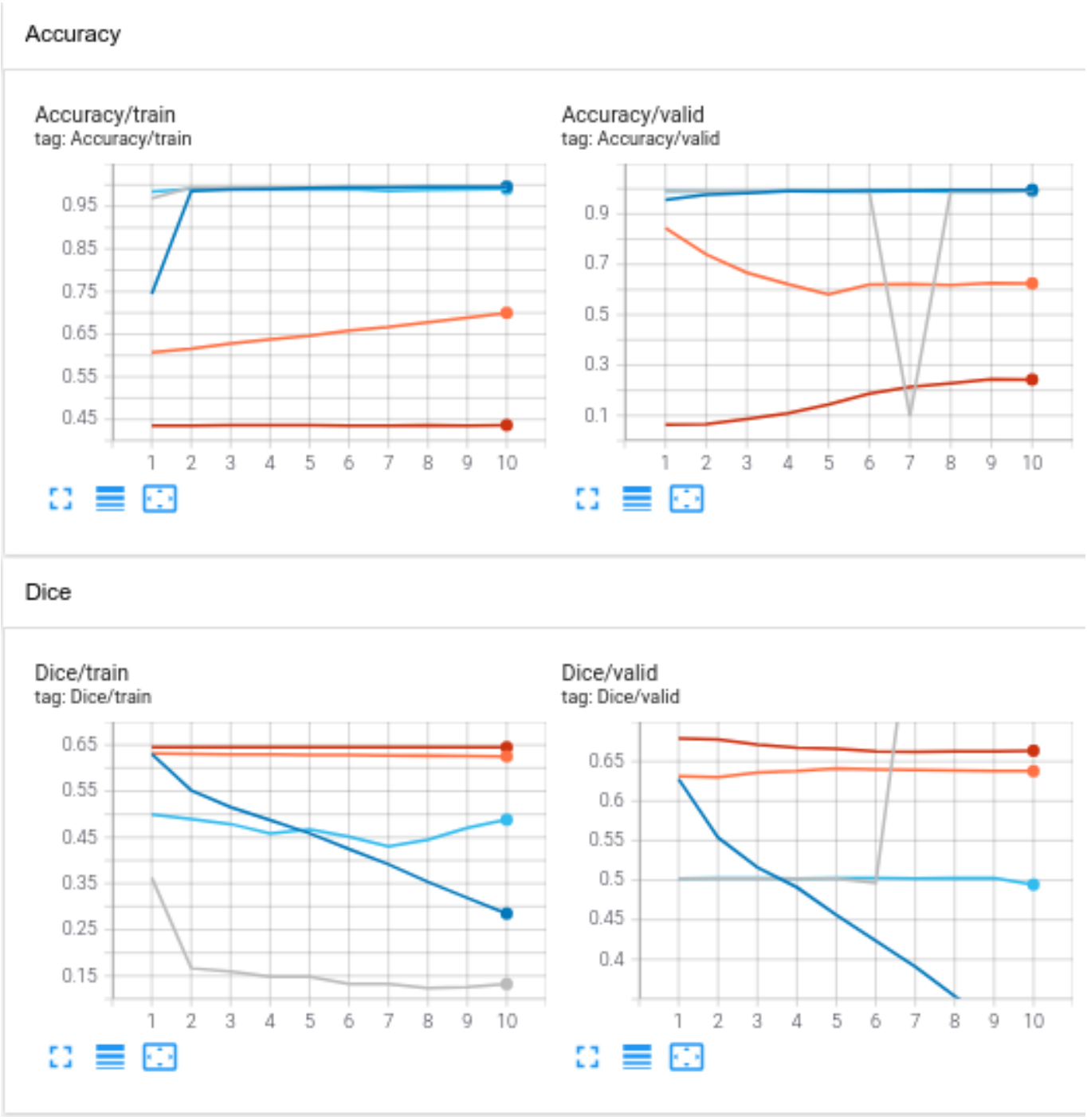

Figure 3. Metrics-1

