A TensorFlow Reimplementation of CheXNet

Classification and Localization of Thoracic Diseases

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DagsHub SOTA, July 2022

Table of Contents

Table of Contents

Goals & Motivations

The primary aim of the paper is to implement the CheXNet paper, prioritizing reproducibility using modern MLOps techniques.

CheXNet detects 14 diseases in the ChestX-ray14 dataset and achieves state of the art results on all 14 diseases.

Original Paper:
`https://arxiv.org/pdf/1711.05225.pdf`

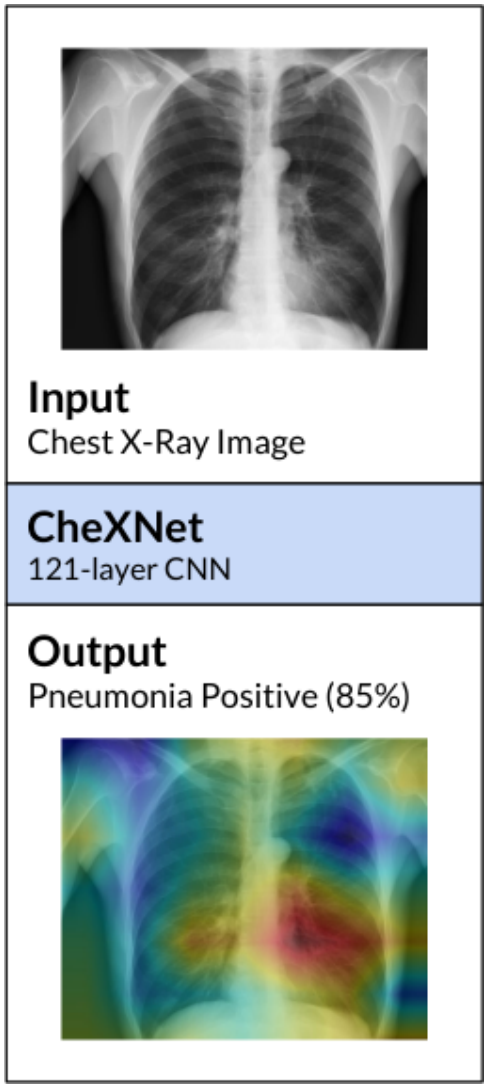


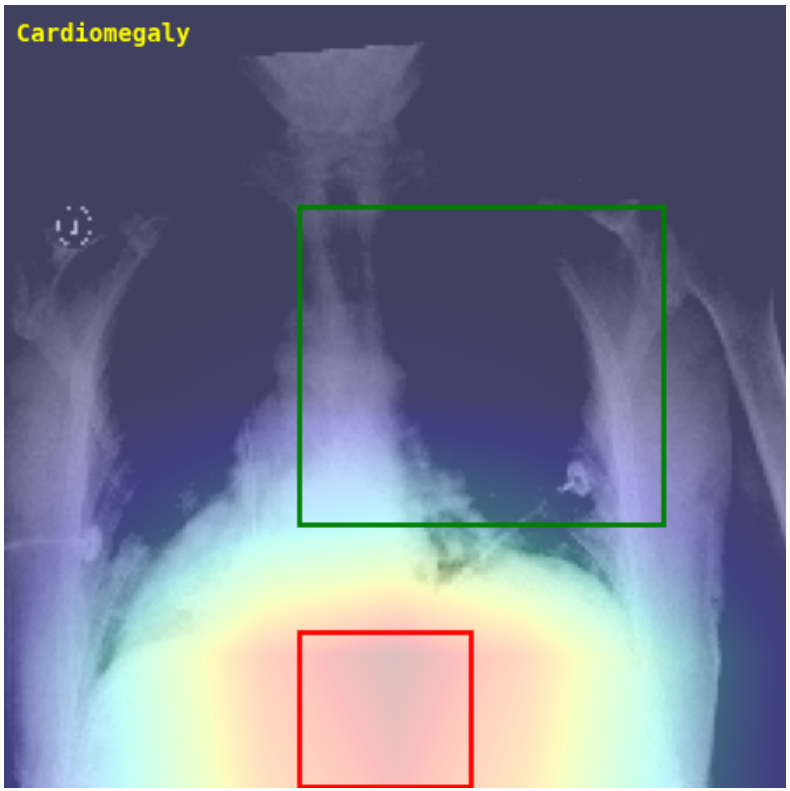
Table of Contents

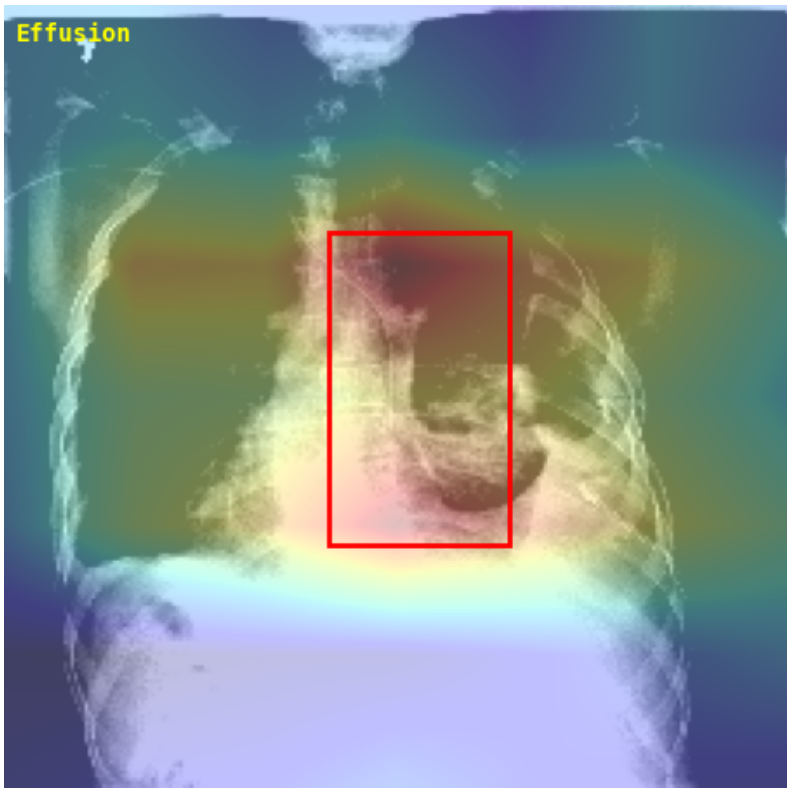
Network ___

1. Architecture
   - `DenseNet-121` Pre-Trained on ImageNet
   - Outputs a vector of binary classifications
2. Optimizer: Adam
   - $\beta_1 = 0.9$
   - $\beta_2 = 0.999$
   - $LR = 0.001$
3. Batch Size: 16
4. Callbacks
   - `ModelCheckpoint`
   - `DAGsHubLogger`
   - `ReduceLROnPlateau`
   - `CSVLogger`
5. Loss: `BinaryCrossentropy`
6. Epochs: 10

