ENGR296-Credit-Card-Fraud-Detection

August 10, 2020

ENGR296 - Final Project

Credit Card Fraud Detection

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```
[1334]: import numpy as np
        import pandas as pd
        import seaborn as sns
        import warnings

        warnings.filterwarnings('ignore')
```

```
[1335]: df=pd.read_csv('creditcard.csv')
        df.head()
```

```
[1335]:    Time        V1        V2        V3        V4        V5        V6        V7  \
        0   0.0 -1.359807 -0.072781  2.536347  1.378155 -0.338321  0.462388  0.239599
        1   0.0  1.191857  0.266151  0.166480  0.448154  0.060018 -0.082361 -0.078803
        2   1.0 -1.358354 -1.340163  1.773209  0.379780 -0.503198  1.800499  0.791461
        3   1.0 -0.966272 -0.185226  1.792993 -0.863291 -0.010309  1.247203  0.237609
        4   2.0 -1.158233  0.877737  1.548718  0.403034 -0.407193  0.095921  0.592941

                 V8        V9  …       V21       V22       V23       V24       V25  \
        0  0.098698  0.363787  … -0.018307  0.277838 -0.110474  0.066928  0.128539
        1  0.085102 -0.255425  … -0.225775 -0.638672  0.101288 -0.339846  0.167170
        2  0.247676 -1.514654  …  0.247998  0.771679  0.909412 -0.689281 -0.327642
        3  0.377436 -1.387024  … -0.108300  0.005274 -0.190321 -1.175575  0.647376
        4 -0.270533  0.817739  … -0.009431  0.798278 -0.137458  0.141267 -0.206010

                 V26       V27       V28  Amount  Class
        0 -0.189115  0.133558 -0.021053  149.62      0
        1  0.125895 -0.008983  0.014724    2.69      0
        2 -0.139097 -0.055353 -0.059752  378.66      0
        3 -0.221929  0.062723  0.061458  123.50      0
        4  0.502292  0.219422  0.215153   69.99      0

        [5 rows x 31 columns]
```

Data Exploration

[1336]: `df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 284807 entries, 0 to 284806
Data columns (total 31 columns):
 #    Column   Non-Null Count    Dtype
---   ------   --------------    -----
 0    Time      284807 non-null   float64
 1    V1        284807 non-null   float64
 2    V2        284807 non-null   float64
 3    V3        284807 non-null   float64
 4    V4        284807 non-null   float64
 5    V5        284807 non-null   float64
 6    V6        284807 non-null   float64
 7    V7        284807 non-null   float64
 8    V8        284807 non-null   float64
 9    V9        284807 non-null   float64
 10   V10       284807 non-null   float64
 11   V11       284807 non-null   float64
 12   V12       284807 non-null   float64
 13   V13       284807 non-null   float64
 14   V14       284807 non-null   float64
 15   V15       284807 non-null   float64
 16   V16       284807 non-null   float64
 17   V17       284807 non-null   float64
 18   V18       284807 non-null   float64
 19   V19       284807 non-null   float64
 20   V20       284807 non-null   float64
 21   V21       284807 non-null   float64
 22   V22       284807 non-null   float64
 23   V23       284807 non-null   float64
 24   V24       284807 non-null   float64
 25   V25       284807 non-null   float64
 26   V26       284807 non-null   float64
 27   V27       284807 non-null   float64
 28   V28       284807 non-null   float64
 29   Amount    284807 non-null   float64
 30   Class     284807 non-null   int64
dtypes: float64(30), int64(1)
memory usage: 67.4 MB
```

**All our columns are Numeric, which means we don't need any Categorical Label ->
Numeric data conversion**

[1337]: `#Calculating the % of Null values in each column`
`df.isnull().sum()/df.shape[0]`

```
[1337]:  Time      0.0
         V1        0.0
         V2        0.0
         V3        0.0
         V4        0.0
         V5        0.0
         V6        0.0
         V7        0.0
         V8        0.0
         V9        0.0
         V10       0.0
         V11       0.0
         V12       0.0
         V13       0.0
         V14       0.0
         V15       0.0
         V16       0.0
         V17       0.0
         V18       0.0
         V19       0.0
         V20       0.0
         V21       0.0
         V22       0.0
         V23       0.0
         V24       0.0
         V25       0.0
         V26       0.0
         V27       0.0
         V28       0.0
         Amount    0.0
         Class     0.0
         dtype: float64
```

There are no NULL values

```
[1338]:  df.shape
```

```
[1338]:  (284807, 31)
```

Checking obvious correlations in the data

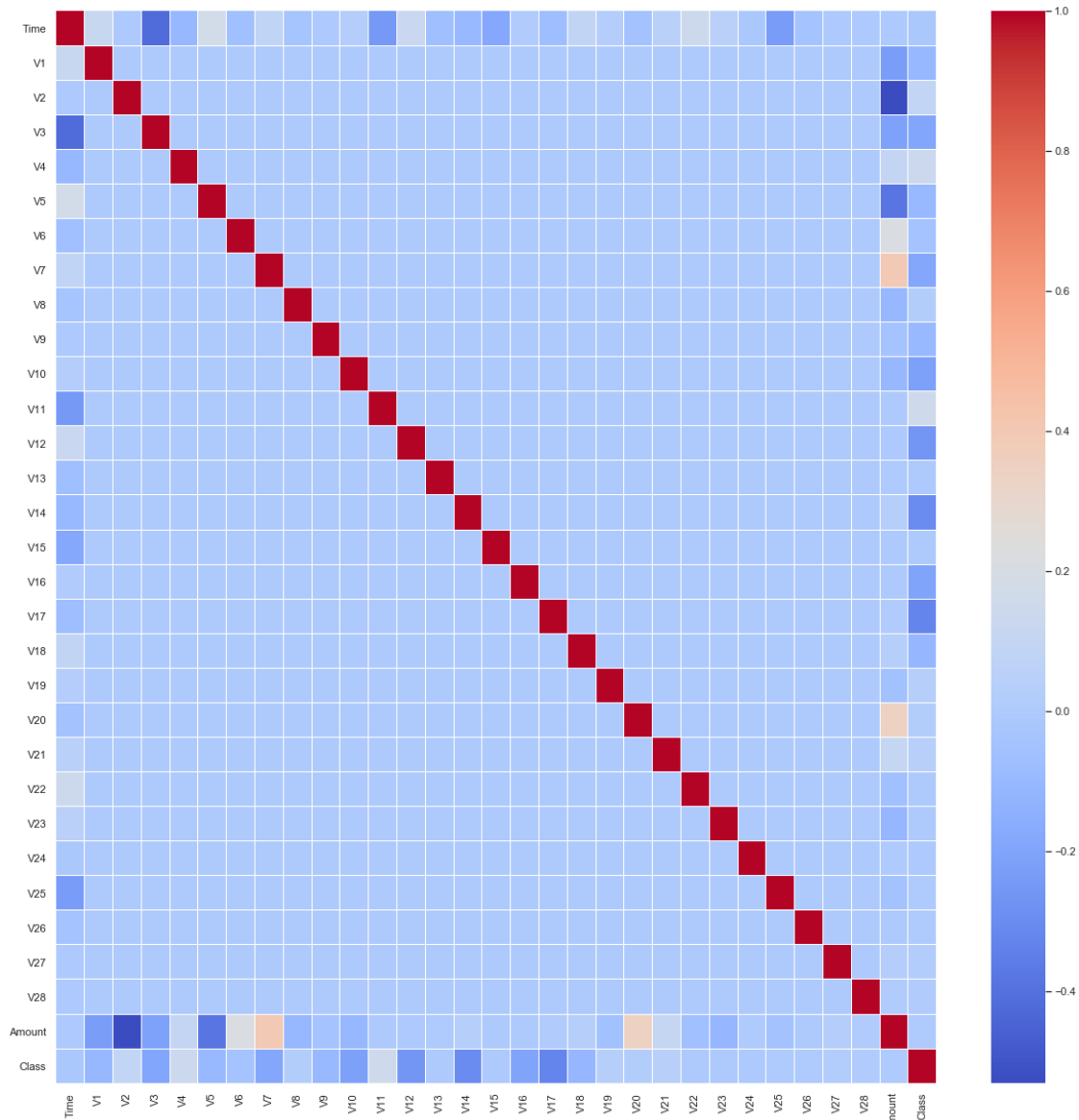```
[1339]: df.corr()
         df.corr().style.set_precision(3)
```

```
[1339]:  <pandas.io.formats.style.Styler at 0x1dc7bdae7c8>
```

Plotting the heatmap of data to see if there any obvious correlations

```
[1340]: import matplotlib.pyplot as plt

        figure = plt.figure(figsize=(20,20))
        figure.set_facecolor('w')
        sns.heatmap(df.corr(),annot=False,linewidths=0.01,cmap='coolwarm')
        plt.show()
```


We can see from the correlation data and heatmap, we can see that the
**V13,V15,V22,V23,V24,V25,V26 have very little correlation with our target variable
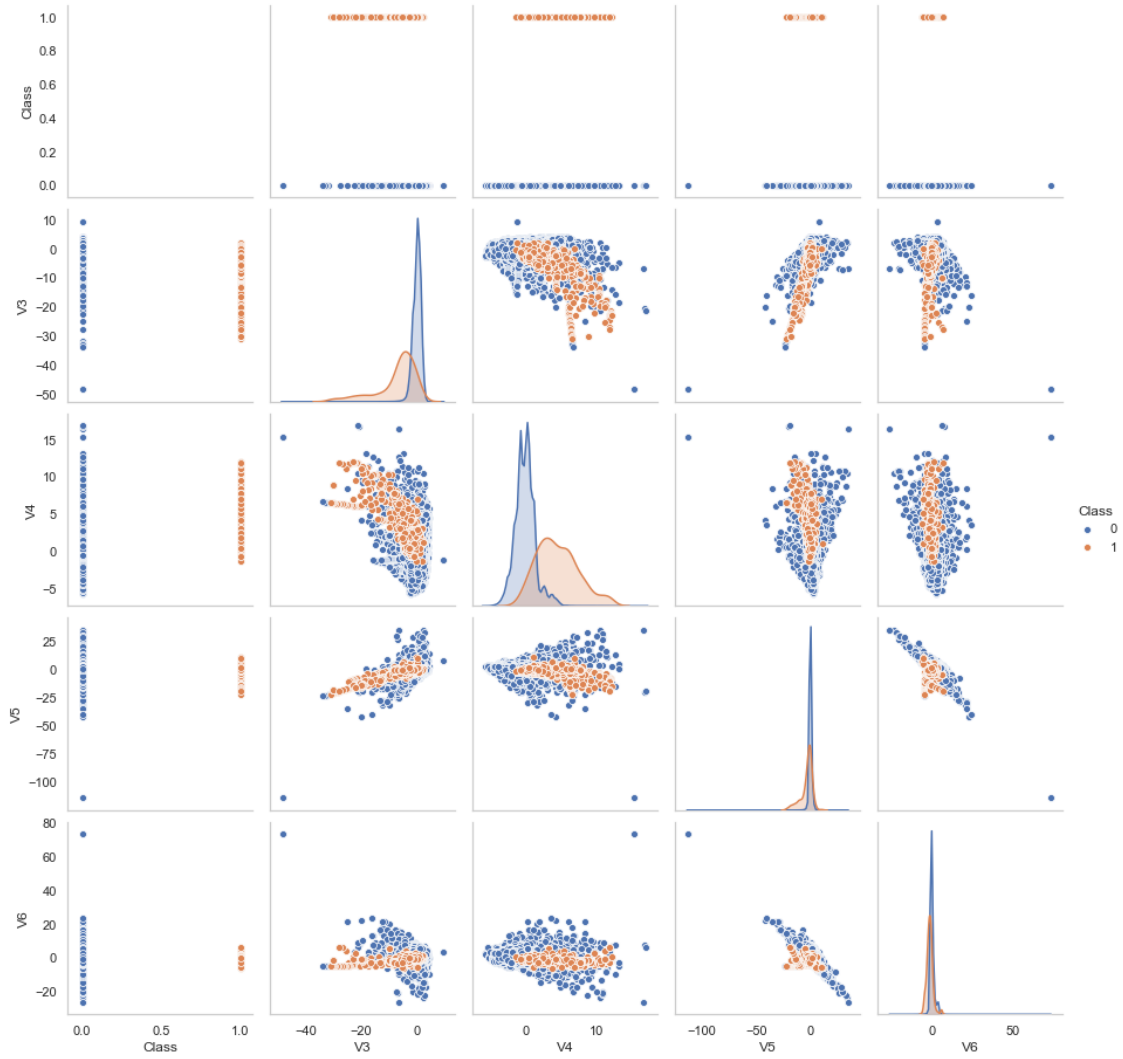Class**

```
[1341]: import seaborn as sns
        sns.set(rc={'figure.facecolor':'white'})
        sns.set_style("whitegrid", {'axes.grid' : False})
        sns.pairplot(df,vars = ['Class', 'Amount', 'Time','V1','V2'], hue = 'Class')
```

[1341]: `<seaborn.axisgrid.PairGrid at 0x1dc6bf3da48>`
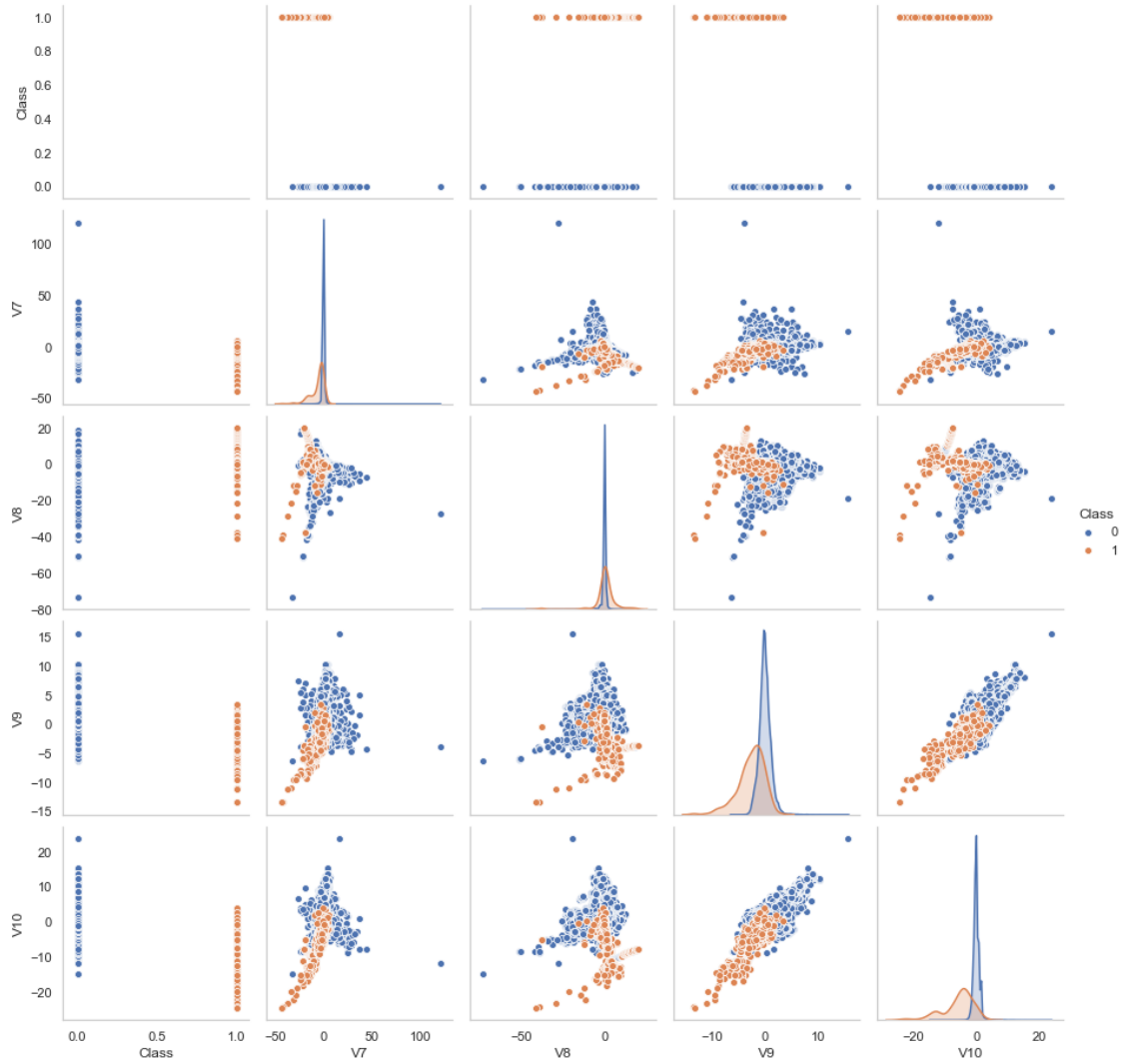


```
[1342]: sns.pairplot(df,vars = ['Class','V3', 'V4', 'V5','V6'], hue = 'Class')
```

[1342]: `<seaborn.axisgrid.PairGrid at 0x1dc6c7d2688>`
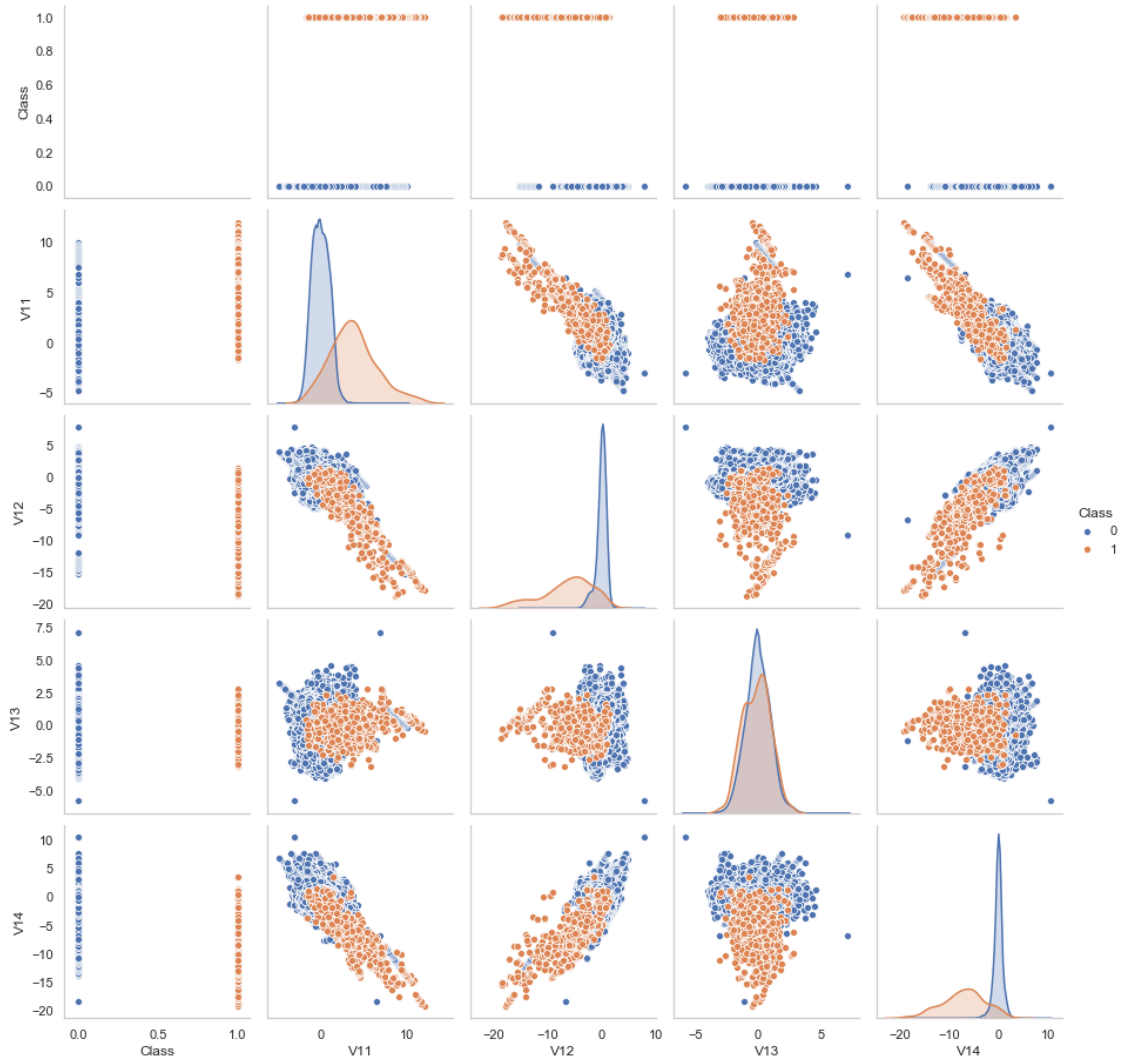
```
[1343]: sns.pairplot(df,vars = ['Class','V7', 'V8', 'V9','V10'], hue = 'Class')
```

[1343]: <seaborn.axisgrid.PairGrid at 0x1dc6b5ecf08>
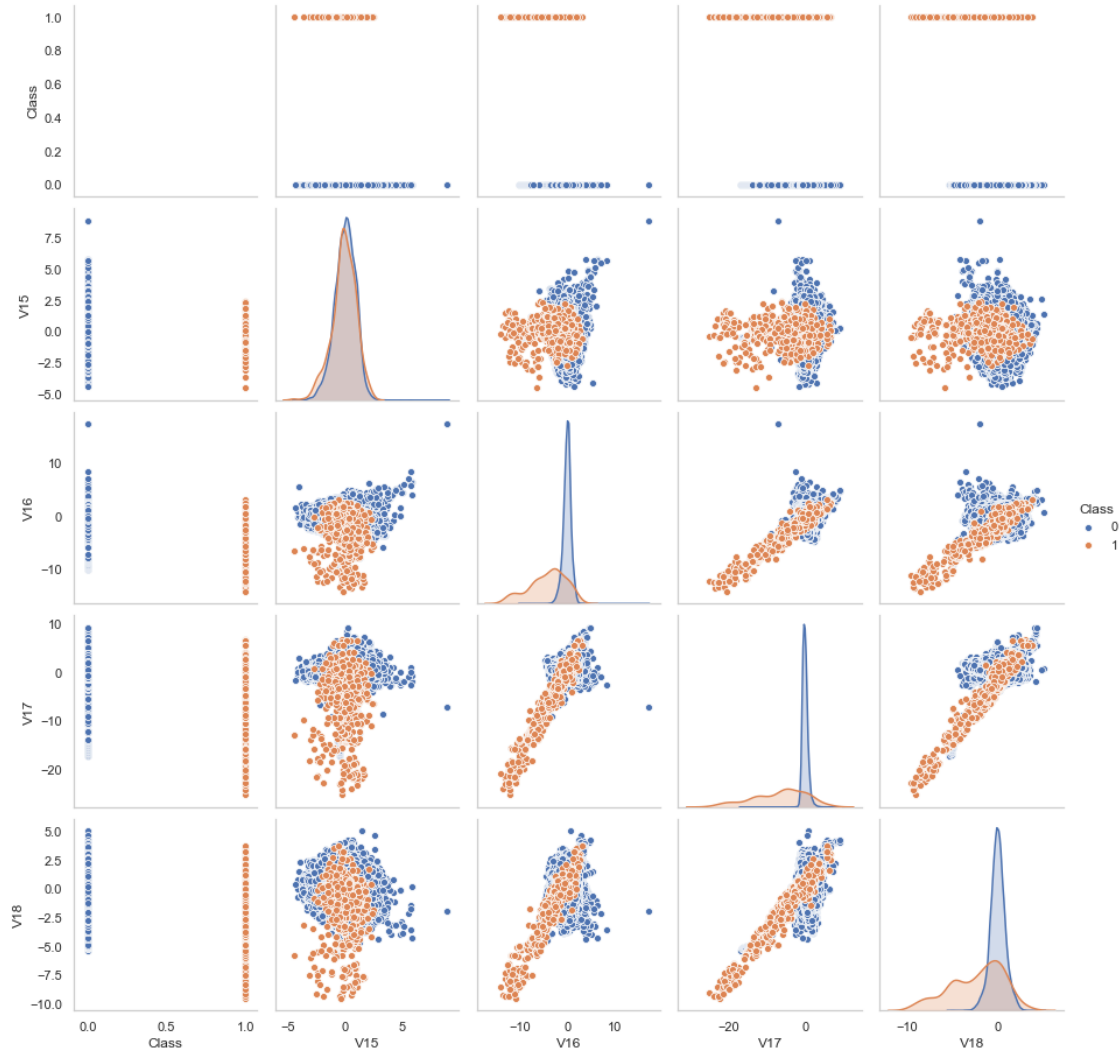
```
[1344]: sns.pairplot(df,vars = ['Class','V11', 'V12', 'V13','V14'], hue = 'Class')
```

```
[1344]: <seaborn.axisgrid.PairGrid at 0x1dc7c607948>
```
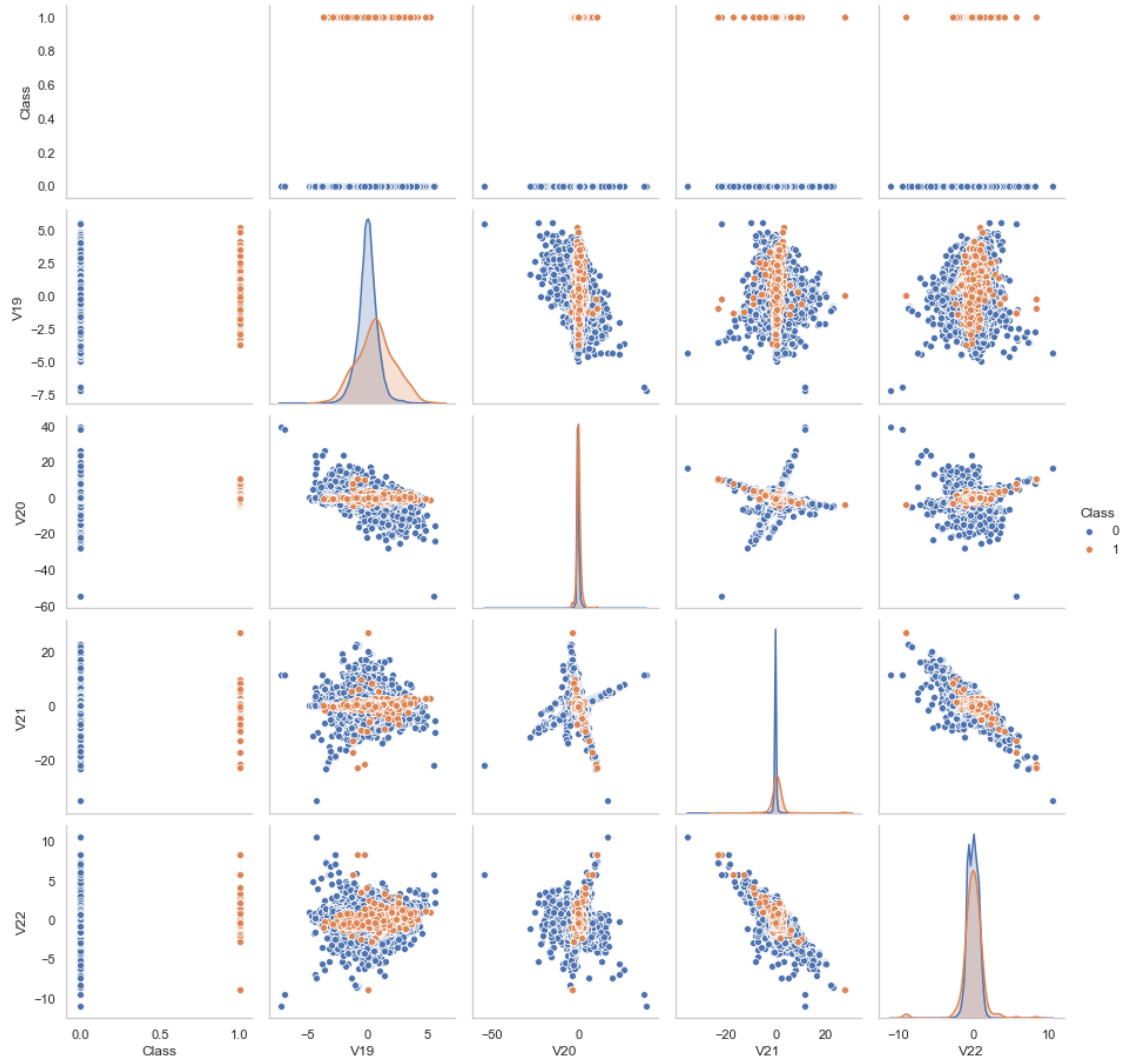
```
[1345]: sns.pairplot(df,vars = ['Class','V15', 'V16', 'V17','V18'], hue = 'Class')
```

```
[1345]: <seaborn.axisgrid.PairGrid at 0x1dbf2d05308>
```

```
[1346]: sns.pairplot(df,vars = ['Class','V19', 'V20', 'V21','V22'], hue = 'Class')
```

```
[1346]: <seaborn.axisgrid.PairGrid at 0x1dbf2cecd88>
```
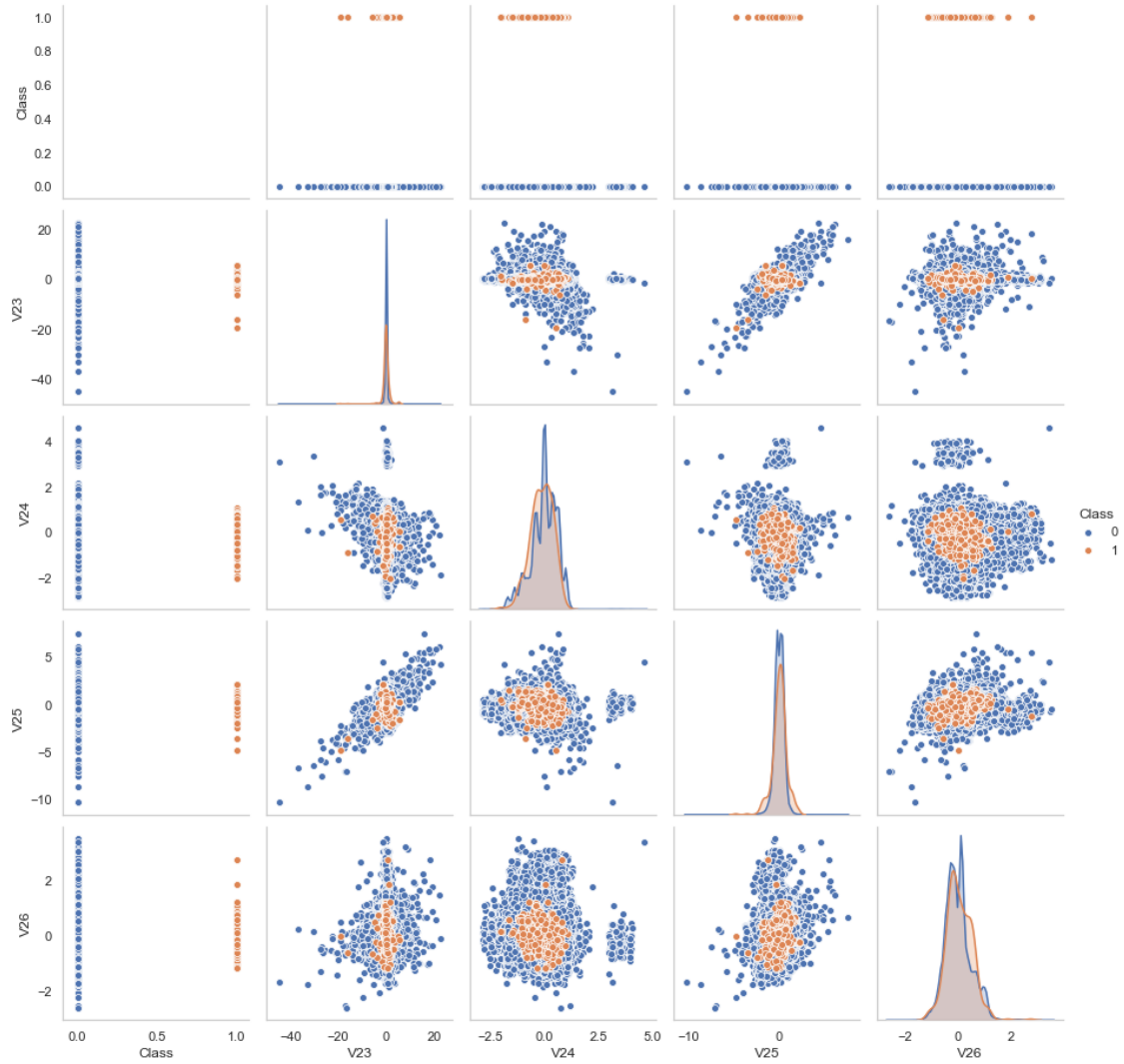
```
[1347]: sns.pairplot(df,vars = ['Class','V23', 'V24', 'V25','V26'], hue = 'Class')
```

```
[1347]: <seaborn.axisgrid.PairGrid at 0x1dc6ac88348>
```

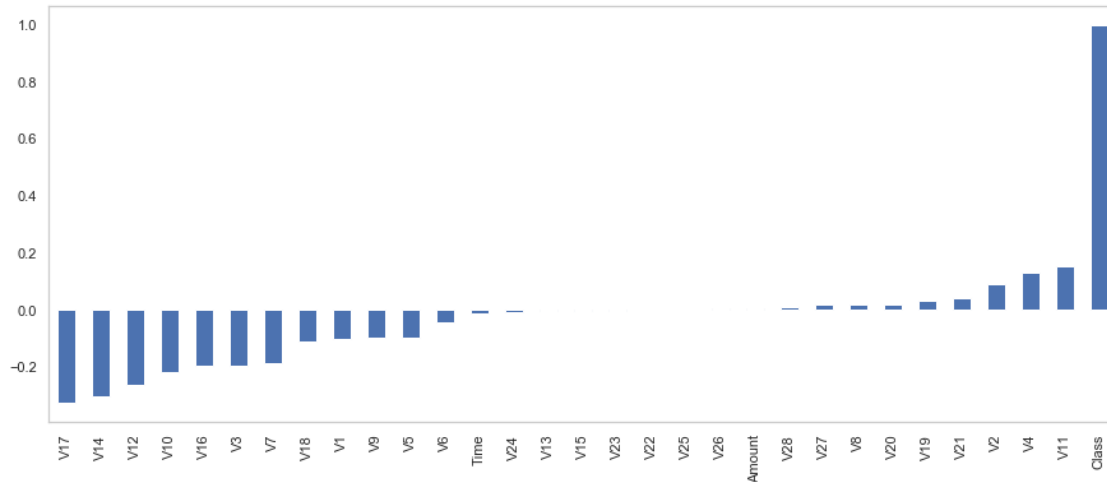```python
sns.pairplot(df,vars = ['Class','V27', 'V28'], hue = 'Class')
```

```
<seaborn.axisgrid.PairGrid at 0x1dc6c217f08>
```
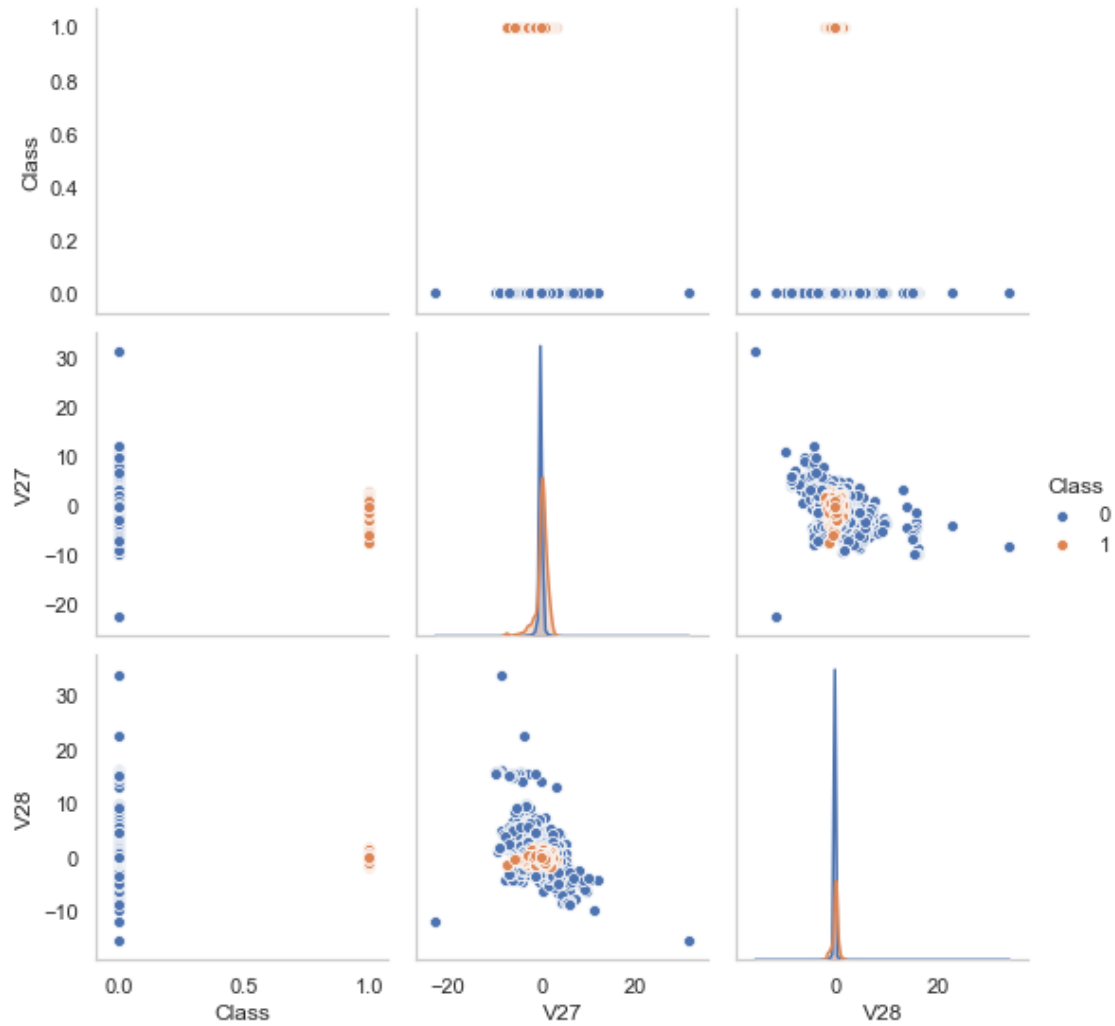
```
[1039]: import matplotlib.pyplot as plt

       figure = plt.figure(figsize=(15,6))
       figure.set_facecolor('w')
       ax = df.corr()['Class'].sort_values().plot(kind='bar',color='b',grid=False)
       ax.set_facecolor('w')
```

We will drop the columns V13,V15,V22,V23,V25,V26 which have no correlation and may not add value to our classification model

```
[1040]: print("The range of Amount column min = "+ str(df['Amount'].min()) +" max = "+
        ↪str(df['Amount'].max()))
```

The range of Amount column min = 0.0 max = 25691.16

The range of Amount is high, we should convert it to log scale.

Checking the distribution of values in the target column Class

```
[1047]: df["Class"].value_counts()
```

```
[1047]: 0    284315
        1       492
        Name: Class, dtype: int64
```
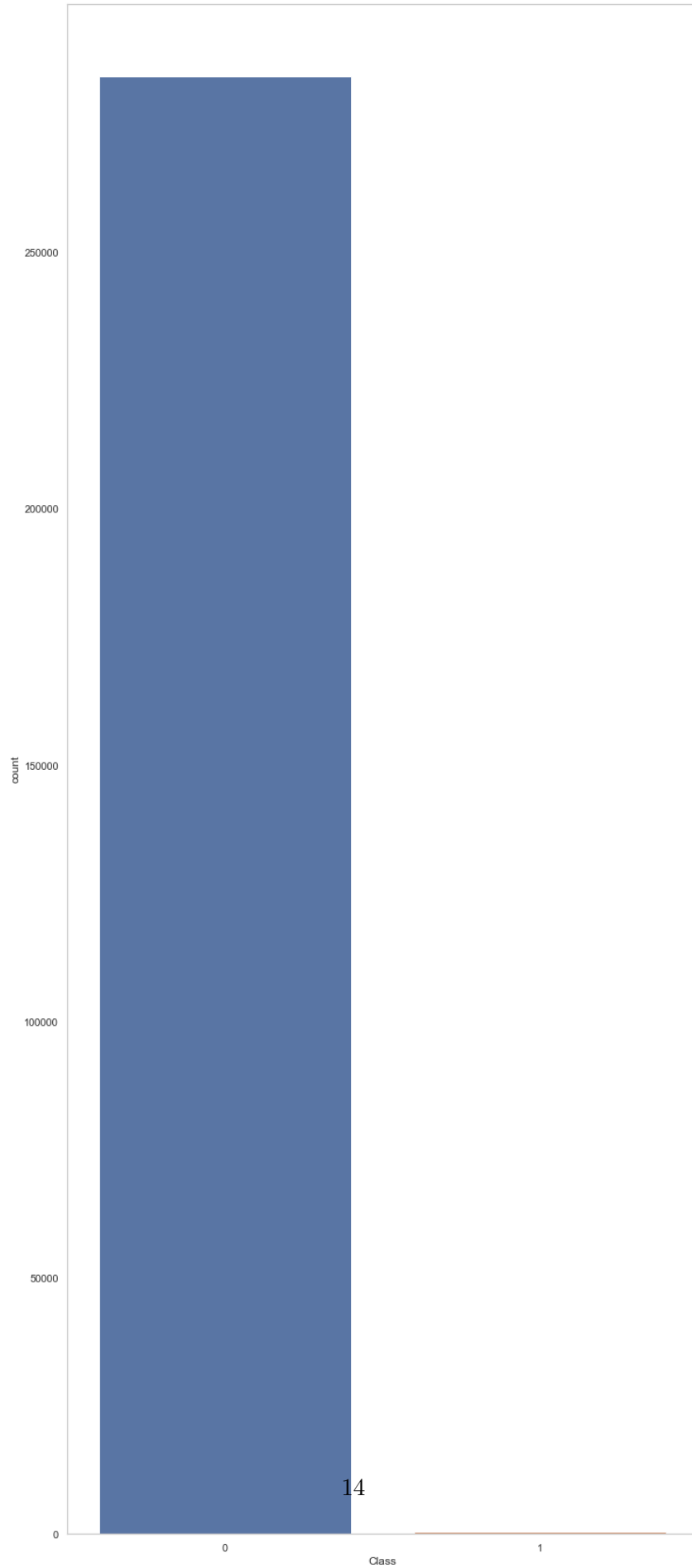
```
[1048]: df["Class"].value_counts()/df.shape[0]
```

```
[1048]: 0    0.998273
        1    0.001727
        Name: Class, dtype: float64
```

```
[1071]: fig, ax = plt.subplots(figsize=(12,30))
        sns.countplot(ax=ax, x='Class', data=df)
```

```
[1071]: <matplotlib.axes._subplots.AxesSubplot at 0x1db86b5ce08>
```

Values for the minority class which indicate fraudulent transacations are **only 0.1727 % of the total data**. The fraud class bar on the barchart is **barely visible.** This is clearly a ***SEVERLY IMBALANCED*** dataset.