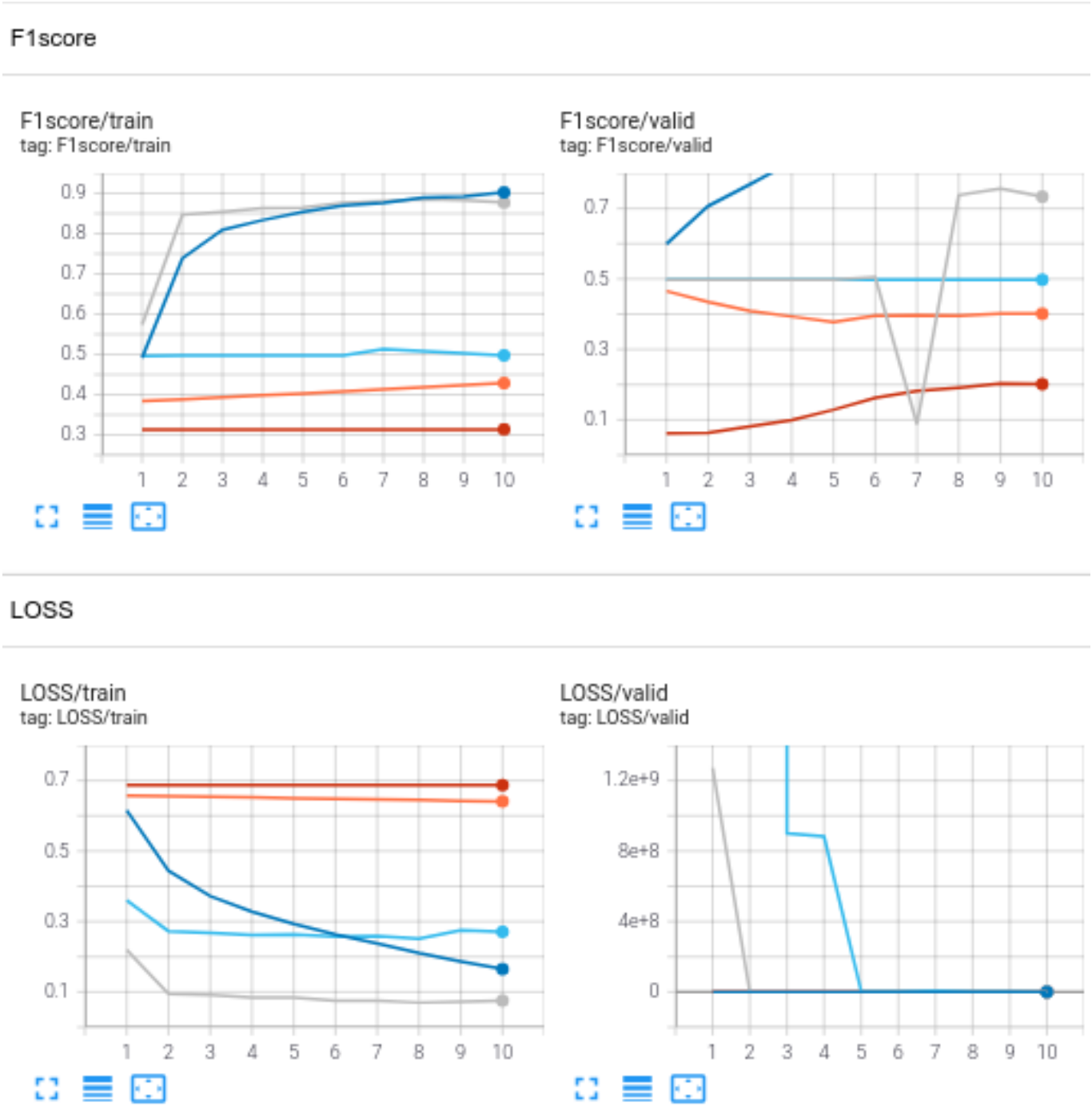

Figure 4. Metrics-2

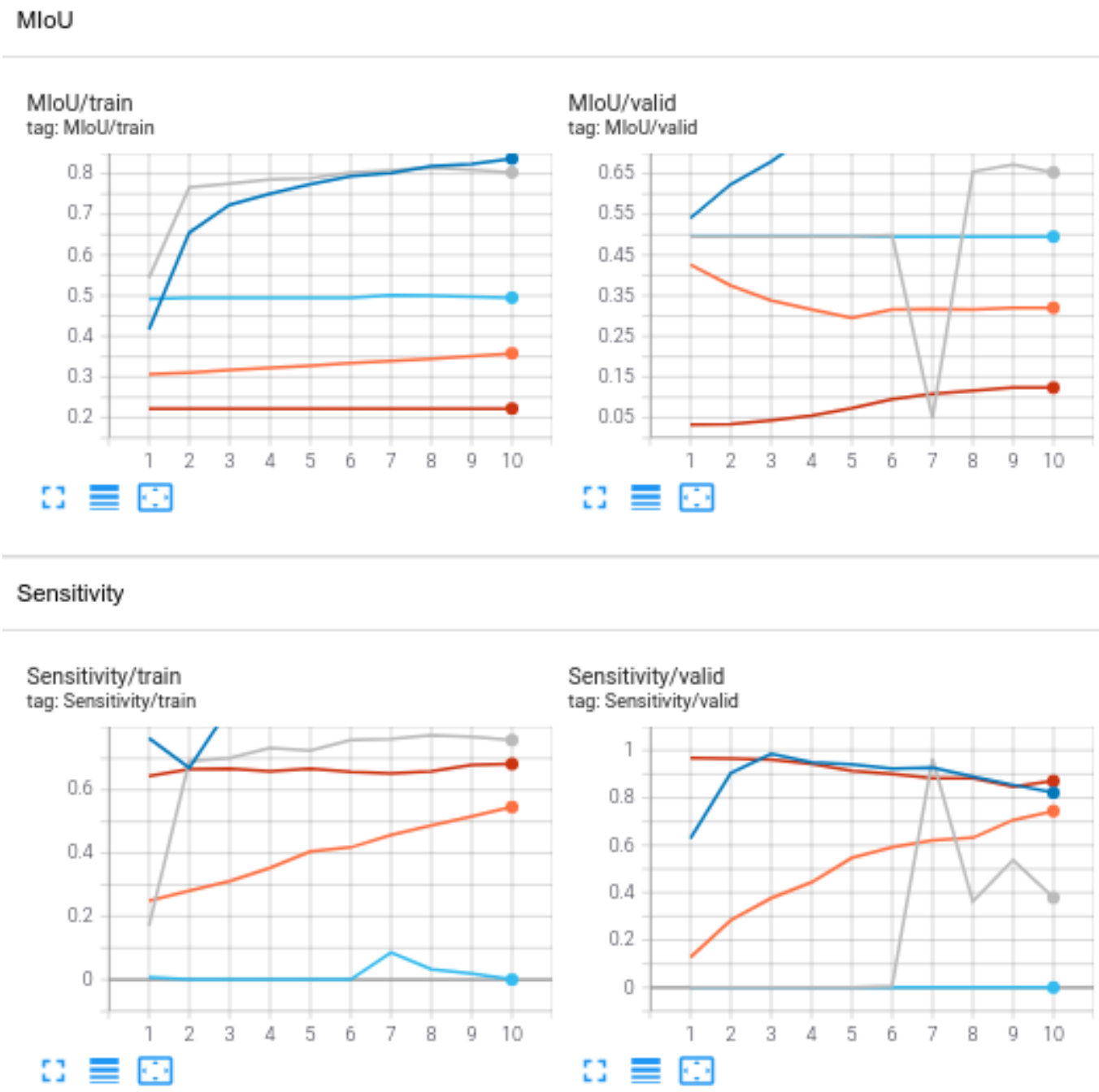