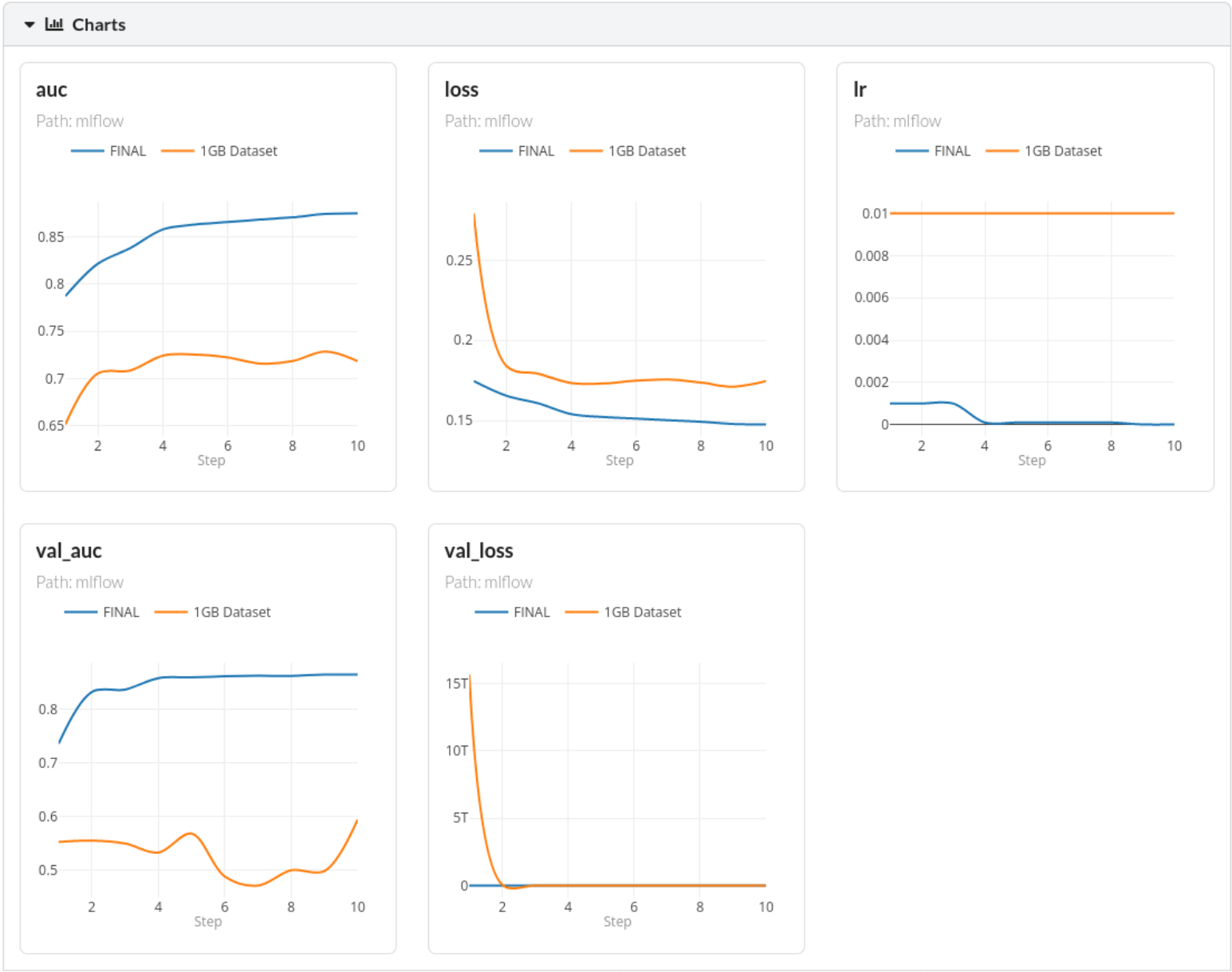
Table of Contents

Stratified Dataset Subsamples are Error-Prone





contd.


Charts
auc
Path: mlflow
FINAL
1GB Dataset
0.85
0.8
0.75
0.7
0.65
2
4
6
8
10
Step
loss
Path: mlflow
FINAL
1GB Dataset
0.25
0.2
0.15
2
4
6
8
10
Step
lr
Path: mlflow
FINAL
1GB Dataset
0.01
0.008
0.006
0.004
0.002
0
2
4
6
8
10
Step
val_auc
Path: mlflow
FINAL
1GB Dataset
0.8
0.7
0.6
0.5
2
4
6
8
10
Step
val_loss
Path: mlflow
FINAL
1GB Dataset
15T
10T
5T
0
2
4
6
8
10
Step

Overfitting with Higher LR

Ebbs in the validation accuracy increase are a symptom of overfitting.