0.0.1 Data Visualisation in 2-dimensional space

```
[1054]:  #For sampling, we will get all the samples from fraud class and only a fraction␣
         ↪of legitimate transactions
         fraud_instances = len(df[df["Class"] == 1])
         fraud_data = df[df["Class"] == 1]
         legitimate_data = df[df["Class"] == 0]
         subset_legitimate_data = legitimate_data.sample(fraud_instances*12) #Only about␣
         ↪2% of legitimate transactions
         fraud_data.reset_index(drop=True, inplace=True)
         subset_legitimate_data.reset_index(drop=True, inplace=True)
         sample_data = pd.concat([fraud_data,subset_legitimate_data])

         X_visualization = sample_data.drop('Class', axis=1)
         y_visualization = sample_data['Class']

         #Applying the standard scaler that we are going to use later
         from sklearn.preprocessing import StandardScaler
         scaler = StandardScaler()

         X_visualization=scaler.fit_transform(X_visualization)
```

```
[1055]:  #Run TSNE dimensionality reduction
         from sklearn.manifold import TSNE
         X_reduced_dim = TSNE(n_components=2, random_state=42).
         ↪fit_transform(X_visualization)
```

```
[1056]:  # t-SNE scatter plot
         import matplotlib.patches as mpatches

         f, ax = plt.subplots(figsize=(24,16))


         legitimate = mpatches.Patch(color='blue', label='Legitimate')
         fraudulent = mpatches.Patch(color='red', label='Fraudulent')

         ax.scatter(X_reduced_dim[:,0], X_reduced_dim[:,1], c=(y_visualization == 0),␣
         ↪cmap='coolwarm', label='No Fraud', linewidths=2)
         ax.scatter(X_reduced_dim[:,0], X_reduced_dim[:,1], c=(y_visualization == 1),␣
         ↪cmap='coolwarm', label='Fraud', linewidths=2)
```

```
ax.set_title('Visualizing the transformed CC Fraud Dataset', fontsize=14)

ax.grid(False)
ax.set_facecolor('w')

ax.legend(handles=[legitimate, fraudulent])
```

[1056]: `<matplotlib.legend.Legend at 0x1dbda24b388>`
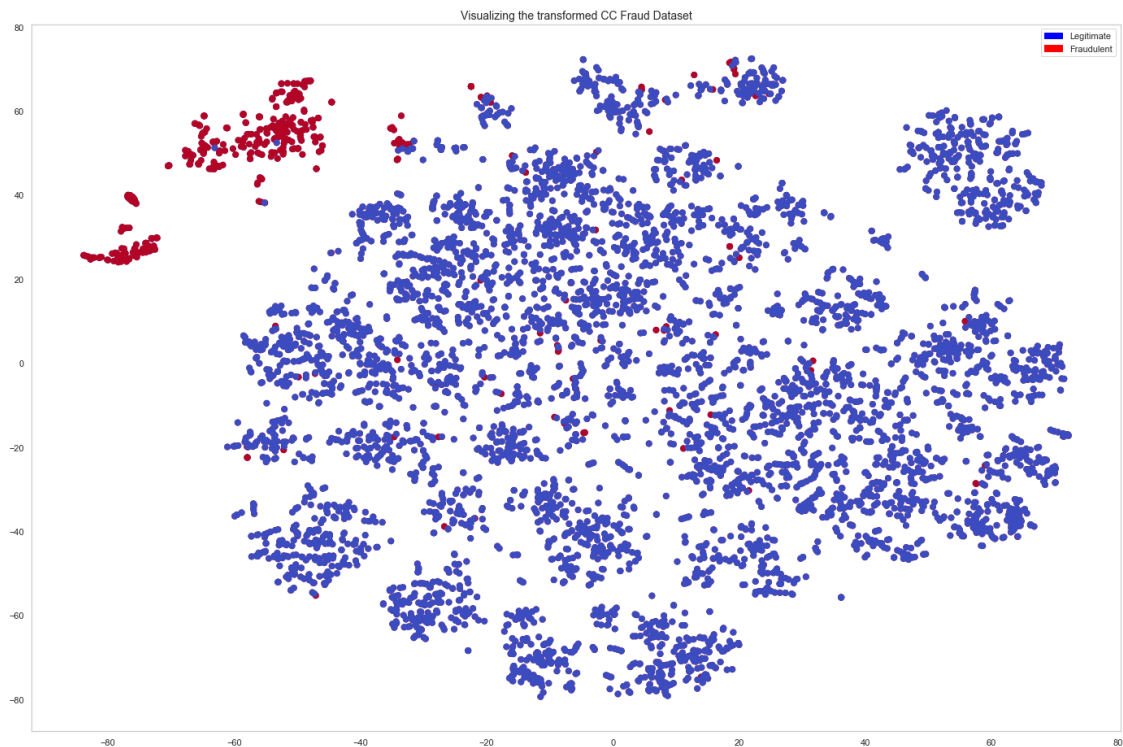
Data Preprocessing

Let's drop the columns that have very little correlation

[1057]:
```
df.drop(columns=['V22','V25','V26'],inplace=True, axis=1)
```

Convert the amount to log scale

[1058]:
```
df['Amount'] = np.log(df['Amount'] + 0.001)
```

The number of minority class (positive) samples are very rare (only 492). While splitting the dataset, let us do it in a way that maintains the same class distribution in each subset. We will do it through *STRATIFIED SAMPLING* by using target variable to control the sampling process.

```
[1059]:  #Class is the target variable
         X=df.loc[:, df.columns != 'Class']
         y=df[['Class']]
```

```
[1060]:  X.shape, y.shape
```

```
[1060]:  ((284807, 27), (284807, 1))
```

```
[1061]:  # split into train/test sets with same class ratio
         from sklearn.model_selection import train_test_split
         trainX, testX, trainy, testy = train_test_split(X, y, test_size=0.3,␣
          ↪random_state=100,stratify=y)
```

```
[1062]:  train_0, train_1 = len(trainy[trainy['Class']==0]),␣
          ↪len(trainy[trainy['Class']==1])
         test_0, test_1 = len(testy[testy['Class']==0]), len(testy[testy['Class']==1])
         print('Checking the Split -->Train: 0=%d, 1=%d, Test: 0=%d, 1=%d' % (train_0,␣
          ↪train_1, test_0, test_1))
```

Checking the Split -->Train: 0=199020, 1=344, Test: 0=85295, 1=148

Split looks good

One approach to addressing imbalanced datasets is to oversample the minority class. New examples can be synthesized from the existing examples. This is a type of data augmentation for the minority class and is referred to as the Synthetic Minority Oversampling Technique **(SMOTE)**. We will use a variant of SMOTE based on Support Vector Machine(SVM) called **SVMSMOTE**

```
[1063]:  from collections import Counter
```

```
[1064]:  counter = Counter(trainy['Class'])
         print(counter)
```

Counter({0: 199020, 1: 344})

```
[1065]:  from sklearn.preprocessing import StandardScaler
         scaler = StandardScaler()

         trainX=scaler.fit_transform(trainX)
         testX=scaler.transform(testX)
```

```
[1066]:  from imblearn.over_sampling import SVMSMOTE
         oversample = SVMSMOTE(sampling_strategy=1)
         trainX_scaled, trainy_scaled = oversample.fit_resample(trainX, trainy)
         counter = Counter(trainy_scaled['Class'])
```

```
[1067]:  print(counter)
```

Counter({0: 199020, 1: 199020})

```
[1069]: fig, ax = plt.subplots(figsize=(12,12))
         sns.countplot(ax=ax, x='Class',data=trainy_scaled)
```

[1069]: <matplotlib.axes._subplots.AxesSubplot at 0x1db86ab3108>
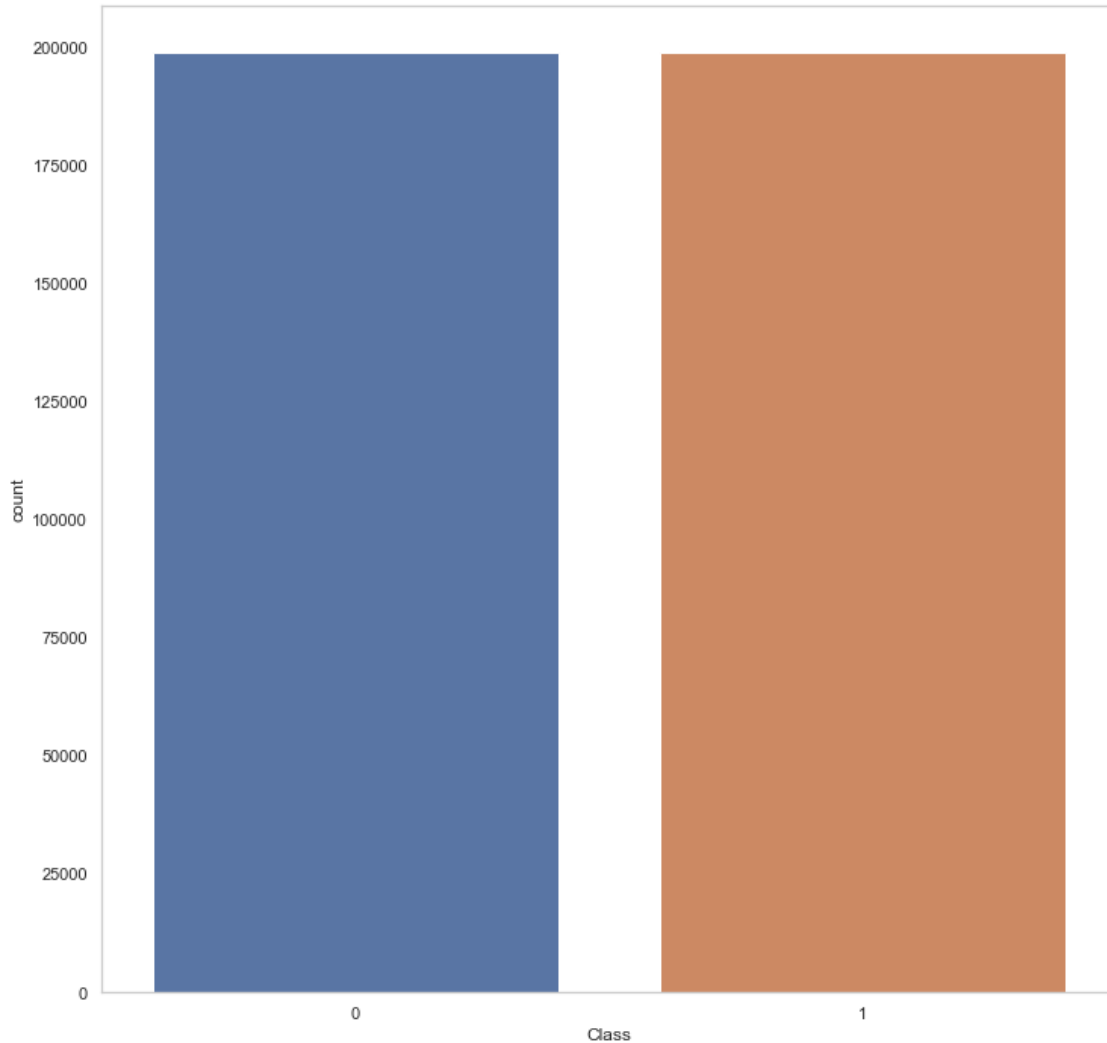
Oversized sampling has brought the size of minority class sample to one third of that of majority class.

```
[1289]: # Arrays for barplots

         arr_table_labels = []
         arr_barchart_labels = []
         arr_accuracy = []
         arr_precision = []
         arr_recall = []
```

```
arr_f1score = []
arr_f2measure = []
arr_roc_auc = []
arr_tn = []
arr_fp = []
arr_fn = []
arr_tp = []
```

[1290]:
```python
from sklearn.metrics import confusion_matrix
def plot_cm(ax,labels, predictions,color_index,title, p=0.5):
  cm_colors = ['BuGn','coolwarm','YlOrRd','YlOrBr','OrRd', 'PuRd', 'RdPu',␣
 ↪'BuPu']
  cm = confusion_matrix(labels, predictions > p)
  #plt.figure(figsize=(5,5))
  sns.heatmap(cm, annot=True, fmt="d",xticklabels = ["No", "Yes"] , yticklabels␣
 ↪= ["legitimate", "Fraudulent"],cbar=False,cmap=cm_colors[color_index])
  ax.set_title(title.format(p))
  ax.set_ylabel('Actual label')
  ax.set_xlabel('Predicted label')
  ax.set_facecolor('w')

  print('Legitimate Transactions Detected (True Negatives): ', cm[0][0])
  arr_tn.append(cm[0][0])
  print('Legitimate Transactions Incorrectly Detected (False Positives): ',␣
 ↪cm[0][1])
  arr_fp.append(cm[0][1])
  print('Fraudulent Transactions Missed (False Negatives): ', cm[1][0])
  arr_fn.append(cm[1][0])
  print('Fraudulent Transactions Detected (True Positives): ', cm[1][1])
  arr_tp.append(cm[1][1])
  print('Total Fraudulent Transactions in validation dataset: ', np.sum(cm[1]))
```

[1291]:
```python
from sklearn import metrics
from sklearn.metrics import accuracy_score
from sklearn.metrics import precision_score
from sklearn.metrics import recall_score
from sklearn.metrics import f1_score
from sklearn.metrics import roc_auc_score
from sklearn.metrics import roc_curve
from sklearn.metrics import fbeta_score
from sklearn.metrics import auc
from sklearn.metrics import precision_recall_curve

def calculate_and_plot(model,color_index,title,label,algorithm):
    # predict crisp classes for test set
    yhat_classes = model.predict(testX)
    # predict probabilities for test set
```

```
    yhat_probs = model.predict_proba(testX)

    fig, (ax1, ax2) = plt.subplots(1, 2)
    fig.set_size_inches(15, 6)

    calculate_and_print_scores(testy, yhat_classes,yhat_probs[:, 1])

    plot_roc_auc(ax1,testy, yhat_probs[:, 1], label)

    plot_cm(ax2,testy, yhat_classes,color_index,title)

    create_barchart_label(label,algorithm)

    create_table_label(label,algorithm)
```

```python
[1292]: def calculate_and_print_scores(testy, yhat_classes, yhat_probs):
    # accuracy: (tp + tn) / (p + n)
    accuracy = accuracy_score(testy, yhat_classes)
    print('Accuracy: %f' % accuracy)
    arr_accuracy.append(accuracy)

    # precision tp / (tp + fp)
    precision = precision_score(testy, yhat_classes)
    print('Precision: %f' % precision)
    arr_precision.append(precision)

    # recall: tp / (tp + fn)
    recall = recall_score(testy, yhat_classes)
    print('Sensitivity AKA Recall: %f' % recall)
    arr_recall.append(recall)

    # f1: 2 tp / (2 tp + fp + fn)
    f1 = f1_score(testy, yhat_classes)
    print('F1 score: %f' % f1)
    arr_f1score.append(f1)

    #F2 Measure
    f = fbeta_score(testy, yhat_classes, beta=2.0)
    print('F2-Measure: %f' % f)
    arr_f2measure.append(f)

    # ROC AUC
    rocauc = roc_auc_score(testy, yhat_probs)
    print('ROC AUC: %f' % rocauc)
    arr_roc_auc.append(rocauc)
```

```
[1293]: import matplotlib.pyplot as plt

        def plot_roc_auc(ax,testy, yhat_probs,label):
            #Show ROC-AUC Plot
            #fig = plt.figure(figsize=(5,5))
            #fig.set_facecolor('w')
            # plot no skill roc curve
            ax.plot([0, 1], [0, 1], linestyle='--', color='red', label='No Skill')
            # calculate roc curve for model
            fpr, tpr, _ = roc_curve(testy, yhat_probs)
            # plot model roc curve
            ax.plot(fpr, tpr, marker='.',color='green', linewidth=4, label = label)
            # axis labels
            ax.set_xlabel('False Positive Rate')
            ax.set_xlim(0,1)
            ax.set_ylabel('True Positive Rate')
            ax.set_ylim(0,1)
            ax.set_xticks(np.arange(0, 1, step=0.1))
            ax.set_yticks(np.arange(0, 1, step=0.1))
            ax.set_facecolor('w')


            #fig.suptitle('Receiver Operating Characteristics (ROC) Curve', fontsize=20)
            # show the legend
            ax.legend()
            # show the plot
```

```
[1294]: def create_barchart_label(label,algorithm):
            barchart_label = algorithm.upper() + " -> " + label
            arr_barchart_labels.append(barchart_label)
```

```
[1295]: def create_table_label(label,algorithm):
            table_label = algorithm.upper() + " -> " + label
            arr_table_labels.append(table_label)
```

Creating ML Models

1. Ensemble Algorithms

0.1 Balanced Bagging Classifier Algorithm

```
[1182]: from imblearn.ensemble import BalancedBaggingClassifier
        from sklearn.tree import DecisionTreeClassifier
        from sklearn.ensemble import BaggingClassifier
        import warnings

        warnings.filterwarnings("ignore", category=FutureWarning)
```

```python
def create_bal_bg_classifier_model(n_estimators=1,max_samples=0.
→1,max_depth=100,sampling_strategy=0.1):
    clf =⊔
→BalancedBaggingClassifier(DecisionTreeClassifier(max_depth=max_depth),max_samples=max_sampl
    return clf
```

[1183]:
```python
clf_bbg_001 = create_bal_bg_classifier_model(100,max_samples=0.
→1,max_depth=100,sampling_strategy=0.01)
clf_bbg_001 = clf_bbg_001.fit(trainX, trainy)
```

[1296]:
```python
calculate_and_plot(clf_bbg_001,0,'Sampling Straegy : 0.01','Sampling Straegy :⊔
→0.01','Bagging')
```

```
Accuracy: 0.999122
Precision: 0.710983
Sensitivity AKA Recall: 0.831081
F1 score: 0.766355
F2-Measure: 0.803922
ROC AUC: 0.937494
Legitimate Transactions Detected (True Negatives):  85245
Legitimate Transactions Incorrectly Detected (False Positives):  50
Fraudulent Transactions Missed (False Negatives):  25
Fraudulent Transactions Detected (True Positives):  123
Total Fraudulent Transactions in validation dataset:  148
```
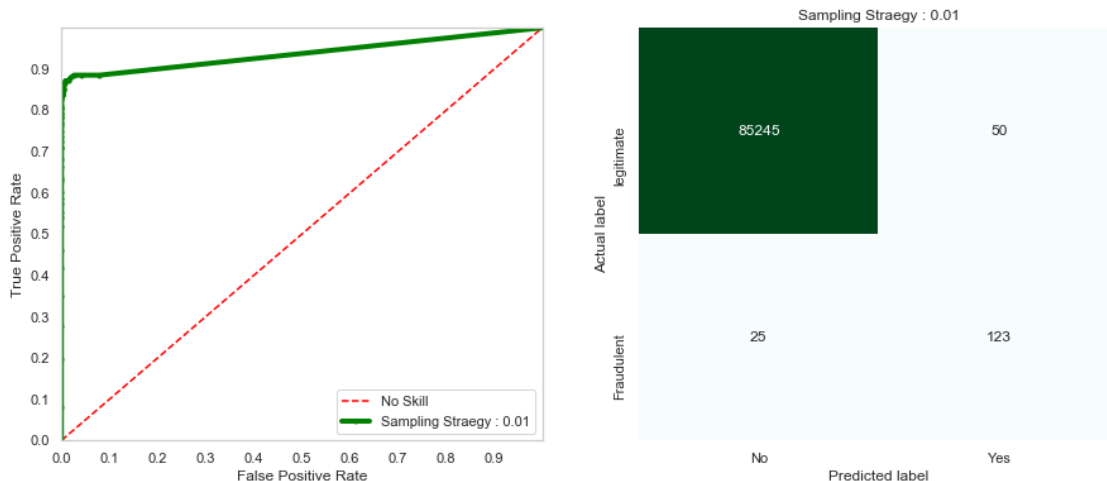

[1185]:
```python
clf_bbg_01 = create_bal_bg_classifier_model(100,max_samples=0.
→1,max_depth=100,sampling_strategy=0.1)
clf_bbg_01 = clf_bbg_01.fit(trainX, trainy)
```

```
[1297]: calculate_and_plot(clf_bbg_01,1,'Sampling Straegy : 0.1','Sampling Straegy : 0.
        →1','Bagging')
```

```
Accuracy: 0.996781
Precision: 0.330667
Sensitivity AKA Recall: 0.837838
F1 score: 0.474187
F2-Measure: 0.641158
ROC AUC: 0.945874
Legitimate Transactions Detected (True Negatives):  85044
Legitimate Transactions Incorrectly Detected (False Positives):  251
Fraudulent Transactions Missed (False Negatives):   24
Fraudulent Transactions Detected (True Positives):   124
Total Fraudulent Transactions in validation dataset:   148
```
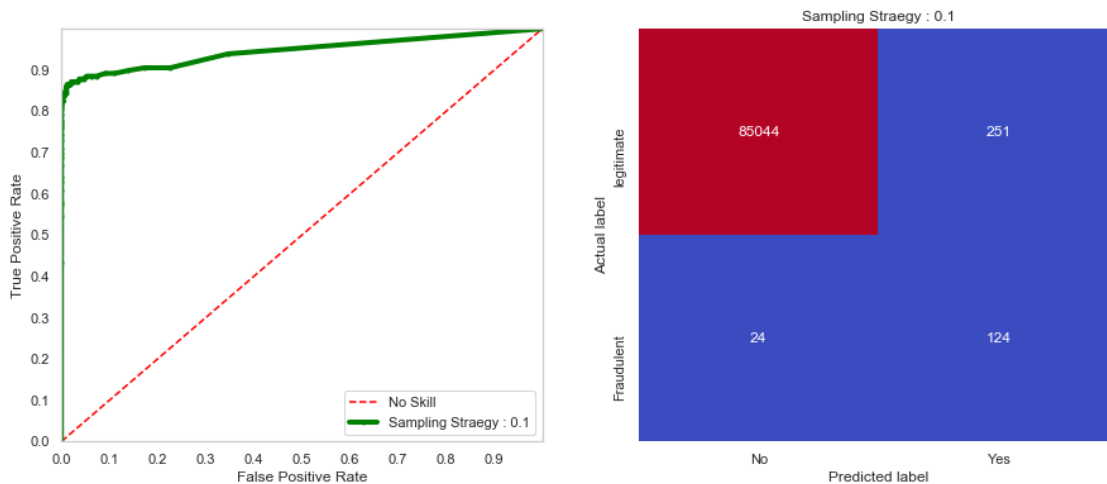


```
[1187]: clf_bbg_1 = create_bal_bg_classifier_model(100,max_samples=0.
        →1,max_depth=100,sampling_strategy=1)
        clf_bbg_1.fit(trainX, trainy)
```

```
[1187]: BalancedBaggingClassifier(base_estimator=DecisionTreeClassifier(max_depth=100),
                                   max_samples=0.1, n_estimators=100, replacement=True,
                                   sampling_strategy=1)
```

```
[1298]: calculate_and_plot(clf_bbg_1,2,'Sampling Straegy : 1','Sampling Straegy :␣
        →1','Bagging')
```

```
Accuracy: 0.975235
Precision: 0.057951
Sensitivity AKA Recall: 0.871622
F1 score: 0.108677
F2-Measure: 0.228886
```

```
ROC AUC: 0.961538
Legitimate Transactions Detected (True Negatives):  83198
Legitimate Transactions Incorrectly Detected (False Positives):  2097
Fraudulent Transactions Missed (False Negatives):  19
Fraudulent Transactions Detected (True Positives):  129
Total Fraudulent Transactions in validation dataset:  148
```


0.2 Random Forest Classifier with Class Weighting

```python
[1189]: from sklearn.ensemble import RandomForestClassifier

        def create_rf_classifier_model(n_estimators=100,max_samples=0.
        ↪1,max_depth=10,class_weight='balanced_subsample'):
            clf =␣
        ↪RandomForestClassifier(max_depth=max_depth,max_samples=max_samples,n_estimator
            return clf
```

```python
[1355]: clf_rf_1 =  create_rf_classifier_model(100,max_samples=0.
        ↪2,max_depth=15,class_weight = {0: 1, 1: 1})
        clf_rf_1 = clf_rf_1.fit(trainX, trainy)
```

```python
[1356]: calculate_and_plot(clf_rf_1,0,'Class Weight 1 (Equal)','Class Weight 1','Random␣
        ↪Forest')
```

```
Accuracy: 0.999356
Precision: 0.884298
Sensitivity AKA Recall: 0.722973
F1 score: 0.795539
F2-Measure: 0.750351
ROC AUC: 0.944044
```

```
Legitimate Transactions Detected (True Negatives):  85281
Legitimate Transactions Incorrectly Detected (False Positives):  14
Fraudulent Transactions Missed (False Negatives):  41
Fraudulent Transactions Detected (True Positives):  107
Total Fraudulent Transactions in validation dataset:  148
```
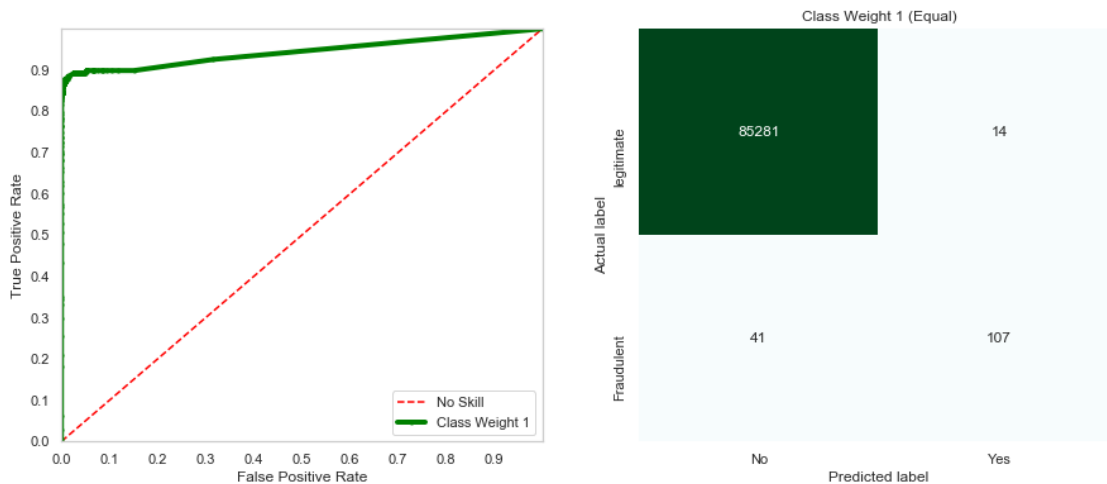

[1192]:
```python
clf_rf_100 =  create_rf_classifier_model(100,max_samples=0.
↪2,max_depth=15,class_weight = {0:1, 1:100})
clf_rf_100 = clf_rf_100.fit(trainX, trainy)
```

[1300]:
```python
calculate_and_plot(clf_rf_100,1,'Class Weight 100','Class Weight 100','Random
↪Forest')
```

```
Accuracy: 0.995681
Precision: 0.266385
Sensitivity AKA Recall: 0.851351
F1 score: 0.405797
F2-Measure: 0.591549
ROC AUC: 0.957426
Legitimate Transactions Detected (True Negatives):  84948
Legitimate Transactions Incorrectly Detected (False Positives):  347
Fraudulent Transactions Missed (False Negatives):  22
Fraudulent Transactions Detected (True Positives):  126
Total Fraudulent Transactions in validation dataset:  148
```
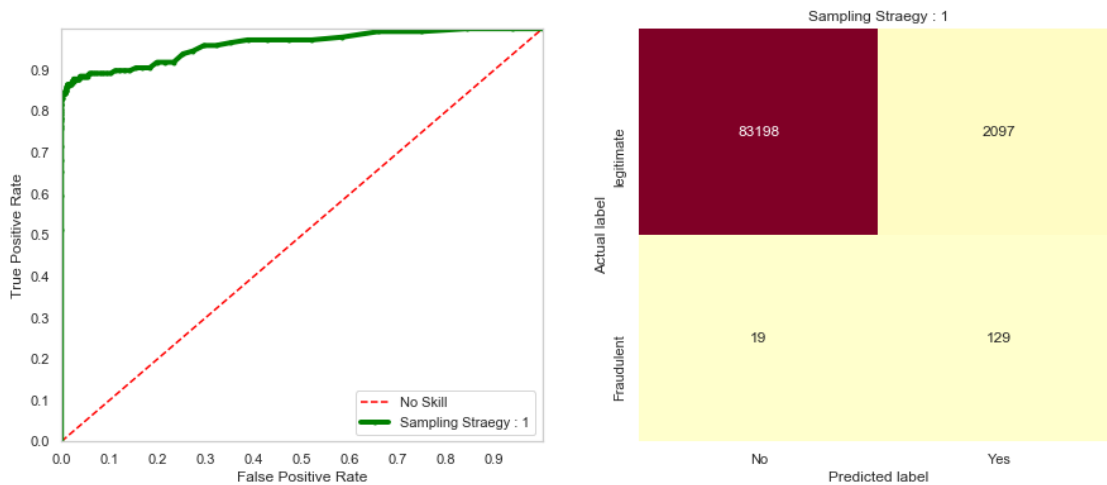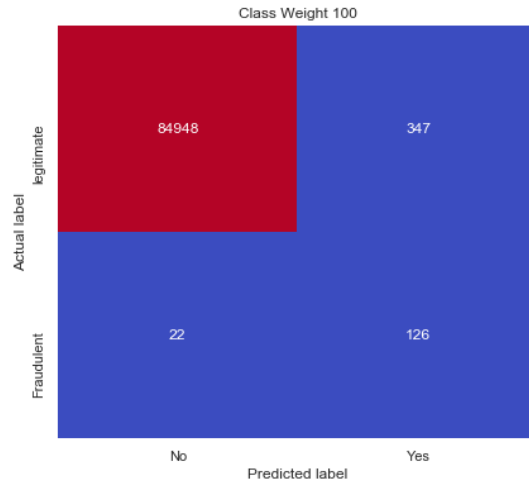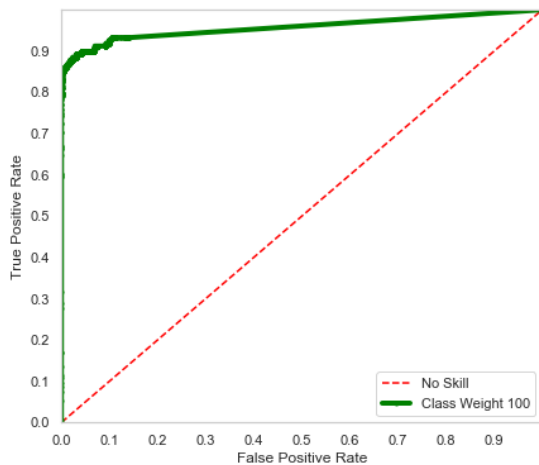
```
[1351]: clf_rf_1000 =  create_rf_classifier_model(100,max_samples=0.
        ↪2,max_depth=15,class_weight = {0:1, 1:1000})
        clf_rf_1000 = clf_rf_100.fit(trainX_scaled, trainy_scaled)
```

```
[1352]: calculate_and_plot(clf_rf_100,2,'Class Weight 1000','Class Weight 1000','Random␣
        ↪Forest')
```

```
Accuracy: 0.980431
Precision: 0.072391
Sensitivity AKA Recall: 0.871622
F1 score: 0.133679
F2-Measure: 0.271693
ROC AUC: 0.972310
Legitimate Transactions Detected (True Negatives):  83642
Legitimate Transactions Incorrectly Detected (False Positives):  1653
Fraudulent Transactions Missed (False Negatives):  19
Fraudulent Transactions Detected (True Positives):  129
Total Fraudulent Transactions in validation dataset:  148
```

2. Cost Sensisitive Algorithms

0.3 Cost Sensitive Logistic Regression

```
[1196]: from sklearn.linear_model import LogisticRegression

        def create_cslr_classifier_model(class_weight):
            clf = LogisticRegression(solver='lbfgs',class_weight=class_weight)
            return clf
```

```
[1197]: clf_lr_1 =  create_cslr_classifier_model([{0: 1, 1: 1}])
        clf_lr_1 = clf_lr_1.fit(trainX_scaled, trainy_scaled)
```

```
[1302]: calculate_and_plot(clf_lr_1,0,'Confusion Matrix with Weight 1 (equal weight)␣
        ↪for Fraud Class','Class Weight 1','Logistic Regression')
```

```
Accuracy: 0.994640
Precision: 0.223214
Sensitivity AKA Recall: 0.844595
F1 score: 0.353107
F2-Measure: 0.542535
ROC AUC: 0.953544
Legitimate Transactions Detected (True Negatives):  84860
Legitimate Transactions Incorrectly Detected (False Positives):  435
Fraudulent Transactions Missed (False Negatives):  23
Fraudulent Transactions Detected (True Positives):  125
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 1 (equal weight) for Fraud Class
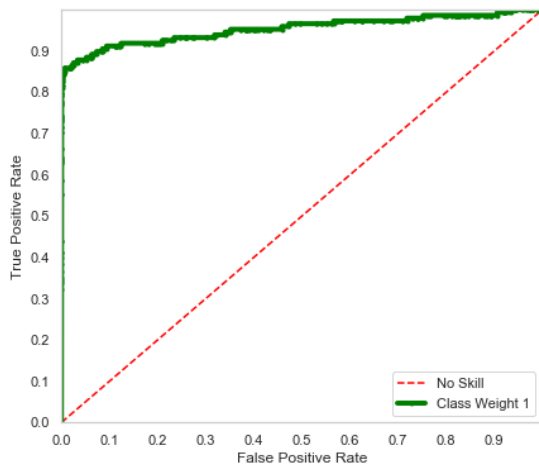
```
[1199]:  clf_lr_100 =  create_cslr_classifier_model([{0: 1, 1: 100}])
         clf_lr_100 = clf_lr_100.fit(trainX_scaled, trainy_scaled)
```

```
[1303]:  calculate_and_plot(clf_lr_100,1,'Confusion Matrix with Weight 100 for Fraud␣
         ↪Class','Class Weight 100','Logistic Regression')
```
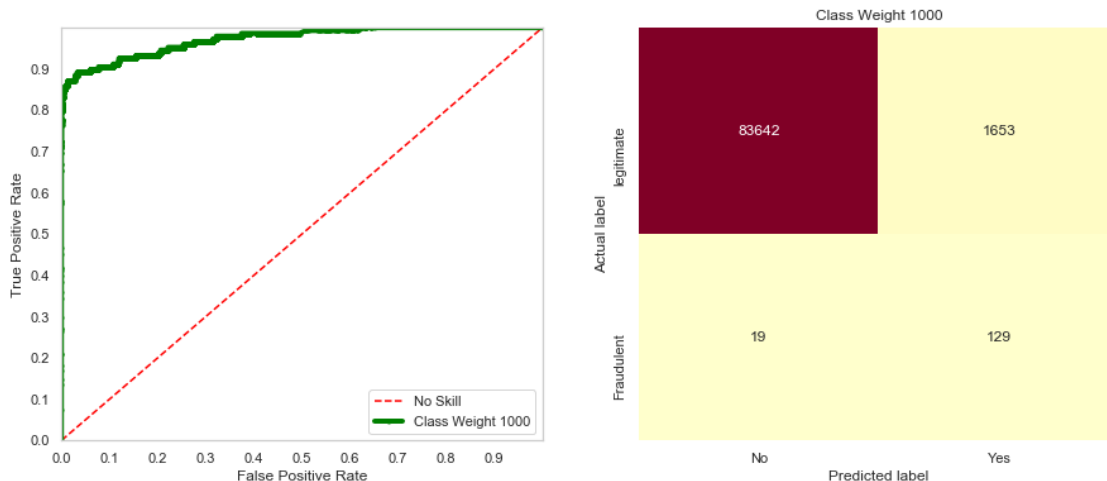
```
Accuracy: 0.994640
Precision: 0.223214
Sensitivity AKA Recall: 0.844595
F1 score: 0.353107
F2-Measure: 0.542535
ROC AUC: 0.953544
Legitimate Transactions Detected (True Negatives):  84860
Legitimate Transactions Incorrectly Detected (False Positives):  435
Fraudulent Transactions Missed (False Negatives):  23
Fraudulent Transactions Detected (True Positives):  125
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 100 for Fraud Class
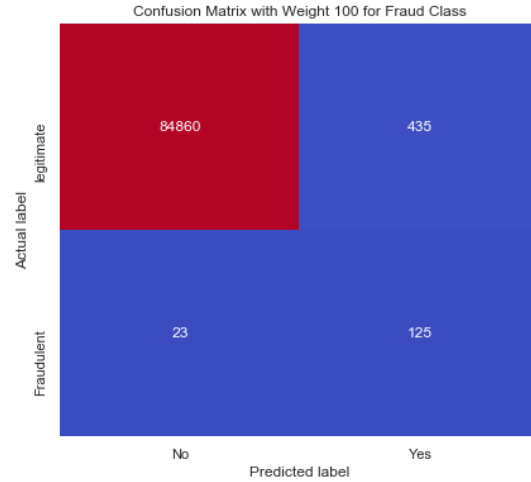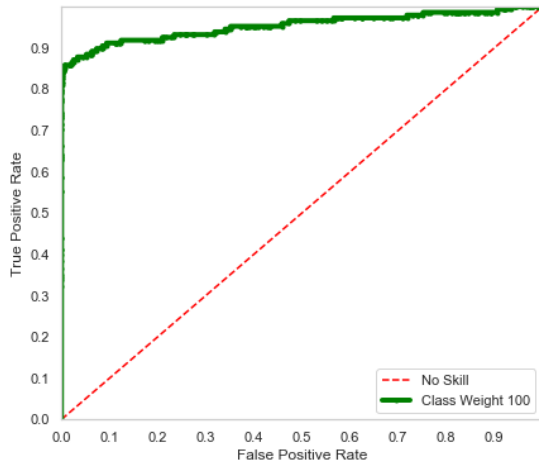
```
[1331]: clf_lr_1000 =  create_cslr_classifier_model([{0: 1, 1: 1000}])
        clf_lr_1000 = clf_lr_1000.fit(trainX_scaled, trainy_scaled)
```

```
[1332]: calculate_and_plot(clf_lr_1000,2,'Confusion Matrix with Weight 1000 for Fraud␣
         ↪Class','Class Weight 1000','Logistic Regression')
```

```
Accuracy: 0.994640
Precision: 0.223214
Sensitivity AKA Recall: 0.844595
F1 score: 0.353107
F2-Measure: 0.542535
ROC AUC: 0.953544
Legitimate Transactions Detected (True Negatives):  84860
Legitimate Transactions Incorrectly Detected (False Positives):  435
Fraudulent Transactions Missed (False Negatives):  23
Fraudulent Transactions Detected (True Positives):  125
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 1000 for Fraud Class
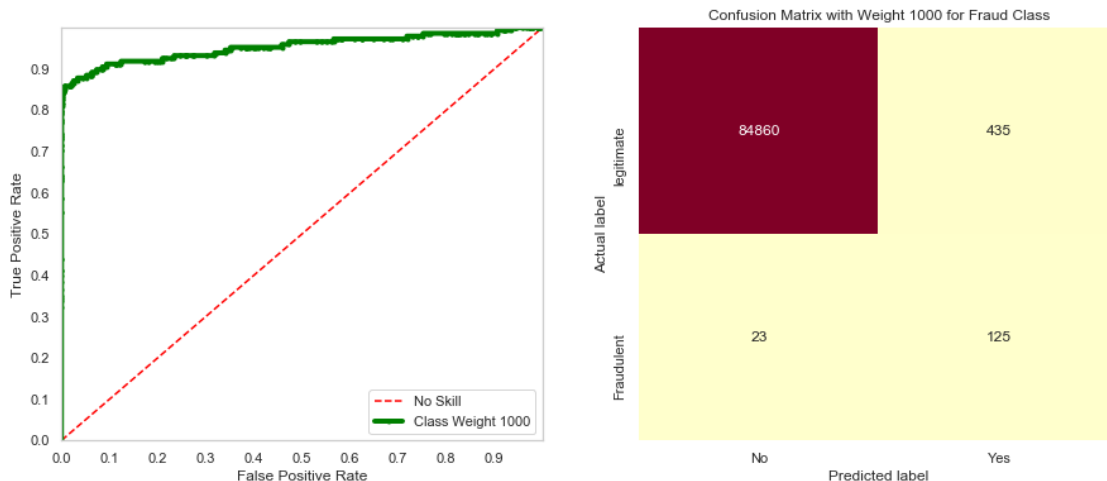
0.4 Cost Sensitive Decision Trees