Figure 5. Metrics-3

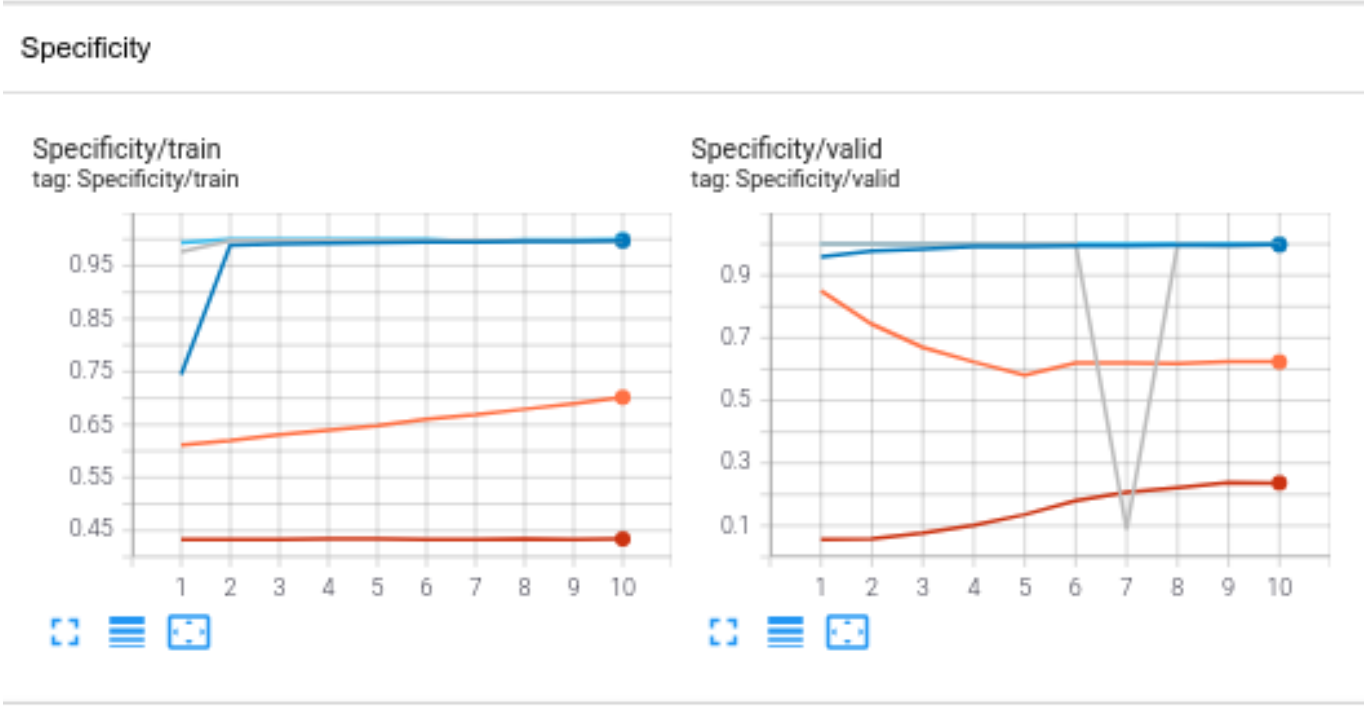

Figure 6. Metrics-4