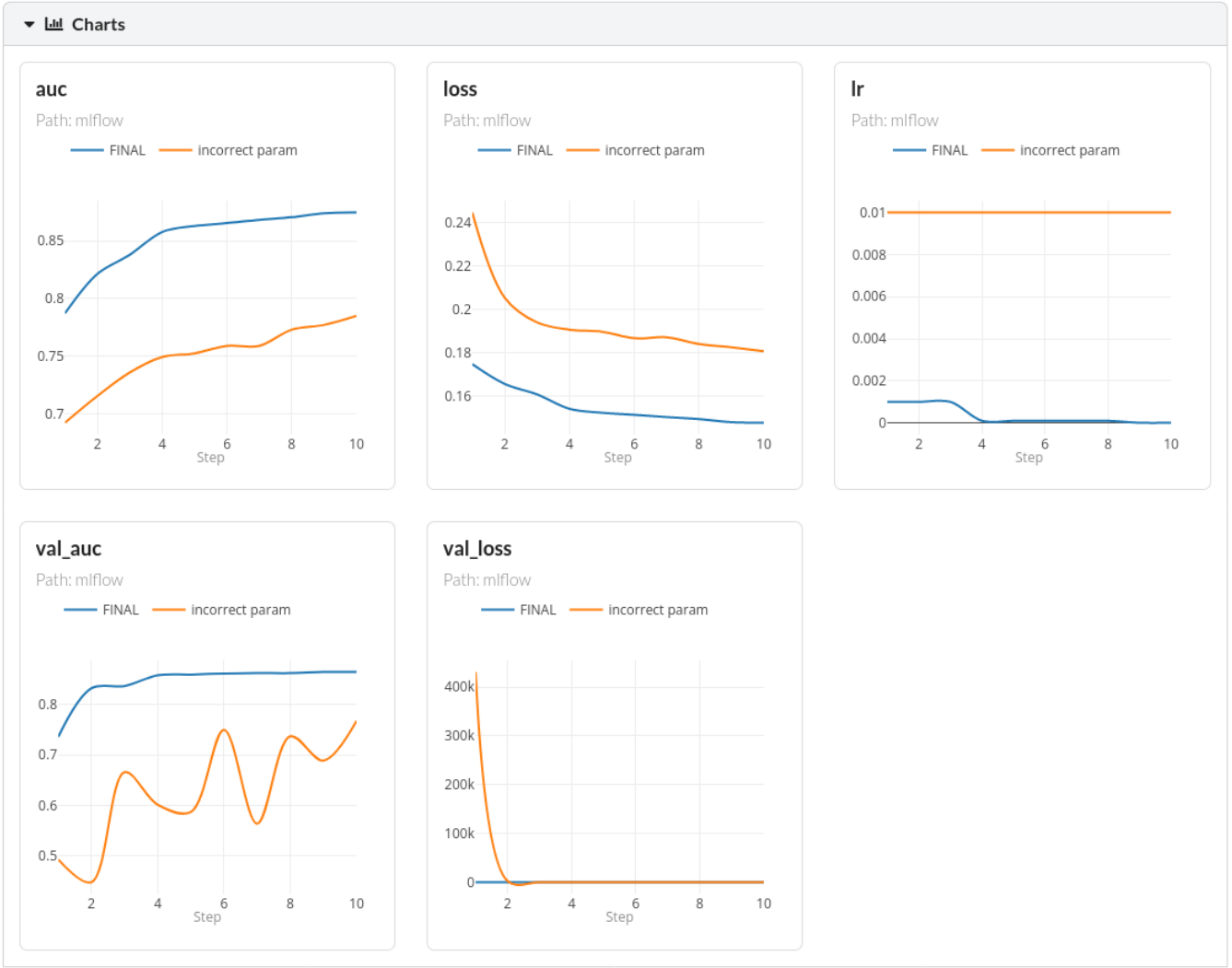


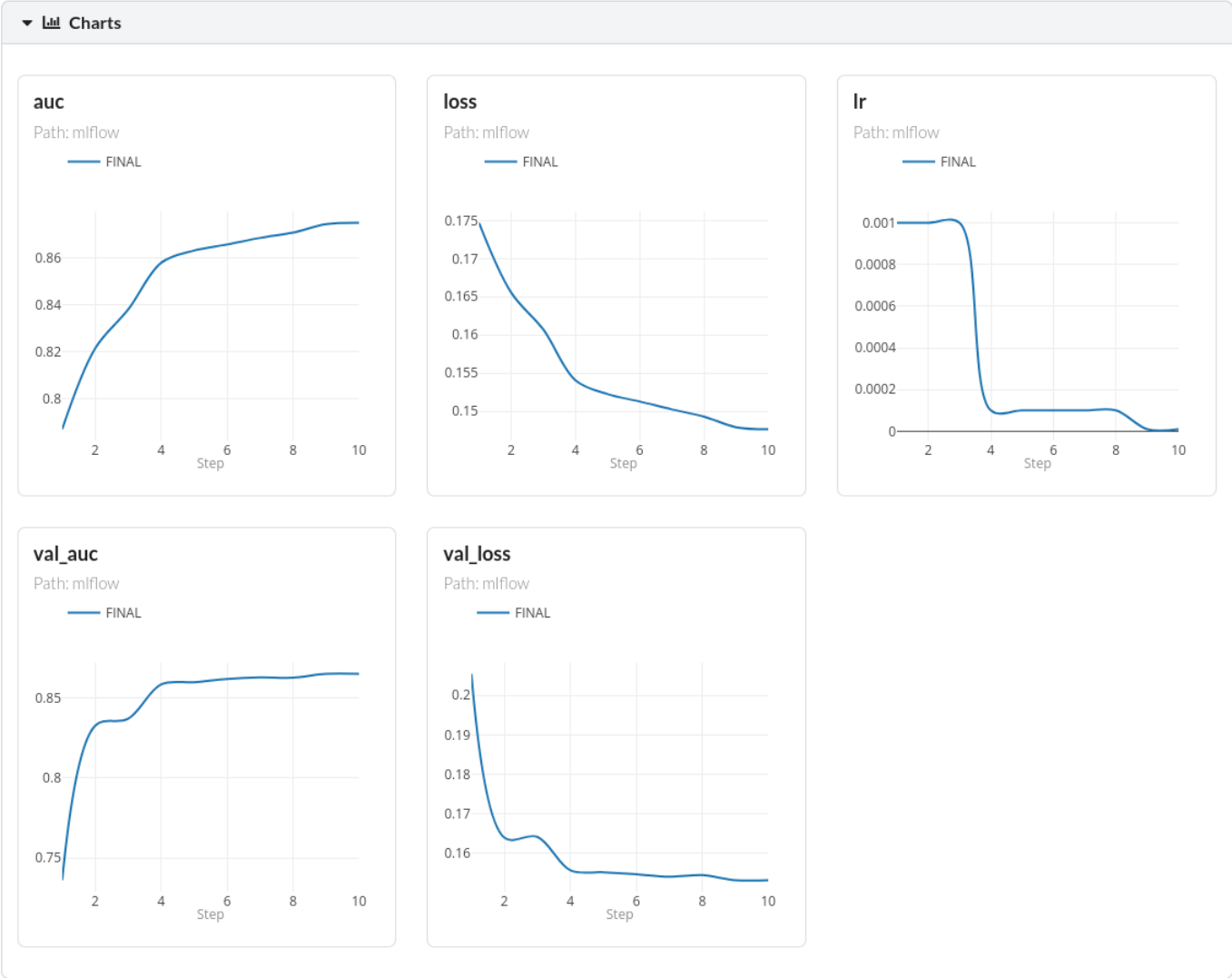
Table of Contents

Metrics

The original paper reports a mean AUROC of 0.841.

Our reproduction:

1. *AUROC* : 0.874
2. *Loss* : 0.147
3. *LR* : $1.0e-05$
4. Validation AUROC: 0.865
5. Validation Loss: 0.153