```
[1203]: def create_csdt_classifier_model(class_weight,max_depth=None):
            model =␣
        ↪DecisionTreeClassifier(max_depth=max_depth,class_weight=class_weight)
            return model
```

```
[1204]: clf_dt_1 =  create_csdt_classifier_model({0: 1.0, 1: 1.0})
        clf_dt_1 = clf_dt_1.fit(trainX_scaled, trainy_scaled)
```

```
[1305]: calculate_and_plot(clf_dt_1,3,'Confusion Matrix with Weight 1 (equal weight)␣
        ↪for Fraud Class','Class Weight 1','Decision Tree')
```

```
Accuracy: 0.999122
Precision: 0.708571
Sensitivity AKA Recall: 0.837838
F1 score: 0.767802
F2-Measure: 0.808344
ROC AUC: 0.918620
Legitimate Transactions Detected (True Negatives):  85244
Legitimate Transactions Incorrectly Detected (False Positives):  51
Fraudulent Transactions Missed (False Negatives):  24
Fraudulent Transactions Detected (True Positives):  124
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 1 (equal weight) for Fraud Class

```
[1206]:  clf_dt_10 =  create_csdt_classifier_model({0: 1.0, 1: 100.0})
         clf_dt_10 = clf_dt_10.fit(trainX_scaled, trainy_scaled)
```

```
[1306]:  calculate_and_plot(clf_dt_10,4,'Confusion Matrix with Weight 100 for Fraud␣
         ↪Class','Class Weight 100','Decision Tree')
```

```
Accuracy: 0.998912
Precision: 0.648649
Sensitivity AKA Recall: 0.810811
F1 score: 0.720721
F2-Measure: 0.772201
ROC AUC: 0.905024
Legitimate Transactions Detected (True Negatives):  85230
Legitimate Transactions Incorrectly Detected (False Positives):  65
Fraudulent Transactions Missed (False Negatives):  28
Fraudulent Transactions Detected (True Positives):  120
Total Fraudulent Transactions in validation dataset:  148
```

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Confusion Matrix with Weight 100 for Fraud Class
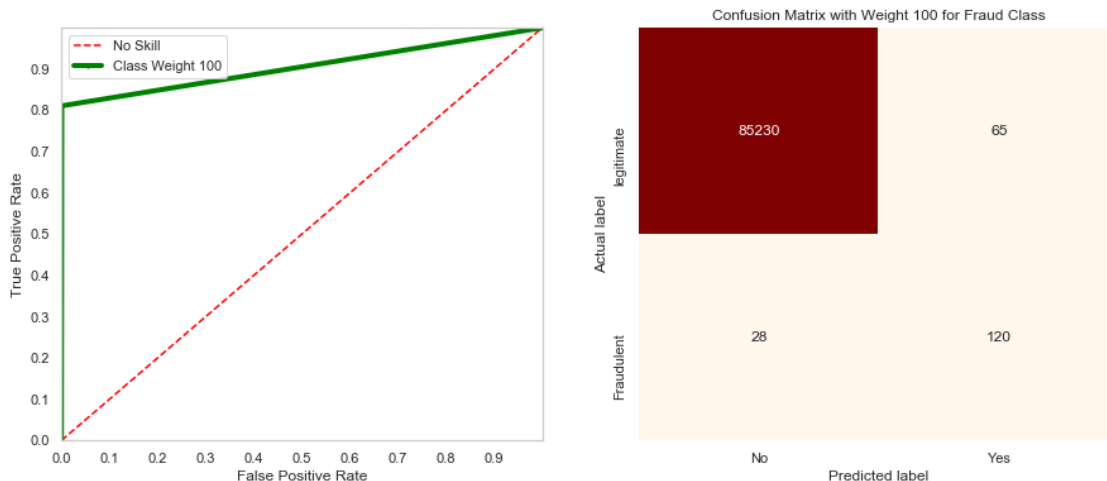
```
[1208]:  clf_dt_100 =  create_csdt_classifier_model({0: 1.0, 1: 1000.0})
         clf_dt_100 = clf_dt_100.fit(trainX_scaled, trainy_scaled)
```

```
[1307]:  calculate_and_plot(clf_dt_100,5,'Confusion Matrix with Weight 1000 for Fraud␣
         ↪Class','Class Weight 1000','Decision Tree')
```

```
Accuracy: 0.998876
Precision: 0.638298
Sensitivity AKA Recall: 0.810811
F1 score: 0.714286
F2-Measure: 0.769231
ROC AUC: 0.905007
Legitimate Transactions Detected (True Negatives):  85227
Legitimate Transactions Incorrectly Detected (False Positives):  68
Fraudulent Transactions Missed (False Negatives):  28
Fraudulent Transactions Detected (True Positives):  120
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 1000 for Fraud Class
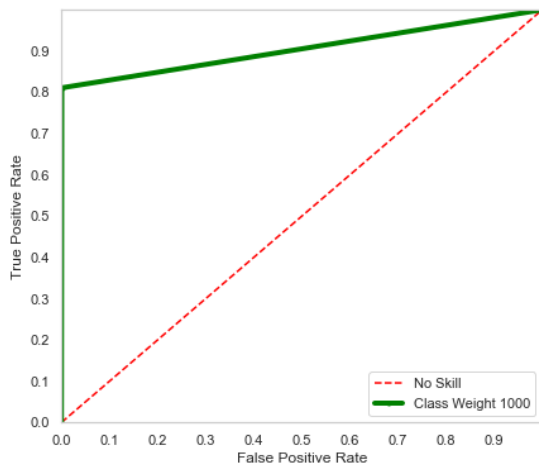
0.5 Cost Sensitive Gradient Boosting XGBoost

```python
[1210]: from xgboost import XGBClassifier

def create_xgb_classifier_model(scale_pos_weight):
    model = XGBClassifier(objective='binary:
    ↪logistic',max_delta_step=5,scale_pos_weight=scale_pos_weight,max_depth=100)
    return model
```

```python
[1353]: clf_xg_1 =  create_xgb_classifier_model(1)
        clf_xg_1 = clf_xg_1.fit(trainX_scaled, trainy_scaled)
```

```python
[1354]: calculate_and_plot(clf_xg_1,0,'Confusion Matrix with Weight 1 (equal weight)
        ↪for Fraud Class','Class Weight 1','XGBoost')
```

```
Accuracy: 0.999345
Precision: 0.794872
Sensitivity AKA Recall: 0.837838
F1 score: 0.815789
F2-Measure: 0.828877
ROC AUC: 0.967556
Legitimate Transactions Detected (True Negatives):  85263
Legitimate Transactions Incorrectly Detected (False Positives):  32
Fraudulent Transactions Missed (False Negatives):  24
Fraudulent Transactions Detected (True Positives):  124
Total Fraudulent Transactions in validation dataset:  148
```
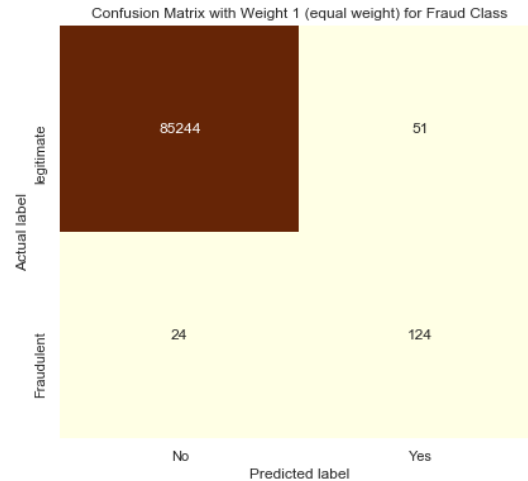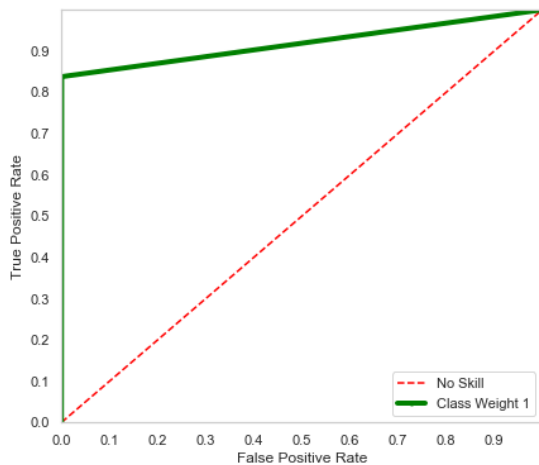
Confusion Matrix with Weight 1 (equal weight) for Fraud Class
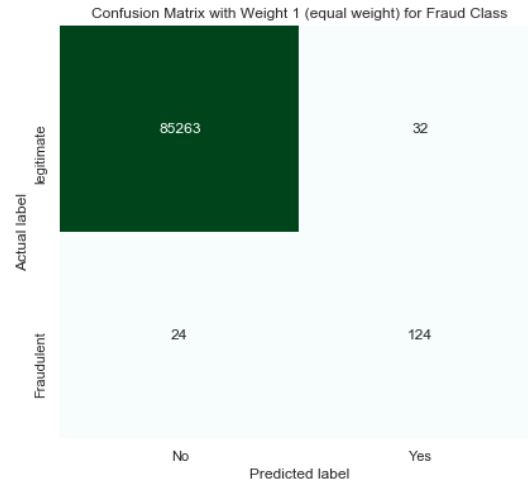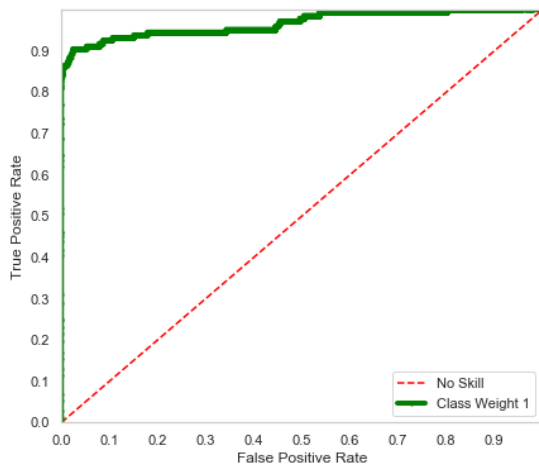
```
[1213]: clf_xg_50 =  create_xgb_classifier_model(50)
        clf_xg_50 = clf_xg_50.fit(trainX_scaled, trainy_scaled)
```

```
[1309]: calculate_and_plot(clf_xg_50,1,'Confusion Matrix with Weight 50 for Fraud␣
        ↪Class','Class Weight 50','XGBoost')
```

```
Accuracy: 0.999146
Precision: 0.716763
Sensitivity AKA Recall: 0.837838
F1 score: 0.772586
F2-Measure: 0.810458
ROC AUC: 0.974359
Legitimate Transactions Detected (True Negatives):  85246
Legitimate Transactions Incorrectly Detected (False Positives):  49
Fraudulent Transactions Missed (False Negatives):  24
Fraudulent Transactions Detected (True Positives):  124
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 50 for Fraud Class
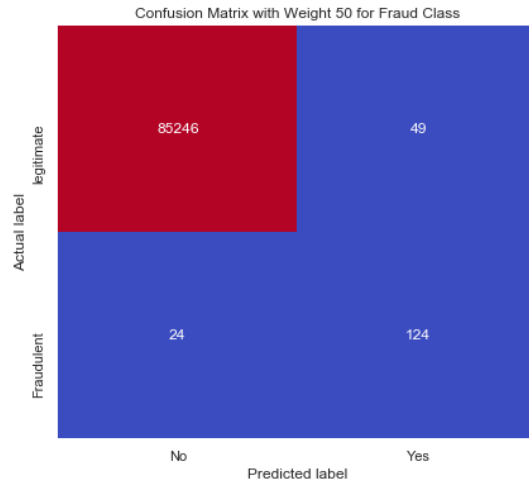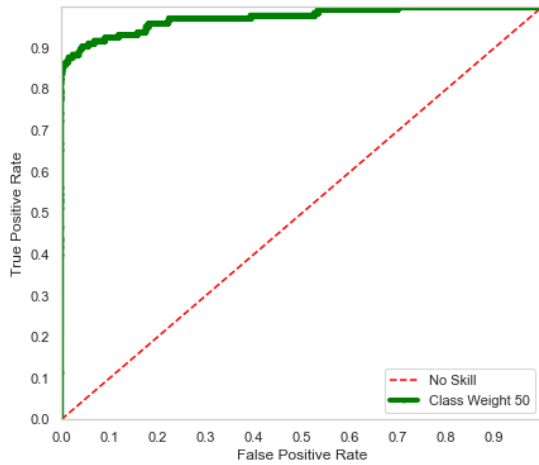
```
[1333]:  clf_xg_100 =  create_xgb_classifier_model(500)
         clf_xg_100 = clf_xg_100.fit(trainX_scaled, trainy_scaled)
```

```
[1310]:  calculate_and_plot(clf_xg_100,2,'Confusion Matrix with Weight 1000 for Fraud␣
         ↪Class','Class Weight 1000','XGBoost')
```

```
Accuracy: 0.998853
Precision: 0.626263
Sensitivity AKA Recall: 0.837838
F1 score: 0.716763
F2-Measure: 0.784810
ROC AUC: 0.957629
Legitimate Transactions Detected (True Negatives):  85221
Legitimate Transactions Incorrectly Detected (False Positives):  74
Fraudulent Transactions Missed (False Negatives):  24
Fraudulent Transactions Detected (True Positives):  124
Total Fraudulent Transactions in validation dataset:  148
```

Confusion Matrix with Weight 1000 for Fraud Class
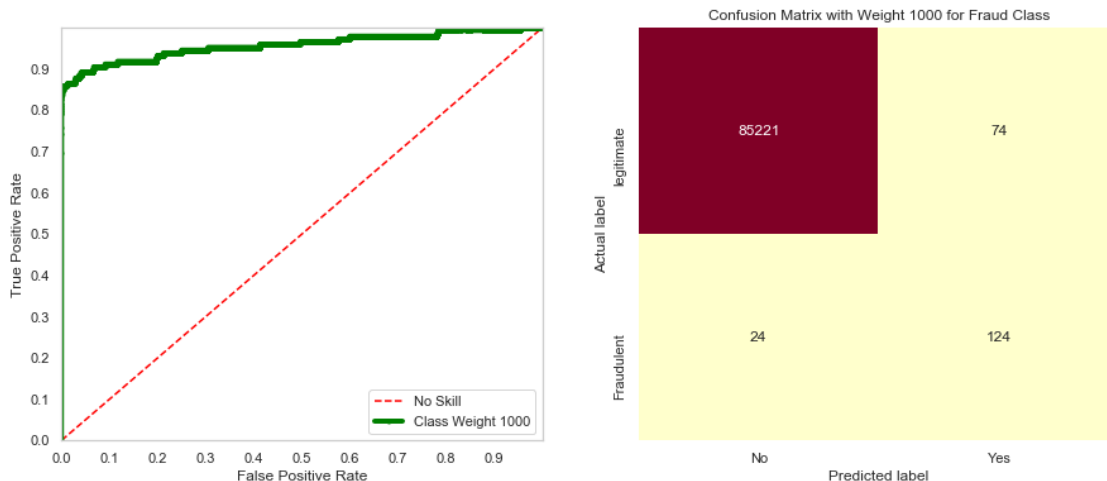
0.6 Cost Sensitive Artificial Neural Network

```
[1217]: import tensorflow as tf
        from tensorflow.keras import layers
        from tensorflow import keras
        from tensorflow.keras.models import Sequential
        from tensorflow.keras.layers import Dense,Dropout, Activation
        from tensorflow.keras.optimizers import Adam,SGD
        from keras.callbacks import EarlyStopping
        from keras.callbacks import ModelCheckpoint
```

```
[1218]: EPOCHS=200
        BATCH_SIZE=1024
```

```
[1219]: METRICS = [
            keras.metrics.TruePositives(name='tp'),
            keras.metrics.FalsePositives(name='fp'),
            keras.metrics.TrueNegatives(name='tn'),
            keras.metrics.FalseNegatives(name='fn'),
            keras.metrics.BinaryAccuracy(name='accuracy'),
            keras.metrics.Precision(name='precision'),
            keras.metrics.Recall(name='recall'),
            keras.metrics.AUC(name='auc'),
            keras.metrics.SensitivityAtSpecificity(specificity=0.
         ↪999,name='sensitivity'),
            keras.metrics.SpecificityAtSensitivity(sensitivity=0.8,name='specificity')
        ]
```

```
[1220]: def make_model(metrics = METRICS, act_function='relu',output_bias=None):
            model = Sequential()
```

```python
    # define first visible layer
    model.add(Dense(trainX_scaled.shape[1],input_dim=trainX_scaled.
 ↪shape[1],activation=act_function))
    model.add(Dropout(0.4))
    #tanh has steeper gradients, so backprop is more effective in cost␣
 ↪sensitive weights which affect backpropagation
    # define first hidden layer
    model.add(Dense(32, activation=act_function)) #number of neurons are kept␣
 ↪to the power of 2
    model.add(Dropout(0.4))
    # define second hidden layer
    model.add(Dense(32, activation=act_function)) #number of neurons are kept␣
 ↪to the power of 2
    model.add(Dropout(0.4))
    # define output layer
    model.add(Dense(1, activation='sigmoid'))
    # Cost sensitive weights to punish the false negatives
    # define loss and optimizer
    model.compile(loss='binary_crossentropy', optimizer=keras.optimizers.
 ↪Adam(lr=1e-3),metrics=METRICS)

    return model
```

```python
[1221]: #We can see that val_tp does not vary through the iterations a lot. However, by␣
        ↪focussing on FPs, we are increasing the precision and user experience
        es = EarlyStopping(monitor='val_precision',mode='max', verbose=1,␣
        ↪restore_best_weights= True, patience=100)

        #tanh has steeper gradients, so backprop is more effective in cost sensitive␣
        ↪weights which affect backpropagation
        model_no_weight = make_model(act_function='tanh')

        #tanh has steeper gradients, so backprop is more effective in cost sensitive␣
        ↪weights which affect backpropagation
        model_5_weight = make_model(act_function='tanh')

        #tanh has steeper gradients, so backprop is more effective in cost sensitive␣
        ↪weights which affect backpropagation
        model_500_weight = make_model(act_function='tanh')
```

0.6.1 Lets Run the 3 models

```python
[1222]: run_no_weight_history = model_no_weight.
        ↪fit(x=trainX_scaled,y=trainy_scaled,class_weight={0:1,1:
        ↪1},validation_data=(testX,testy),batch_size=BATCH_SIZE,epochs=EPOCHS,callbacks=[es])
```

```
Train on 398040 samples, validate on 85443 samples
Epoch 1/200
398040/398040 [==============================] - 6s 14us/sample - loss: 0.1244 -
tp: 194086.0000 - fp: 16250.0000 - tn: 182770.0000 - fn: 4934.0000 - accuracy:
0.9468 - precision: 0.9227 - recall: 0.9752 - auc: 0.9927 - sensitivity: 0.6358
- specificity: 0.9968 - val_loss: 0.0204 - val_tp: 127.0000 - val_fp: 422.0000 -
val_tn: 84873.0000 - val_fn: 21.0000 - val_accuracy: 0.9948 - val_precision:
0.2313 - val_recall: 0.8581 - val_auc: 0.9391 - val_sensitivity: 0.8446 -
val_specificity: 0.9992
Epoch 2/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0209 -
tp: 198127.0000 - fp: 1516.0000 - tn: 197504.0000 - fn: 893.0000 - accuracy:
0.9939 - precision: 0.9924 - recall: 0.9955 - auc: 0.9992 - sensitivity: 0.8827
- specificity: 0.9990 - val_loss: 0.0198 - val_tp: 127.0000 - val_fp: 378.0000 -
val_tn: 84917.0000 - val_fn: 21.0000 - val_accuracy: 0.9953 - val_precision:
0.2515 - val_recall: 0.8581 - val_auc: 0.9337 - val_sensitivity: 0.8378 -
val_specificity: 0.9980
Epoch 3/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0167 -
tp: 198317.0000 - fp: 1201.0000 - tn: 197819.0000 - fn: 703.0000 - accuracy:
0.9952 - precision: 0.9940 - recall: 0.9965 - auc: 0.9993 - sensitivity: 0.9028
- specificity: 0.9991 - val_loss: 0.0184 - val_tp: 127.0000 - val_fp: 336.0000 -
val_tn: 84959.0000 - val_fn: 21.0000 - val_accuracy: 0.9958 - val_precision:
0.2743 - val_recall: 0.8581 - val_auc: 0.9340 - val_sensitivity: 0.8378 -
val_specificity: 0.9977
Epoch 4/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0142 -
tp: 198490.0000 - fp: 1016.0000 - tn: 198004.0000 - fn: 530.0000 - accuracy:
0.9961 - precision: 0.9949 - recall: 0.9973 - auc: 0.9993 - sensitivity: 0.9161
- specificity: 0.9991 - val_loss: 0.0172 - val_tp: 127.0000 - val_fp: 313.0000 -
val_tn: 84982.0000 - val_fn: 21.0000 - val_accuracy: 0.9961 - val_precision:
0.2886 - val_recall: 0.8581 - val_auc: 0.9342 - val_sensitivity: 0.8378 -
val_specificity: 0.9983
Epoch 5/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0131 -
tp: 198539.0000 - fp: 899.0000 - tn: 198121.0000 - fn: 481.0000 - accuracy:
0.9965 - precision: 0.9955 - recall: 0.9976 - auc: 0.9994 - sensitivity: 0.9196
- specificity: 0.9991 - val_loss: 0.0151 - val_tp: 126.0000 - val_fp: 262.0000 -
val_tn: 85033.0000 - val_fn: 22.0000 - val_accuracy: 0.9967 - val_precision:
0.3247 - val_recall: 0.8514 - val_auc: 0.9344 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 6/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0118 -
tp: 198620.0000 - fp: 812.0000 - tn: 198208.0000 - fn: 400.0000 - accuracy:
0.9970 - precision: 0.9959 - recall: 0.9980 - auc: 0.9994 - sensitivity: 0.9560
- specificity: 0.9992 - val_loss: 0.0161 - val_tp: 126.0000 - val_fp: 263.0000 -
val_tn: 85032.0000 - val_fn: 22.0000 - val_accuracy: 0.9967 - val_precision:
0.3239 - val_recall: 0.8514 - val_auc: 0.9309 - val_sensitivity: 0.8378 -
```

val_specificity: 0.9989
Epoch 7/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0111 -
tp: 198672.0000 - fp: 749.0000 - tn: 198271.0000 - fn: 348.0000 - accuracy:
0.9972 - precision: 0.9962 - recall: 0.9983 - auc: 0.9994 - sensitivity: 0.9578
- specificity: 0.9992 - val_loss: 0.0151 - val_tp: 126.0000 - val_fp: 254.0000 -
val_tn: 85041.0000 - val_fn: 22.0000 - val_accuracy: 0.9968 - val_precision:
0.3316 - val_recall: 0.8514 - val_auc: 0.9311 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 8/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0106 -
tp: 198676.0000 - fp: 670.0000 - tn: 198350.0000 - fn: 344.0000 - accuracy:
0.9975 - precision: 0.9966 - recall: 0.9983 - auc: 0.9994 - sensitivity: 0.9607
- specificity: 0.9992 - val_loss: 0.0150 - val_tp: 126.0000 - val_fp: 251.0000 -
val_tn: 85044.0000 - val_fn: 22.0000 - val_accuracy: 0.9968 - val_precision:
0.3342 - val_recall: 0.8514 - val_auc: 0.9344 - val_sensitivity: 0.8378 -
val_specificity: 0.9989
Epoch 9/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0100 -
tp: 198708.0000 - fp: 668.0000 - tn: 198352.0000 - fn: 312.0000 - accuracy:
0.9975 - precision: 0.9966 - recall: 0.9984 - auc: 0.9995 - sensitivity: 0.9733
- specificity: 0.9992 - val_loss: 0.0122 - val_tp: 126.0000 - val_fp: 186.0000 -
val_tn: 85109.0000 - val_fn: 22.0000 - val_accuracy: 0.9976 - val_precision:
0.4038 - val_recall: 0.8514 - val_auc: 0.9313 - val_sensitivity: 0.8378 -
val_specificity: 0.9989
Epoch 10/200
398040/398040 [==============================] - 4s 9us/sample - loss: 0.0093 -
tp: 198743.0000 - fp: 600.0000 - tn: 198420.0000 - fn: 277.0000 - accuracy:
0.9978 - precision: 0.9970 - recall: 0.9986 - auc: 0.9995 - sensitivity: 0.9661
- specificity: 0.9993 - val_loss: 0.0142 - val_tp: 126.0000 - val_fp: 219.0000 -
val_tn: 85076.0000 - val_fn: 22.0000 - val_accuracy: 0.9972 - val_precision:
0.3652 - val_recall: 0.8514 - val_auc: 0.9312 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 11/200
398040/398040 [==============================] - 4s 9us/sample - loss: 0.0088 -
tp: 198754.0000 - fp: 559.0000 - tn: 198461.0000 - fn: 266.0000 - accuracy:
0.9979 - precision: 0.9972 - recall: 0.9987 - auc: 0.9995 - sensitivity: 0.9816
- specificity: 0.9993 - val_loss: 0.0126 - val_tp: 126.0000 - val_fp: 196.0000 -
val_tn: 85099.0000 - val_fn: 22.0000 - val_accuracy: 0.9974 - val_precision:
0.3913 - val_recall: 0.8514 - val_auc: 0.9279 - val_sensitivity: 0.8446 -
val_specificity: 0.9992
Epoch 12/200
398040/398040 [==============================] - 4s 9us/sample - loss: 0.0084 -
tp: 198800.0000 - fp: 520.0000 - tn: 198500.0000 - fn: 220.0000 - accuracy:
0.9981 - precision: 0.9974 - recall: 0.9989 - auc: 0.9995 - sensitivity: 0.9820
- specificity: 0.9993 - val_loss: 0.0115 - val_tp: 126.0000 - val_fp: 166.0000 -
val_tn: 85129.0000 - val_fn: 22.0000 - val_accuracy: 0.9978 - val_precision:
0.4315 - val_recall: 0.8514 - val_auc: 0.9280 - val_sensitivity: 0.8446 -

val_specificity: 0.9993
Epoch 13/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198817.0000 - fp: 482.0000 - tn: 198538.0000 - fn: 203.0000 - accuracy:
0.9983 - precision: 0.9976 - recall: 0.9990 - auc: 0.9996 - sensitivity: 0.9834
- specificity: 0.9994 - val_loss: 0.0118 - val_tp: 126.0000 - val_fp: 179.0000 -
val_tn: 85116.0000 - val_fn: 22.0000 - val_accuracy: 0.9976 - val_precision:
0.4131 - val_recall: 0.8514 - val_auc: 0.9281 - val_sensitivity: 0.8446 -
val_specificity: 0.9988
Epoch 14/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -
tp: 198825.0000 - fp: 462.0000 - tn: 198558.0000 - fn: 195.0000 - accuracy:
0.9983 - precision: 0.9977 - recall: 0.9990 - auc: 0.9995 - sensitivity: 0.9902
- specificity: 0.9993 - val_loss: 0.0110 - val_tp: 126.0000 - val_fp: 146.0000 -
val_tn: 85149.0000 - val_fn: 22.0000 - val_accuracy: 0.9980 - val_precision:
0.4632 - val_recall: 0.8514 - val_auc: 0.9249 - val_sensitivity: 0.8446 -
val_specificity: 0.9993
Epoch 15/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 -
tp: 198849.0000 - fp: 437.0000 - tn: 198583.0000 - fn: 171.0000 - accuracy:
0.9985 - precision: 0.9978 - recall: 0.9991 - auc: 0.9996 - sensitivity: 0.9922
- specificity: 0.9993 - val_loss: 0.0108 - val_tp: 126.0000 - val_fp: 147.0000 -
val_tn: 85148.0000 - val_fn: 22.0000 - val_accuracy: 0.9980 - val_precision:
0.4615 - val_recall: 0.8514 - val_auc: 0.9249 - val_sensitivity: 0.8446 -
val_specificity: 0.9992
Epoch 16/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0072 -
tp: 198835.0000 - fp: 411.0000 - tn: 198609.0000 - fn: 185.0000 - accuracy:
0.9985 - precision: 0.9979 - recall: 0.9991 - auc: 0.9995 - sensitivity: 0.9888
- specificity: 0.9993 - val_loss: 0.0116 - val_tp: 126.0000 - val_fp: 164.0000 -
val_tn: 85131.0000 - val_fn: 22.0000 - val_accuracy: 0.9978 - val_precision:
0.4345 - val_recall: 0.8514 - val_auc: 0.9248 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 17/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0068 -
tp: 198861.0000 - fp: 401.0000 - tn: 198619.0000 - fn: 159.0000 - accuracy:
0.9986 - precision: 0.9980 - recall: 0.9992 - auc: 0.9996 - sensitivity: 0.9938
- specificity: 0.9994 - val_loss: 0.0100 - val_tp: 126.0000 - val_fp: 128.0000 -
val_tn: 85167.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4961 - val_recall: 0.8514 - val_auc: 0.9250 - val_sensitivity: 0.8446 -
val_specificity: 0.9993
Epoch 18/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0070 -
tp: 198857.0000 - fp: 391.0000 - tn: 198629.0000 - fn: 163.0000 - accuracy:
0.9986 - precision: 0.9980 - recall: 0.9992 - auc: 0.9995 - sensitivity: 0.9890
- specificity: 0.9993 - val_loss: 0.0110 - val_tp: 126.0000 - val_fp: 145.0000 -
val_tn: 85150.0000 - val_fn: 22.0000 - val_accuracy: 0.9980 - val_precision:
0.4649 - val_recall: 0.8514 - val_auc: 0.9249 - val_sensitivity: 0.8514 -

val_specificity: 0.9993
Epoch 19/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0066 -
tp: 198868.0000 - fp: 374.0000 - tn: 198646.0000 - fn: 152.0000 - accuracy:
0.9987 - precision: 0.9981 - recall: 0.9992 - auc: 0.9996 - sensitivity: 0.9951
- specificity: 0.9993 - val_loss: 0.0104 - val_tp: 126.0000 - val_fp: 131.0000 -
val_tn: 85164.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4903 - val_recall: 0.8514 - val_auc: 0.9249 - val_sensitivity: 0.8514 -
val_specificity: 0.9993
Epoch 20/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0063 -
tp: 198851.0000 - fp: 356.0000 - tn: 198664.0000 - fn: 169.0000 - accuracy:
0.9987 - precision: 0.9982 - recall: 0.9992 - auc: 0.9996 - sensitivity: 0.9957
- specificity: 0.9994 - val_loss: 0.0107 - val_tp: 126.0000 - val_fp: 133.0000 -
val_tn: 85162.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4865 - val_recall: 0.8514 - val_auc: 0.9283 - val_sensitivity: 0.8446 -
val_specificity: 0.9993
Epoch 21/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0062 -
tp: 198890.0000 - fp: 321.0000 - tn: 198699.0000 - fn: 130.0000 - accuracy:
0.9989 - precision: 0.9984 - recall: 0.9993 - auc: 0.9996 - sensitivity: 0.9966
- specificity: 0.9994 - val_loss: 0.0101 - val_tp: 126.0000 - val_fp: 121.0000 -
val_tn: 85174.0000 - val_fn: 22.0000 - val_accuracy: 0.9983 - val_precision:
0.5101 - val_recall: 0.8514 - val_auc: 0.9284 - val_sensitivity: 0.8446 -
val_specificity: 0.9993
Epoch 22/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0061 -
tp: 198892.0000 - fp: 338.0000 - tn: 198682.0000 - fn: 128.0000 - accuracy:
0.9988 - precision: 0.9983 - recall: 0.9994 - auc: 0.9996 - sensitivity: 0.9963
- specificity: 0.9994 - val_loss: 0.0106 - val_tp: 126.0000 - val_fp: 132.0000 -
val_tn: 85163.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4884 - val_recall: 0.8514 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 23/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0061 -
tp: 198883.0000 - fp: 325.0000 - tn: 198695.0000 - fn: 137.0000 - accuracy:
0.9988 - precision: 0.9984 - recall: 0.9993 - auc: 0.9996 - sensitivity: 0.9967
- specificity: 0.9994 - val_loss: 0.0100 - val_tp: 126.0000 - val_fp: 118.0000 -
val_tn: 85177.0000 - val_fn: 22.0000 - val_accuracy: 0.9984 - val_precision:
0.5164 - val_recall: 0.8514 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9993
Epoch 24/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0058 -
tp: 198895.0000 - fp: 306.0000 - tn: 198714.0000 - fn: 125.0000 - accuracy:
0.9989 - precision: 0.9985 - recall: 0.9994 - auc: 0.9996 - sensitivity: 0.9971
- specificity: 0.9995 - val_loss: 0.0100 - val_tp: 126.0000 - val_fp: 116.0000 -
val_tn: 85179.0000 - val_fn: 22.0000 - val_accuracy: 0.9984 - val_precision:
0.5207 - val_recall: 0.8514 - val_auc: 0.9284 - val_sensitivity: 0.8378 -

val_specificity: 0.9993
Epoch 25/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0058 - tp: 198892.0000 - fp: 306.0000 - tn: 198714.0000 - fn: 128.0000 - accuracy: 0.9989 - precision: 0.9985 - recall: 0.9994 - auc: 0.9996 - sensitivity: 0.9968 - specificity: 0.9995 - val_loss: 0.0088 - val_tp: 126.0000 - val_fp: 105.0000 - val_tn: 85190.0000 - val_fn: 22.0000 - val_accuracy: 0.9985 - val_precision: 0.5455 - val_recall: 0.8514 - val_auc: 0.9284 - val_sensitivity: 0.8446 - val_specificity: 0.9995fn: 60.0000 - accuracy: 0.9989 - precision: 0.9985 - recall: 0.9
Epoch 26/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0056 - tp: 198902.0000 - fp: 316.0000 - tn: 198704.0000 - fn: 118.0000 - accuracy: 0.9989 - precision: 0.9984 - recall: 0.9994 - auc: 0.9996 - sensitivity: 0.9978 - specificity: 0.9994 - val_loss: 0.0091 - val_tp: 125.0000 - val_fp: 108.0000 - val_tn: 85187.0000 - val_fn: 23.0000 - val_accuracy: 0.9985 - val_precision: 0.5365 - val_recall: 0.8446 - val_auc: 0.9285 - val_sensitivity: 0.8378 - val_specificity: 0.9993
Epoch 27/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0055 - tp: 198897.0000 - fp: 303.0000 - tn: 198717.0000 - fn: 123.0000 - accuracy: 0.9989 - precision: 0.9985 - recall: 0.9994 - auc: 0.9996 - sensitivity: 0.9980 - specificity: 0.9995 - val_loss: 0.0099 - val_tp: 125.0000 - val_fp: 109.0000 - val_tn: 85186.0000 - val_fn: 23.0000 - val_accuracy: 0.9985 - val_precision: 0.5342 - val_recall: 0.8446 - val_auc: 0.9250 - val_sensitivity: 0.8378 - val_specificity: 0.9992
Epoch 28/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0054 - tp: 198911.0000 - fp: 280.0000 - tn: 198740.0000 - fn: 109.0000 - accuracy: 0.9990 - precision: 0.9986 - recall: 0.9995 - auc: 0.9996 - sensitivity: 0.9981 - specificity: 0.9995 - val_loss: 0.0092 - val_tp: 125.0000 - val_fp: 108.0000 - val_tn: 85187.0000 - val_fn: 23.0000 - val_accuracy: 0.9985 - val_precision: 0.5365 - val_recall: 0.8446 - val_auc: 0.9284 - val_sensitivity: 0.8378 - val_specificity: 0.9994
Epoch 29/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0053 - tp: 198902.0000 - fp: 290.0000 - tn: 198730.0000 - fn: 118.0000 - accuracy: 0.9990 - precision: 0.9985 - recall: 0.9994 - auc: 0.9997 - sensitivity: 0.9984 - specificity: 0.9995 - val_loss: 0.0093 - val_tp: 125.0000 - val_fp: 108.0000 - val_tn: 85187.0000 - val_fn: 23.0000 - val_accuracy: 0.9985 - val_precision: 0.5365 - val_recall: 0.8446 - val_auc: 0.9285 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 30/200
398040/398040 [==============================] - 6s 14us/sample - loss: 0.0055 - tp: 198912.0000 - fp: 275.0000 - tn: 198745.0000 - fn: 108.0000 - accuracy: 0.9990 - precision: 0.9986 - recall: 0.9995 - auc: 0.9996 - sensitivity: 0.9982 - specificity: 0.9995 - val_loss: 0.0083 - val_tp: 125.0000 - val_fp: 88.0000 - val_tn: 85207.0000 - val_fn: 23.0000 - val_accuracy: 0.9987 - val_precision:

0.5869 - val_recall: 0.8446 - val_auc: 0.9285 - val_sensitivity: 0.8446 -
val_specificity: 0.9994
Epoch 31/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0054 -
tp: 198908.0000 - fp: 260.0000 - tn: 198760.0000 - fn: 112.0000 - accuracy:
0.9991 - precision: 0.9987 - recall: 0.9994 - auc: 0.9996 - sensitivity: 0.9985
- specificity: 0.9995 - val_loss: 0.0083 - val_tp: 125.0000 - val_fp: 94.0000 -
val_tn: 85201.0000 - val_fn: 23.0000 - val_accuracy: 0.9986 - val_precision:
0.5708 - val_recall: 0.8446 - val_auc: 0.9285 - val_sensitivity: 0.8446 -
val_specificity: 0.9995
Epoch 32/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0048 -
tp: 198929.0000 - fp: 248.0000 - tn: 198772.0000 - fn: 91.0000 - accuracy:
0.9991 - precision: 0.9988 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9992
- specificity: 0.9995 - val_loss: 0.0095 - val_tp: 125.0000 - val_fp: 106.0000 -
val_tn: 85189.0000 - val_fn: 23.0000 - val_accuracy: 0.9985 - val_precision:
0.5411 - val_recall: 0.8446 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 33/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0049 -
tp: 198909.0000 - fp: 239.0000 - tn: 198781.0000 - fn: 111.0000 - accuracy:
0.9991 - precision: 0.9988 - recall: 0.9994 - auc: 0.9997 - sensitivity: 0.9991
- specificity: 0.9995 - val_loss: 0.0088 - val_tp: 125.0000 - val_fp: 99.0000 -
val_tn: 85196.0000 - val_fn: 23.0000 - val_accuracy: 0.9986 - val_precision:
0.5580 - val_recall: 0.8446 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 34/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0050 -
tp: 198905.0000 - fp: 241.0000 - tn: 198779.0000 - fn: 115.0000 - accuracy:
0.9991 - precision: 0.9988 - recall: 0.9994 - auc: 0.9997 - sensitivity: 0.9990
- specificity: 0.9995 - val_loss: 0.0082 - val_tp: 123.0000 - val_fp: 83.0000 -
val_tn: 85212.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5971 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 35/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0049 -
tp: 198922.0000 - fp: 239.0000 - tn: 198781.0000 - fn: 98.0000 - accuracy:
0.9992 - precision: 0.9988 - recall: 0.9995 - auc: 0.9996 - sensitivity: 0.9993
- specificity: 0.9995 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 69.0000 -
val_tn: 85226.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6406 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 36/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0050 -
tp: 198908.0000 - fp: 239.0000 - tn: 198781.0000 - fn: 112.0000 - accuracy:
0.9991 - precision: 0.9988 - recall: 0.9994 - auc: 0.9997 - sensitivity: 0.9990
- specificity: 0.9995 - val_loss: 0.0082 - val_tp: 123.0000 - val_fp: 84.0000 -
val_tn: 85211.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:

0.5942 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 37/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0048 -
tp: 198914.0000 - fp: 233.0000 - tn: 198787.0000 - fn: 106.0000 - accuracy:
0.9991 - precision: 0.9988 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9993
- specificity: 0.9996 - val_loss: 0.0081 - val_tp: 123.0000 - val_fp: 79.0000 -
val_tn: 85216.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6089 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 38/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0046 -
tp: 198913.0000 - fp: 205.0000 - tn: 198815.0000 - fn: 107.0000 - accuracy:
0.9992 - precision: 0.9990 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9994
- specificity: 0.9996 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 84.0000 -
val_tn: 85211.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5942 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 39/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0046 -
tp: 198932.0000 - fp: 221.0000 - tn: 198799.0000 - fn: 88.0000 - accuracy:
0.9992 - precision: 0.9989 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9995
- specificity: 0.9996 - val_loss: 0.0080 - val_tp: 123.0000 - val_fp: 75.0000 -
val_tn: 85220.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6212 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 40/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0045 -
tp: 198931.0000 - fp: 227.0000 - tn: 198793.0000 - fn: 89.0000 - accuracy:
0.9992 - precision: 0.9989 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9994
- specificity: 0.9996 - val_loss: 0.0079 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 41/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0045 -
tp: 198926.0000 - fp: 202.0000 - tn: 198818.0000 - fn: 94.0000 - accuracy:
0.9993 - precision: 0.9990 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9995
- specificity: 0.9995 - val_loss: 0.0078 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 42/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0046 -
tp: 198919.0000 - fp: 205.0000 - tn: 198815.0000 - fn: 101.0000 - accuracy:
0.9992 - precision: 0.9990 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9995
- specificity: 0.9996 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 83.0000 -
val_tn: 85212.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:

0.5971 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 43/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0044 -
tp: 198934.0000 - fp: 192.0000 - tn: 198828.0000 - fn: 86.0000 - accuracy:
0.9993 - precision: 0.9990 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9996
- specificity: 0.9995 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 62.0000 -
val_tn: 85233.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6649 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 44/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0046 -
tp: 198926.0000 - fp: 210.0000 - tn: 198810.0000 - fn: 94.0000 - accuracy:
0.9992 - precision: 0.9989 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9995
- specificity: 0.9995 - val_loss: 0.0079 - val_tp: 123.0000 - val_fp: 71.0000 -
val_tn: 85224.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6340 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 45/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0043 -
tp: 198928.0000 - fp: 190.0000 - tn: 198830.0000 - fn: 92.0000 - accuracy:
0.9993 - precision: 0.9990 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9996
- specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 46/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0044 -
tp: 198919.0000 - fp: 210.0000 - tn: 198810.0000 - fn: 101.0000 - accuracy:
0.9992 - precision: 0.9989 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9995
- specificity: 0.9996 - val_loss: 0.0077 - val_tp: 123.0000 - val_fp: 66.0000 -
val_tn: 85229.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6508 - val_recall: 0.8311 - val_auc: 0.9286 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 47/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0042 -
tp: 198941.0000 - fp: 184.0000 - tn: 198836.0000 - fn: 79.0000 - accuracy:
0.9993 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0077 - val_tp: 123.0000 - val_fp: 66.0000 -
val_tn: 85229.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6508 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 48/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0041 -
tp: 198931.0000 - fp: 176.0000 - tn: 198844.0000 - fn: 89.0000 - accuracy:
0.9993 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 61.0000 -
val_tn: 85234.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:

0.6685 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 49/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0042 - tp: 198941.0000 - fp: 188.0000 - tn: 198832.0000 - fn: 79.0000 - accuracy: 0.9993 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9996 - specificity: 0.9996 - val_loss: 0.0075 - val_tp: 123.0000 - val_fp: 64.0000 - val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6578 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 50/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0041 - tp: 198926.0000 - fp: 171.0000 - tn: 198849.0000 - fn: 94.0000 - accuracy: 0.9993 - precision: 0.9991 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9996 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 63.0000 - val_tn: 85232.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6613 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 51/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0042 - tp: 198934.0000 - fp: 187.0000 - tn: 198833.0000 - fn: 86.0000 - accuracy: 0.9993 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9996 - specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 60.0000 - val_tn: 85235.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6721 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 52/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0040 - tp: 198946.0000 - fp: 178.0000 - tn: 198842.0000 - fn: 74.0000 - accuracy: 0.9994 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9996 - val_loss: 0.0083 - val_tp: 123.0000 - val_fp: 78.0000 - val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision: 0.6119 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 53/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0043 - tp: 198930.0000 - fp: 180.0000 - tn: 198840.0000 - fn: 90.0000 - accuracy: 0.9993 - precision: 0.9991 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9996 - specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 62.0000 - val_tn: 85233.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6649 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 - val_specificity: 0.9994
Epoch 54/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0040 - tp: 198946.0000 - fp: 168.0000 - tn: 198852.0000 - fn: 74.0000 - accuracy: 0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9996 - val_loss: 0.0078 - val_tp: 123.0000 - val_fp: 64.0000 - val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:

0.6578 - val_recall: 0.8311 - val_auc: 0.9286 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 55/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0041 -
tp: 198932.0000 - fp: 188.0000 - tn: 198832.0000 - fn: 88.0000 - accuracy:
0.9993 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9996
- specificity: 0.9996 - val_loss: 0.0075 - val_tp: 123.0000 - val_fp: 61.0000 -
val_tn: 85234.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6685 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 56/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0039 -
tp: 198934.0000 - fp: 168.0000 - tn: 198852.0000 - fn: 86.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0079 - val_tp: 123.0000 - val_fp: 64.0000 -
val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6578 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 57/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0039 -
tp: 198940.0000 - fp: 163.0000 - tn: 198857.0000 - fn: 80.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 62.0000 -
val_tn: 85233.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6649 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 58/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0039 -
tp: 198940.0000 - fp: 181.0000 - tn: 198839.0000 - fn: 80.0000 - accuracy:
0.9993 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 59.0000 -
val_tn: 85236.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6758 - val_recall: 0.8311 - val_auc: 0.9253 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 59/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0040 -
tp: 198942.0000 - fp: 174.0000 - tn: 198846.0000 - fn: 78.0000 - accuracy:
0.9994 - precision: 0.9991 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 55.0000 -
val_tn: 85240.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6910 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 60/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0040 -
tp: 198933.0000 - fp: 164.0000 - tn: 198856.0000 - fn: 87.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9996
- specificity: 0.9996 - val_loss: 0.0078 - val_tp: 123.0000 - val_fp: 64.0000 -
val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:

0.6578 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 61/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0039 -
tp: 198936.0000 - fp: 165.0000 - tn: 198855.0000 - fn: 84.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 60.0000 -
val_tn: 85235.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6721 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 62/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198940.0000 - fp: 155.0000 - tn: 198865.0000 - fn: 80.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 55.0000 -
val_tn: 85240.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6910 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 63/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0038 -
tp: 198945.0000 - fp: 155.0000 - tn: 198865.0000 - fn: 75.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 64/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198953.0000 - fp: 157.0000 - tn: 198863.0000 - fn: 67.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0078 - val_tp: 123.0000 - val_fp: 67.0000 -
val_tn: 85228.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6474 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 65/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198939.0000 - fp: 153.0000 - tn: 198867.0000 - fn: 81.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0079 - val_tp: 123.0000 - val_fp: 65.0000 -
val_tn: 85230.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6543 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8378 -
val_specificity: 0.9994
Epoch 66/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0038 -
tp: 198950.0000 - fp: 164.0000 - tn: 198856.0000 - fn: 70.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 53.0000 -
val_tn: 85242.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:

0.6989 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 67/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198941.0000 - fp: 145.0000 - tn: 198875.0000 - fn: 79.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0076 - val_tp: 123.0000 - val_fp: 62.0000 -
val_tn: 85233.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6649 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 68/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198948.0000 - fp: 151.0000 - tn: 198869.0000 - fn: 72.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 56.0000 -
val_tn: 85239.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6872 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 69/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0039 -
tp: 198934.0000 - fp: 154.0000 - tn: 198866.0000 - fn: 86.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 59.0000 -
val_tn: 85236.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6758 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 70/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0038 -
tp: 198952.0000 - fp: 152.0000 - tn: 198868.0000 - fn: 68.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 71/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198944.0000 - fp: 144.0000 - tn: 198876.0000 - fn: 76.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0068 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9996
Epoch 72/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198929.0000 - fp: 147.0000 - tn: 198873.0000 - fn: 91.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9995 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 53.0000 -
val_tn: 85242.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:

0.6989 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 73/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198939.0000 - fp: 149.0000 - tn: 198871.0000 - fn: 81.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 56.0000 -
val_tn: 85239.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6872 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 74/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0038 -
tp: 198941.0000 - fp: 155.0000 - tn: 198865.0000 - fn: 79.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 53.0000 -
val_tn: 85242.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6989 - val_recall: 0.8311 - val_auc: 0.9253 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 75/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198957.0000 - fp: 148.0000 - tn: 198872.0000 - fn: 63.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 55.0000 -
val_tn: 85240.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6910 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 76/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0036 -
tp: 198946.0000 - fp: 147.0000 - tn: 198873.0000 - fn: 74.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7069 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 77/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0037 -
tp: 198947.0000 - fp: 147.0000 - tn: 198873.0000 - fn: 73.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 78/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0036 -
tp: 198948.0000 - fp: 140.0000 - tn: 198880.0000 - fn: 72.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:

0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 79/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0037 -
tp: 198938.0000 - fp: 144.0000 - tn: 198876.0000 - fn: 82.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 80/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0037 -
tp: 198947.0000 - fp: 146.0000 - tn: 198874.0000 - fn: 73.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 49.0000 -
val_tn: 85246.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7151 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 81/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0037 -
tp: 198940.0000 - fp: 148.0000 - tn: 198872.0000 - fn: 80.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9253 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 82/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198936.0000 - fp: 141.0000 - tn: 198879.0000 - fn: 84.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 83/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0036 -
tp: 198940.0000 - fp: 151.0000 - tn: 198869.0000 - fn: 80.0000 - accuracy:
0.9994 - precision: 0.9992 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 84/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198941.0000 - fp: 149.0000 - tn: 198871.0000 - fn: 79.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 52.0000 -
val_tn: 85243.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:

0.7029 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 85/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0036 -
tp: 198943.0000 - fp: 130.0000 - tn: 198890.0000 - fn: 77.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 52.0000 -
val_tn: 85243.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7029 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 86/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0037 -
tp: 198940.0000 - fp: 143.0000 - tn: 198877.0000 - fn: 80.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 49.0000 -
val_tn: 85246.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7151 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 87/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198941.0000 - fp: 144.0000 - tn: 198876.0000 - fn: 79.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 88/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0037 -
tp: 198952.0000 - fp: 149.0000 - tn: 198871.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0075 - val_tp: 123.0000 - val_fp: 56.0000 -
val_tn: 85239.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6872 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 89/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198947.0000 - fp: 144.0000 - tn: 198876.0000 - fn: 73.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0074 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 90/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0035 -
tp: 198939.0000 - fp: 142.0000 - tn: 198878.0000 - fn: 81.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:

0.7069 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 91/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0035 -
tp: 198939.0000 - fp: 139.0000 - tn: 198881.0000 - fn: 81.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 92/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0034 -
tp: 198955.0000 - fp: 124.0000 - tn: 198896.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 93/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198943.0000 - fp: 138.0000 - tn: 198882.0000 - fn: 77.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7069 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 94/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198952.0000 - fp: 139.0000 - tn: 198881.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 49.0000 -
val_tn: 85246.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7151 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 95/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -
tp: 198946.0000 - fp: 123.0000 - tn: 198897.0000 - fn: 74.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7069 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 96/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0036 -
tp: 198945.0000 - fp: 134.0000 - tn: 198886.0000 - fn: 75.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:

0.7069 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 97/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -
tp: 198953.0000 - fp: 138.0000 - tn: 198882.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0067 - val_tp: 123.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7410 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9995
Epoch 98/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198950.0000 - fp: 128.0000 - tn: 198892.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 52.0000 -
val_tn: 85243.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7029 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 99/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0036 -
tp: 198942.0000 - fp: 136.0000 - tn: 198884.0000 - fn: 78.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 54.0000 -
val_tn: 85241.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.6949 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 100/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198952.0000 - fp: 137.0000 - tn: 198883.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 123.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7235 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 101/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198949.0000 - fp: 126.0000 - tn: 198894.0000 - fn: 71.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 102/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198955.0000 - fp: 135.0000 - tn: 198885.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:

0.7176 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 103/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198950.0000 - fp: 132.0000 - tn: 198888.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7069 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 104/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198953.0000 - fp: 130.0000 - tn: 198890.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 46.0000 -
val_tn: 85249.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7262 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 105/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198952.0000 - fp: 121.0000 - tn: 198899.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7305 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9996
Epoch 106/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198943.0000 - fp: 144.0000 - tn: 198876.0000 - fn: 77.0000 - accuracy:
0.9994 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7193 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 107/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198952.0000 - fp: 124.0000 - tn: 198896.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0071 - val_tp: 123.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7193 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 108/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0036 -
tp: 198950.0000 - fp: 118.0000 - tn: 198902.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0068 - val_tp: 123.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:

0.7235 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 109/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198951.0000 - fp: 133.0000 - tn: 198887.0000 - fn: 69.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 52.0000 -
val_tn: 85243.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7029 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 110/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198953.0000 - fp: 126.0000 - tn: 198894.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0073 - val_tp: 123.0000 - val_fp: 52.0000 -
val_tn: 85243.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7029 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 111/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198953.0000 - fp: 129.0000 - tn: 198891.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 112/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -
tp: 198956.0000 - fp: 132.0000 - tn: 198888.0000 - fn: 64.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 123.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7410 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 113/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0036 -
tp: 198948.0000 - fp: 126.0000 - tn: 198894.0000 - fn: 72.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0067 - val_tp: 123.0000 - val_fp: 46.0000 -
val_tn: 85249.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7278 - val_recall: 0.8311 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 114/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0035 -
tp: 198946.0000 - fp: 124.0000 - tn: 198896.0000 - fn: 74.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:

0.7093 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 115/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198949.0000 - fp: 133.0000 - tn: 198887.0000 - fn: 71.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7219 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9993
Epoch 116/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198953.0000 - fp: 136.0000 - tn: 198884.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 46.0000 -
val_tn: 85249.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7262 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 117/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198949.0000 - fp: 129.0000 - tn: 198891.0000 - fn: 71.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0066 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 118/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198944.0000 - fp: 132.0000 - tn: 198888.0000 - fn: 76.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0069 - val_tp: 123.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7235 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 119/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0035 -
tp: 198954.0000 - fp: 124.0000 - tn: 198896.0000 - fn: 66.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0069 - val_tp: 123.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7235 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 120/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198952.0000 - fp: 132.0000 - tn: 198888.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 123.0000 - val_fp: 46.0000 -
val_tn: 85249.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:

0.7278 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 121/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198950.0000 - fp: 115.0000 - tn: 198905.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7305 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 122/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198956.0000 - fp: 120.0000 - tn: 198900.0000 - fn: 64.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 123/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198964.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 56.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 124/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0035 -
tp: 198944.0000 - fp: 130.0000 - tn: 198890.0000 - fn: 76.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9996
Epoch 125/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198953.0000 - fp: 122.0000 - tn: 198898.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7305 - val_recall: 0.8243 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 126/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -
tp: 198956.0000 - fp: 117.0000 - tn: 198903.0000 - fn: 64.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:

0.7439 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9995fp: 88.0000 - tn: 147772.0000 - fn: 42.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificit - ETA: 0s - loss: 0.0033 - tp: 173527.0000 - fp: 99.0000 - tn:
173457.0000 - fn: 53.0000 - accuracy: 0.9996 - precision: 0.9994 - recall:
0.9997 - auc: 0.9997 - sensitivity: 0.9998 - spe
Epoch 127/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198948.0000 - fp: 128.0000 - tn: 198892.0000 - fn: 72.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0068 - val_tp: 123.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 25.0000 - val_accuracy: 0.9992 - val_precision:
0.7235 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 128/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198957.0000 - fp: 120.0000 - tn: 198900.0000 - fn: 63.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7305 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 129/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198952.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 121.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 27.0000 - val_accuracy: 0.9992 - val_precision:
0.7289 - val_recall: 0.8176 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 130/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198955.0000 - fp: 121.0000 - tn: 198899.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 131/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198948.0000 - fp: 117.0000 - tn: 198903.0000 - fn: 72.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 132/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -

tp: 198947.0000 - fp: 127.0000 - tn: 198893.0000 - fn: 73.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0066 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9995
Epoch 133/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198950.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0072 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 134/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198962.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 58.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 121.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 27.0000 - val_accuracy: 0.9992 - val_precision:
0.7333 - val_recall: 0.8176 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 135/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198949.0000 - fp: 115.0000 - tn: 198905.0000 - fn: 71.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7176 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9994
Epoch 136/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198951.0000 - fp: 124.0000 - tn: 198896.0000 - fn: 69.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 46.0000 -
val_tn: 85249.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7262 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 137/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198948.0000 - fp: 123.0000 - tn: 198897.0000 - fn: 72.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 123.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 25.0000 - val_accuracy: 0.9991 - val_precision:
0.7110 - val_recall: 0.8311 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 138/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -

tp: 198951.0000 - fp: 127.0000 - tn: 198893.0000 - fn: 69.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7219 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 139/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198947.0000 - fp: 125.0000 - tn: 198895.0000 - fn: 73.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 50.0000 -
val_tn: 85245.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7093 - val_recall: 0.8243 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 140/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0034 -
tp: 198957.0000 - fp: 118.0000 - tn: 198902.0000 - fn: 63.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 51.0000 -
val_tn: 85244.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7052 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 141/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0031 -
tp: 198954.0000 - fp: 111.0000 - tn: 198909.0000 - fn: 66.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0071 - val_tp: 122.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7176 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9995
Epoch 142/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0034 -
tp: 198950.0000 - fp: 124.0000 - tn: 198896.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9996 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 143/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0033 -
tp: 198953.0000 - fp: 109.0000 - tn: 198911.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7219 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 144/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -

tp: 198955.0000 - fp: 132.0000 - tn: 198888.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 145/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198956.0000 - fp: 106.0000 - tn: 198914.0000 - fn: 64.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 146/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198958.0000 - fp: 119.0000 - tn: 198901.0000 - fn: 62.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0066 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 147/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198946.0000 - fp: 121.0000 - tn: 198899.0000 - fn: 74.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 148/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198953.0000 - fp: 115.0000 - tn: 198905.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 149/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198952.0000 - fp: 113.0000 - tn: 198907.0000 - fn: 68.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9996
Epoch 150/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0031 -

tp: 198958.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 62.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9993
Epoch 151/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0035 -
tp: 198951.0000 - fp: 130.0000 - tn: 198890.0000 - fn: 69.0000 - accuracy:
0.9995 - precision: 0.9993 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 152/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198956.0000 - fp: 106.0000 - tn: 198914.0000 - fn: 64.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9254 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 153/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -
tp: 198950.0000 - fp: 123.0000 - tn: 198897.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9996
Epoch 154/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198957.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 63.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 155/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198955.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7305 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 156/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -

tp: 198953.0000 - fp: 110.0000 - tn: 198910.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0075 - val_tp: 122.0000 - val_fp: 56.0000 -
val_tn: 85239.0000 - val_fn: 26.0000 - val_accuracy: 0.9990 - val_precision:
0.6854 - val_recall: 0.8243 - val_auc: 0.9219 - val_sensitivity: 0.8311 -
val_specificity: 0.9993
Epoch 157/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198958.0000 - fp: 115.0000 - tn: 198905.0000 - fn: 62.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9152 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 158/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0032 -
tp: 198953.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 159/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198948.0000 - fp: 120.0000 - tn: 198900.0000 - fn: 72.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 160/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0034 -
tp: 198953.0000 - fp: 121.0000 - tn: 198899.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 161/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198950.0000 - fp: 116.0000 - tn: 198904.0000 - fn: 70.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 53.0000 -
val_tn: 85242.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.6971 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 162/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -

tp: 198957.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 63.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 163/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0033 -
tp: 198953.0000 - fp: 118.0000 - tn: 198902.0000 - fn: 67.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 164/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0032 -
tp: 198959.0000 - fp: 106.0000 - tn: 198914.0000 - fn: 61.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0065 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 165/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198953.0000 - fp: 111.0000 - tn: 198909.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 166/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198959.0000 - fp: 114.0000 - tn: 198906.0000 - fn: 61.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 167/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0031 -
tp: 198965.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 55.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 168/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -

tp: 198953.0000 - fp: 105.0000 - tn: 198915.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9996
Epoch 169/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198957.0000 - fp: 111.0000 - tn: 198909.0000 - fn: 63.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8446 -
val_specificity: 0.9996
Epoch 170/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198954.0000 - fp: 114.0000 - tn: 198906.0000 - fn: 66.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 171/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198954.0000 - fp: 114.0000 - tn: 198906.0000 - fn: 66.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 46.0000 -
val_tn: 85249.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7262 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9993
Epoch 172/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0031 -
tp: 198955.0000 - fp: 115.0000 - tn: 198905.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 173/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198963.0000 - fp: 109.0000 - tn: 198911.0000 - fn: 57.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 174/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -

tp: 198955.0000 - fp: 119.0000 - tn: 198901.0000 - fn: 65.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 175/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198946.0000 - fp: 123.0000 - tn: 198897.0000 - fn: 74.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.9995
Epoch 176/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0031 -
tp: 198957.0000 - fp: 109.0000 - tn: 198911.0000 - fn: 63.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 177/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198958.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 62.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 44.0000 -
val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7349 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 178/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0033 -
tp: 198947.0000 - fp: 111.0000 - tn: 198909.0000 - fn: 73.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 45.0000 -
val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7305 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 179/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198958.0000 - fp: 119.0000 - tn: 198901.0000 - fn: 62.0000 - accuracy:
0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0066 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 180/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0030 -

tp: 198958.0000 - fp: 105.0000 - tn: 198915.0000 - fn: 62.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 43.0000 -
val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7394 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 -
val_specificity: 0.9993
Epoch 181/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198962.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 58.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0066 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 182/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0033 -
tp: 198953.0000 - fp: 110.0000 - tn: 198910.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9992
Epoch 183/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0032 -
tp: 198954.0000 - fp: 111.0000 - tn: 198909.0000 - fn: 66.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 41.0000 -
val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7485 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
Epoch 184/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0032 -
tp: 198960.0000 - fp: 114.0000 - tn: 198906.0000 - fn: 60.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 40.0000 -
val_tn: 85255.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7531 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 185/200
398040/398040 [==============================] - 6s 15us/sample - loss: 0.0031 -
tp: 198953.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 67.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 42.0000 -
val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision:
0.7439 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 -
val_specificity: 0.99930000 - tn: 170383.0000 - fn: 60.0000 - accuracy: 0.9995 -
precision: 0.9994 - recall: 0.9996 - auc: 0.9997 - sensitivity: 0.9998
Epoch 186/200

398040/398040 [==============================] - 5s 12us/sample - loss: 0.0032 - tp: 198960.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 60.0000 - accuracy: 0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 42.0000 - val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7439 - val_recall: 0.8243 - val_auc: 0.9152 - val_sensitivity: 0.8311 - val_specificity: 0.9996
Epoch 187/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 - tp: 198956.0000 - fp: 113.0000 - tn: 198907.0000 - fn: 64.0000 - accuracy: 0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 42.0000 - val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7439 - val_recall: 0.8243 - val_auc: 0.9152 - val_sensitivity: 0.8311 - val_specificity: 0.9993
Epoch 188/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0030 - tp: 198955.0000 - fp: 102.0000 - tn: 198918.0000 - fn: 65.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 43.0000 - val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7394 - val_recall: 0.8243 - val_auc: 0.9152 - val_sensitivity: 0.8311 - val_specificity: 0.9993
Epoch 189/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0030 - tp: 198962.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 58.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0070 - val_tp: 122.0000 - val_fp: 46.0000 - val_tn: 85249.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7262 - val_recall: 0.8243 - val_auc: 0.9152 - val_sensitivity: 0.8311 - val_specificity: 0.9996
Epoch 190/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 - tp: 198952.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 68.0000 - accuracy: 0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 41.0000 - val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7485 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 - val_specificity: 0.9996
Epoch 191/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 - tp: 198954.0000 - fp: 119.0000 - tn: 198901.0000 - fn: 66.0000 - accuracy: 0.9995 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 45.0000 - val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7305 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8378 - val_specificity: 0.9996
Epoch 192/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 - tp: 198954.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 66.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 43.0000 - val_tn: 85252.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7394 - val_recall: 0.8243 - val_auc: 0.9186 - val_sensitivity: 0.8311 - val_specificity: 0.9995
Epoch 193/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0030 - tp: 198955.0000 - fp: 108.0000 - tn: 198912.0000 - fn: 65.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 41.0000 - val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7485 - val_recall: 0.8243 - val_auc: 0.9187 - val_sensitivity: 0.8378 - val_specificity: 0.9995
Epoch 194/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0030 - tp: 198959.0000 - fp: 102.0000 - tn: 198918.0000 - fn: 61.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9998 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 42.0000 - val_tn: 85253.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7439 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 - val_specificity: 0.9995
Epoch 195/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0031 - tp: 198966.0000 - fp: 106.0000 - tn: 198914.0000 - fn: 54.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 41.0000 - val_tn: 85254.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7485 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 - val_specificity: 0.9996
Epoch 196/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0032 - tp: 198954.0000 - fp: 106.0000 - tn: 198914.0000 - fn: 66.0000 - accuracy: 0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0067 - val_tp: 122.0000 - val_fp: 45.0000 - val_tn: 85250.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7305 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 - val_specificity: 0.9995
Epoch 197/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 - tp: 198959.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 61.0000 - accuracy: 0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9997 - val_loss: 0.0066 - val_tp: 122.0000 - val_fp: 44.0000 - val_tn: 85251.0000 - val_fn: 26.0000 - val_accuracy: 0.9992 - val_precision: 0.7349 - val_recall: 0.8243 - val_auc: 0.9153 - val_sensitivity: 0.8311 - val_specificity: 0.9995
Epoch 198/200

```
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198958.0000 - fp: 104.0000 - tn: 198916.0000 - fn: 62.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0068 - val_tp: 122.0000 - val_fp: 47.0000 -
val_tn: 85248.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7219 - val_recall: 0.8243 - val_auc: 0.9152 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 199/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0032 -
tp: 198960.0000 - fp: 112.0000 - tn: 198908.0000 - fn: 60.0000 - accuracy:
0.9996 - precision: 0.9994 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7176 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9996
Epoch 200/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0031 -
tp: 198957.0000 - fp: 103.0000 - tn: 198917.0000 - fn: 63.0000 - accuracy:
0.9996 - precision: 0.9995 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9997 - val_loss: 0.0069 - val_tp: 122.0000 - val_fp: 48.0000 -
val_tn: 85247.0000 - val_fn: 26.0000 - val_accuracy: 0.9991 - val_precision:
0.7176 - val_recall: 0.8243 - val_auc: 0.9220 - val_sensitivity: 0.8311 -
val_specificity: 0.9995
```

[1223]:
```python
#cost_sensitive weights to punish to the false negatives
run_5_weight_history = model_5_weight.
    fit(x=trainX_scaled,y=trainy_scaled,class_weight={0:1,1:
    5},validation_data=(testX,testy),batch_size=BATCH_SIZE,epochs=EPOCHS,callbacks=[es])
```

```
Train on 398040 samples, validate on 85443 samples
Epoch 1/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.3123 -
tp: 195595.0000 - fp: 34194.0000 - tn: 164826.0000 - fn: 3425.0000 - accuracy:
0.9055 - precision: 0.8512 - recall: 0.9828 - auc: 0.9866 - sensitivity: 0.5200
- specificity: 0.9915 - val_loss: 0.0457 - val_tp: 128.0000 - val_fp: 956.0000 -
val_tn: 84339.0000 - val_fn: 20.0000 - val_accuracy: 0.9886 - val_precision:
0.1181 - val_recall: 0.8649 - val_auc: 0.9575 - val_sensitivity: 0.0000e+00 -
val_specificity: 0.9954
Epoch 2/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0424 -
tp: 198755.0000 - fp: 3195.0000 - tn: 195825.0000 - fn: 265.0000 - accuracy:
0.9913 - precision: 0.9842 - recall: 0.9987 - auc: 0.9986 - sensitivity:
0.0000e+00 - specificity: 0.9978 - val_loss: 0.0342 - val_tp: 127.0000 - val_fp:
610.0000 - val_tn: 84685.0000 - val_fn: 21.0000 - val_accuracy: 0.9926 -
val_precision: 0.1723 - val_recall: 0.8581 - val_auc: 0.9389 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9972
Epoch 3/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0309 -
```

tp: 198816.0000 - fp: 2038.0000 - tn: 196982.0000 - fn: 204.0000 - accuracy:
0.9944 - precision: 0.9899 - recall: 0.9990 - auc: 0.9987 - sensitivity:
0.0000e+00 - specificity: 0.9979 - val_loss: 0.0305 - val_tp: 127.0000 - val_fp:
515.0000 - val_tn: 84780.0000 - val_fn: 21.0000 - val_accuracy: 0.9937 -
val_precision: 0.1978 - val_recall: 0.8581 - val_auc: 0.9331 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9975
Epoch 4/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0269 -
tp: 198854.0000 - fp: 1719.0000 - tn: 197301.0000 - fn: 166.0000 - accuracy:
0.9953 - precision: 0.9914 - recall: 0.9992 - auc: 0.9987 - sensitivity:
0.0000e+00 - specificity: 0.9978 - val_loss: 0.0294 - val_tp: 127.0000 - val_fp:
489.0000 - val_tn: 84806.0000 - val_fn: 21.0000 - val_accuracy: 0.9940 -
val_precision: 0.2062 - val_recall: 0.8581 - val_auc: 0.9333 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9975
Epoch 5/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0244 -
tp: 198885.0000 - fp: 1515.0000 - tn: 197505.0000 - fn: 135.0000 - accuracy:
0.9959 - precision: 0.9924 - recall: 0.9993 - auc: 0.9988 - sensitivity:
0.0000e+00 - specificity: 0.9979 - val_loss: 0.0282 - val_tp: 127.0000 - val_fp:
446.0000 - val_tn: 84849.0000 - val_fn: 21.0000 - val_accuracy: 0.9945 -
val_precision: 0.2216 - val_recall: 0.8581 - val_auc: 0.9335 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9976
Epoch 6/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0233 -
tp: 198885.0000 - fp: 1451.0000 - tn: 197569.0000 - fn: 135.0000 - accuracy:
0.9960 - precision: 0.9928 - recall: 0.9993 - auc: 0.9989 - sensitivity: 0.9687
- specificity: 0.9981 - val_loss: 0.0255 - val_tp: 127.0000 - val_fp: 401.0000 -
val_tn: 84894.0000 - val_fn: 21.0000 - val_accuracy: 0.9951 - val_precision:
0.2405 - val_recall: 0.8581 - val_auc: 0.9338 - val_sensitivity: 0.0000e+00 -
val_specificity: 0.9974
Epoch 7/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0217 -
tp: 198909.0000 - fp: 1297.0000 - tn: 197723.0000 - fn: 111.0000 - accuracy:
0.9965 - precision: 0.9935 - recall: 0.9994 - auc: 0.9989 - sensitivity: 0.9714
- specificity: 0.9981 - val_loss: 0.0284 - val_tp: 127.0000 - val_fp: 453.0000 -
val_tn: 84842.0000 - val_fn: 21.0000 - val_accuracy: 0.9945 - val_precision:
0.2190 - val_recall: 0.8581 - val_auc: 0.9302 - val_sensitivity: 0.0000e+00 -
val_specificity: 0.9975
Epoch 8/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0210 -
tp: 198904.0000 - fp: 1235.0000 - tn: 197785.0000 - fn: 116.0000 - accuracy:
0.9966 - precision: 0.9938 - recall: 0.9994 - auc: 0.9990 - sensitivity: 0.9722
- specificity: 0.9982 - val_loss: 0.0242 - val_tp: 126.0000 - val_fp: 372.0000 -
val_tn: 84923.0000 - val_fn: 22.0000 - val_accuracy: 0.9954 - val_precision:
0.2530 - val_recall: 0.8514 - val_auc: 0.9338 - val_sensitivity: 0.8446 -
val_specificity: 0.9971
Epoch 9/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0200 -

tp: 198914.0000 - fp: 1200.0000 - tn: 197820.0000 - fn: 106.0000 - accuracy:
0.9967 - precision: 0.9940 - recall: 0.9995 - auc: 0.9990 - sensitivity: 0.9744
- specificity: 0.9983 - val_loss: 0.0216 - val_tp: 126.0000 - val_fp: 326.0000 -
val_tn: 84969.0000 - val_fn: 22.0000 - val_accuracy: 0.9959 - val_precision:
0.2788 - val_recall: 0.8514 - val_auc: 0.9305 - val_sensitivity: 0.8446 -
val_specificity: 0.9971
Epoch 10/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0190 -
tp: 198932.0000 - fp: 1118.0000 - tn: 197902.0000 - fn: 88.0000 - accuracy:
0.9970 - precision: 0.9944 - recall: 0.9996 - auc: 0.9991 - sensitivity: 0.9760
- specificity: 0.9984 - val_loss: 0.0209 - val_tp: 126.0000 - val_fp: 327.0000 -
val_tn: 84968.0000 - val_fn: 22.0000 - val_accuracy: 0.9959 - val_precision:
0.2781 - val_recall: 0.8514 - val_auc: 0.9304 - val_sensitivity: 0.8446 -
val_specificity: 0.9967
Epoch 11/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0181 -
tp: 198932.0000 - fp: 1043.0000 - tn: 197977.0000 - fn: 88.0000 - accuracy:
0.9972 - precision: 0.9948 - recall: 0.9996 - auc: 0.9991 - sensitivity: 0.9789
- specificity: 0.9984 - val_loss: 0.0220 - val_tp: 126.0000 - val_fp: 327.0000 -
val_tn: 84968.0000 - val_fn: 22.0000 - val_accuracy: 0.9959 - val_precision:
0.2781 - val_recall: 0.8514 - val_auc: 0.9304 - val_sensitivity: 0.8446 -
val_specificity: 0.9969
Epoch 12/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0174 -
tp: 198942.0000 - fp: 968.0000 - tn: 198052.0000 - fn: 78.0000 - accuracy:
0.9974 - precision: 0.9952 - recall: 0.9996 - auc: 0.9992 - sensitivity: 0.9798
- specificity: 0.9985 - val_loss: 0.0211 - val_tp: 126.0000 - val_fp: 318.0000 -
val_tn: 84977.0000 - val_fn: 22.0000 - val_accuracy: 0.9960 - val_precision:
0.2838 - val_recall: 0.8514 - val_auc: 0.9304 - val_sensitivity: 0.8446 -
val_specificity: 0.9971
Epoch 13/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0164 -
tp: 198956.0000 - fp: 902.0000 - tn: 198118.0000 - fn: 64.0000 - accuracy:
0.9976 - precision: 0.9955 - recall: 0.9997 - auc: 0.9992 - sensitivity: 0.9797
- specificity: 0.9986 - val_loss: 0.0216 - val_tp: 126.0000 - val_fp: 311.0000 -
val_tn: 84984.0000 - val_fn: 22.0000 - val_accuracy: 0.9961 - val_precision:
0.2883 - val_recall: 0.8514 - val_auc: 0.9304 - val_sensitivity: 0.8446 -
val_specificity: 0.9969
Epoch 14/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0159 -
tp: 198945.0000 - fp: 856.0000 - tn: 198164.0000 - fn: 75.0000 - accuracy:
0.9977 - precision: 0.9957 - recall: 0.9996 - auc: 0.9993 - sensitivity: 0.9832
- specificity: 0.9987 - val_loss: 0.0184 - val_tp: 126.0000 - val_fp: 259.0000 -
val_tn: 85036.0000 - val_fn: 22.0000 - val_accuracy: 0.9967 - val_precision:
0.3273 - val_recall: 0.8514 - val_auc: 0.9305 - val_sensitivity: 0.8446 -
val_specificity: 0.9970
Epoch 15/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0155 -

tp: 198940.0000 - fp: 789.0000 - tn: 198231.0000 - fn: 80.0000 - accuracy:
0.9978 - precision: 0.9960 - recall: 0.9996 - auc: 0.9992 - sensitivity: 0.9832
- specificity: 0.9987 - val_loss: 0.0199 - val_tp: 126.0000 - val_fp: 293.0000 -
val_tn: 85002.0000 - val_fn: 22.0000 - val_accuracy: 0.9963 - val_precision:
0.3007 - val_recall: 0.8514 - val_auc: 0.9305 - val_sensitivity: 0.8446 -
val_specificity: 0.9972
Epoch 16/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0151 -
tp: 198956.0000 - fp: 737.0000 - tn: 198283.0000 - fn: 64.0000 - accuracy:
0.9980 - precision: 0.9963 - recall: 0.9997 - auc: 0.9993 - sensitivity: 0.9847
- specificity: 0.9987 - val_loss: 0.0180 - val_tp: 126.0000 - val_fp: 263.0000 -
val_tn: 85032.0000 - val_fn: 22.0000 - val_accuracy: 0.9967 - val_precision:
0.3239 - val_recall: 0.8514 - val_auc: 0.9275 - val_sensitivity: 0.8446 -
val_specificity: 0.9973
Epoch 17/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0145 -
tp: 198949.0000 - fp: 682.0000 - tn: 198338.0000 - fn: 71.0000 - accuracy:
0.9981 - precision: 0.9966 - recall: 0.9996 - auc: 0.9993 - sensitivity: 0.9853
- specificity: 0.9988 - val_loss: 0.0179 - val_tp: 126.0000 - val_fp: 262.0000 -
val_tn: 85033.0000 - val_fn: 22.0000 - val_accuracy: 0.9967 - val_precision:
0.3247 - val_recall: 0.8514 - val_auc: 0.9307 - val_sensitivity: 0.8446 -
val_specificity: 0.9972
Epoch 18/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0141 -
tp: 198951.0000 - fp: 644.0000 - tn: 198376.0000 - fn: 69.0000 - accuracy:
0.9982 - precision: 0.9968 - recall: 0.9997 - auc: 0.9993 - sensitivity: 0.9860
- specificity: 0.9989 - val_loss: 0.0160 - val_tp: 125.0000 - val_fp: 213.0000 -
val_tn: 85082.0000 - val_fn: 23.0000 - val_accuracy: 0.9972 - val_precision:
0.3698 - val_recall: 0.8446 - val_auc: 0.9308 - val_sensitivity: 0.8446 -
val_specificity: 0.9966
Epoch 19/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0138 -
tp: 198959.0000 - fp: 625.0000 - tn: 198395.0000 - fn: 61.0000 - accuracy:
0.9983 - precision: 0.9969 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9869
- specificity: 0.9989 - val_loss: 0.0189 - val_tp: 126.0000 - val_fp: 260.0000 -
val_tn: 85035.0000 - val_fn: 22.0000 - val_accuracy: 0.9967 - val_precision:
0.3264 - val_recall: 0.8514 - val_auc: 0.9307 - val_sensitivity: 0.8446 -
val_specificity: 0.9974
Epoch 20/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0131 -
tp: 198956.0000 - fp: 579.0000 - tn: 198441.0000 - fn: 64.0000 - accuracy:
0.9984 - precision: 0.9971 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9878
- specificity: 0.9989 - val_loss: 0.0147 - val_tp: 125.0000 - val_fp: 198.0000 -
val_tn: 85097.0000 - val_fn: 23.0000 - val_accuracy: 0.9974 - val_precision:
0.3870 - val_recall: 0.8446 - val_auc: 0.9277 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 21/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0127 -

tp: 198965.0000 - fp: 551.0000 - tn: 198469.0000 - fn: 55.0000 - accuracy:
0.9985 - precision: 0.9972 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9881
- specificity: 0.9990 - val_loss: 0.0161 - val_tp: 125.0000 - val_fp: 217.0000 -
val_tn: 85078.0000 - val_fn: 23.0000 - val_accuracy: 0.9972 - val_precision:
0.3655 - val_recall: 0.8446 - val_auc: 0.9276 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 22/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0125 -
tp: 198966.0000 - fp: 526.0000 - tn: 198494.0000 - fn: 54.0000 - accuracy:
0.9985 - precision: 0.9974 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9879
- specificity: 0.9989 - val_loss: 0.0144 - val_tp: 125.0000 - val_fp: 170.0000 -
val_tn: 85125.0000 - val_fn: 23.0000 - val_accuracy: 0.9977 - val_precision:
0.4237 - val_recall: 0.8446 - val_auc: 0.9246 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 23/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0124 -
tp: 198956.0000 - fp: 529.0000 - tn: 198491.0000 - fn: 64.0000 - accuracy:
0.9985 - precision: 0.9973 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9886
- specificity: 0.9990 - val_loss: 0.0155 - val_tp: 126.0000 - val_fp: 195.0000 -
val_tn: 85100.0000 - val_fn: 22.0000 - val_accuracy: 0.9975 - val_precision:
0.3925 - val_recall: 0.8514 - val_auc: 0.9279 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 24/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0121 -
tp: 198957.0000 - fp: 503.0000 - tn: 198517.0000 - fn: 63.0000 - accuracy:
0.9986 - precision: 0.9975 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9896
- specificity: 0.9990 - val_loss: 0.0152 - val_tp: 126.0000 - val_fp: 198.0000 -
val_tn: 85097.0000 - val_fn: 22.0000 - val_accuracy: 0.9974 - val_precision:
0.3889 - val_recall: 0.8514 - val_auc: 0.9245 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 25/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0123 -
tp: 198966.0000 - fp: 506.0000 - tn: 198514.0000 - fn: 54.0000 - accuracy:
0.9986 - precision: 0.9975 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9885
- specificity: 0.9990 - val_loss: 0.0151 - val_tp: 126.0000 - val_fp: 187.0000 -
val_tn: 85108.0000 - val_fn: 22.0000 - val_accuracy: 0.9976 - val_precision:
0.4026 - val_recall: 0.8514 - val_auc: 0.9246 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 26/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0118 -
tp: 198968.0000 - fp: 465.0000 - tn: 198555.0000 - fn: 52.0000 - accuracy:
0.9987 - precision: 0.9977 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9896
- specificity: 0.9990 - val_loss: 0.0137 - val_tp: 126.0000 - val_fp: 174.0000 -
val_tn: 85121.0000 - val_fn: 22.0000 - val_accuracy: 0.9977 - val_precision:
0.4200 - val_recall: 0.8514 - val_auc: 0.9280 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 27/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0116 -