Localization

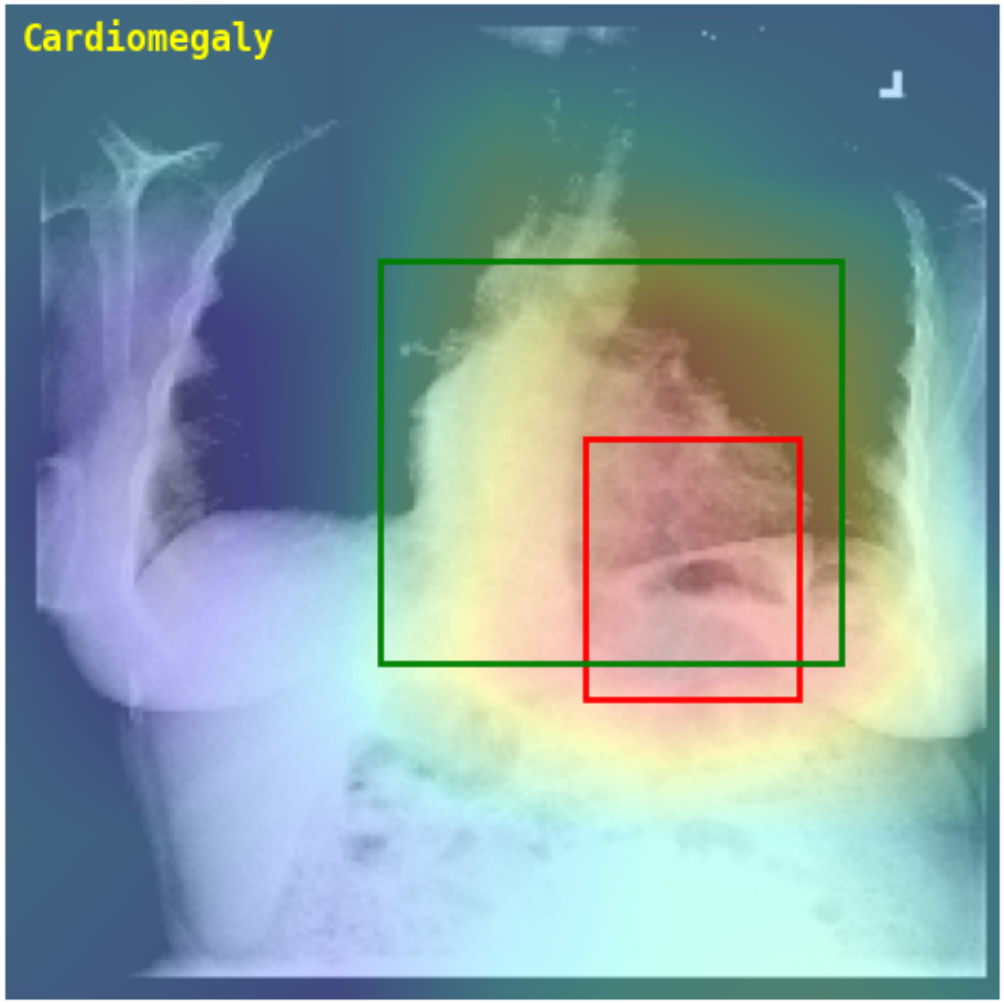
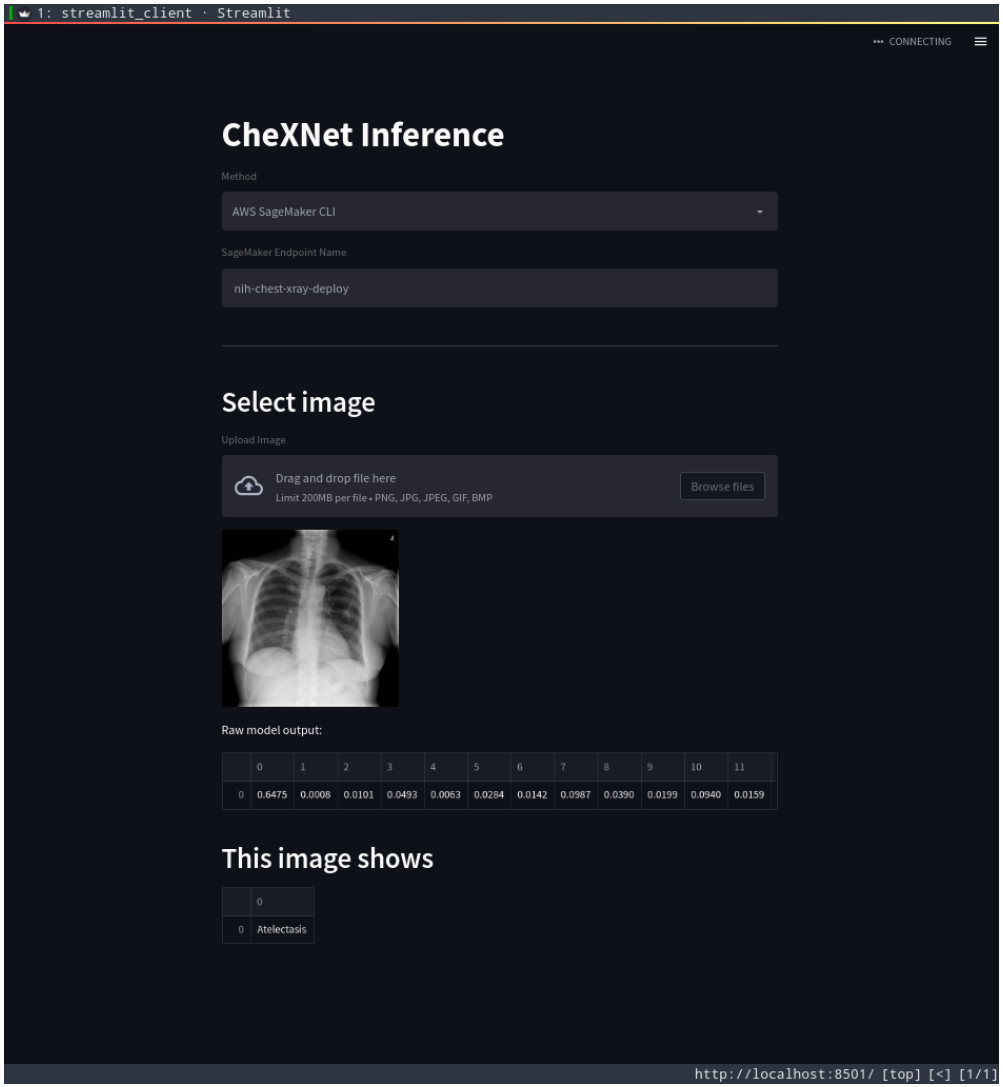


Table of Contents

Streamlit x MLFlow Model Registry

Streamlit as a frontend, MLFlow model registry handling web requests via a cloud backend.



Thank you!

Have an awesome rest of your day!

Project Repository: `https://dagshub.com/nirbarazida/chexnet.git`
Slides: `https://www.cs.purdue.edu/homes/jsetpal/chexnet.pdf`