tp: 198963.0000 - fp: 446.0000 - tn: 198574.0000 - fn: 57.0000 - accuracy:
0.9987 - precision: 0.9978 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9898
- specificity: 0.9991 - val_loss: 0.0149 - val_tp: 126.0000 - val_fp: 184.0000 -
val_tn: 85111.0000 - val_fn: 22.0000 - val_accuracy: 0.9976 - val_precision:
0.4065 - val_recall: 0.8514 - val_auc: 0.9279 - val_sensitivity: 0.8446 -
val_specificity: 0.9988
Epoch 28/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0116 -
tp: 198965.0000 - fp: 447.0000 - tn: 198573.0000 - fn: 55.0000 - accuracy:
0.9987 - precision: 0.9978 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9948
- specificity: 0.9991 - val_loss: 0.0134 - val_tp: 126.0000 - val_fp: 152.0000 -
val_tn: 85143.0000 - val_fn: 22.0000 - val_accuracy: 0.9980 - val_precision:
0.4532 - val_recall: 0.8514 - val_auc: 0.9280 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 29/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0114 -
tp: 198968.0000 - fp: 437.0000 - tn: 198583.0000 - fn: 52.0000 - accuracy:
0.9988 - precision: 0.9978 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9950
- specificity: 0.9991 - val_loss: 0.0134 - val_tp: 126.0000 - val_fp: 144.0000 -
val_tn: 85151.0000 - val_fn: 22.0000 - val_accuracy: 0.9981 - val_precision:
0.4667 - val_recall: 0.8514 - val_auc: 0.9247 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 30/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0112 -
tp: 198968.0000 - fp: 408.0000 - tn: 198612.0000 - fn: 52.0000 - accuracy:
0.9988 - precision: 0.9980 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9955
- specificity: 0.9991 - val_loss: 0.0125 - val_tp: 126.0000 - val_fp: 135.0000 -
val_tn: 85160.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4828 - val_recall: 0.8514 - val_auc: 0.9247 - val_sensitivity: 0.8378 -
val_specificity: 0.9989
Epoch 31/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0109 -
tp: 198974.0000 - fp: 389.0000 - tn: 198631.0000 - fn: 46.0000 - accuracy:
0.9989 - precision: 0.9980 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9953
- specificity: 0.9991 - val_loss: 0.0116 - val_tp: 126.0000 - val_fp: 116.0000 -
val_tn: 85179.0000 - val_fn: 22.0000 - val_accuracy: 0.9984 - val_precision:
0.5207 - val_recall: 0.8514 - val_auc: 0.9248 - val_sensitivity: 0.8378 -
val_specificity: 0.9989
Epoch 32/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0116 -
tp: 198958.0000 - fp: 445.0000 - tn: 198575.0000 - fn: 62.0000 - accuracy:
0.9987 - precision: 0.9978 - recall: 0.9997 - auc: 0.9994 - sensitivity: 0.9909
- specificity: 0.9990 - val_loss: 0.0121 - val_tp: 125.0000 - val_fp: 128.0000 -
val_tn: 85167.0000 - val_fn: 23.0000 - val_accuracy: 0.9982 - val_precision:
0.4941 - val_recall: 0.8446 - val_auc: 0.9247 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 33/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0109 -

tp: 198967.0000 - fp: 399.0000 - tn: 198621.0000 - fn: 53.0000 - accuracy:
0.9989 - precision: 0.9980 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9955
- specificity: 0.9991 - val_loss: 0.0136 - val_tp: 125.0000 - val_fp: 149.0000 -
val_tn: 85146.0000 - val_fn: 23.0000 - val_accuracy: 0.9980 - val_precision:
0.4562 - val_recall: 0.8446 - val_auc: 0.9247 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 34/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0105 -
tp: 198968.0000 - fp: 398.0000 - tn: 198622.0000 - fn: 52.0000 - accuracy:
0.9989 - precision: 0.9980 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9977
- specificity: 0.9992 - val_loss: 0.0115 - val_tp: 125.0000 - val_fp: 114.0000 -
val_tn: 85181.0000 - val_fn: 23.0000 - val_accuracy: 0.9984 - val_precision:
0.5230 - val_recall: 0.8446 - val_auc: 0.9249 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 35/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0110 -
tp: 198959.0000 - fp: 402.0000 - tn: 198618.0000 - fn: 61.0000 - accuracy:
0.9988 - precision: 0.9980 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9956
- specificity: 0.9991 - val_loss: 0.0148 - val_tp: 126.0000 - val_fp: 182.0000 -
val_tn: 85113.0000 - val_fn: 22.0000 - val_accuracy: 0.9976 - val_precision:
0.4091 - val_recall: 0.8514 - val_auc: 0.9279 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 36/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0107 -
tp: 198961.0000 - fp: 402.0000 - tn: 198618.0000 - fn: 59.0000 - accuracy:
0.9988 - precision: 0.9980 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9958
- specificity: 0.9991 - val_loss: 0.0125 - val_tp: 126.0000 - val_fp: 131.0000 -
val_tn: 85164.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4903 - val_recall: 0.8514 - val_auc: 0.9280 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 37/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0102 -
tp: 198975.0000 - fp: 353.0000 - tn: 198667.0000 - fn: 45.0000 - accuracy:
0.9990 - precision: 0.9982 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9971
- specificity: 0.9991 - val_loss: 0.0124 - val_tp: 126.0000 - val_fp: 125.0000 -
val_tn: 85170.0000 - val_fn: 22.0000 - val_accuracy: 0.9983 - val_precision:
0.5020 - val_recall: 0.8514 - val_auc: 0.9281 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 38/200
398040/398040 [==============================] - 4s 9us/sample - loss: 0.0104 -
tp: 198965.0000 - fp: 363.0000 - tn: 198657.0000 - fn: 55.0000 - accuracy:
0.9989 - precision: 0.9982 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9973
- specificity: 0.9991 - val_loss: 0.0145 - val_tp: 126.0000 - val_fp: 173.0000 -
val_tn: 85122.0000 - val_fn: 22.0000 - val_accuracy: 0.9977 - val_precision:
0.4214 - val_recall: 0.8514 - val_auc: 0.9279 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 39/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0104 -

tp: 198966.0000 - fp: 388.0000 - tn: 198632.0000 - fn: 54.0000 - accuracy:
0.9989 - precision: 0.9981 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9978
- specificity: 0.9992 - val_loss: 0.0136 - val_tp: 126.0000 - val_fp: 148.0000 -
val_tn: 85147.0000 - val_fn: 22.0000 - val_accuracy: 0.9980 - val_precision:
0.4599 - val_recall: 0.8514 - val_auc: 0.9281 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 40/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0099 -
tp: 198976.0000 - fp: 340.0000 - tn: 198680.0000 - fn: 44.0000 - accuracy:
0.9990 - precision: 0.9983 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9983
- specificity: 0.9992 - val_loss: 0.0124 - val_tp: 126.0000 - val_fp: 131.0000 -
val_tn: 85164.0000 - val_fn: 22.0000 - val_accuracy: 0.9982 - val_precision:
0.4903 - val_recall: 0.8514 - val_auc: 0.9281 - val_sensitivity: 0.8378 -
val_specificity: 0.9988
Epoch 41/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0101 -
tp: 198970.0000 - fp: 332.0000 - tn: 198688.0000 - fn: 50.0000 - accuracy:
0.9990 - precision: 0.9983 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9987
- specificity: 0.9992 - val_loss: 0.0135 - val_tp: 126.0000 - val_fp: 151.0000 -
val_tn: 85144.0000 - val_fn: 22.0000 - val_accuracy: 0.9980 - val_precision:
0.4549 - val_recall: 0.8514 - val_auc: 0.9280 - val_sensitivity: 0.8378 -
val_specificity: 0.9985
Epoch 42/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0096 -
tp: 198975.0000 - fp: 338.0000 - tn: 198682.0000 - fn: 45.0000 - accuracy:
0.9990 - precision: 0.9983 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9984
- specificity: 0.9993 - val_loss: 0.0116 - val_tp: 124.0000 - val_fp: 119.0000 -
val_tn: 85176.0000 - val_fn: 24.0000 - val_accuracy: 0.9983 - val_precision:
0.5103 - val_recall: 0.8378 - val_auc: 0.9282 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 43/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0100 -
tp: 198967.0000 - fp: 360.0000 - tn: 198660.0000 - fn: 53.0000 - accuracy:
0.9990 - precision: 0.9982 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9974
- specificity: 0.9991 - val_loss: 0.0108 - val_tp: 124.0000 - val_fp: 104.0000 -
val_tn: 85191.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5439 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 44/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0101 -
tp: 198970.0000 - fp: 353.0000 - tn: 198667.0000 - fn: 50.0000 - accuracy:
0.9990 - precision: 0.9982 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9973
- specificity: 0.9992 - val_loss: 0.0122 - val_tp: 125.0000 - val_fp: 127.0000 -
val_tn: 85168.0000 - val_fn: 23.0000 - val_accuracy: 0.9982 - val_precision:
0.4960 - val_recall: 0.8446 - val_auc: 0.9281 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 45/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0095 -

tp: 198975.0000 - fp: 335.0000 - tn: 198685.0000 - fn: 45.0000 - accuracy:
0.9990 - precision: 0.9983 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9985
- specificity: 0.9992 - val_loss: 0.0120 - val_tp: 125.0000 - val_fp: 114.0000 -
val_tn: 85181.0000 - val_fn: 23.0000 - val_accuracy: 0.9984 - val_precision:
0.5230 - val_recall: 0.8446 - val_auc: 0.9249 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 46/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0096 -
tp: 198975.0000 - fp: 316.0000 - tn: 198704.0000 - fn: 45.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9990
- specificity: 0.9992 - val_loss: 0.0108 - val_tp: 124.0000 - val_fp: 104.0000 -
val_tn: 85191.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5439 - val_recall: 0.8378 - val_auc: 0.9249 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 47/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0094 -
tp: 198977.0000 - fp: 334.0000 - tn: 198686.0000 - fn: 43.0000 - accuracy:
0.9991 - precision: 0.9983 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9990
- specificity: 0.9993 - val_loss: 0.0117 - val_tp: 125.0000 - val_fp: 113.0000 -
val_tn: 85182.0000 - val_fn: 23.0000 - val_accuracy: 0.9984 - val_precision:
0.5252 - val_recall: 0.8446 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 48/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0094 -
tp: 198969.0000 - fp: 333.0000 - tn: 198687.0000 - fn: 51.0000 - accuracy:
0.9990 - precision: 0.9983 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9989
- specificity: 0.9992 - val_loss: 0.0116 - val_tp: 125.0000 - val_fp: 118.0000 -
val_tn: 85177.0000 - val_fn: 23.0000 - val_accuracy: 0.9983 - val_precision:
0.5144 - val_recall: 0.8446 - val_auc: 0.9282 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 49/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0096 -
tp: 198972.0000 - fp: 326.0000 - tn: 198694.0000 - fn: 48.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9988
- specificity: 0.9992 - val_loss: 0.0122 - val_tp: 124.0000 - val_fp: 120.0000 -
val_tn: 85175.0000 - val_fn: 24.0000 - val_accuracy: 0.9983 - val_precision:
0.5082 - val_recall: 0.8378 - val_auc: 0.9249 - val_sensitivity: 0.8378 -
val_specificity: 0.9985
Epoch 50/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0097 -
tp: 198968.0000 - fp: 310.0000 - tn: 198710.0000 - fn: 52.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9991
- specificity: 0.9992 - val_loss: 0.0109 - val_tp: 124.0000 - val_fp: 107.0000 -
val_tn: 85188.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5368 - val_recall: 0.8378 - val_auc: 0.9282 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 51/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0094 -

tp: 198966.0000 - fp: 314.0000 - tn: 198706.0000 - fn: 54.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9991
- specificity: 0.9993 - val_loss: 0.0113 - val_tp: 124.0000 - val_fp: 109.0000 -
val_tn: 85186.0000 - val_fn: 24.0000 - val_accuracy: 0.9984 - val_precision:
0.5322 - val_recall: 0.8378 - val_auc: 0.9282 - val_sensitivity: 0.8378 -
val_specificity: 0.9984
Epoch 52/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0094 -
tp: 198967.0000 - fp: 319.0000 - tn: 198701.0000 - fn: 53.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9992
- specificity: 0.9992 - val_loss: 0.0111 - val_tp: 124.0000 - val_fp: 105.0000 -
val_tn: 85190.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5415 - val_recall: 0.8378 - val_auc: 0.9249 - val_sensitivity: 0.8378 -
val_specificity: 0.9985
Epoch 53/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0095 -
tp: 198969.0000 - fp: 302.0000 - tn: 198718.0000 - fn: 51.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9989
- specificity: 0.9993 - val_loss: 0.0112 - val_tp: 124.0000 - val_fp: 103.0000 -
val_tn: 85192.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5463 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 54/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0099 -
tp: 198968.0000 - fp: 334.0000 - tn: 198686.0000 - fn: 52.0000 - accuracy:
0.9990 - precision: 0.9983 - recall: 0.9997 - auc: 0.9995 - sensitivity: 0.9989
- specificity: 0.9992 - val_loss: 0.0108 - val_tp: 124.0000 - val_fp: 102.0000 -
val_tn: 85193.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5487 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 55/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0091 -
tp: 198970.0000 - fp: 306.0000 - tn: 198714.0000 - fn: 50.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9994
- specificity: 0.9993 - val_loss: 0.0109 - val_tp: 124.0000 - val_fp: 104.0000 -
val_tn: 85191.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5439 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 56/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0094 -
tp: 198975.0000 - fp: 317.0000 - tn: 198703.0000 - fn: 45.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9998 - auc: 0.9995 - sensitivity: 0.9990
- specificity: 0.9993 - val_loss: 0.0111 - val_tp: 124.0000 - val_fp: 106.0000 -
val_tn: 85189.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5391 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9987
Epoch 57/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0094 -

tp: 198978.0000 - fp: 296.0000 - tn: 198724.0000 - fn: 42.0000 - accuracy:
0.9992 - precision: 0.9985 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9992
- specificity: 0.9993 - val_loss: 0.0105 - val_tp: 124.0000 - val_fp: 96.0000 -
val_tn: 85199.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5636 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9984
Epoch 58/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0091 -
tp: 198974.0000 - fp: 319.0000 - tn: 198701.0000 - fn: 46.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9994
- specificity: 0.9994 - val_loss: 0.0111 - val_tp: 124.0000 - val_fp: 103.0000 -
val_tn: 85192.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5463 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 59/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0095 -
tp: 198970.0000 - fp: 290.0000 - tn: 198730.0000 - fn: 50.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9993
- specificity: 0.9993 - val_loss: 0.0106 - val_tp: 124.0000 - val_fp: 98.0000 -
val_tn: 85197.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5586 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9984
Epoch 60/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0090 -
tp: 198973.0000 - fp: 286.0000 - tn: 198734.0000 - fn: 47.0000 - accuracy:
0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9993 - val_loss: 0.0115 - val_tp: 124.0000 - val_fp: 106.0000 -
val_tn: 85189.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5391 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9984
Epoch 61/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0092 -
tp: 198969.0000 - fp: 322.0000 - tn: 198698.0000 - fn: 51.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9990
- specificity: 0.9993 - val_loss: 0.0107 - val_tp: 124.0000 - val_fp: 98.0000 -
val_tn: 85197.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5586 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9985
Epoch 62/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0095 -
tp: 198967.0000 - fp: 305.0000 - tn: 198715.0000 - fn: 53.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9992
- specificity: 0.9993 - val_loss: 0.0102 - val_tp: 124.0000 - val_fp: 98.0000 -
val_tn: 85197.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5586 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9986
Epoch 63/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0092 -

tp: 198973.0000 - fp: 307.0000 - tn: 198713.0000 - fn: 47.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9992
- specificity: 0.9993 - val_loss: 0.0109 - val_tp: 124.0000 - val_fp: 101.0000 -
val_tn: 85194.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5511 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9992
Epoch 64/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0090 -
tp: 198976.0000 - fp: 311.0000 - tn: 198709.0000 - fn: 44.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9993 - val_loss: 0.0097 - val_tp: 124.0000 - val_fp: 91.0000 -
val_tn: 85204.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision:
0.5767 - val_recall: 0.8378 - val_auc: 0.9251 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 65/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0089 -
tp: 198972.0000 - fp: 284.0000 - tn: 198736.0000 - fn: 48.0000 - accuracy:
0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9993 - val_loss: 0.0106 - val_tp: 124.0000 - val_fp: 102.0000 -
val_tn: 85193.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5487 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9992
Epoch 66/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0090 -
tp: 198975.0000 - fp: 285.0000 - tn: 198735.0000 - fn: 45.0000 - accuracy:
0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9994 - val_loss: 0.0103 - val_tp: 124.0000 - val_fp: 96.0000 -
val_tn: 85199.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5636 - val_recall: 0.8378 - val_auc: 0.9250 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 67/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0091 -
tp: 198973.0000 - fp: 278.0000 - tn: 198742.0000 - fn: 47.0000 - accuracy:
0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9993 - val_loss: 0.0101 - val_tp: 124.0000 - val_fp: 95.0000 -
val_tn: 85200.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5662 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9992
Epoch 68/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0090 -
tp: 198974.0000 - fp: 293.0000 - tn: 198727.0000 - fn: 46.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9994
- specificity: 0.9993 - val_loss: 0.0102 - val_tp: 124.0000 - val_fp: 96.0000 -
val_tn: 85199.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5636 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 -
val_specificity: 0.9992
Epoch 69/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0086 -

tp: 198972.0000 - fp: 253.0000 - tn: 198767.0000 - fn: 48.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9994 - val_loss: 0.0111 - val_tp: 124.0000 - val_fp: 105.0000 -
val_tn: 85190.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision:
0.5415 - val_recall: 0.8378 - val_auc: 0.9316 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 70/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0087 -
tp: 198974.0000 - fp: 294.0000 - tn: 198726.0000 - fn: 46.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9994
- specificity: 0.9993 - val_loss: 0.0099 - val_tp: 124.0000 - val_fp: 94.0000 -
val_tn: 85201.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5688 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 -
val_specificity: 0.9992
Epoch 71/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0088 -
tp: 198971.0000 - fp: 263.0000 - tn: 198757.0000 - fn: 49.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9993 - val_loss: 0.0102 - val_tp: 124.0000 - val_fp: 93.0000 -
val_tn: 85202.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5714 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 72/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0088 -
tp: 198973.0000 - fp: 297.0000 - tn: 198723.0000 - fn: 47.0000 - accuracy:
0.9991 - precision: 0.9985 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9993 - val_loss: 0.0105 - val_tp: 124.0000 - val_fp: 98.0000 -
val_tn: 85197.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5586 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 -
val_specificity: 0.9992
Epoch 73/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0089 -
tp: 198971.0000 - fp: 314.0000 - tn: 198706.0000 - fn: 49.0000 - accuracy:
0.9991 - precision: 0.9984 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9993 - val_loss: 0.0097 - val_tp: 124.0000 - val_fp: 89.0000 -
val_tn: 85206.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision:
0.5822 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 74/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0087 -
tp: 198971.0000 - fp: 273.0000 - tn: 198747.0000 - fn: 49.0000 - accuracy:
0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9994 - val_loss: 0.0109 - val_tp: 123.0000 - val_fp: 97.0000 -
val_tn: 85198.0000 - val_fn: 25.0000 - val_accuracy: 0.9986 - val_precision:
0.5591 - val_recall: 0.8311 - val_auc: 0.9283 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 75/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0087 -

tp: 198978.0000 - fp: 264.0000 - tn: 198756.0000 - fn: 42.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996 - specificity: 0.9993 - val_loss: 0.0098 - val_tp: 124.0000 - val_fp: 85.0000 - val_tn: 85210.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision: 0.5933 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 - val_specificity: 0.9991
Epoch 76/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0083 - tp: 198973.0000 - fp: 265.0000 - tn: 198755.0000 - fn: 47.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996 - specificity: 0.9994 - val_loss: 0.0106 - val_tp: 124.0000 - val_fp: 98.0000 - val_tn: 85197.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision: 0.5586 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8378 - val_specificity: 0.9990
Epoch 77/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0085 - tp: 198974.0000 - fp: 258.0000 - tn: 198762.0000 - fn: 46.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996 - specificity: 0.9994 - val_loss: 0.0103 - val_tp: 124.0000 - val_fp: 95.0000 - val_tn: 85200.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision: 0.5662 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 78/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0085 - tp: 198972.0000 - fp: 273.0000 - tn: 198747.0000 - fn: 48.0000 - accuracy: 0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996 - specificity: 0.9994 - val_loss: 0.0098 - val_tp: 124.0000 - val_fp: 87.0000 - val_tn: 85208.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision: 0.5877 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 - val_specificity: 0.9991
Epoch 79/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0087 - tp: 198974.0000 - fp: 269.0000 - tn: 198751.0000 - fn: 46.0000 - accuracy: 0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9993 - val_loss: 0.0106 - val_tp: 124.0000 - val_fp: 102.0000 - val_tn: 85193.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision: 0.5487 - val_recall: 0.8378 - val_auc: 0.9283 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 80/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0087 - tp: 198971.0000 - fp: 265.0000 - tn: 198755.0000 - fn: 49.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996 - specificity: 0.9993 - val_loss: 0.0096 - val_tp: 124.0000 - val_fp: 85.0000 - val_tn: 85210.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision: 0.5933 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 - val_specificity: 0.9991
Epoch 81/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0085 -

tp: 198974.0000 - fp: 254.0000 - tn: 198766.0000 - fn: 46.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0099 - val_tp: 124.0000 - val_fp: 91.0000 -
val_tn: 85204.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision:
0.5767 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 82/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0088 -
tp: 198973.0000 - fp: 267.0000 - tn: 198753.0000 - fn: 47.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9994 - val_loss: 0.0095 - val_tp: 124.0000 - val_fp: 84.0000 -
val_tn: 85211.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision:
0.5962 - val_recall: 0.8378 - val_auc: 0.9285 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 83/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0083 -
tp: 198975.0000 - fp: 239.0000 - tn: 198781.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0107 - val_tp: 124.0000 - val_fp: 98.0000 -
val_tn: 85197.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision:
0.5586 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 84/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0087 -
tp: 198977.0000 - fp: 250.0000 - tn: 198770.0000 - fn: 43.0000 - accuracy:
0.9993 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9994 - val_loss: 0.0098 - val_tp: 123.0000 - val_fp: 85.0000 -
val_tn: 85210.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5913 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 85/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0086 -
tp: 198970.0000 - fp: 268.0000 - tn: 198752.0000 - fn: 50.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9993 - val_loss: 0.0100 - val_tp: 123.0000 - val_fp: 92.0000 -
val_tn: 85203.0000 - val_fn: 25.0000 - val_accuracy: 0.9986 - val_precision:
0.5721 - val_recall: 0.8311 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 86/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0088 -
tp: 198974.0000 - fp: 272.0000 - tn: 198748.0000 - fn: 46.0000 - accuracy:
0.9992 - precision: 0.9986 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995
- specificity: 0.9994 - val_loss: 0.0100 - val_tp: 123.0000 - val_fp: 86.0000 -
val_tn: 85209.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5885 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 87/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0086 -

tp: 198974.0000 - fp: 249.0000 - tn: 198771.0000 - fn: 46.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0095 - val_tp: 123.0000 - val_fp: 85.0000 - val_tn: 85210.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.5913 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 88/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0083 - tp: 198977.0000 - fp: 241.0000 - tn: 198779.0000 - fn: 43.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0094 - val_tp: 123.0000 - val_fp: 82.0000 - val_tn: 85213.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.6000 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8378 - val_specificity: 0.9990
Epoch 89/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0089 - tp: 198976.0000 - fp: 263.0000 - tn: 198757.0000 - fn: 44.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9995 - specificity: 0.9993 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 81.0000 - val_tn: 85214.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision: 0.6029 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 90/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0083 - tp: 198976.0000 - fp: 242.0000 - tn: 198778.0000 - fn: 44.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0100 - val_tp: 124.0000 - val_fp: 88.0000 - val_tn: 85207.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision: 0.5849 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 - val_specificity: 0.9990
Epoch 91/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0083 - tp: 198973.0000 - fp: 248.0000 - tn: 198772.0000 - fn: 47.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0106 - val_tp: 124.0000 - val_fp: 99.0000 - val_tn: 85196.0000 - val_fn: 24.0000 - val_accuracy: 0.9986 - val_precision: 0.5561 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 92/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 - tp: 198975.0000 - fp: 229.0000 - tn: 198791.0000 - fn: 45.0000 - accuracy: 0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0110 - val_tp: 124.0000 - val_fp: 100.0000 - val_tn: 85195.0000 - val_fn: 24.0000 - val_accuracy: 0.9985 - val_precision: 0.5536 - val_recall: 0.8378 - val_auc: 0.9317 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 93/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0081 -

tp: 198975.0000 - fp: 239.0000 - tn: 198781.0000 - fn: 45.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0098 - val_tp: 123.0000 - val_fp: 90.0000 - val_tn: 85205.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.5775 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 94/200
398040/398040 [==============================] - 5s 14us/sample - loss: 0.0085 - tp: 198970.0000 - fp: 252.0000 - tn: 198768.0000 - fn: 50.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9996 - specificity: 0.9994 - val_loss: 0.0099 - val_tp: 123.0000 - val_fp: 91.0000 - val_tn: 85204.0000 - val_fn: 25.0000 - val_accuracy: 0.9986 - val_precision: 0.5748 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 95/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0078 - tp: 198974.0000 - fp: 244.0000 - tn: 198776.0000 - fn: 46.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0098 - val_tp: 123.0000 - val_fp: 82.0000 - val_tn: 85213.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.6000 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 - val_specificity: 0.9988
Epoch 96/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0083 - tp: 198971.0000 - fp: 251.0000 - tn: 198769.0000 - fn: 49.0000 - accuracy: 0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0096 - val_tp: 123.0000 - val_fp: 83.0000 - val_tn: 85212.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.5971 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 97/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0083 - tp: 198978.0000 - fp: 241.0000 - tn: 198779.0000 - fn: 42.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 78.0000 - val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision: 0.6119 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 98/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0081 - tp: 198975.0000 - fp: 241.0000 - tn: 198779.0000 - fn: 45.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0106 - val_tp: 123.0000 - val_fp: 98.0000 - val_tn: 85197.0000 - val_fn: 25.0000 - val_accuracy: 0.9986 - val_precision: 0.5566 - val_recall: 0.8311 - val_auc: 0.9283 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 99/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0079 -

tp: 198976.0000 - fp: 253.0000 - tn: 198767.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0103 - val_tp: 123.0000 - val_fp: 88.0000 -
val_tn: 85207.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5829 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 100/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0078 -
tp: 198976.0000 - fp: 223.0000 - tn: 198797.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0100 - val_tp: 123.0000 - val_fp: 89.0000 -
val_tn: 85206.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5802 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 101/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0085 -
tp: 198970.0000 - fp: 257.0000 - tn: 198763.0000 - fn: 50.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9994 - val_loss: 0.0097 - val_tp: 123.0000 - val_fp: 83.0000 -
val_tn: 85212.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5971 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 102/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0081 -
tp: 198976.0000 - fp: 235.0000 - tn: 198785.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0102 - val_tp: 123.0000 - val_fp: 94.0000 -
val_tn: 85201.0000 - val_fn: 25.0000 - val_accuracy: 0.9986 - val_precision:
0.5668 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 -
val_specificity: 0.9986
Epoch 103/200
398040/398040 [==============================] - 5s 13us/sample - loss: 0.0082 -
tp: 198975.0000 - fp: 249.0000 - tn: 198771.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0099 - val_tp: 123.0000 - val_fp: 88.0000 -
val_tn: 85207.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5829 - val_recall: 0.8311 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 104/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0080 -
tp: 198975.0000 - fp: 219.0000 - tn: 198801.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0094 - val_tp: 123.0000 - val_fp: 78.0000 -
val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6119 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 105/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0082 -

tp: 198972.0000 - fp: 232.0000 - tn: 198788.0000 - fn: 48.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 106/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0084 -
tp: 198971.0000 - fp: 258.0000 - tn: 198762.0000 - fn: 49.0000 - accuracy:
0.9992 - precision: 0.9987 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0092 - val_tp: 123.0000 - val_fp: 78.0000 -
val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6119 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 107/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198974.0000 - fp: 223.0000 - tn: 198797.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0095 - val_tp: 123.0000 - val_fp: 81.0000 -
val_tn: 85214.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6029 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 108/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198977.0000 - fp: 223.0000 - tn: 198797.0000 - fn: 43.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0088 - val_tp: 123.0000 - val_fp: 71.0000 -
val_tn: 85224.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6340 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 109/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0079 -
tp: 198976.0000 - fp: 241.0000 - tn: 198779.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 110/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -
tp: 198976.0000 - fp: 228.0000 - tn: 198792.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 75.0000 -
val_tn: 85220.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6212 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 111/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -

tp: 198972.0000 - fp: 221.0000 - tn: 198799.0000 - fn: 48.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0088 - val_tp: 123.0000 - val_fp: 71.0000 -
val_tn: 85224.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6340 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 112/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198977.0000 - fp: 244.0000 - tn: 198776.0000 - fn: 43.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9996
- specificity: 0.9994 - val_loss: 0.0098 - val_tp: 123.0000 - val_fp: 81.0000 -
val_tn: 85214.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6029 - val_recall: 0.8311 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 113/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198980.0000 - fp: 208.0000 - tn: 198812.0000 - fn: 40.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0101 - val_tp: 123.0000 - val_fp: 95.0000 -
val_tn: 85200.0000 - val_fn: 25.0000 - val_accuracy: 0.9986 - val_precision:
0.5642 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 114/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198977.0000 - fp: 212.0000 - tn: 198808.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0102 - val_tp: 123.0000 - val_fp: 89.0000 -
val_tn: 85206.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5802 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 115/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0082 -
tp: 198975.0000 - fp: 236.0000 - tn: 198784.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0084 - val_tp: 123.0000 - val_fp: 68.0000 -
val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6440 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 116/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -
tp: 198980.0000 - fp: 211.0000 - tn: 198809.0000 - fn: 40.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 117/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -

tp: 198968.0000 - fp: 211.0000 - tn: 198809.0000 - fn: 52.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0102 - val_tp: 124.0000 - val_fp: 86.0000 -
val_tn: 85209.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision:
0.5905 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 118/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198977.0000 - fp: 228.0000 - tn: 198792.0000 - fn: 43.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0094 - val_tp: 123.0000 - val_fp: 79.0000 -
val_tn: 85216.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6089 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 119/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0082 -
tp: 198979.0000 - fp: 230.0000 - tn: 198790.0000 - fn: 41.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 120/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198975.0000 - fp: 216.0000 - tn: 198804.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0100 - val_tp: 123.0000 - val_fp: 88.0000 -
val_tn: 85207.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5829 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 121/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -
tp: 198974.0000 - fp: 222.0000 - tn: 198798.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0094 - val_tp: 123.0000 - val_fp: 78.0000 -
val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6119 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 122/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198974.0000 - fp: 225.0000 - tn: 198795.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 78.0000 -
val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6119 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 123/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0079 -

tp: 198973.0000 - fp: 230.0000 - tn: 198790.0000 - fn: 47.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 79.0000 - val_tn: 85216.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision: 0.6089 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 124/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 - tp: 198977.0000 - fp: 226.0000 - tn: 198794.0000 - fn: 43.0000 - accuracy: 0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 68.0000 - val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6440 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8378 - val_specificity: 0.9990
Epoch 125/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 - tp: 198975.0000 - fp: 210.0000 - tn: 198810.0000 - fn: 45.0000 - accuracy: 0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 69.0000 - val_tn: 85226.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6406 - val_recall: 0.8311 - val_auc: 0.9286 - val_sensitivity: 0.8378 - val_specificity: 0.9991
Epoch 126/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 - tp: 198970.0000 - fp: 231.0000 - tn: 198789.0000 - fn: 50.0000 - accuracy: 0.9993 - precision: 0.9988 - recall: 0.9997 - auc: 0.9996 - sensitivity: 0.9997 - specificity: 0.9994 - val_loss: 0.0098 - val_tp: 124.0000 - val_fp: 89.0000 - val_tn: 85206.0000 - val_fn: 24.0000 - val_accuracy: 0.9987 - val_precision: 0.5822 - val_recall: 0.8378 - val_auc: 0.9284 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 127/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 - tp: 198977.0000 - fp: 217.0000 - tn: 198803.0000 - fn: 43.0000 - accuracy: 0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 82.0000 - val_tn: 85213.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.6000 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9987
Epoch 128/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 - tp: 198975.0000 - fp: 218.0000 - tn: 198802.0000 - fn: 45.0000 - accuracy: 0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0097 - val_tp: 123.0000 - val_fp: 82.0000 - val_tn: 85213.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision: 0.6000 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 129/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -

tp: 198971.0000 - fp: 230.0000 - tn: 198790.0000 - fn: 49.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 80.0000 -
val_tn: 85215.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6059 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 130/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198976.0000 - fp: 228.0000 - tn: 198792.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 77.0000 -
val_tn: 85218.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6150 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 131/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -
tp: 198974.0000 - fp: 214.0000 - tn: 198806.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0088 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 132/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0076 -
tp: 198977.0000 - fp: 218.0000 - tn: 198802.0000 - fn: 43.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 80.0000 -
val_tn: 85215.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6059 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9985
Epoch 133/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -
tp: 198978.0000 - fp: 217.0000 - tn: 198803.0000 - fn: 42.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0090 - val_tp: 123.0000 - val_fp: 77.0000 -
val_tn: 85218.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6150 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 134/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198974.0000 - fp: 221.0000 - tn: 198799.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0097 - val_tp: 123.0000 - val_fp: 86.0000 -
val_tn: 85209.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5885 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 135/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0081 -

tp: 198973.0000 - fp: 223.0000 - tn: 198797.0000 - fn: 47.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 66.0000 -
val_tn: 85229.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6508 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 136/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0076 -
tp: 198977.0000 - fp: 211.0000 - tn: 198809.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 78.0000 -
val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6119 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 137/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198976.0000 - fp: 220.0000 - tn: 198800.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 64.0000 -
val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6578 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 138/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -
tp: 198976.0000 - fp: 231.0000 - tn: 198789.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0096 - val_tp: 123.0000 - val_fp: 81.0000 -
val_tn: 85214.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6029 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 139/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0078 -
tp: 198975.0000 - fp: 223.0000 - tn: 198797.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 140/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198974.0000 - fp: 222.0000 - tn: 198798.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 141/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -

tp: 198972.0000 - fp: 213.0000 - tn: 198807.0000 - fn: 48.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9994 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 69.0000 -
val_tn: 85226.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6406 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 142/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0074 -
tp: 198980.0000 - fp: 194.0000 - tn: 198826.0000 - fn: 40.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 64.0000 -
val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6578 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 143/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -
tp: 198976.0000 - fp: 220.0000 - tn: 198800.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 68.0000 -
val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6440 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 144/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -
tp: 198975.0000 - fp: 213.0000 - tn: 198807.0000 - fn: 45.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 69.0000 -
val_tn: 85226.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6406 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 145/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -
tp: 198977.0000 - fp: 201.0000 - tn: 198819.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0091 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 146/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0078 -
tp: 198974.0000 - fp: 219.0000 - tn: 198801.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0083 - val_tp: 123.0000 - val_fp: 68.0000 -
val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6440 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 147/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -

tp: 198979.0000 - fp: 220.0000 - tn: 198800.0000 - fn: 41.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 76.0000 -
val_tn: 85219.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6181 - val_recall: 0.8311 - val_auc: 0.9319 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 148/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -
tp: 198978.0000 - fp: 211.0000 - tn: 198809.0000 - fn: 42.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 149/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -
tp: 198979.0000 - fp: 229.0000 - tn: 198791.0000 - fn: 41.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 150/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198979.0000 - fp: 194.0000 - tn: 198826.0000 - fn: 41.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 69.0000 -
val_tn: 85226.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6406 - val_recall: 0.8311 - val_auc: 0.9185 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 151/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0079 -
tp: 198971.0000 - fp: 232.0000 - tn: 198788.0000 - fn: 49.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0091 - val_tp: 123.0000 - val_fp: 80.0000 -
val_tn: 85215.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6059 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 152/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0076 -
tp: 198974.0000 - fp: 221.0000 - tn: 198799.0000 - fn: 46.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9986
Epoch 153/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -

tp: 198973.0000 - fp: 238.0000 - tn: 198782.0000 - fn: 47.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9996 - sensitivity: 0.9997
- specificity: 0.9994 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 154/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0074 -
tp: 198980.0000 - fp: 189.0000 - tn: 198831.0000 - fn: 40.0000 - accuracy:
0.9994 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 155/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0073 -
tp: 198975.0000 - fp: 197.0000 - tn: 198823.0000 - fn: 45.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 72.0000 -
val_tn: 85223.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6308 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 156/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -
tp: 198971.0000 - fp: 202.0000 - tn: 198818.0000 - fn: 49.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 157/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0080 -
tp: 198973.0000 - fp: 234.0000 - tn: 198786.0000 - fn: 47.0000 - accuracy:
0.9993 - precision: 0.9988 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0094 - val_tp: 123.0000 - val_fp: 84.0000 -
val_tn: 85211.0000 - val_fn: 25.0000 - val_accuracy: 0.9987 - val_precision:
0.5942 - val_recall: 0.8311 - val_auc: 0.9284 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 158/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198981.0000 - fp: 206.0000 - tn: 198814.0000 - fn: 39.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0080 - val_tp: 123.0000 - val_fp: 60.0000 -
val_tn: 85235.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6721 - val_recall: 0.8311 - val_auc: 0.9185 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 159/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0073 -

tp: 198978.0000 - fp: 203.0000 - tn: 198817.0000 - fn: 42.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0090 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 160/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -
tp: 198972.0000 - fp: 209.0000 - tn: 198811.0000 - fn: 48.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0095 - val_tp: 123.0000 - val_fp: 81.0000 -
val_tn: 85214.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6029 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 161/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0077 -
tp: 198979.0000 - fp: 207.0000 - tn: 198813.0000 - fn: 41.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 68.0000 -
val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6440 - val_recall: 0.8311 - val_auc: 0.9286 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 162/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0075 -
tp: 198976.0000 - fp: 212.0000 - tn: 198808.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 73.0000 -
val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6276 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 163/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.0073 -
tp: 198974.0000 - fp: 199.0000 - tn: 198821.0000 - fn: 46.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 164/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0075 -
tp: 198976.0000 - fp: 207.0000 - tn: 198813.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 65.0000 -
val_tn: 85230.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6543 - val_recall: 0.8311 - val_auc: 0.9185 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 165/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -

tp: 198972.0000 - fp: 220.0000 - tn: 198800.0000 - fn: 48.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0088 - val_tp: 123.0000 - val_fp: 69.0000 -
val_tn: 85226.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6406 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 166/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198976.0000 - fp: 213.0000 - tn: 198807.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 79.0000 -
val_tn: 85216.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6089 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 167/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0074 -
tp: 198973.0000 - fp: 204.0000 - tn: 198816.0000 - fn: 47.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0090 - val_tp: 123.0000 - val_fp: 72.0000 -
val_tn: 85223.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6308 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 168/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0077 -
tp: 198975.0000 - fp: 189.0000 - tn: 198831.0000 - fn: 45.0000 - accuracy:
0.9994 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 77.0000 -
val_tn: 85218.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6150 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 169/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0073 -
tp: 198976.0000 - fp: 213.0000 - tn: 198807.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 66.0000 -
val_tn: 85229.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6508 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 170/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0074 -
tp: 198977.0000 - fp: 205.0000 - tn: 198815.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 65.0000 -
val_tn: 85230.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6543 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 171/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -

tp: 198977.0000 - fp: 202.0000 - tn: 198818.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0090 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 172/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0076 -
tp: 198974.0000 - fp: 208.0000 - tn: 198812.0000 - fn: 46.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0085 - val_tp: 123.0000 - val_fp: 67.0000 -
val_tn: 85228.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6474 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8378 -
val_specificity: 0.9990
Epoch 173/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0078 -
tp: 198978.0000 - fp: 213.0000 - tn: 198807.0000 - fn: 42.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0083 - val_tp: 123.0000 - val_fp: 61.0000 -
val_tn: 85234.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6685 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 174/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0074 -
tp: 198975.0000 - fp: 208.0000 - tn: 198812.0000 - fn: 45.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 68.0000 -
val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6440 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9988
Epoch 175/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0073 -
tp: 198976.0000 - fp: 189.0000 - tn: 198831.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0082 - val_tp: 123.0000 - val_fp: 60.0000 -
val_tn: 85235.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6721 - val_recall: 0.8311 - val_auc: 0.9185 - val_sensitivity: 0.8311 -
val_specificity: 0.9987
Epoch 176/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0074 -
tp: 198974.0000 - fp: 204.0000 - tn: 198816.0000 - fn: 46.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0088 - val_tp: 123.0000 - val_fp: 72.0000 -
val_tn: 85223.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6308 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9990
Epoch 177/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.0072 -

tp: 198977.0000 - fp: 194.0000 - tn: 198826.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0093 - val_tp: 123.0000 - val_fp: 75.0000 -
val_tn: 85220.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6212 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 178/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0077 -
tp: 198976.0000 - fp: 217.0000 - tn: 198803.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0097 - val_tp: 124.0000 - val_fp: 81.0000 -
val_tn: 85214.0000 - val_fn: 24.0000 - val_accuracy: 0.9988 - val_precision:
0.6049 - val_recall: 0.8378 - val_auc: 0.9285 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 179/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0078 -
tp: 198970.0000 - fp: 216.0000 - tn: 198804.0000 - fn: 50.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0088 - val_tp: 123.0000 - val_fp: 72.0000 -
val_tn: 85223.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6308 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 180/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0070 -
tp: 198980.0000 - fp: 174.0000 - tn: 198846.0000 - fn: 40.0000 - accuracy:
0.9995 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9996 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 65.0000 -
val_tn: 85230.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6543 - val_recall: 0.8311 - val_auc: 0.9185 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 181/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -
tp: 198974.0000 - fp: 195.0000 - tn: 198825.0000 - fn: 46.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 70.0000 -
val_tn: 85225.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6373 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 182/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 -
tp: 198977.0000 - fp: 212.0000 - tn: 198808.0000 - fn: 43.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 66.0000 -
val_tn: 85229.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6508 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 183/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 -

tp: 198980.0000 - fp: 198.0000 - tn: 198822.0000 - fn: 40.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0091 - val_tp: 123.0000 - val_fp: 71.0000 -
val_tn: 85224.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6340 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 184/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 -
tp: 198976.0000 - fp: 191.0000 - tn: 198829.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 72.0000 -
val_tn: 85223.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision:
0.6308 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 185/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 -
tp: 198976.0000 - fp: 223.0000 - tn: 198797.0000 - fn: 44.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0091 - val_tp: 123.0000 - val_fp: 74.0000 -
val_tn: 85221.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6244 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 186/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0074 -
tp: 198975.0000 - fp: 216.0000 - tn: 198804.0000 - fn: 45.0000 - accuracy:
0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997
- specificity: 0.9995 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 78.0000 -
val_tn: 85217.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6119 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 187/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 -
tp: 198976.0000 - fp: 191.0000 - tn: 198829.0000 - fn: 44.0000 - accuracy:
0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0092 - val_tp: 123.0000 - val_fp: 79.0000 -
val_tn: 85216.0000 - val_fn: 25.0000 - val_accuracy: 0.9988 - val_precision:
0.6089 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 -
val_specificity: 0.9989
Epoch 188/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0075 -
tp: 198974.0000 - fp: 210.0000 - tn: 198810.0000 - fn: 46.0000 - accuracy:
0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998
- specificity: 0.9995 - val_loss: 0.0083 - val_tp: 123.0000 - val_fp: 64.0000 -
val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision:
0.6578 - val_recall: 0.8311 - val_auc: 0.9319 - val_sensitivity: 0.8378 -
val_specificity: 0.9991
Epoch 189/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0073 -

tp: 198979.0000 - fp: 185.0000 - tn: 198835.0000 - fn: 41.0000 - accuracy: 0.9994 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 68.0000 - val_tn: 85227.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6440 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8378 - val_specificity: 0.9990
Epoch 190/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 - tp: 198976.0000 - fp: 212.0000 - tn: 198808.0000 - fn: 44.0000 - accuracy: 0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0084 - val_tp: 123.0000 - val_fp: 64.0000 - val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6578 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 191/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0077 - tp: 198972.0000 - fp: 210.0000 - tn: 198810.0000 - fn: 48.0000 - accuracy: 0.9994 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0084 - val_tp: 123.0000 - val_fp: 62.0000 - val_tn: 85233.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6649 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 192/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0076 - tp: 198970.0000 - fp: 208.0000 - tn: 198812.0000 - fn: 50.0000 - accuracy: 0.9994 - precision: 0.9990 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0089 - val_tp: 123.0000 - val_fp: 73.0000 - val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6276 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 193/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 - tp: 198981.0000 - fp: 193.0000 - tn: 198827.0000 - fn: 39.0000 - accuracy: 0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 65.0000 - val_tn: 85230.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6543 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 194/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 - tp: 198978.0000 - fp: 186.0000 - tn: 198834.0000 - fn: 42.0000 - accuracy: 0.9994 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0084 - val_tp: 123.0000 - val_fp: 59.0000 - val_tn: 85236.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6758 - val_recall: 0.8311 - val_auc: 0.9218 - val_sensitivity: 0.8378 - val_specificity: 0.9991
Epoch 195/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0074 -

tp: 198969.0000 - fp: 221.0000 - tn: 198799.0000 - fn: 51.0000 - accuracy: 0.9993 - precision: 0.9989 - recall: 0.9997 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 64.0000 - val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6578 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9988
Epoch 196/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 - tp: 198977.0000 - fp: 192.0000 - tn: 198828.0000 - fn: 43.0000 - accuracy: 0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 64.0000 - val_tn: 85231.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6578 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 197/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0072 - tp: 198975.0000 - fp: 186.0000 - tn: 198834.0000 - fn: 45.0000 - accuracy: 0.9994 - precision: 0.9991 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9996 - val_loss: 0.0090 - val_tp: 123.0000 - val_fp: 73.0000 - val_tn: 85222.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6276 - val_recall: 0.8311 - val_auc: 0.9318 - val_sensitivity: 0.8311 - val_specificity: 0.9988
Epoch 198/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0076 - tp: 198973.0000 - fp: 220.0000 - tn: 198800.0000 - fn: 47.0000 - accuracy: 0.9993 - precision: 0.9989 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9997 - specificity: 0.9995 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 67.0000 - val_tn: 85228.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6474 - val_recall: 0.8311 - val_auc: 0.9251 - val_sensitivity: 0.8311 - val_specificity: 0.9990
Epoch 199/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0069 - tp: 198975.0000 - fp: 198.0000 - tn: 198822.0000 - fn: 45.0000 - accuracy: 0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9996 - val_loss: 0.0087 - val_tp: 123.0000 - val_fp: 66.0000 - val_tn: 85229.0000 - val_fn: 25.0000 - val_accuracy: 0.9989 - val_precision: 0.6508 - val_recall: 0.8311 - val_auc: 0.9285 - val_sensitivity: 0.8311 - val_specificity: 0.9989
Epoch 200/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0070 - tp: 198976.0000 - fp: 195.0000 - tn: 198825.0000 - fn: 44.0000 - accuracy: 0.9994 - precision: 0.9990 - recall: 0.9998 - auc: 0.9997 - sensitivity: 0.9998 - specificity: 0.9996 - val_loss: 0.0086 - val_tp: 123.0000 - val_fp: 62.0000 - val_tn: 85233.0000 - val_fn: 25.0000 - val_accuracy: 0.9990 - val_precision: 0.6649 - val_recall: 0.8311 - val_auc: 0.9252 - val_sensitivity: 0.8311 - val_specificity: 0.9989

```
[1224]: #cost_sensitive weights to punish to the false negatives
        run_500_weight_history = model_500_weight.
        ↪fit(x=trainX_scaled,y=trainy_scaled,class_weight={0:1,1:
        ↪500},validation_data=(testX,testy),batch_size=BATCH_SIZE,epochs=EPOCHS)#,callbacks=[es])
```

```
Train on 398040 samples, validate on 85443 samples
Epoch 1/200
398040/398040 [==============================] - 5s 14us/sample - loss: 12.3821
- tp: 195687.0000 - fp: 121798.0000 - tn: 77222.0000 - fn: 3333.0000 - accuracy:
0.6856 - precision: 0.6164 - recall: 0.9833 - auc: 0.9135 - sensitivity:
0.0000e+00 - specificity: 0.8833 - val_loss: 1.6347 - val_tp: 148.0000 - val_fp:
43660.0000 - val_tn: 41635.0000 - val_fn: 0.0000e+00 - val_accuracy: 0.4890 -
val_precision: 0.0034 - val_recall: 1.0000 - val_auc: 0.9349 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9151
Epoch 2/200
398040/398040 [==============================] - 4s 11us/sample - loss: 1.0265 -
tp: 199011.0000 - fp: 81463.0000 - tn: 117557.0000 - fn: 9.0000 - accuracy:
0.7953 - precision: 0.7096 - recall: 1.0000 - auc: 0.9621 - sensitivity:
0.0000e+00 - specificity: 0.9299 - val_loss: 0.8463 - val_tp: 139.0000 - val_fp:
18931.0000 - val_tn: 66364.0000 - val_fn: 9.0000 - val_accuracy: 0.7783 -
val_precision: 0.0073 - val_recall: 0.9392 - val_auc: 0.9525 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9162
Epoch 3/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.6359 -
tp: 198997.0000 - fp: 45777.0000 - tn: 153243.0000 - fn: 23.0000 - accuracy:
0.8849 - precision: 0.8130 - recall: 0.9999 - auc: 0.9758 - sensitivity:
0.0000e+00 - specificity: 0.9531 - val_loss: 0.4991 - val_tp: 137.0000 - val_fp:
10472.0000 - val_tn: 74823.0000 - val_fn: 11.0000 - val_accuracy: 0.8773 -
val_precision: 0.0129 - val_recall: 0.9257 - val_auc: 0.9583 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9659
Epoch 4/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.4930 -
tp: 198999.0000 - fp: 29416.0000 - tn: 169604.0000 - fn: 21.0000 - accuracy:
0.9260 - precision: 0.8712 - recall: 0.9999 - auc: 0.9822 - sensitivity:
0.0000e+00 - specificity: 0.9650 - val_loss: 0.3547 - val_tp: 137.0000 - val_fp:
6592.0000 - val_tn: 78703.0000 - val_fn: 11.0000 - val_accuracy: 0.9227 -
val_precision: 0.0204 - val_recall: 0.9257 - val_auc: 0.9577 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9735
Epoch 5/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.4094 -
tp: 199000.0000 - fp: 22232.0000 - tn: 176788.0000 - fn: 20.0000 - accuracy:
0.9441 - precision: 0.8995 - recall: 0.9999 - auc: 0.9854 - sensitivity:
0.0000e+00 - specificity: 0.9713 - val_loss: 0.3020 - val_tp: 137.0000 - val_fp:
5258.0000 - val_tn: 80037.0000 - val_fn: 11.0000 - val_accuracy: 0.9383 -
val_precision: 0.0254 - val_recall: 0.9257 - val_auc: 0.9583 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9731
Epoch 6/200
```

398040/398040 [==============================] - 4s 11us/sample - loss: 0.3791 - tp: 199000.0000 - fp: 18689.0000 - tn: 180331.0000 - fn: 20.0000 - accuracy: 0.9530 - precision: 0.9141 - recall: 0.9999 - auc: 0.9873 - sensitivity: 0.0000e+00 - specificity: 0.9749 - val_loss: 0.2527 - val_tp: 137.0000 - val_fp: 4618.0000 - val_tn: 80677.0000 - val_fn: 11.0000 - val_accuracy: 0.9458 - val_precision: 0.0288 - val_recall: 0.9257 - val_auc: 0.9592 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9783
Epoch 7/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.3252 - tp: 199000.0000 - fp: 16536.0000 - tn: 182484.0000 - fn: 20.0000 - accuracy: 0.9584 - precision: 0.9233 - recall: 0.9999 - auc: 0.9883 - sensitivity: 0.0000e+00 - specificity: 0.9767 - val_loss: 0.2326 - val_tp: 137.0000 - val_fp: 4074.0000 - val_tn: 81221.0000 - val_fn: 11.0000 - val_accuracy: 0.9522 - val_precision: 0.0325 - val_recall: 0.9257 - val_auc: 0.9611 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9822
Epoch 8/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.3464 - tp: 198994.0000 - fp: 14835.0000 - tn: 184185.0000 - fn: 26.0000 - accuracy: 0.9627 - precision: 0.9306 - recall: 0.9999 - auc: 0.9895 - sensitivity: 0.0000e+00 - specificity: 0.9792 - val_loss: 0.2836 - val_tp: 136.0000 - val_fp: 4877.0000 - val_tn: 80418.0000 - val_fn: 12.0000 - val_accuracy: 0.9428 - val_precision: 0.0271 - val_recall: 0.9189 - val_auc: 0.9583 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9777
Epoch 9/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.3176 - tp: 198998.0000 - fp: 15415.0000 - tn: 183605.0000 - fn: 22.0000 - accuracy: 0.9612 - precision: 0.9281 - recall: 0.9999 - auc: 0.9894 - sensitivity: 0.0000e+00 - specificity: 0.9790 - val_loss: 0.2291 - val_tp: 136.0000 - val_fp: 3918.0000 - val_tn: 81377.0000 - val_fn: 12.0000 - val_accuracy: 0.9540 - val_precision: 0.0335 - val_recall: 0.9189 - val_auc: 0.9614 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9825
Epoch 10/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.3096 - tp: 199000.0000 - fp: 13889.0000 - tn: 185131.0000 - fn: 20.0000 - accuracy: 0.9651 - precision: 0.9348 - recall: 0.9999 - auc: 0.9904 - sensitivity: 0.0000e+00 - specificity: 0.9809 - val_loss: 0.2280 - val_tp: 136.0000 - val_fp: 3833.0000 - val_tn: 81462.0000 - val_fn: 12.0000 - val_accuracy: 0.9550 - val_precision: 0.0343 - val_recall: 0.9189 - val_auc: 0.9615 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9746
Epoch 11/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2970 - tp: 198999.0000 - fp: 12718.0000 - tn: 186302.0000 - fn: 21.0000 - accuracy: 0.9680 - precision: 0.9399 - recall: 0.9999 - auc: 0.9911 - sensitivity: 0.0000e+00 - specificity: 0.9824 - val_loss: 0.2081 - val_tp: 137.0000 - val_fp: 3444.0000 - val_tn: 81851.0000 - val_fn: 11.0000 - val_accuracy: 0.9596 - val_precision: 0.0383 - val_recall: 0.9257 - val_auc: 0.9626 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9819
Epoch 12/200

398040/398040 [==============================] - 5s 12us/sample - loss: 0.2937 - tp: 199003.0000 - fp: 12649.0000 - tn: 186371.0000 - fn: 17.0000 - accuracy: 0.9682 - precision: 0.9402 - recall: 0.9999 - auc: 0.9916 - sensitivity: 0.0000e+00 - specificity: 0.9833 - val_loss: 0.1803 - val_tp: 135.0000 - val_fp: 3010.0000 - val_tn: 82285.0000 - val_fn: 13.0000 - val_accuracy: 0.9646 - val_precision: 0.0429 - val_recall: 0.9122 - val_auc: 0.9636 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9862
Epoch 13/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.2915 - tp: 198999.0000 - fp: 12299.0000 - tn: 186721.0000 - fn: 21.0000 - accuracy: 0.9690 - precision: 0.9418 - recall: 0.9999 - auc: 0.9916 - sensitivity: 0.0000e+00 - specificity: 0.9833 - val_loss: 0.1661 - val_tp: 134.0000 - val_fp: 2967.0000 - val_tn: 82328.0000 - val_fn: 14.0000 - val_accuracy: 0.9651 - val_precision: 0.0432 - val_recall: 0.9054 - val_auc: 0.9618 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9844
Epoch 14/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2812 - tp: 199001.0000 - fp: 12043.0000 - tn: 186977.0000 - fn: 19.0000 - accuracy: 0.9697 - precision: 0.9429 - recall: 0.9999 - auc: 0.9921 - sensitivity: 0.0000e+00 - specificity: 0.9843 - val_loss: 0.1882 - val_tp: 137.0000 - val_fp: 3114.0000 - val_tn: 82181.0000 - val_fn: 11.0000 - val_accuracy: 0.9634 - val_precision: 0.0421 - val_recall: 0.9257 - val_auc: 0.9593 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9817
Epoch 15/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2643 - tp: 199003.0000 - fp: 12181.0000 - tn: 186839.0000 - fn: 17.0000 - accuracy: 0.9694 - precision: 0.9423 - recall: 0.9999 - auc: 0.9923 - sensitivity: 0.0000e+00 - specificity: 0.9848 - val_loss: 0.1633 - val_tp: 135.0000 - val_fp: 3182.0000 - val_tn: 82113.0000 - val_fn: 13.0000 - val_accuracy: 0.9626 - val_precision: 0.0407 - val_recall: 0.9122 - val_auc: 0.9618 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9880
Epoch 16/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2985 - tp: 198996.0000 - fp: 12744.0000 - tn: 186276.0000 - fn: 24.0000 - accuracy: 0.9679 - precision: 0.9398 - recall: 0.9999 - auc: 0.9928 - sensitivity: 0.0000e+00 - specificity: 0.9859 - val_loss: 0.1460 - val_tp: 134.0000 - val_fp: 2809.0000 - val_tn: 82486.0000 - val_fn: 14.0000 - val_accuracy: 0.9670 - val_precision: 0.0455 - val_recall: 0.9054 - val_auc: 0.9625 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9892
Epoch 17/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2721 - tp: 198996.0000 - fp: 11764.0000 - tn: 187256.0000 - fn: 24.0000 - accuracy: 0.9704 - precision: 0.9442 - recall: 0.9999 - auc: 0.9933 - sensitivity: 0.0000e+00 - specificity: 0.9867 - val_loss: 0.1669 - val_tp: 135.0000 - val_fp: 3394.0000 - val_tn: 81901.0000 - val_fn: 13.0000 - val_accuracy: 0.9601 - val_precision: 0.0383 - val_recall: 0.9122 - val_auc: 0.9611 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9902
Epoch 18/200

398040/398040 [==============================] - 4s 11us/sample - loss: 0.2546 - tp: 199001.0000 - fp: 11473.0000 - tn: 187547.0000 - fn: 19.0000 - accuracy: 0.9711 - precision: 0.9455 - recall: 0.9999 - auc: 0.9937 - sensitivity: 0.0000e+00 - specificity: 0.9876 - val_loss: 0.1582 - val_tp: 135.0000 - val_fp: 2877.0000 - val_tn: 82418.0000 - val_fn: 13.0000 - val_accuracy: 0.9662 - val_precision: 0.0448 - val_recall: 0.9122 - val_auc: 0.9611 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9870
Epoch 19/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2480 - tp: 198999.0000 - fp: 12228.0000 - tn: 186792.0000 - fn: 21.0000 - accuracy: 0.9692 - precision: 0.9421 - recall: 0.9999 - auc: 0.9936 - sensitivity: 0.0000e+00 - specificity: 0.9874 - val_loss: 0.1630 - val_tp: 135.0000 - val_fp: 3432.0000 - val_tn: 81863.0000 - val_fn: 13.0000 - val_accuracy: 0.9597 - val_precision: 0.0378 - val_recall: 0.9122 - val_auc: 0.9609 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9887
Epoch 20/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.2298 - tp: 199000.0000 - fp: 11810.0000 - tn: 187210.0000 - fn: 20.0000 - accuracy: 0.9703 - precision: 0.9440 - recall: 0.9999 - auc: 0.9939 - sensitivity: 0.0000e+00 - specificity: 0.9879 - val_loss: 0.1397 - val_tp: 134.0000 - val_fp: 2619.0000 - val_tn: 82676.0000 - val_fn: 14.0000 - val_accuracy: 0.9692 - val_precision: 0.0487 - val_recall: 0.9054 - val_auc: 0.9625 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9868
Epoch 21/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2413 - tp: 199001.0000 - fp: 11891.0000 - tn: 187129.0000 - fn: 19.0000 - accuracy: 0.9701 - precision: 0.9436 - recall: 0.9999 - auc: 0.9942 - sensitivity: 0.0000e+00 - specificity: 0.9884 - val_loss: 0.1363 - val_tp: 135.0000 - val_fp: 2567.0000 - val_tn: 82728.0000 - val_fn: 13.0000 - val_accuracy: 0.9698 - val_precision: 0.0500 - val_recall: 0.9122 - val_auc: 0.9616 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9909
Epoch 22/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.2435 - tp: 198998.0000 - fp: 10942.0000 - tn: 188078.0000 - fn: 22.0000 - accuracy: 0.9725 - precision: 0.9479 - recall: 0.9999 - auc: 0.9949 - sensitivity: 0.0000e+00 - specificity: 0.9898 - val_loss: 0.1313 - val_tp: 133.0000 - val_fp: 2525.0000 - val_tn: 82770.0000 - val_fn: 15.0000 - val_accuracy: 0.9703 - val_precision: 0.0500 - val_recall: 0.8986 - val_auc: 0.9639 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9902
Epoch 23/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1841 - tp: 199001.0000 - fp: 10022.0000 - tn: 188998.0000 - fn: 19.0000 - accuracy: 0.9748 - precision: 0.9521 - recall: 0.9999 - auc: 0.9947 - sensitivity: 0.0000e+00 - specificity: 0.9895 - val_loss: 0.1289 - val_tp: 133.0000 - val_fp: 2451.0000 - val_tn: 82844.0000 - val_fn: 15.0000 - val_accuracy: 0.9711 - val_precision: 0.0515 - val_recall: 0.8986 - val_auc: 0.9645 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9909
Epoch 24/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.2091 - tp: 199001.0000 - fp: 10301.0000 - tn: 188719.0000 - fn: 19.0000 - accuracy: 0.9741 - precision: 0.9508 - recall: 0.9999 - auc: 0.9948 - sensitivity: 0.0000e+00 - specificity: 0.9898 - val_loss: 0.1509 - val_tp: 134.0000 - val_fp: 2748.0000 - val_tn: 82547.0000 - val_fn: 14.0000 - val_accuracy: 0.9677 - val_precision: 0.0465 - val_recall: 0.9054 - val_auc: 0.9613 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9894
Epoch 25/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1924 - tp: 199001.0000 - fp: 10585.0000 - tn: 188435.0000 - fn: 19.0000 - accuracy: 0.9734 - precision: 0.9495 - recall: 0.9999 - auc: 0.9949 - sensitivity: 0.0000e+00 - specificity: 0.9899 - val_loss: 0.1372 - val_tp: 133.0000 - val_fp: 2475.0000 - val_tn: 82820.0000 - val_fn: 15.0000 - val_accuracy: 0.9709 - val_precision: 0.0510 - val_recall: 0.8986 - val_auc: 0.9643 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9917
Epoch 26/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.2143 - tp: 198999.0000 - fp: 10436.0000 - tn: 188584.0000 - fn: 21.0000 - accuracy: 0.9737 - precision: 0.9502 - recall: 0.9999 - auc: 0.9949 - sensitivity: 0.0000e+00 - specificity: 0.9899 - val_loss: 0.1379 - val_tp: 135.0000 - val_fp: 2685.0000 - val_tn: 82610.0000 - val_fn: 13.0000 - val_accuracy: 0.9684 - val_precision: 0.0479 - val_recall: 0.9122 - val_auc: 0.9661 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9925
Epoch 27/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1997 - tp: 199001.0000 - fp: 10362.0000 - tn: 188658.0000 - fn: 19.0000 - accuracy: 0.9739 - precision: 0.9505 - recall: 0.9999 - auc: 0.9951 - sensitivity: 0.0000e+00 - specificity: 0.9903 - val_loss: 0.1230 - val_tp: 133.0000 - val_fp: 2268.0000 - val_tn: 83027.0000 - val_fn: 15.0000 - val_accuracy: 0.9733 - val_precision: 0.0554 - val_recall: 0.8986 - val_auc: 0.9634 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9918
Epoch 28/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1923 - tp: 199000.0000 - fp: 10756.0000 - tn: 188264.0000 - fn: 20.0000 - accuracy: 0.9729 - precision: 0.9487 - recall: 0.9999 - auc: 0.9952 - sensitivity: 0.0000e+00 - specificity: 0.9904 - val_loss: 0.1140 - val_tp: 132.0000 - val_fp: 2003.0000 - val_tn: 83292.0000 - val_fn: 16.0000 - val_accuracy: 0.9764 - val_precision: 0.0618 - val_recall: 0.8919 - val_auc: 0.9606 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9919
Epoch 29/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1716 - tp: 199003.0000 - fp: 9232.0000 - tn: 189788.0000 - fn: 17.0000 - accuracy: 0.9768 - precision: 0.9557 - recall: 0.9999 - auc: 0.9957 - sensitivity: 0.0000e+00 - specificity: 0.9914 - val_loss: 0.1078 - val_tp: 131.0000 - val_fp: 1790.0000 - val_tn: 83505.0000 - val_fn: 17.0000 - val_accuracy: 0.9789 - val_precision: 0.0682 - val_recall: 0.8851 - val_auc: 0.9607 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9918
Epoch 30/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1936 - tp: 199000.0000 - fp: 9156.0000 - tn: 189864.0000 - fn: 20.0000 - accuracy: 0.9769 - precision: 0.9560 - recall: 0.9999 - auc: 0.9955 - sensitivity: 0.0000e+00 - specificity: 0.9910 - val_loss: 0.1093 - val_tp: 132.0000 - val_fp: 1870.0000 - val_tn: 83425.0000 - val_fn: 16.0000 - val_accuracy: 0.9779 - val_precision: 0.0659 - val_recall: 0.8919 - val_auc: 0.9637 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9915
Epoch 31/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1883 - tp: 199002.0000 - fp: 9269.0000 - tn: 189751.0000 - fn: 18.0000 - accuracy: 0.9767 - precision: 0.9555 - recall: 0.9999 - auc: 0.9956 - sensitivity: 0.0000e+00 - specificity: 0.9914 - val_loss: 0.1190 - val_tp: 133.0000 - val_fp: 2157.0000 - val_tn: 83138.0000 - val_fn: 15.0000 - val_accuracy: 0.9746 - val_precision: 0.0581 - val_recall: 0.8986 - val_auc: 0.9647 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9895
Epoch 32/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1897 - tp: 199002.0000 - fp: 9024.0000 - tn: 189996.0000 - fn: 18.0000 - accuracy: 0.9773 - precision: 0.9566 - recall: 0.9999 - auc: 0.9958 - sensitivity: 0.0000e+00 - specificity: 0.9917 - val_loss: 0.1450 - val_tp: 133.0000 - val_fp: 2701.0000 - val_tn: 82594.0000 - val_fn: 15.0000 - val_accuracy: 0.9682 - val_precision: 0.0469 - val_recall: 0.8986 - val_auc: 0.9632 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9916
Epoch 33/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1832 - tp: 199003.0000 - fp: 10066.0000 - tn: 188954.0000 - fn: 17.0000 - accuracy: 0.9747 - precision: 0.9519 - recall: 0.9999 - auc: 0.9960 - sensitivity: 0.0000e+00 - specificity: 0.9920 - val_loss: 0.1138 - val_tp: 131.0000 - val_fp: 1816.0000 - val_tn: 83479.0000 - val_fn: 17.0000 - val_accuracy: 0.9785 - val_precision: 0.0673 - val_recall: 0.8851 - val_auc: 0.9626 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9925
Epoch 34/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1893 - tp: 198999.0000 - fp: 8628.0000 - tn: 190392.0000 - fn: 21.0000 - accuracy: 0.9783 - precision: 0.9584 - recall: 0.9999 - auc: 0.9958 - sensitivity: 0.0000e+00 - specificity: 0.9917 - val_loss: 0.1148 - val_tp: 132.0000 - val_fp: 1782.0000 - val_tn: 83513.0000 - val_fn: 16.0000 - val_accuracy: 0.9790 - val_precision: 0.0690 - val_recall: 0.8919 - val_auc: 0.9642 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9905
Epoch 35/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1711 - tp: 199000.0000 - fp: 8653.0000 - tn: 190367.0000 - fn: 20.0000 - accuracy: 0.9782 - precision: 0.9583 - recall: 0.9999 - auc: 0.9960 - sensitivity: 0.0000e+00 - specificity: 0.9920 - val_loss: 0.1129 - val_tp: 132.0000 - val_fp: 1962.0000 - val_tn: 83333.0000 - val_fn: 16.0000 - val_accuracy: 0.9769 - val_precision: 0.0630 - val_recall: 0.8919 - val_auc: 0.9643 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9912
Epoch 36/200

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398040/398040 [==============================] - 4s 10us/sample - loss: 0.1715 -
tp: 199000.0000 - fp: 8061.0000 - tn: 190959.0000 - fn: 20.0000 - accuracy:
0.9797 - precision: 0.9611 - recall: 0.9999 - auc: 0.9963 - sensitivity:
0.0000e+00 - specificity: 0.9926 - val_loss: 0.1304 - val_tp: 133.0000 - val_fp:
2320.0000 - val_tn: 82975.0000 - val_fn: 15.0000 - val_accuracy: 0.9727 -
val_precision: 0.0542 - val_recall: 0.8986 - val_auc: 0.9644 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9928
Epoch 37/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1860 -
tp: 199002.0000 - fp: 9671.0000 - tn: 189349.0000 - fn: 18.0000 - accuracy:
0.9757 - precision: 0.9537 - recall: 0.9999 - auc: 0.9958 - sensitivity:
0.0000e+00 - specificity: 0.9917 - val_loss: 0.1218 - val_tp: 133.0000 - val_fp:
2373.0000 - val_tn: 82922.0000 - val_fn: 15.0000 - val_accuracy: 0.9721 -
val_precision: 0.0531 - val_recall: 0.8986 - val_auc: 0.9631 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9934
Epoch 38/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1695 -
tp: 199000.0000 - fp: 9800.0000 - tn: 189220.0000 - fn: 20.0000 - accuracy:
0.9753 - precision: 0.9531 - recall: 0.9999 - auc: 0.9959 - sensitivity:
0.0000e+00 - specificity: 0.9919 - val_loss: 0.1122 - val_tp: 133.0000 - val_fp:
1892.0000 - val_tn: 83403.0000 - val_fn: 15.0000 - val_accuracy: 0.9777 -
val_precision: 0.0657 - val_recall: 0.8986 - val_auc: 0.9637 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9937
Epoch 39/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1993 -
tp: 199000.0000 - fp: 8309.0000 - tn: 190711.0000 - fn: 20.0000 - accuracy:
0.9791 - precision: 0.9599 - recall: 0.9999 - auc: 0.9962 - sensitivity:
0.0000e+00 - specificity: 0.9924 - val_loss: 0.1335 - val_tp: 133.0000 - val_fp:
2436.0000 - val_tn: 82859.0000 - val_fn: 15.0000 - val_accuracy: 0.9713 -
val_precision: 0.0518 - val_recall: 0.8986 - val_auc: 0.9626 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9922
Epoch 40/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1773 -
tp: 199001.0000 - fp: 9365.0000 - tn: 189655.0000 - fn: 19.0000 - accuracy:
0.9764 - precision: 0.9551 - recall: 0.9999 - auc: 0.9961 - sensitivity:
0.0000e+00 - specificity: 0.9923 - val_loss: 0.1108 - val_tp: 132.0000 - val_fp:
1758.0000 - val_tn: 83537.0000 - val_fn: 16.0000 - val_accuracy: 0.9792 -
val_precision: 0.0698 - val_recall: 0.8919 - val_auc: 0.9645 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9910
Epoch 41/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1562 -
tp: 199003.0000 - fp: 7118.0000 - tn: 191902.0000 - fn: 17.0000 - accuracy:
0.9821 - precision: 0.9655 - recall: 0.9999 - auc: 0.9966 - sensitivity:
0.0000e+00 - specificity: 0.9933 - val_loss: 0.1049 - val_tp: 131.0000 - val_fp:
1820.0000 - val_tn: 83475.0000 - val_fn: 17.0000 - val_accuracy: 0.9785 -
val_precision: 0.0671 - val_recall: 0.8851 - val_auc: 0.9638 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9922
Epoch 42/200
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398040/398040 [==============================] - 4s 11us/sample - loss: 0.1572 -
tp: 199003.0000 - fp: 7806.0000 - tn: 191214.0000 - fn: 17.0000 - accuracy:
0.9803 - precision: 0.9623 - recall: 0.9999 - auc: 0.9962 - sensitivity:
0.0000e+00 - specificity: 0.9924 - val_loss: 0.1111 - val_tp: 131.0000 - val_fp:
1820.0000 - val_tn: 83475.0000 - val_fn: 17.0000 - val_accuracy: 0.9785 -
val_precision: 0.0671 - val_recall: 0.8851 - val_auc: 0.9631 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9902
Epoch 43/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1624 -
tp: 199001.0000 - fp: 8848.0000 - tn: 190172.0000 - fn: 19.0000 - accuracy:
0.9777 - precision: 0.9574 - recall: 0.9999 - auc: 0.9962 - sensitivity:
0.0000e+00 - specificity: 0.9925 - val_loss: 0.0927 - val_tp: 132.0000 - val_fp:
1511.0000 - val_tn: 83784.0000 - val_fn: 16.0000 - val_accuracy: 0.9821 -
val_precision: 0.0803 - val_recall: 0.8919 - val_auc: 0.9654 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9919
Epoch 44/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1820 -
tp: 198999.0000 - fp: 8520.0000 - tn: 190500.0000 - fn: 21.0000 - accuracy:
0.9785 - precision: 0.9589 - recall: 0.9999 - auc: 0.9961 - sensitivity:
0.0000e+00 - specificity: 0.9922 - val_loss: 0.1015 - val_tp: 133.0000 - val_fp:
1832.0000 - val_tn: 83463.0000 - val_fn: 15.0000 - val_accuracy: 0.9784 -
val_precision: 0.0677 - val_recall: 0.8986 - val_auc: 0.9630 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9932
Epoch 45/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1878 -
tp: 198997.0000 - fp: 9108.0000 - tn: 189912.0000 - fn: 23.0000 - accuracy:
0.9771 - precision: 0.9562 - recall: 0.9999 - auc: 0.9964 - sensitivity:
0.0000e+00 - specificity: 0.9928 - val_loss: 0.1102 - val_tp: 133.0000 - val_fp:
1881.0000 - val_tn: 83414.0000 - val_fn: 15.0000 - val_accuracy: 0.9778 -
val_precision: 0.0660 - val_recall: 0.8986 - val_auc: 0.9650 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9931
Epoch 46/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1783 -
tp: 198998.0000 - fp: 8940.0000 - tn: 190080.0000 - fn: 22.0000 - accuracy:
0.9775 - precision: 0.9570 - recall: 0.9999 - auc: 0.9965 - sensitivity:
0.0000e+00 - specificity: 0.9931 - val_loss: 0.0955 - val_tp: 133.0000 - val_fp:
1722.0000 - val_tn: 83573.0000 - val_fn: 15.0000 - val_accuracy: 0.9797 -
val_precision: 0.0717 - val_recall: 0.8986 - val_auc: 0.9651 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9919
Epoch 47/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1584 -
tp: 199004.0000 - fp: 8121.0000 - tn: 190899.0000 - fn: 16.0000 - accuracy:
0.9796 - precision: 0.9608 - recall: 0.9999 - auc: 0.9967 - sensitivity:
0.0000e+00 - specificity: 0.9935 - val_loss: 0.1037 - val_tp: 133.0000 - val_fp:
1902.0000 - val_tn: 83393.0000 - val_fn: 15.0000 - val_accuracy: 0.9776 -
val_precision: 0.0654 - val_recall: 0.8986 - val_auc: 0.9610 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9925
Epoch 48/200
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398040/398040 [==============================] - 4s 10us/sample - loss: 0.1498 - tp: 199003.0000 - fp: 7932.0000 - tn: 191088.0000 - fn: 17.0000 - accuracy: 0.9800 - precision: 0.9617 - recall: 0.9999 - auc: 0.9967 - sensitivity: 0.0000e+00 - specificity: 0.9934 - val_loss: 0.0918 - val_tp: 133.0000 - val_fp: 1618.0000 - val_tn: 83677.0000 - val_fn: 15.0000 - val_accuracy: 0.9809 - val_precision: 0.0760 - val_recall: 0.8986 - val_auc: 0.9637 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9932
Epoch 49/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1566 - tp: 199002.0000 - fp: 8293.0000 - tn: 190727.0000 - fn: 18.0000 - accuracy: 0.9791 - precision: 0.9600 - recall: 0.9999 - auc: 0.9965 - sensitivity: 0.0000e+00 - specificity: 0.9930 - val_loss: 0.0966 - val_tp: 132.0000 - val_fp: 1553.0000 - val_tn: 83742.0000 - val_fn: 16.0000 - val_accuracy: 0.9816 - val_precision: 0.0783 - val_recall: 0.8919 - val_auc: 0.9625 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9922
Epoch 50/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1745 - tp: 198998.0000 - fp: 8141.0000 - tn: 190879.0000 - fn: 22.0000 - accuracy: 0.9795 - precision: 0.9607 - recall: 0.9999 - auc: 0.9966 - sensitivity: 0.0000e+00 - specificity: 0.9933 - val_loss: 0.1090 - val_tp: 133.0000 - val_fp: 1973.0000 - val_tn: 83322.0000 - val_fn: 15.0000 - val_accuracy: 0.9767 - val_precision: 0.0632 - val_recall: 0.8986 - val_auc: 0.9643 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9942
Epoch 51/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1513 - tp: 199003.0000 - fp: 9172.0000 - tn: 189848.0000 - fn: 17.0000 - accuracy: 0.9769 - precision: 0.9559 - recall: 0.9999 - auc: 0.9965 - sensitivity: 0.0000e+00 - specificity: 0.9931 - val_loss: 0.1158 - val_tp: 132.0000 - val_fp: 2171.0000 - val_tn: 83124.0000 - val_fn: 16.0000 - val_accuracy: 0.9744 - val_precision: 0.0573 - val_recall: 0.8919 - val_auc: 0.9645 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9922
Epoch 52/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1570 - tp: 199000.0000 - fp: 8634.0000 - tn: 190386.0000 - fn: 20.0000 - accuracy: 0.9783 - precision: 0.9584 - recall: 0.9999 - auc: 0.9966 - sensitivity: 0.0000e+00 - specificity: 0.9933 - val_loss: 0.1043 - val_tp: 133.0000 - val_fp: 1921.0000 - val_tn: 83374.0000 - val_fn: 15.0000 - val_accuracy: 0.9773 - val_precision: 0.0648 - val_recall: 0.8986 - val_auc: 0.9633 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9909
Epoch 53/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1624 - tp: 199001.0000 - fp: 8124.0000 - tn: 190896.0000 - fn: 19.0000 - accuracy: 0.9795 - precision: 0.9608 - recall: 0.9999 - auc: 0.9967 - sensitivity: 0.0000e+00 - specificity: 0.9934 - val_loss: 0.1129 - val_tp: 134.0000 - val_fp: 2180.0000 - val_tn: 83115.0000 - val_fn: 14.0000 - val_accuracy: 0.9743 - val_precision: 0.0579 - val_recall: 0.9054 - val_auc: 0.9665 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9908
Epoch 54/200

398040/398040 [==============================] - 4s 11us/sample - loss: 0.1555 - tp: 199000.0000 - fp: 7626.0000 - tn: 191394.0000 - fn: 20.0000 - accuracy: 0.9808 - precision: 0.9631 - recall: 0.9999 - auc: 0.9964 - sensitivity: 0.0000e+00 - specificity: 0.9929 - val_loss: 0.1201 - val_tp: 134.0000 - val_fp: 2279.0000 - val_tn: 83016.0000 - val_fn: 14.0000 - val_accuracy: 0.9732 - val_precision: 0.0555 - val_recall: 0.9054 - val_auc: 0.9679 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9937
Epoch 55/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1524 - tp: 199003.0000 - fp: 8774.0000 - tn: 190246.0000 - fn: 17.0000 - accuracy: 0.9779 - precision: 0.9578 - recall: 0.9999 - auc: 0.9968 - sensitivity: 0.0000e+00 - specificity: 0.9936 - val_loss: 0.0983 - val_tp: 132.0000 - val_fp: 1824.0000 - val_tn: 83471.0000 - val_fn: 16.0000 - val_accuracy: 0.9785 - val_precision: 0.0675 - val_recall: 0.8919 - val_auc: 0.9635 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9938
Epoch 56/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1642 - tp: 199000.0000 - fp: 7970.0000 - tn: 191050.0000 - fn: 20.0000 - accuracy: 0.9799 - precision: 0.9615 - recall: 0.9999 - auc: 0.9967 - sensitivity: 0.0000e+00 - specificity: 0.9934 - val_loss: 0.1042 - val_tp: 132.0000 - val_fp: 1965.0000 - val_tn: 83330.0000 - val_fn: 16.0000 - val_accuracy: 0.9768 - val_precision: 0.0629 - val_recall: 0.8919 - val_auc: 0.9628 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9930
Epoch 57/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1491 - tp: 199001.0000 - fp: 8386.0000 - tn: 190634.0000 - fn: 19.0000 - accuracy: 0.9789 - precision: 0.9596 - recall: 0.9999 - auc: 0.9968 - sensitivity: 0.0000e+00 - specificity: 0.9936 - val_loss: 0.0854 - val_tp: 132.0000 - val_fp: 1441.0000 - val_tn: 83854.0000 - val_fn: 16.0000 - val_accuracy: 0.9829 - val_precision: 0.0839 - val_recall: 0.8919 - val_auc: 0.9643 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9917
Epoch 58/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1327 - tp: 199004.0000 - fp: 6788.0000 - tn: 192232.0000 - fn: 16.0000 - accuracy: 0.9829 - precision: 0.9670 - recall: 0.9999 - auc: 0.9966 - sensitivity: 0.0000e+00 - specificity: 0.9933 - val_loss: 0.1044 - val_tp: 132.0000 - val_fp: 1706.0000 - val_tn: 83589.0000 - val_fn: 16.0000 - val_accuracy: 0.9798 - val_precision: 0.0718 - val_recall: 0.8919 - val_auc: 0.9628 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9913
Epoch 59/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1388 - tp: 199000.0000 - fp: 6551.0000 - tn: 192469.0000 - fn: 20.0000 - accuracy: 0.9835 - precision: 0.9681 - recall: 0.9999 - auc: 0.9965 - sensitivity: 0.0000e+00 - specificity: 0.9931 - val_loss: 0.1120 - val_tp: 134.0000 - val_fp: 2034.0000 - val_tn: 83261.0000 - val_fn: 14.0000 - val_accuracy: 0.9760 - val_precision: 0.0618 - val_recall: 0.9054 - val_auc: 0.9663 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9930
Epoch 60/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1519 - tp: 199002.0000 - fp: 8644.0000 - tn: 190376.0000 - fn: 18.0000 - accuracy: 0.9782 - precision: 0.9584 - recall: 0.9999 - auc: 0.9967 - sensitivity: 0.0000e+00 - specificity: 0.9934 - val_loss: 0.1016 - val_tp: 132.0000 - val_fp: 1714.0000 - val_tn: 83581.0000 - val_fn: 16.0000 - val_accuracy: 0.9798 - val_precision: 0.0715 - val_recall: 0.8919 - val_auc: 0.9652 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9913
Epoch 61/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1616 - tp: 198999.0000 - fp: 7989.0000 - tn: 191031.0000 - fn: 21.0000 - accuracy: 0.9799 - precision: 0.9614 - recall: 0.9999 - auc: 0.9967 - sensitivity: 0.0000e+00 - specificity: 0.9934 - val_loss: 0.0880 - val_tp: 131.0000 - val_fp: 1471.0000 - val_tn: 83824.0000 - val_fn: 17.0000 - val_accuracy: 0.9826 - val_precision: 0.0818 - val_recall: 0.8851 - val_auc: 0.9644 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9915
Epoch 62/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1431 - tp: 199004.0000 - fp: 7489.0000 - tn: 191531.0000 - fn: 16.0000 - accuracy: 0.9811 - precision: 0.9637 - recall: 0.9999 - auc: 0.9969 - sensitivity: 0.0000e+00 - specificity: 0.9938 - val_loss: 0.0891 - val_tp: 131.0000 - val_fp: 1481.0000 - val_tn: 83814.0000 - val_fn: 17.0000 - val_accuracy: 0.9825 - val_precision: 0.0813 - val_recall: 0.8851 - val_auc: 0.9587 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9914
Epoch 63/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1483 - tp: 199002.0000 - fp: 7742.0000 - tn: 191278.0000 - fn: 18.0000 - accuracy: 0.9805 - precision: 0.9626 - recall: 0.9999 - auc: 0.9968 - sensitivity: 0.0000e+00 - specificity: 0.9936 - val_loss: 0.0875 - val_tp: 132.0000 - val_fp: 1543.0000 - val_tn: 83752.0000 - val_fn: 16.0000 - val_accuracy: 0.9818 - val_precision: 0.0788 - val_recall: 0.8919 - val_auc: 0.9608 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9922
Epoch 64/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1669 - tp: 199001.0000 - fp: 8469.0000 - tn: 190551.0000 - fn: 19.0000 - accuracy: 0.9787 - precision: 0.9592 - recall: 0.9999 - auc: 0.9970 - sensitivity: 0.0000e+00 - specificity: 0.9941 - val_loss: 0.0862 - val_tp: 131.0000 - val_fp: 1555.0000 - val_tn: 83740.0000 - val_fn: 17.0000 - val_accuracy: 0.9816 - val_precision: 0.0777 - val_recall: 0.8851 - val_auc: 0.9571 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9942
Epoch 65/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1466 - tp: 199003.0000 - fp: 7565.0000 - tn: 191455.0000 - fn: 17.0000 - accuracy: 0.9810 - precision: 0.9634 - recall: 0.9999 - auc: 0.9970 - sensitivity: 0.0000e+00 - specificity: 0.9939 - val_loss: 0.1066 - val_tp: 132.0000 - val_fp: 1971.0000 - val_tn: 83324.0000 - val_fn: 16.0000 - val_accuracy: 0.9767 - val_precision: 0.0628 - val_recall: 0.8919 - val_auc: 0.9601 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9905
Epoch 66/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1410 - tp: 199005.0000 - fp: 8330.0000 - tn: 190690.0000 - fn: 15.0000 - accuracy: 0.9790 - precision: 0.9598 - recall: 0.9999 - auc: 0.9969 - sensitivity: 0.0000e+00 - specificity: 0.9938 - val_loss: 0.0914 - val_tp: 131.0000 - val_fp: 1538.0000 - val_tn: 83757.0000 - val_fn: 17.0000 - val_accuracy: 0.9818 - val_precision: 0.0785 - val_recall: 0.8851 - val_auc: 0.9609 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9917
Epoch 67/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1493 - tp: 199000.0000 - fp: 7600.0000 - tn: 191420.0000 - fn: 20.0000 - accuracy: 0.9809 - precision: 0.9632 - recall: 0.9999 - auc: 0.9967 - sensitivity: 0.0000e+00 - specificity: 0.9935 - val_loss: 0.1280 - val_tp: 135.0000 - val_fp: 2175.0000 - val_tn: 83120.0000 - val_fn: 13.0000 - val_accuracy: 0.9744 - val_precision: 0.0584 - val_recall: 0.9122 - val_auc: 0.9592 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9924
Epoch 68/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1508 - tp: 199000.0000 - fp: 8819.0000 - tn: 190201.0000 - fn: 20.0000 - accuracy: 0.9778 - precision: 0.9576 - recall: 0.9999 - auc: 0.9966 - sensitivity: 0.0000e+00 - specificity: 0.9932 - val_loss: 0.1036 - val_tp: 131.0000 - val_fp: 1809.0000 - val_tn: 83486.0000 - val_fn: 17.0000 - val_accuracy: 0.9786 - val_precision: 0.0675 - val_recall: 0.8851 - val_auc: 0.9600 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9943
Epoch 69/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1373 - tp: 199002.0000 - fp: 7571.0000 - tn: 191449.0000 - fn: 18.0000 - accuracy: 0.9809 - precision: 0.9633 - recall: 0.9999 - auc: 0.9969 - sensitivity: 0.0000e+00 - specificity: 0.9939 - val_loss: 0.1026 - val_tp: 133.0000 - val_fp: 1933.0000 - val_tn: 83362.0000 - val_fn: 15.0000 - val_accuracy: 0.9772 - val_precision: 0.0644 - val_recall: 0.8986 - val_auc: 0.9604 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9924
Epoch 70/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1453 - tp: 199000.0000 - fp: 8230.0000 - tn: 190790.0000 - fn: 20.0000 - accuracy: 0.9793 - precision: 0.9603 - recall: 0.9999 - auc: 0.9970 - sensitivity: 0.0000e+00 - specificity: 0.9940 - val_loss: 0.1041 - val_tp: 132.0000 - val_fp: 1898.0000 - val_tn: 83397.0000 - val_fn: 16.0000 - val_accuracy: 0.9776 - val_precision: 0.0650 - val_recall: 0.8919 - val_auc: 0.9577 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9898
Epoch 71/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1278 - tp: 199006.0000 - fp: 7255.0000 - tn: 191765.0000 - fn: 14.0000 - accuracy: 0.9817 - precision: 0.9648 - recall: 0.9999 - auc: 0.9970 - sensitivity: 0.0000e+00 - specificity: 0.9941 - val_loss: 0.0918 - val_tp: 132.0000 - val_fp: 1622.0000 - val_tn: 83673.0000 - val_fn: 16.0000 - val_accuracy: 0.9808 - val_precision: 0.0753 - val_recall: 0.8919 - val_auc: 0.9580 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9911
Epoch 72/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1340 - tp: 199004.0000 - fp: 7512.0000 - tn: 191508.0000 - fn: 16.0000 - accuracy: 0.9811 - precision: 0.9636 - recall: 0.9999 - auc: 0.9969 - sensitivity: 0.0000e+00 - specificity: 0.9939 - val_loss: 0.0798 - val_tp: 130.0000 - val_fp: 1284.0000 - val_tn: 84011.0000 - val_fn: 18.0000 - val_accuracy: 0.9848 - val_precision: 0.0919 - val_recall: 0.8784 - val_auc: 0.9593 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9913
Epoch 73/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1364 - tp: 199004.0000 - fp: 7071.0000 - tn: 191949.0000 - fn: 16.0000 - accuracy: 0.9822 - precision: 0.9657 - recall: 0.9999 - auc: 0.9970 - sensitivity: 0.0000e+00 - specificity: 0.9941 - val_loss: 0.0960 - val_tp: 131.0000 - val_fp: 1666.0000 - val_tn: 83629.0000 - val_fn: 17.0000 - val_accuracy: 0.9803 - val_precision: 0.0729 - val_recall: 0.8851 - val_auc: 0.9586 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9901
Epoch 74/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1454 - tp: 199000.0000 - fp: 6920.0000 - tn: 192100.0000 - fn: 20.0000 - accuracy: 0.9826 - precision: 0.9664 - recall: 0.9999 - auc: 0.9971 - sensitivity: 0.0000e+00 - specificity: 0.9942 - val_loss: 0.0937 - val_tp: 133.0000 - val_fp: 1781.0000 - val_tn: 83514.0000 - val_fn: 15.0000 - val_accuracy: 0.9790 - val_precision: 0.0695 - val_recall: 0.8986 - val_auc: 0.9618 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9927
Epoch 75/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1584 - tp: 199004.0000 - fp: 7800.0000 - tn: 191220.0000 - fn: 16.0000 - accuracy: 0.9804 - precision: 0.9623 - recall: 0.9999 - auc: 0.9968 - sensitivity: 0.0000e+00 - specificity: 0.9937 - val_loss: 0.1085 - val_tp: 134.0000 - val_fp: 2252.0000 - val_tn: 83043.0000 - val_fn: 14.0000 - val_accuracy: 0.9735 - val_precision: 0.0562 - val_recall: 0.9054 - val_auc: 0.9624 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9904
Epoch 76/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1388 - tp: 199001.0000 - fp: 8921.0000 - tn: 190099.0000 - fn: 19.0000 - accuracy: 0.9775 - precision: 0.9571 - recall: 0.9999 - auc: 0.9969 - sensitivity: 0.0000e+00 - specificity: 0.9937 - val_loss: 0.0845 - val_tp: 131.0000 - val_fp: 1521.0000 - val_tn: 83774.0000 - val_fn: 17.0000 - val_accuracy: 0.9820 - val_precision: 0.0793 - val_recall: 0.8851 - val_auc: 0.9593 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9929
Epoch 77/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1364 - tp: 199006.0000 - fp: 6987.0000 - tn: 192033.0000 - fn: 14.0000 - accuracy: 0.9824 - precision: 0.9661 - recall: 0.9999 - auc: 0.9972 - sensitivity: 0.0000e+00 - specificity: 0.9944 - val_loss: 0.0870 - val_tp: 131.0000 - val_fp: 1568.0000 - val_tn: 83727.0000 - val_fn: 17.0000 - val_accuracy: 0.9814 - val_precision: 0.0771 - val_recall: 0.8851 - val_auc: 0.9583 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9955
Epoch 78/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1220 -
tp: 199004.0000 - fp: 6681.0000 - tn: 192339.0000 - fn: 16.0000 - accuracy:
0.9832 - precision: 0.9675 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9945 - val_loss: 0.0885 - val_tp: 132.0000 - val_fp:
1588.0000 - val_tn: 83707.0000 - val_fn: 16.0000 - val_accuracy: 0.9812 -
val_precision: 0.0767 - val_recall: 0.8919 - val_auc: 0.9616 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9917
Epoch 79/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1418 -
tp: 199002.0000 - fp: 8370.0000 - tn: 190650.0000 - fn: 18.0000 - accuracy:
0.9789 - precision: 0.9596 - recall: 0.9999 - auc: 0.9969 - sensitivity:
0.0000e+00 - specificity: 0.9939 - val_loss: 0.1048 - val_tp: 132.0000 - val_fp:
1786.0000 - val_tn: 83509.0000 - val_fn: 16.0000 - val_accuracy: 0.9789 -
val_precision: 0.0688 - val_recall: 0.8919 - val_auc: 0.9591 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9919
Epoch 80/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1389 -
tp: 199002.0000 - fp: 7351.0000 - tn: 191669.0000 - fn: 18.0000 - accuracy:
0.9815 - precision: 0.9644 - recall: 0.9999 - auc: 0.9969 - sensitivity:
0.0000e+00 - specificity: 0.9939 - val_loss: 0.0830 - val_tp: 131.0000 - val_fp:
1415.0000 - val_tn: 83880.0000 - val_fn: 17.0000 - val_accuracy: 0.9832 -
val_precision: 0.0847 - val_recall: 0.8851 - val_auc: 0.9617 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9913
Epoch 81/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1297 -
tp: 199004.0000 - fp: 7558.0000 - tn: 191462.0000 - fn: 16.0000 - accuracy:
0.9810 - precision: 0.9634 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9945 - val_loss: 0.0862 - val_tp: 132.0000 - val_fp:
1557.0000 - val_tn: 83738.0000 - val_fn: 16.0000 - val_accuracy: 0.9816 -
val_precision: 0.0782 - val_recall: 0.8919 - val_auc: 0.9620 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9909
Epoch 82/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1477 -
tp: 199003.0000 - fp: 7992.0000 - tn: 191028.0000 - fn: 17.0000 - accuracy:
0.9799 - precision: 0.9614 - recall: 0.9999 - auc: 0.9966 - sensitivity:
0.0000e+00 - specificity: 0.9933 - val_loss: 0.0981 - val_tp: 132.0000 - val_fp:
1971.0000 - val_tn: 83324.0000 - val_fn: 16.0000 - val_accuracy: 0.9767 -
val_precision: 0.0628 - val_recall: 0.8919 - val_auc: 0.9616 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9913
Epoch 83/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1339 -
tp: 199006.0000 - fp: 7594.0000 - tn: 191426.0000 - fn: 14.0000 - accuracy:
0.9809 - precision: 0.9632 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9945 - val_loss: 0.0884 - val_tp: 131.0000 - val_fp:
1718.0000 - val_tn: 83577.0000 - val_fn: 17.0000 - val_accuracy: 0.9797 -
val_precision: 0.0708 - val_recall: 0.8851 - val_auc: 0.9620 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9924
Epoch 84/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1374 - tp: 199006.0000 - fp: 7321.0000 - tn: 191699.0000 - fn: 14.0000 - accuracy: 0.9816 - precision: 0.9645 - recall: 0.9999 - auc: 0.9974 - sensitivity: 0.0000e+00 - specificity: 0.9949 - val_loss: 0.0839 - val_tp: 131.0000 - val_fp: 1455.0000 - val_tn: 83840.0000 - val_fn: 17.0000 - val_accuracy: 0.9828 - val_precision: 0.0826 - val_recall: 0.8851 - val_auc: 0.9613 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9924
Epoch 85/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1300 - tp: 198999.0000 - fp: 7631.0000 - tn: 191389.0000 - fn: 21.0000 - accuracy: 0.9808 - precision: 0.9631 - recall: 0.9999 - auc: 0.9972 - sensitivity: 0.0000e+00 - specificity: 0.9945 - val_loss: 0.1017 - val_tp: 134.0000 - val_fp: 1972.0000 - val_tn: 83323.0000 - val_fn: 14.0000 - val_accuracy: 0.9768 - val_precision: 0.0636 - val_recall: 0.9054 - val_auc: 0.9615 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9916
Epoch 86/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1318 - tp: 199003.0000 - fp: 7724.0000 - tn: 191296.0000 - fn: 17.0000 - accuracy: 0.9806 - precision: 0.9626 - recall: 0.9999 - auc: 0.9974 - sensitivity: 0.0000e+00 - specificity: 0.9949 - val_loss: 0.0804 - val_tp: 131.0000 - val_fp: 1407.0000 - val_tn: 83888.0000 - val_fn: 17.0000 - val_accuracy: 0.9833 - val_precision: 0.0852 - val_recall: 0.8851 - val_auc: 0.9619 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9950
Epoch 87/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1292 - tp: 199003.0000 - fp: 7554.0000 - tn: 191466.0000 - fn: 17.0000 - accuracy: 0.9810 - precision: 0.9634 - recall: 0.9999 - auc: 0.9974 - sensitivity: 0.0000e+00 - specificity: 0.9947 - val_loss: 0.0822 - val_tp: 129.0000 - val_fp: 1387.0000 - val_tn: 83908.0000 - val_fn: 19.0000 - val_accuracy: 0.9835 - val_precision: 0.0851 - val_recall: 0.8716 - val_auc: 0.9643 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9955
Epoch 88/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1253 - tp: 199004.0000 - fp: 6992.0000 - tn: 192028.0000 - fn: 16.0000 - accuracy: 0.9824 - precision: 0.9661 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9946 - val_loss: 0.0896 - val_tp: 129.0000 - val_fp: 1508.0000 - val_tn: 83787.0000 - val_fn: 19.0000 - val_accuracy: 0.9821 - val_precision: 0.0788 - val_recall: 0.8716 - val_auc: 0.9595 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9907
Epoch 89/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1122 - tp: 199005.0000 - fp: 6737.0000 - tn: 192283.0000 - fn: 15.0000 - accuracy: 0.9830 - precision: 0.9673 - recall: 0.9999 - auc: 0.9975 - sensitivity: 0.0000e+00 - specificity: 0.9950 - val_loss: 0.0804 - val_tp: 130.0000 - val_fp: 1424.0000 - val_tn: 83871.0000 - val_fn: 18.0000 - val_accuracy: 0.9831 - val_precision: 0.0837 - val_recall: 0.8784 - val_auc: 0.9596 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9902
Epoch 90/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1152 - tp: 199005.0000 - fp: 6937.0000 - tn: 192083.0000 - fn: 15.0000 - accuracy: 0.9825 - precision: 0.9663 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9946 - val_loss: 0.1052 - val_tp: 131.0000 - val_fp: 1885.0000 - val_tn: 83410.0000 - val_fn: 17.0000 - val_accuracy: 0.9777 - val_precision: 0.0650 - val_recall: 0.8851 - val_auc: 0.9617 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9917
Epoch 91/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1248 - tp: 199004.0000 - fp: 7987.0000 - tn: 191033.0000 - fn: 16.0000 - accuracy: 0.9799 - precision: 0.9614 - recall: 0.9999 - auc: 0.9971 - sensitivity: 0.0000e+00 - specificity: 0.9942 - val_loss: 0.0938 - val_tp: 130.0000 - val_fp: 1704.0000 - val_tn: 83591.0000 - val_fn: 18.0000 - val_accuracy: 0.9798 - val_precision: 0.0709 - val_recall: 0.8784 - val_auc: 0.9587 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9906
Epoch 92/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1252 - tp: 199004.0000 - fp: 7045.0000 - tn: 191975.0000 - fn: 16.0000 - accuracy: 0.9823 - precision: 0.9658 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9947 - val_loss: 0.0878 - val_tp: 130.0000 - val_fp: 1574.0000 - val_tn: 83721.0000 - val_fn: 18.0000 - val_accuracy: 0.9814 - val_precision: 0.0763 - val_recall: 0.8784 - val_auc: 0.9615 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9920
Epoch 93/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1478 - tp: 199001.0000 - fp: 7735.0000 - tn: 191285.0000 - fn: 19.0000 - accuracy: 0.9805 - precision: 0.9626 - recall: 0.9999 - auc: 0.9975 - sensitivity: 0.0000e+00 - specificity: 0.9950 - val_loss: 0.0848 - val_tp: 131.0000 - val_fp: 1572.0000 - val_tn: 83723.0000 - val_fn: 17.0000 - val_accuracy: 0.9814 - val_precision: 0.0769 - val_recall: 0.8851 - val_auc: 0.9636 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9917
Epoch 94/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1320 - tp: 199003.0000 - fp: 6820.0000 - tn: 192200.0000 - fn: 17.0000 - accuracy: 0.9828 - precision: 0.9669 - recall: 0.9999 - auc: 0.9970 - sensitivity: 0.0000e+00 - specificity: 0.9940 - val_loss: 0.1032 - val_tp: 131.0000 - val_fp: 1857.0000 - val_tn: 83438.0000 - val_fn: 17.0000 - val_accuracy: 0.9781 - val_precision: 0.0659 - val_recall: 0.8851 - val_auc: 0.9625 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9894
Epoch 95/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1278 - tp: 199003.0000 - fp: 7125.0000 - tn: 191895.0000 - fn: 17.0000 - accuracy: 0.9821 - precision: 0.9654 - recall: 0.9999 - auc: 0.9971 - sensitivity: 0.0000e+00 - specificity: 0.9942 - val_loss: 0.0771 - val_tp: 130.0000 - val_fp: 1415.0000 - val_tn: 83880.0000 - val_fn: 18.0000 - val_accuracy: 0.9832 - val_precision: 0.0841 - val_recall: 0.8784 - val_auc: 0.9593 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9932
Epoch 96/200

398040/398040 [==============================] - 4s 11us/sample - loss: 0.1262 -
tp: 199000.0000 - fp: 6971.0000 - tn: 192049.0000 - fn: 20.0000 - accuracy:
0.9824 - precision: 0.9662 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9944 - val_loss: 0.0912 - val_tp: 132.0000 - val_fp:
1788.0000 - val_tn: 83507.0000 - val_fn: 16.0000 - val_accuracy: 0.9789 -
val_precision: 0.0688 - val_recall: 0.8919 - val_auc: 0.9616 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9919
Epoch 97/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1161 -
tp: 199003.0000 - fp: 7322.0000 - tn: 191698.0000 - fn: 17.0000 - accuracy:
0.9816 - precision: 0.9645 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0882 - val_tp: 132.0000 - val_fp:
1574.0000 - val_tn: 83721.0000 - val_fn: 16.0000 - val_accuracy: 0.9814 -
val_precision: 0.0774 - val_recall: 0.8919 - val_auc: 0.9597 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9921
Epoch 98/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1337 -
tp: 199004.0000 - fp: 7354.0000 - tn: 191666.0000 - fn: 16.0000 - accuracy:
0.9815 - precision: 0.9644 - recall: 0.9999 - auc: 0.9971 - sensitivity:
0.0000e+00 - specificity: 0.9943 - val_loss: 0.0861 - val_tp: 132.0000 - val_fp:
1674.0000 - val_tn: 83621.0000 - val_fn: 16.0000 - val_accuracy: 0.9802 -
val_precision: 0.0731 - val_recall: 0.8919 - val_auc: 0.9592 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9922
Epoch 99/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1319 -
tp: 199002.0000 - fp: 7304.0000 - tn: 191716.0000 - fn: 18.0000 - accuracy:
0.9816 - precision: 0.9646 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9944 - val_loss: 0.0918 - val_tp: 133.0000 - val_fp:
1735.0000 - val_tn: 83560.0000 - val_fn: 15.0000 - val_accuracy: 0.9795 -
val_precision: 0.0712 - val_recall: 0.8986 - val_auc: 0.9594 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9921
Epoch 100/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1313 -
tp: 199004.0000 - fp: 7029.0000 - tn: 191991.0000 - fn: 16.0000 - accuracy:
0.9823 - precision: 0.9659 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9948 - val_loss: 0.0832 - val_tp: 131.0000 - val_fp:
1572.0000 - val_tn: 83723.0000 - val_fn: 17.0000 - val_accuracy: 0.9814 -
val_precision: 0.0769 - val_recall: 0.8851 - val_auc: 0.9598 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9933
Epoch 101/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1169 -
tp: 199007.0000 - fp: 6310.0000 - tn: 192710.0000 - fn: 13.0000 - accuracy:
0.9841 - precision: 0.9693 - recall: 0.9999 - auc: 0.9973 - sensitivity:
0.0000e+00 - specificity: 0.9946 - val_loss: 0.0782 - val_tp: 130.0000 - val_fp:
1466.0000 - val_tn: 83829.0000 - val_fn: 18.0000 - val_accuracy: 0.9826 -
val_precision: 0.0815 - val_recall: 0.8784 - val_auc: 0.9627 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9960
Epoch 102/200

398040/398040 [==============================] – 4s 11us/sample – loss: 0.1191 – tp: 199008.0000 – fp: 6526.0000 – tn: 192494.0000 – fn: 12.0000 – accuracy: 0.9836 – precision: 0.9682 – recall: 0.9999 – auc: 0.9970 – sensitivity: 0.0000e+00 – specificity: 0.9940 – val_loss: 0.0886 – val_tp: 132.0000 – val_fp: 1571.0000 – val_tn: 83724.0000 – val_fn: 16.0000 – val_accuracy: 0.9814 – val_precision: 0.0775 – val_recall: 0.8919 – val_auc: 0.9623 – val_sensitivity: 0.0000e+00 – val_specificity: 0.9928
Epoch 103/200
398040/398040 [==============================] – 4s 11us/sample – loss: 0.1189 – tp: 199008.0000 – fp: 7452.0000 – tn: 191568.0000 – fn: 12.0000 – accuracy: 0.9812 – precision: 0.9639 – recall: 0.9999 – auc: 0.9970 – sensitivity: 0.0000e+00 – specificity: 0.9941 – val_loss: 0.0786 – val_tp: 130.0000 – val_fp: 1295.0000 – val_tn: 84000.0000 – val_fn: 18.0000 – val_accuracy: 0.9846 – val_precision: 0.0912 – val_recall: 0.8784 – val_auc: 0.9605 – val_sensitivity: 0.0000e+00 – val_specificity: 0.9932
Epoch 104/200
398040/398040 [==============================] – 4s 11us/sample – loss: 0.1229 – tp: 199005.0000 – fp: 6312.0000 – tn: 192708.0000 – fn: 15.0000 – accuracy: 0.9841 – precision: 0.9693 – recall: 0.9999 – auc: 0.9973 – sensitivity: 0.0000e+00 – specificity: 0.9947 – val_loss: 0.0760 – val_tp: 130.0000 – val_fp: 1351.0000 – val_tn: 83944.0000 – val_fn: 18.0000 – val_accuracy: 0.9840 – val_precision: 0.0878 – val_recall: 0.8784 – val_auc: 0.9597 – val_sensitivity: 0.0000e+00 – val_specificity: 0.9943
Epoch 105/200
398040/398040 [==============================] – 4s 11us/sample – loss: 0.1426 – tp: 199000.0000 – fp: 7774.0000 – tn: 191246.0000 – fn: 20.0000 – accuracy: 0.9804 – precision: 0.9624 – recall: 0.9999 – auc: 0.9972 – sensitivity: 0.0000e+00 – specificity: 0.9945 – val_loss: 0.0868 – val_tp: 132.0000 – val_fp: 1670.0000 – val_tn: 83625.0000 – val_fn: 16.0000 – val_accuracy: 0.9803 – val_precision: 0.0733 – val_recall: 0.8919 – val_auc: 0.9590 – val_sensitivity: 0.0000e+00 – val_specificity: 0.9940
Epoch 106/200
398040/398040 [==============================] – 4s 11us/sample – loss: 0.1133 – tp: 199011.0000 – fp: 7188.0000 – tn: 191832.0000 – fn: 9.0000 – accuracy: 0.9819 – precision: 0.9651 – recall: 1.0000 – auc: 0.9973 – sensitivity: 0.0000e+00 – specificity: 0.9946 – val_loss: 0.0788 – val_tp: 130.0000 – val_fp: 1357.0000 – val_tn: 83938.0000 – val_fn: 18.0000 – val_accuracy: 0.9839 – val_precision: 0.0874 – val_recall: 0.8784 – val_auc: 0.9600 – val_sensitivity: 0.0000e+00 – val_specificity: 0.9939
Epoch 107/200
398040/398040 [==============================] – 4s 11us/sample – loss: 0.1328 – tp: 198999.0000 – fp: 7003.0000 – tn: 192017.0000 – fn: 21.0000 – accuracy: 0.9824 – precision: 0.9660 – recall: 0.9999 – auc: 0.9975 – sensitivity: 0.0000e+00 – specificity: 0.9950 – val_loss: 0.0833 – val_tp: 132.0000 – val_fp: 1700.0000 – val_tn: 83595.0000 – val_fn: 16.0000 – val_accuracy: 0.9799 – val_precision: 0.0721 – val_recall: 0.8919 – val_auc: 0.9599 – val_sensitivity: 0.0000e+00 – val_specificity: 0.9951
Epoch 108/200

398040/398040 [==============================] - 4s 11us/sample - loss: 0.1253 - tp: 199005.0000 - fp: 7127.0000 - tn: 191893.0000 - fn: 15.0000 - accuracy: 0.9821 - precision: 0.9654 - recall: 0.9999 - auc: 0.9972 - sensitivity: 0.0000e+00 - specificity: 0.9945 - val_loss: 0.0785 - val_tp: 131.0000 - val_fp: 1513.0000 - val_tn: 83782.0000 - val_fn: 17.0000 - val_accuracy: 0.9821 - val_precision: 0.0797 - val_recall: 0.8851 - val_auc: 0.9598 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9947
Epoch 109/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1233 - tp: 199002.0000 - fp: 6939.0000 - tn: 192081.0000 - fn: 18.0000 - accuracy: 0.9825 - precision: 0.9663 - recall: 0.9999 - auc: 0.9975 - sensitivity: 0.0000e+00 - specificity: 0.9950 - val_loss: 0.0766 - val_tp: 131.0000 - val_fp: 1502.0000 - val_tn: 83793.0000 - val_fn: 17.0000 - val_accuracy: 0.9822 - val_precision: 0.0802 - val_recall: 0.8851 - val_auc: 0.9628 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9960
Epoch 110/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1096 - tp: 199007.0000 - fp: 6751.0000 - tn: 192269.0000 - fn: 13.0000 - accuracy: 0.9830 - precision: 0.9672 - recall: 0.9999 - auc: 0.9975 - sensitivity: 0.0000e+00 - specificity: 0.9949 - val_loss: 0.1011 - val_tp: 134.0000 - val_fp: 1906.0000 - val_tn: 83389.0000 - val_fn: 14.0000 - val_accuracy: 0.9775 - val_precision: 0.0657 - val_recall: 0.9054 - val_auc: 0.9596 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9926
Epoch 111/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1038 - tp: 199007.0000 - fp: 6865.0000 - tn: 192155.0000 - fn: 13.0000 - accuracy: 0.9827 - precision: 0.9667 - recall: 0.9999 - auc: 0.9974 - sensitivity: 0.0000e+00 - specificity: 0.9947 - val_loss: 0.0798 - val_tp: 130.0000 - val_fp: 1435.0000 - val_tn: 83860.0000 - val_fn: 18.0000 - val_accuracy: 0.9830 - val_precision: 0.0831 - val_recall: 0.8784 - val_auc: 0.9611 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9937
Epoch 112/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1194 - tp: 199005.0000 - fp: 6825.0000 - tn: 192195.0000 - fn: 15.0000 - accuracy: 0.9828 - precision: 0.9668 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9946 - val_loss: 0.0782 - val_tp: 130.0000 - val_fp: 1407.0000 - val_tn: 83888.0000 - val_fn: 18.0000 - val_accuracy: 0.9833 - val_precision: 0.0846 - val_recall: 0.8784 - val_auc: 0.9600 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9937
Epoch 113/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1230 - tp: 199000.0000 - fp: 6943.0000 - tn: 192077.0000 - fn: 20.0000 - accuracy: 0.9825 - precision: 0.9663 - recall: 0.9999 - auc: 0.9976 - sensitivity: 0.0000e+00 - specificity: 0.9952 - val_loss: 0.0920 - val_tp: 131.0000 - val_fp: 1623.0000 - val_tn: 83672.0000 - val_fn: 17.0000 - val_accuracy: 0.9808 - val_precision: 0.0747 - val_recall: 0.8851 - val_auc: 0.9613 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9933
Epoch 114/200

398040/398040 [==============================] - 4s 10us/sample - loss: 0.1333 - tp: 199002.0000 - fp: 7270.0000 - tn: 191750.0000 - fn: 18.0000 - accuracy: 0.9817 - precision: 0.9648 - recall: 0.9999 - auc: 0.9974 - sensitivity: 0.0000e+00 - specificity: 0.9947 - val_loss: 0.0772 - val_tp: 131.0000 - val_fp: 1457.0000 - val_tn: 83838.0000 - val_fn: 17.0000 - val_accuracy: 0.9827 - val_precision: 0.0825 - val_recall: 0.8851 - val_auc: 0.9621 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9936
Epoch 115/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1150 - tp: 199004.0000 - fp: 7305.0000 - tn: 191715.0000 - fn: 16.0000 - accuracy: 0.9816 - precision: 0.9646 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9946 - val_loss: 0.0814 - val_tp: 130.0000 - val_fp: 1553.0000 - val_tn: 83742.0000 - val_fn: 18.0000 - val_accuracy: 0.9816 - val_precision: 0.0772 - val_recall: 0.8784 - val_auc: 0.9598 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9934
Epoch 116/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1216 - tp: 199005.0000 - fp: 7058.0000 - tn: 191962.0000 - fn: 15.0000 - accuracy: 0.9822 - precision: 0.9657 - recall: 0.9999 - auc: 0.9976 - sensitivity: 0.0000e+00 - specificity: 0.9952 - val_loss: 0.0743 - val_tp: 130.0000 - val_fp: 1383.0000 - val_tn: 83912.0000 - val_fn: 18.0000 - val_accuracy: 0.9836 - val_precision: 0.0859 - val_recall: 0.8784 - val_auc: 0.9597 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9943
Epoch 117/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1275 - tp: 199006.0000 - fp: 7730.0000 - tn: 191290.0000 - fn: 14.0000 - accuracy: 0.9805 - precision: 0.9626 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9947 - val_loss: 0.0725 - val_tp: 130.0000 - val_fp: 1214.0000 - val_tn: 84081.0000 - val_fn: 18.0000 - val_accuracy: 0.9856 - val_precision: 0.0967 - val_recall: 0.8784 - val_auc: 0.9605 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9933
Epoch 118/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.1242 - tp: 199007.0000 - fp: 6435.0000 - tn: 192585.0000 - fn: 13.0000 - accuracy: 0.9838 - precision: 0.9687 - recall: 0.9999 - auc: 0.9975 - sensitivity: 0.0000e+00 - specificity: 0.9949 - val_loss: 0.0764 - val_tp: 130.0000 - val_fp: 1292.0000 - val_tn: 84003.0000 - val_fn: 18.0000 - val_accuracy: 0.9847 - val_precision: 0.0914 - val_recall: 0.8784 - val_auc: 0.9603 - val_sensitivity: 0.0000e+00 - val_specificity: 0.99270 - fp: 873.0000 - tn: 30339.0000 - fn: 0.0000e+00 - accuracy: 0.9860 -
Epoch 119/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1271 - tp: 199003.0000 - fp: 6690.0000 - tn: 192330.0000 - fn: 17.0000 - accuracy: 0.9831 - precision: 0.9675 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9946 - val_loss: 0.0848 - val_tp: 132.0000 - val_fp: 1608.0000 - val_tn: 83687.0000 - val_fn: 16.0000 - val_accuracy: 0.9810 - val_precision: 0.0759 - val_recall: 0.8919 - val_auc: 0.9590 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9944

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Epoch 120/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1359 -
tp: 199000.0000 - fp: 7775.0000 - tn: 191245.0000 - fn: 20.0000 - accuracy:
0.9804 - precision: 0.9624 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9943 - val_loss: 0.0910 - val_tp: 132.0000 - val_fp:
1925.0000 - val_tn: 83370.0000 - val_fn: 16.0000 - val_accuracy: 0.9773 -
val_precision: 0.0642 - val_recall: 0.8919 - val_auc: 0.9640 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9961
Epoch 121/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1209 -
tp: 199009.0000 - fp: 7841.0000 - tn: 191179.0000 - fn: 11.0000 - accuracy:
0.9803 - precision: 0.9621 - recall: 0.9999 - auc: 0.9972 - sensitivity:
0.0000e+00 - specificity: 0.9945 - val_loss: 0.0877 - val_tp: 131.0000 - val_fp:
1684.0000 - val_tn: 83611.0000 - val_fn: 17.0000 - val_accuracy: 0.9801 -
val_precision: 0.0722 - val_recall: 0.8851 - val_auc: 0.9615 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9935
Epoch 122/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1077 -
tp: 199007.0000 - fp: 6988.0000 - tn: 192032.0000 - fn: 13.0000 - accuracy:
0.9824 - precision: 0.9661 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9948 - val_loss: 0.0784 - val_tp: 132.0000 - val_fp:
1338.0000 - val_tn: 83957.0000 - val_fn: 16.0000 - val_accuracy: 0.9842 -
val_precision: 0.0898 - val_recall: 0.8919 - val_auc: 0.9600 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9928
Epoch 123/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1237 -
tp: 199003.0000 - fp: 6575.0000 - tn: 192445.0000 - fn: 17.0000 - accuracy:
0.9834 - precision: 0.9680 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0816 - val_tp: 133.0000 - val_fp:
1533.0000 - val_tn: 83762.0000 - val_fn: 15.0000 - val_accuracy: 0.9819 -
val_precision: 0.0798 - val_recall: 0.8986 - val_auc: 0.9618 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9961
Epoch 124/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1321 -
tp: 199002.0000 - fp: 7835.0000 - tn: 191185.0000 - fn: 18.0000 - accuracy:
0.9803 - precision: 0.9621 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0848 - val_tp: 131.0000 - val_fp:
1650.0000 - val_tn: 83645.0000 - val_fn: 17.0000 - val_accuracy: 0.9805 -
val_precision: 0.0736 - val_recall: 0.8851 - val_auc: 0.9650 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9959
Epoch 125/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1097 -
tp: 199008.0000 - fp: 7033.0000 - tn: 191987.0000 - fn: 12.0000 - accuracy:
0.9823 - precision: 0.9659 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0832 - val_tp: 130.0000 - val_fp:
1480.0000 - val_tn: 83815.0000 - val_fn: 18.0000 - val_accuracy: 0.9825 -
val_precision: 0.0807 - val_recall: 0.8784 - val_auc: 0.9632 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9940
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Epoch 126/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1168 -
tp: 199003.0000 - fp: 7100.0000 - tn: 191920.0000 - fn: 17.0000 - accuracy:
0.9821 - precision: 0.9656 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0788 - val_tp: 131.0000 - val_fp:
1441.0000 - val_tn: 83854.0000 - val_fn: 17.0000 - val_accuracy: 0.9829 -
val_precision: 0.0833 - val_recall: 0.8851 - val_auc: 0.9632 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9945
Epoch 127/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1102 -
tp: 199004.0000 - fp: 6587.0000 - tn: 192433.0000 - fn: 16.0000 - accuracy:
0.9834 - precision: 0.9680 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9955 - val_loss: 0.0822 - val_tp: 130.0000 - val_fp:
1436.0000 - val_tn: 83859.0000 - val_fn: 18.0000 - val_accuracy: 0.9830 -
val_precision: 0.0830 - val_recall: 0.8784 - val_auc: 0.9596 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9942
Epoch 128/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1127 -
tp: 199004.0000 - fp: 6701.0000 - tn: 192319.0000 - fn: 16.0000 - accuracy:
0.9831 - precision: 0.9674 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0942 - val_tp: 132.0000 - val_fp:
1886.0000 - val_tn: 83409.0000 - val_fn: 16.0000 - val_accuracy: 0.9777 -
val_precision: 0.0654 - val_recall: 0.8919 - val_auc: 0.9593 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9941
Epoch 129/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1031 -
tp: 199010.0000 - fp: 7398.0000 - tn: 191622.0000 - fn: 10.0000 - accuracy:
0.9814 - precision: 0.9642 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0792 - val_tp: 130.0000 - val_fp:
1341.0000 - val_tn: 83954.0000 - val_fn: 18.0000 - val_accuracy: 0.9841 -
val_precision: 0.0884 - val_recall: 0.8784 - val_auc: 0.9609 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9942
Epoch 130/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1150 -
tp: 199006.0000 - fp: 6223.0000 - tn: 192797.0000 - fn: 14.0000 - accuracy:
0.9843 - precision: 0.9697 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0872 - val_tp: 131.0000 - val_fp:
1493.0000 - val_tn: 83802.0000 - val_fn: 17.0000 - val_accuracy: 0.9823 -
val_precision: 0.0807 - val_recall: 0.8851 - val_auc: 0.9603 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9938
Epoch 131/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1248 -
tp: 199005.0000 - fp: 6447.0000 - tn: 192573.0000 - fn: 15.0000 - accuracy:
0.9838 - precision: 0.9686 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0778 - val_tp: 131.0000 - val_fp:
1403.0000 - val_tn: 83892.0000 - val_fn: 17.0000 - val_accuracy: 0.9834 -
val_precision: 0.0854 - val_recall: 0.8851 - val_auc: 0.9636 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9945
```

Epoch 132/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1224 - tp: 199004.0000 - fp: 6344.0000 - tn: 192676.0000 - fn: 16.0000 - accuracy: 0.9840 - precision: 0.9691 - recall: 0.9999 - auc: 0.9973 - sensitivity: 0.0000e+00 - specificity: 0.9946 - val_loss: 0.0712 - val_tp: 131.0000 - val_fp: 1236.0000 - val_tn: 84059.0000 - val_fn: 17.0000 - val_accuracy: 0.9853 - val_precision: 0.0958 - val_recall: 0.8851 - val_auc: 0.9611 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9949
Epoch 133/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1134 - tp: 199007.0000 - fp: 6378.0000 - tn: 192642.0000 - fn: 13.0000 - accuracy: 0.9839 - precision: 0.9689 - recall: 0.9999 - auc: 0.9977 - sensitivity: 0.0000e+00 - specificity: 0.9954 - val_loss: 0.0839 - val_tp: 130.0000 - val_fp: 1450.0000 - val_tn: 83845.0000 - val_fn: 18.0000 - val_accuracy: 0.9828 - val_precision: 0.0823 - val_recall: 0.8784 - val_auc: 0.9647 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9942
Epoch 134/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1106 - tp: 199007.0000 - fp: 7225.0000 - tn: 191795.0000 - fn: 13.0000 - accuracy: 0.9818 - precision: 0.9650 - recall: 0.9999 - auc: 0.9976 - sensitivity: 0.0000e+00 - specificity: 0.9953 - val_loss: 0.0817 - val_tp: 130.0000 - val_fp: 1392.0000 - val_tn: 83903.0000 - val_fn: 18.0000 - val_accuracy: 0.9835 - val_precision: 0.0854 - val_recall: 0.8784 - val_auc: 0.9595 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9940
Epoch 135/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1144 - tp: 199006.0000 - fp: 6406.0000 - tn: 192614.0000 - fn: 14.0000 - accuracy: 0.9839 - precision: 0.9688 - recall: 0.9999 - auc: 0.9977 - sensitivity: 0.0000e+00 - specificity: 0.9954 - val_loss: 0.0764 - val_tp: 130.0000 - val_fp: 1277.0000 - val_tn: 84018.0000 - val_fn: 18.0000 - val_accuracy: 0.9848 - val_precision: 0.0924 - val_recall: 0.8784 - val_auc: 0.9664 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9945
Epoch 136/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1137 - tp: 199008.0000 - fp: 6782.0000 - tn: 192238.0000 - fn: 12.0000 - accuracy: 0.9829 - precision: 0.9670 - recall: 0.9999 - auc: 0.9969 - sensitivity: 0.0000e+00 - specificity: 0.9939 - val_loss: 0.0786 - val_tp: 130.0000 - val_fp: 1399.0000 - val_tn: 83896.0000 - val_fn: 18.0000 - val_accuracy: 0.9834 - val_precision: 0.0850 - val_recall: 0.8784 - val_auc: 0.9603 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9950
Epoch 137/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1039 - tp: 199006.0000 - fp: 6049.0000 - tn: 192971.0000 - fn: 14.0000 - accuracy: 0.9848 - precision: 0.9705 - recall: 0.9999 - auc: 0.9976 - sensitivity: 0.0000e+00 - specificity: 0.9951 - val_loss: 0.0832 - val_tp: 131.0000 - val_fp: 1535.0000 - val_tn: 83760.0000 - val_fn: 17.0000 - val_accuracy: 0.9818 - val_precision: 0.0786 - val_recall: 0.8851 - val_auc: 0.9598 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9954

```
Epoch 138/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1127 -
tp: 199006.0000 - fp: 7335.0000 - tn: 191685.0000 - fn: 14.0000 - accuracy:
0.9815 - precision: 0.9645 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0726 - val_tp: 130.0000 - val_fp:
1190.0000 - val_tn: 84105.0000 - val_fn: 18.0000 - val_accuracy: 0.9859 -
val_precision: 0.0985 - val_recall: 0.8784 - val_auc: 0.9620 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9948
Epoch 139/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1125 -
tp: 199007.0000 - fp: 6535.0000 - tn: 192485.0000 - fn: 13.0000 - accuracy:
0.9835 - precision: 0.9682 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0784 - val_tp: 130.0000 - val_fp:
1286.0000 - val_tn: 84009.0000 - val_fn: 18.0000 - val_accuracy: 0.9847 -
val_precision: 0.0918 - val_recall: 0.8784 - val_auc: 0.9624 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9953
Epoch 140/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.1200 -
tp: 199006.0000 - fp: 7036.0000 - tn: 191984.0000 - fn: 14.0000 - accuracy:
0.9823 - precision: 0.9659 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0896 - val_tp: 132.0000 - val_fp:
1521.0000 - val_tn: 83774.0000 - val_fn: 16.0000 - val_accuracy: 0.9820 -
val_precision: 0.0799 - val_recall: 0.8919 - val_auc: 0.9634 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9958
Epoch 141/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1137 -
tp: 199008.0000 - fp: 7130.0000 - tn: 191890.0000 - fn: 12.0000 - accuracy:
0.9821 - precision: 0.9654 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0805 - val_tp: 129.0000 - val_fp:
1320.0000 - val_tn: 83975.0000 - val_fn: 19.0000 - val_accuracy: 0.9843 -
val_precision: 0.0890 - val_recall: 0.8716 - val_auc: 0.9613 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9937
Epoch 142/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1086 -
tp: 199004.0000 - fp: 6328.0000 - tn: 192692.0000 - fn: 16.0000 - accuracy:
0.9841 - precision: 0.9692 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0756 - val_tp: 131.0000 - val_fp:
1295.0000 - val_tn: 84000.0000 - val_fn: 17.0000 - val_accuracy: 0.9846 -
val_precision: 0.0919 - val_recall: 0.8851 - val_auc: 0.9620 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9960
Epoch 143/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1186 -
tp: 199006.0000 - fp: 6548.0000 - tn: 192472.0000 - fn: 14.0000 - accuracy:
0.9835 - precision: 0.9681 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0726 - val_tp: 130.0000 - val_fp:
1198.0000 - val_tn: 84097.0000 - val_fn: 18.0000 - val_accuracy: 0.9858 -
val_precision: 0.0979 - val_recall: 0.8784 - val_auc: 0.9596 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9945
```

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Epoch 144/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.1117 -
tp: 199003.0000 - fp: 6353.0000 - tn: 192667.0000 - fn: 17.0000 - accuracy:
0.9840 - precision: 0.9691 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0869 - val_tp: 132.0000 - val_fp:
1572.0000 - val_tn: 83723.0000 - val_fn: 16.0000 - val_accuracy: 0.9814 -
val_precision: 0.0775 - val_recall: 0.8919 - val_auc: 0.9646 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9941
Epoch 145/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1055 -
tp: 199008.0000 - fp: 6833.0000 - tn: 192187.0000 - fn: 12.0000 - accuracy:
0.9828 - precision: 0.9668 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0884 - val_tp: 131.0000 - val_fp:
1389.0000 - val_tn: 83906.0000 - val_fn: 17.0000 - val_accuracy: 0.9835 -
val_precision: 0.0862 - val_recall: 0.8851 - val_auc: 0.9600 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9929
Epoch 146/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.1102 -
tp: 199006.0000 - fp: 6257.0000 - tn: 192763.0000 - fn: 14.0000 - accuracy:
0.9842 - precision: 0.9695 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0692 - val_tp: 129.0000 - val_fp:
1181.0000 - val_tn: 84114.0000 - val_fn: 19.0000 - val_accuracy: 0.9860 -
val_precision: 0.0985 - val_recall: 0.8716 - val_auc: 0.9601 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9954
Epoch 147/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1176 -
tp: 199004.0000 - fp: 6214.0000 - tn: 192806.0000 - fn: 16.0000 - accuracy:
0.9843 - precision: 0.9697 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0762 - val_tp: 129.0000 - val_fp:
1182.0000 - val_tn: 84113.0000 - val_fn: 19.0000 - val_accuracy: 0.9859 -
val_precision: 0.0984 - val_recall: 0.8716 - val_auc: 0.9600 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9960
Epoch 148/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0951 -
tp: 199007.0000 - fp: 5628.0000 - tn: 193392.0000 - fn: 13.0000 - accuracy:
0.9858 - precision: 0.9725 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0660 - val_tp: 130.0000 - val_fp:
1081.0000 - val_tn: 84214.0000 - val_fn: 18.0000 - val_accuracy: 0.9871 -
val_precision: 0.1073 - val_recall: 0.8784 - val_auc: 0.9607 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9960
Epoch 149/200
398040/398040 [==============================] - 5s 12us/sample - loss: 0.1057 -
tp: 199007.0000 - fp: 5912.0000 - tn: 193108.0000 - fn: 13.0000 - accuracy:
0.9851 - precision: 0.9711 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9953 - val_loss: 0.0710 - val_tp: 130.0000 - val_fp:
1165.0000 - val_tn: 84130.0000 - val_fn: 18.0000 - val_accuracy: 0.9862 -
val_precision: 0.1004 - val_recall: 0.8784 - val_auc: 0.9595 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9948
```

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Epoch 150/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1145 -
tp: 199006.0000 - fp: 6062.0000 - tn: 192958.0000 - fn: 14.0000 - accuracy:
0.9847 - precision: 0.9704 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0678 - val_tp: 130.0000 - val_fp:
1087.0000 - val_tn: 84208.0000 - val_fn: 18.0000 - val_accuracy: 0.9871 -
val_precision: 0.1068 - val_recall: 0.8784 - val_auc: 0.9619 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9954
Epoch 151/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1067 -
tp: 199004.0000 - fp: 6723.0000 - tn: 192297.0000 - fn: 16.0000 - accuracy:
0.9831 - precision: 0.9673 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0742 - val_tp: 130.0000 - val_fp:
1200.0000 - val_tn: 84095.0000 - val_fn: 18.0000 - val_accuracy: 0.9857 -
val_precision: 0.0977 - val_recall: 0.8784 - val_auc: 0.9593 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9958
Epoch 152/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1070 -
tp: 199006.0000 - fp: 5831.0000 - tn: 193189.0000 - fn: 14.0000 - accuracy:
0.9853 - precision: 0.9715 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0904 - val_tp: 131.0000 - val_fp:
1400.0000 - val_tn: 83895.0000 - val_fn: 17.0000 - val_accuracy: 0.9834 -
val_precision: 0.0856 - val_recall: 0.8851 - val_auc: 0.9586 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9922
Epoch 153/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1119 -
tp: 199007.0000 - fp: 6884.0000 - tn: 192136.0000 - fn: 13.0000 - accuracy:
0.9827 - precision: 0.9666 - recall: 0.9999 - auc: 0.9976 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0707 - val_tp: 130.0000 - val_fp:
1184.0000 - val_tn: 84111.0000 - val_fn: 18.0000 - val_accuracy: 0.9859 -
val_precision: 0.0989 - val_recall: 0.8784 - val_auc: 0.9624 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9958
Epoch 154/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1064 -
tp: 199007.0000 - fp: 6773.0000 - tn: 192247.0000 - fn: 13.0000 - accuracy:
0.9830 - precision: 0.9671 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9948 - val_loss: 0.0878 - val_tp: 131.0000 - val_fp:
1495.0000 - val_tn: 83800.0000 - val_fn: 17.0000 - val_accuracy: 0.9823 -
val_precision: 0.0806 - val_recall: 0.8851 - val_auc: 0.9601 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9922
Epoch 155/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1189 -
tp: 199004.0000 - fp: 6583.0000 - tn: 192437.0000 - fn: 16.0000 - accuracy:
0.9834 - precision: 0.9680 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0795 - val_tp: 132.0000 - val_fp:
1519.0000 - val_tn: 83776.0000 - val_fn: 16.0000 - val_accuracy: 0.9820 -
val_precision: 0.0800 - val_recall: 0.8919 - val_auc: 0.9659 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9956
```

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Epoch 156/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1114 -
tp: 199006.0000 - fp: 6815.0000 - tn: 192205.0000 - fn: 14.0000 - accuracy:
0.9828 - precision: 0.9669 - recall: 0.9999 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9958 - val_loss: 0.0750 - val_tp: 131.0000 - val_fp:
1290.0000 - val_tn: 84005.0000 - val_fn: 17.0000 - val_accuracy: 0.9847 -
val_precision: 0.0922 - val_recall: 0.8851 - val_auc: 0.9663 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9950
Epoch 157/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0954 -
tp: 199008.0000 - fp: 5768.0000 - tn: 193252.0000 - fn: 12.0000 - accuracy:
0.9855 - precision: 0.9718 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0712 - val_tp: 130.0000 - val_fp:
1173.0000 - val_tn: 84122.0000 - val_fn: 18.0000 - val_accuracy: 0.9861 -
val_precision: 0.0998 - val_recall: 0.8784 - val_auc: 0.9603 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9959
Epoch 158/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1097 -
tp: 199005.0000 - fp: 5853.0000 - tn: 193167.0000 - fn: 15.0000 - accuracy:
0.9853 - precision: 0.9714 - recall: 0.9999 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9958 - val_loss: 0.0743 - val_tp: 130.0000 - val_fp:
1257.0000 - val_tn: 84038.0000 - val_fn: 18.0000 - val_accuracy: 0.9851 -
val_precision: 0.0937 - val_recall: 0.8784 - val_auc: 0.9646 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9957
Epoch 159/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1197 -
tp: 199004.0000 - fp: 6408.0000 - tn: 192612.0000 - fn: 16.0000 - accuracy:
0.9839 - precision: 0.9688 - recall: 0.9999 - auc: 0.9976 - sensitivity:
0.0000e+00 - specificity: 0.9953 - val_loss: 0.0795 - val_tp: 130.0000 - val_fp:
1359.0000 - val_tn: 83936.0000 - val_fn: 18.0000 - val_accuracy: 0.9839 -
val_precision: 0.0873 - val_recall: 0.8784 - val_auc: 0.9639 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9942
Epoch 160/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1071 -
tp: 199005.0000 - fp: 6310.0000 - tn: 192710.0000 - fn: 15.0000 - accuracy:
0.9841 - precision: 0.9693 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0810 - val_tp: 130.0000 - val_fp:
1441.0000 - val_tn: 83854.0000 - val_fn: 18.0000 - val_accuracy: 0.9829 -
val_precision: 0.0827 - val_recall: 0.8784 - val_auc: 0.9586 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9951
Epoch 161/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0988 -
tp: 199008.0000 - fp: 5703.0000 - tn: 193317.0000 - fn: 12.0000 - accuracy:
0.9856 - precision: 0.9721 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9957 - val_loss: 0.0747 - val_tp: 130.0000 - val_fp:
1152.0000 - val_tn: 84143.0000 - val_fn: 18.0000 - val_accuracy: 0.9863 -
val_precision: 0.1014 - val_recall: 0.8784 - val_auc: 0.9601 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9928
```

Epoch 162/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1113 -
tp: 199005.0000 - fp: 6664.0000 - tn: 192356.0000 - fn: 15.0000 - accuracy:
0.9832 - precision: 0.9676 - recall: 0.9999 - auc: 0.9973 - sensitivity:
0.0000e+00 - specificity: 0.9945 - val_loss: 0.0745 - val_tp: 130.0000 - val_fp:
1267.0000 - val_tn: 84028.0000 - val_fn: 18.0000 - val_accuracy: 0.9850 -
val_precision: 0.0931 - val_recall: 0.8784 - val_auc: 0.9596 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9935
Epoch 163/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1091 -
tp: 199006.0000 - fp: 5854.0000 - tn: 193166.0000 - fn: 14.0000 - accuracy:
0.9853 - precision: 0.9714 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0672 - val_tp: 130.0000 - val_fp:
1161.0000 - val_tn: 84134.0000 - val_fn: 18.0000 - val_accuracy: 0.9862 -
val_precision: 0.1007 - val_recall: 0.8784 - val_auc: 0.9628 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9964
Epoch 164/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1012 -
tp: 199005.0000 - fp: 6382.0000 - tn: 192638.0000 - fn: 15.0000 - accuracy:
0.9839 - precision: 0.9689 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9955 - val_loss: 0.0729 - val_tp: 130.0000 - val_fp:
1222.0000 - val_tn: 84073.0000 - val_fn: 18.0000 - val_accuracy: 0.9855 -
val_precision: 0.0962 - val_recall: 0.8784 - val_auc: 0.9602 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9941
Epoch 165/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0991 -
tp: 199007.0000 - fp: 5742.0000 - tn: 193278.0000 - fn: 13.0000 - accuracy:
0.9855 - precision: 0.9720 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9955 - val_loss: 0.0853 - val_tp: 130.0000 - val_fp:
1346.0000 - val_tn: 83949.0000 - val_fn: 18.0000 - val_accuracy: 0.9840 -
val_precision: 0.0881 - val_recall: 0.8784 - val_auc: 0.9584 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9926
Epoch 166/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0985 -
tp: 199008.0000 - fp: 5732.0000 - tn: 193288.0000 - fn: 12.0000 - accuracy:
0.9856 - precision: 0.9720 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9955 - val_loss: 0.0764 - val_tp: 130.0000 - val_fp:
1266.0000 - val_tn: 84029.0000 - val_fn: 18.0000 - val_accuracy: 0.9850 -
val_precision: 0.0931 - val_recall: 0.8784 - val_auc: 0.9639 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9932
Epoch 167/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0973 -
tp: 199009.0000 - fp: 5338.0000 - tn: 193682.0000 - fn: 11.0000 - accuracy:
0.9866 - precision: 0.9739 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0724 - val_tp: 130.0000 - val_fp:
1194.0000 - val_tn: 84101.0000 - val_fn: 18.0000 - val_accuracy: 0.9858 -
val_precision: 0.0982 - val_recall: 0.8784 - val_auc: 0.9644 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9940

```
Epoch 168/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1072 -
tp: 199007.0000 - fp: 6061.0000 - tn: 192959.0000 - fn: 13.0000 - accuracy:
0.9847 - precision: 0.9704 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9957 - val_loss: 0.0669 - val_tp: 130.0000 - val_fp:
1179.0000 - val_tn: 84116.0000 - val_fn: 18.0000 - val_accuracy: 0.9860 -
val_precision: 0.0993 - val_recall: 0.8784 - val_auc: 0.9656 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9959
Epoch 169/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1096 -
tp: 199005.0000 - fp: 6329.0000 - tn: 192691.0000 - fn: 15.0000 - accuracy:
0.9841 - precision: 0.9692 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0813 - val_tp: 130.0000 - val_fp:
1455.0000 - val_tn: 83840.0000 - val_fn: 18.0000 - val_accuracy: 0.9828 -
val_precision: 0.0820 - val_recall: 0.8784 - val_auc: 0.9647 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9939
Epoch 170/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1046 -
tp: 199006.0000 - fp: 6827.0000 - tn: 192193.0000 - fn: 14.0000 - accuracy:
0.9828 - precision: 0.9668 - recall: 0.9999 - auc: 0.9974 - sensitivity:
0.0000e+00 - specificity: 0.9949 - val_loss: 0.0799 - val_tp: 131.0000 - val_fp:
1412.0000 - val_tn: 83883.0000 - val_fn: 17.0000 - val_accuracy: 0.9833 -
val_precision: 0.0849 - val_recall: 0.8851 - val_auc: 0.9649 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9937
Epoch 171/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1126 -
tp: 199003.0000 - fp: 6598.0000 - tn: 192422.0000 - fn: 17.0000 - accuracy:
0.9834 - precision: 0.9679 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9953 - val_loss: 0.0746 - val_tp: 131.0000 - val_fp:
1446.0000 - val_tn: 83849.0000 - val_fn: 17.0000 - val_accuracy: 0.9829 -
val_precision: 0.0831 - val_recall: 0.8851 - val_auc: 0.9615 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9960
Epoch 172/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1052 -
tp: 199008.0000 - fp: 6343.0000 - tn: 192677.0000 - fn: 12.0000 - accuracy:
0.9840 - precision: 0.9691 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0753 - val_tp: 130.0000 - val_fp:
1406.0000 - val_tn: 83889.0000 - val_fn: 18.0000 - val_accuracy: 0.9833 -
val_precision: 0.0846 - val_recall: 0.8784 - val_auc: 0.9618 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9937
Epoch 173/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1081 -
tp: 199005.0000 - fp: 6007.0000 - tn: 193013.0000 - fn: 15.0000 - accuracy:
0.9849 - precision: 0.9707 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0810 - val_tp: 130.0000 - val_fp:
1569.0000 - val_tn: 83726.0000 - val_fn: 18.0000 - val_accuracy: 0.9814 -
val_precision: 0.0765 - val_recall: 0.8784 - val_auc: 0.9647 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9938
```

```
Epoch 174/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1160 -
tp: 199002.0000 - fp: 7020.0000 - tn: 192000.0000 - fn: 18.0000 - accuracy:
0.9823 - precision: 0.9659 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9953 - val_loss: 0.0842 - val_tp: 132.0000 - val_fp:
1669.0000 - val_tn: 83626.0000 - val_fn: 16.0000 - val_accuracy: 0.9803 -
val_precision: 0.0733 - val_recall: 0.8919 - val_auc: 0.9676 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9942
Epoch 175/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1007 -
tp: 199010.0000 - fp: 7032.0000 - tn: 191988.0000 - fn: 10.0000 - accuracy:
0.9823 - precision: 0.9659 - recall: 0.9999 - auc: 0.9976 - sensitivity:
0.0000e+00 - specificity: 0.9953 - val_loss: 0.0681 - val_tp: 130.0000 - val_fp:
1209.0000 - val_tn: 84086.0000 - val_fn: 18.0000 - val_accuracy: 0.9856 -
val_precision: 0.0971 - val_recall: 0.8784 - val_auc: 0.9663 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9940
Epoch 176/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1106 -
tp: 199007.0000 - fp: 6206.0000 - tn: 192814.0000 - fn: 13.0000 - accuracy:
0.9844 - precision: 0.9698 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9954 - val_loss: 0.0664 - val_tp: 131.0000 - val_fp:
1157.0000 - val_tn: 84138.0000 - val_fn: 17.0000 - val_accuracy: 0.9863 -
val_precision: 0.1017 - val_recall: 0.8851 - val_auc: 0.9626 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9966
Epoch 177/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1023 -
tp: 199008.0000 - fp: 5996.0000 - tn: 193024.0000 - fn: 12.0000 - accuracy:
0.9849 - precision: 0.9708 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0721 - val_tp: 131.0000 - val_fp:
1273.0000 - val_tn: 84022.0000 - val_fn: 17.0000 - val_accuracy: 0.9849 -
val_precision: 0.0933 - val_recall: 0.8851 - val_auc: 0.9656 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9942
Epoch 178/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1040 -
tp: 199007.0000 - fp: 5857.0000 - tn: 193163.0000 - fn: 13.0000 - accuracy:
0.9853 - precision: 0.9714 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9955 - val_loss: 0.0690 - val_tp: 131.0000 - val_fp:
1206.0000 - val_tn: 84089.0000 - val_fn: 17.0000 - val_accuracy: 0.9857 -
val_precision: 0.0980 - val_recall: 0.8851 - val_auc: 0.9625 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9967
Epoch 179/200
398040/398040 [==============================] - 5s 11us/sample - loss: 0.1123 -
tp: 199007.0000 - fp: 6952.0000 - tn: 192068.0000 - fn: 13.0000 - accuracy:
0.9825 - precision: 0.9662 - recall: 0.9999 - auc: 0.9977 - sensitivity:
0.0000e+00 - specificity: 0.9955 - val_loss: 0.0685 - val_tp: 130.0000 - val_fp:
1126.0000 - val_tn: 84169.0000 - val_fn: 18.0000 - val_accuracy: 0.9866 -
val_precision: 0.1035 - val_recall: 0.8784 - val_auc: 0.9650 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9940
```

Epoch 180/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1040 - tp: 199010.0000 - fp: 6039.0000 - tn: 192981.0000 - fn: 10.0000 - accuracy: 0.9848 - precision: 0.9705 - recall: 0.9999 - auc: 0.9977 - sensitivity: 0.0000e+00 - specificity: 0.9954 - val_loss: 0.0631 - val_tp: 130.0000 - val_fp: 1003.0000 - val_tn: 84292.0000 - val_fn: 18.0000 - val_accuracy: 0.9881 - val_precision: 0.1147 - val_recall: 0.8784 - val_auc: 0.9606 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9965
Epoch 181/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1180 - tp: 199004.0000 - fp: 5868.0000 - tn: 193152.0000 - fn: 16.0000 - accuracy: 0.9852 - precision: 0.9714 - recall: 0.9999 - auc: 0.9978 - sensitivity: 0.0000e+00 - specificity: 0.9956 - val_loss: 0.0631 - val_tp: 130.0000 - val_fp: 1035.0000 - val_tn: 84260.0000 - val_fn: 18.0000 - val_accuracy: 0.9877 - val_precision: 0.1116 - val_recall: 0.8784 - val_auc: 0.9631 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9968
Epoch 182/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0952 - tp: 199010.0000 - fp: 5593.0000 - tn: 193427.0000 - fn: 10.0000 - accuracy: 0.9859 - precision: 0.9727 - recall: 0.9999 - auc: 0.9979 - sensitivity: 0.0000e+00 - specificity: 0.9957 - val_loss: 0.0576 - val_tp: 129.0000 - val_fp: 915.0000 - val_tn: 84380.0000 - val_fn: 19.0000 - val_accuracy: 0.9891 - val_precision: 0.1236 - val_recall: 0.8716 - val_auc: 0.9612 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9965
Epoch 183/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1066 - tp: 199007.0000 - fp: 5487.0000 - tn: 193533.0000 - fn: 13.0000 - accuracy: 0.9862 - precision: 0.9732 - recall: 0.9999 - auc: 0.9979 - sensitivity: 0.0000e+00 - specificity: 0.9959 - val_loss: 0.0637 - val_tp: 130.0000 - val_fp: 1015.0000 - val_tn: 84280.0000 - val_fn: 18.0000 - val_accuracy: 0.9879 - val_precision: 0.1135 - val_recall: 0.8784 - val_auc: 0.9653 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9966
Epoch 184/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1123 - tp: 199003.0000 - fp: 6086.0000 - tn: 192934.0000 - fn: 17.0000 - accuracy: 0.9847 - precision: 0.9703 - recall: 0.9999 - auc: 0.9979 - sensitivity: 0.0000e+00 - specificity: 0.9959 - val_loss: 0.0772 - val_tp: 132.0000 - val_fp: 1280.0000 - val_tn: 84015.0000 - val_fn: 16.0000 - val_accuracy: 0.9848 - val_precision: 0.0935 - val_recall: 0.8919 - val_auc: 0.9670 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9931
Epoch 185/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1016 - tp: 199005.0000 - fp: 6438.0000 - tn: 192582.0000 - fn: 15.0000 - accuracy: 0.9838 - precision: 0.9687 - recall: 0.9999 - auc: 0.9977 - sensitivity: 0.0000e+00 - specificity: 0.9955 - val_loss: 0.0708 - val_tp: 131.0000 - val_fp: 1114.0000 - val_tn: 84181.0000 - val_fn: 17.0000 - val_accuracy: 0.9868 - val_precision: 0.1052 - val_recall: 0.8851 - val_auc: 0.9628 - val_sensitivity: 0.0000e+00 - val_specificity: 0.9938

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```
Epoch 186/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0960 -
tp: 199011.0000 - fp: 5035.0000 - tn: 193985.0000 - fn: 9.0000 - accuracy:
0.9873 - precision: 0.9753 - recall: 1.0000 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9958 - val_loss: 0.0681 - val_tp: 131.0000 - val_fp:
1109.0000 - val_tn: 84186.0000 - val_fn: 17.0000 - val_accuracy: 0.9868 -
val_precision: 0.1056 - val_recall: 0.8851 - val_auc: 0.9687 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9942
Epoch 187/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0905 -
tp: 199005.0000 - fp: 5555.0000 - tn: 193465.0000 - fn: 15.0000 - accuracy:
0.9860 - precision: 0.9728 - recall: 0.9999 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9959 - val_loss: 0.0755 - val_tp: 131.0000 - val_fp:
1317.0000 - val_tn: 83978.0000 - val_fn: 17.0000 - val_accuracy: 0.9844 -
val_precision: 0.0905 - val_recall: 0.8851 - val_auc: 0.9625 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9940
Epoch 188/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1064 -
tp: 199006.0000 - fp: 6059.0000 - tn: 192961.0000 - fn: 14.0000 - accuracy:
0.9847 - precision: 0.9705 - recall: 0.9999 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9957 - val_loss: 0.0648 - val_tp: 130.0000 - val_fp:
1166.0000 - val_tn: 84129.0000 - val_fn: 18.0000 - val_accuracy: 0.9861 -
val_precision: 0.1003 - val_recall: 0.8784 - val_auc: 0.9631 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9948
Epoch 189/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1022 -
tp: 199010.0000 - fp: 6082.0000 - tn: 192938.0000 - fn: 10.0000 - accuracy:
0.9847 - precision: 0.9703 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0779 - val_tp: 130.0000 - val_fp:
1331.0000 - val_tn: 83964.0000 - val_fn: 18.0000 - val_accuracy: 0.9842 -
val_precision: 0.0890 - val_recall: 0.8784 - val_auc: 0.9603 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9932
Epoch 190/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1038 -
tp: 199006.0000 - fp: 6062.0000 - tn: 192958.0000 - fn: 14.0000 - accuracy:
0.9847 - precision: 0.9704 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0591 - val_tp: 129.0000 - val_fp:
994.0000 - val_tn: 84301.0000 - val_fn: 19.0000 - val_accuracy: 0.9881 -
val_precision: 0.1149 - val_recall: 0.8716 - val_auc: 0.9635 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9966
Epoch 191/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1165 -
tp: 199004.0000 - fp: 5991.0000 - tn: 193029.0000 - fn: 16.0000 - accuracy:
0.9849 - precision: 0.9708 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0846 - val_tp: 129.0000 - val_fp:
1559.0000 - val_tn: 83736.0000 - val_fn: 19.0000 - val_accuracy: 0.9815 -
val_precision: 0.0764 - val_recall: 0.8716 - val_auc: 0.9669 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9934
```

```
Epoch 192/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1151 -
tp: 199001.0000 - fp: 6215.0000 - tn: 192805.0000 - fn: 19.0000 - accuracy:
0.9843 - precision: 0.9697 - recall: 0.9999 - auc: 0.9980 - sensitivity:
0.0000e+00 - specificity: 0.9960 - val_loss: 0.0692 - val_tp: 131.0000 - val_fp:
1344.0000 - val_tn: 83951.0000 - val_fn: 17.0000 - val_accuracy: 0.9841 -
val_precision: 0.0888 - val_recall: 0.8851 - val_auc: 0.9664 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9968
Epoch 193/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1267 -
tp: 199000.0000 - fp: 7322.0000 - tn: 191698.0000 - fn: 20.0000 - accuracy:
0.9816 - precision: 0.9645 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0735 - val_tp: 131.0000 - val_fp:
1393.0000 - val_tn: 83902.0000 - val_fn: 17.0000 - val_accuracy: 0.9835 -
val_precision: 0.0860 - val_recall: 0.8851 - val_auc: 0.9654 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9964
Epoch 194/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1005 -
tp: 199008.0000 - fp: 6187.0000 - tn: 192833.0000 - fn: 12.0000 - accuracy:
0.9844 - precision: 0.9698 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0655 - val_tp: 130.0000 - val_fp:
1169.0000 - val_tn: 84126.0000 - val_fn: 18.0000 - val_accuracy: 0.9861 -
val_precision: 0.1001 - val_recall: 0.8784 - val_auc: 0.9622 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9962
Epoch 195/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1165 -
tp: 199007.0000 - fp: 6944.0000 - tn: 192076.0000 - fn: 13.0000 - accuracy:
0.9825 - precision: 0.9663 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9950 - val_loss: 0.0697 - val_tp: 130.0000 - val_fp:
1148.0000 - val_tn: 84147.0000 - val_fn: 18.0000 - val_accuracy: 0.9864 -
val_precision: 0.1017 - val_recall: 0.8784 - val_auc: 0.9625 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9940
Epoch 196/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0931 -
tp: 199007.0000 - fp: 5635.0000 - tn: 193385.0000 - fn: 13.0000 - accuracy:
0.9858 - precision: 0.9725 - recall: 0.9999 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9957 - val_loss: 0.0572 - val_tp: 129.0000 - val_fp:
993.0000 - val_tn: 84302.0000 - val_fn: 19.0000 - val_accuracy: 0.9882 -
val_precision: 0.1150 - val_recall: 0.8716 - val_auc: 0.9610 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9967
Epoch 197/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.1090 -
tp: 199005.0000 - fp: 5969.0000 - tn: 193051.0000 - fn: 15.0000 - accuracy:
0.9850 - precision: 0.9709 - recall: 0.9999 - auc: 0.9978 - sensitivity:
0.0000e+00 - specificity: 0.9956 - val_loss: 0.0666 - val_tp: 130.0000 - val_fp:
1145.0000 - val_tn: 84150.0000 - val_fn: 18.0000 - val_accuracy: 0.9864 -
val_precision: 0.1020 - val_recall: 0.8784 - val_auc: 0.9598 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9961
```

```
Epoch 198/200
398040/398040 [==============================] - 4s 10us/sample - loss: 0.0964 -
tp: 199010.0000 - fp: 5878.0000 - tn: 193142.0000 - fn: 10.0000 - accuracy:
0.9852 - precision: 0.9713 - recall: 0.9999 - auc: 0.9979 - sensitivity:
0.0000e+00 - specificity: 0.9958 - val_loss: 0.0666 - val_tp: 130.0000 - val_fp:
1111.0000 - val_tn: 84184.0000 - val_fn: 18.0000 - val_accuracy: 0.9868 -
val_precision: 0.1048 - val_recall: 0.8784 - val_auc: 0.9600 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9958
Epoch 199/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.1075 -
tp: 199005.0000 - fp: 5730.0000 - tn: 193290.0000 - fn: 15.0000 - accuracy:
0.9856 - precision: 0.9720 - recall: 0.9999 - auc: 0.9975 - sensitivity:
0.0000e+00 - specificity: 0.9951 - val_loss: 0.0692 - val_tp: 130.0000 - val_fp:
1285.0000 - val_tn: 84010.0000 - val_fn: 18.0000 - val_accuracy: 0.9848 -
val_precision: 0.0919 - val_recall: 0.8784 - val_auc: 0.9623 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9947
Epoch 200/200
398040/398040 [==============================] - 4s 11us/sample - loss: 0.0883 -
tp: 199013.0000 - fp: 5937.0000 - tn: 193083.0000 - fn: 7.0000 - accuracy:
0.9851 - precision: 0.9710 - recall: 1.0000 - auc: 0.9976 - sensitivity:
0.0000e+00 - specificity: 0.9952 - val_loss: 0.0733 - val_tp: 130.0000 - val_fp:
1198.0000 - val_tn: 84097.0000 - val_fn: 18.0000 - val_accuracy: 0.9858 -
val_precision: 0.0979 - val_recall: 0.8784 - val_auc: 0.9611 - val_sensitivity:
0.0000e+00 - val_specificity: 0.9931cision: 0.9705 - recall: 1.0000 - auc:
0.9977 - sen
```

[1311]:
```python
run_data = []
run_data.append(run_no_weight_history)
run_data.append(run_5_weight_history)
run_data.append(run_500_weight_history)
```

[1312]:
```python
import matplotlib.pyplot as plt
def␣
 ↪plot_data(run_data,train_param,test_param,xstep,yrangestart,yrangeend,ystep,title,ylabel,xl
 ↪right'):
    plt.figure(figsize=(10,10),facecolor='w')
    colorMap = ['red','blue','green']
    colorCounter = 0
    for hist_data in run_data:
        plt.plot(hist_data.history[train_param],color=colorMap[colorCounter])
        plt.plot(hist_data.history[test_param],color=colorMap[colorCounter],␣
 ↪linestyle="dotted")
        colorCounter = colorCounter + 1
    plt.xticks(np.arange(0, EPOCHS+1,step=xstep))
    plt.yticks(np.arange(yrangestart, yrangeend, step=ystep))
    plt.title(title)
    plt.ylabel(ylabel)
```

```
        plt.xlabel(xlabel)
        plt.legend(legend,loc=loc,prop={'size': 11})
        plt.show()
```
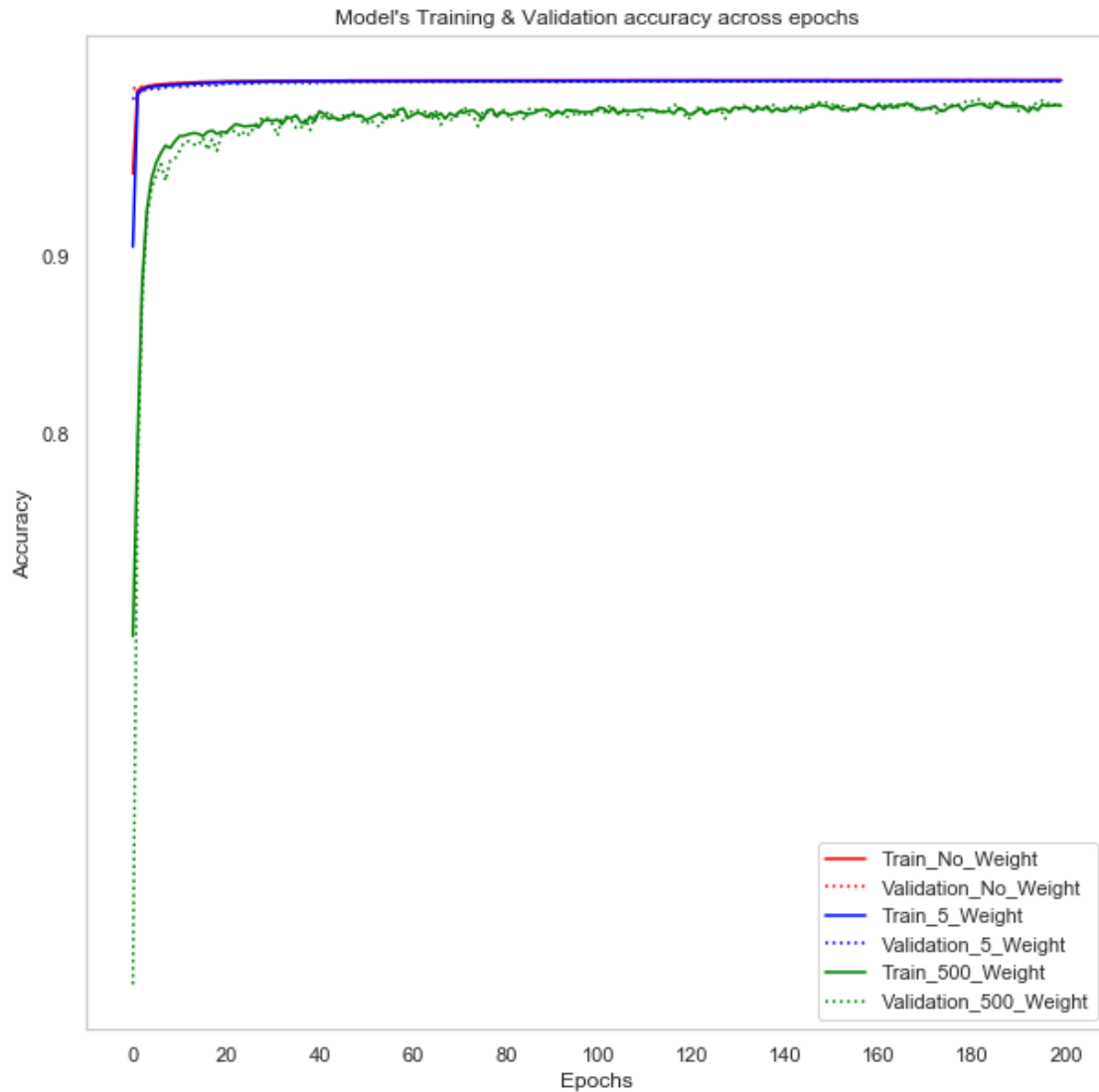
0.6.2   Training & Validation Loss

```
[1313]: plot_data(run_data,'loss','val_loss',20,0,0.5,0.25,"Model's Training &␣
        ↪Validation loss across␣
        ↪epochs",'Loss','Epochs',['Train_No_Weight','Validation_No_Weight','Train_5_Weight','Validat
        ↪right')
```
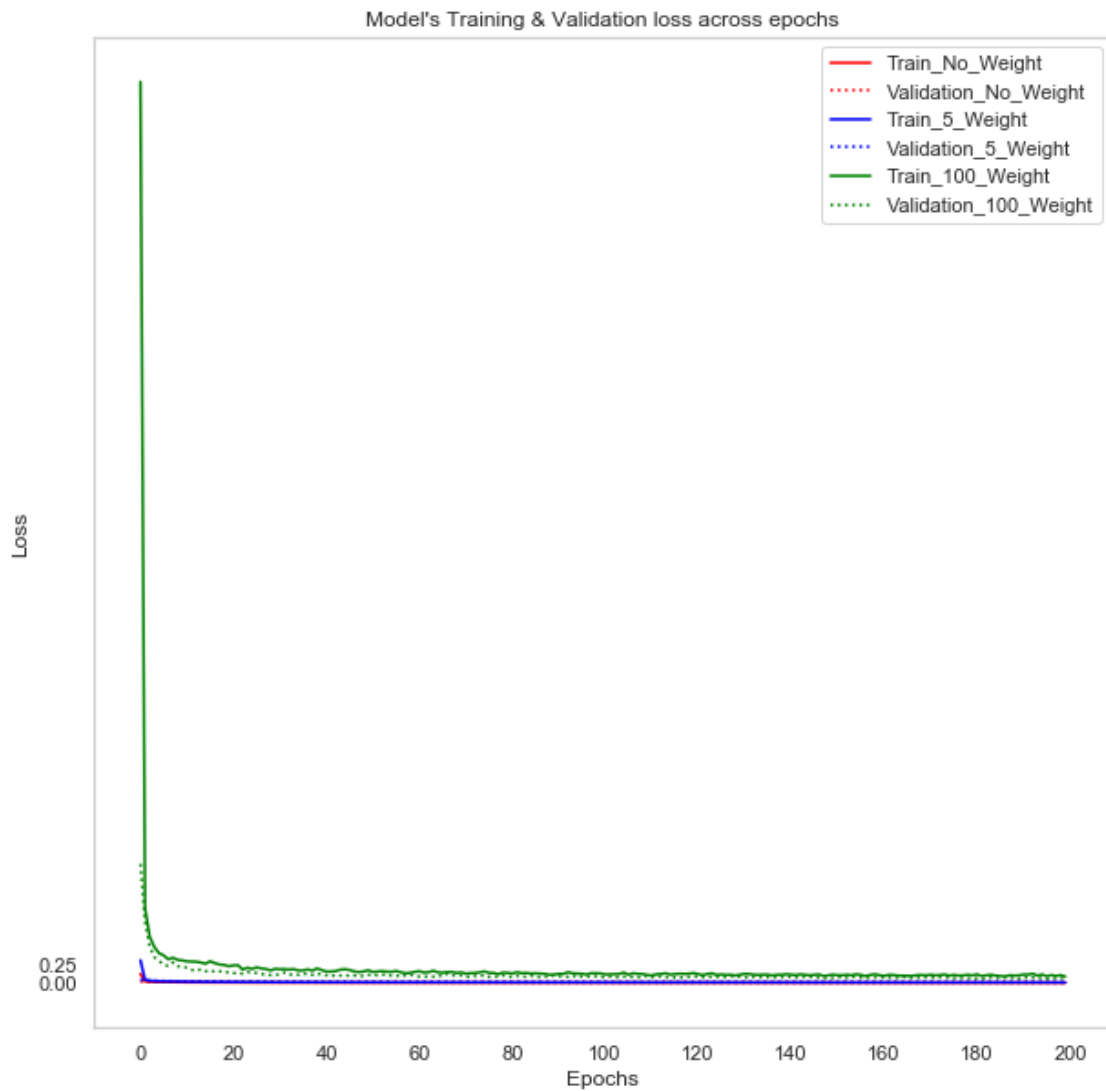
0.6.3 Training & Validation Accuracy

```
[1314]: plot_data(run_data,'accuracy','val_accuracy',20,0.8, 1,0.1,"Model's Training &␣
        ↪Validation accuracy across␣
        ↪epochs",'Accuracy','Epochs',['Train_No_Weight','Validation_No_Weight','Train_5_Weight','Val
        ↪right')
```


0.6.4 Training & Validation Precision

```
[1315]: plot_data(run_data,'precision','val_precision',20,0,1,0.1,"Model's Training &␣
        ↪Validation Precision across␣
        ↪epochs",'Precision','Epochs',['Train_No_Weight','Validation_No_Weight','Train_5_Weight','Va
        ↪middle')
```

Model's Training & Validation Precision across epochs
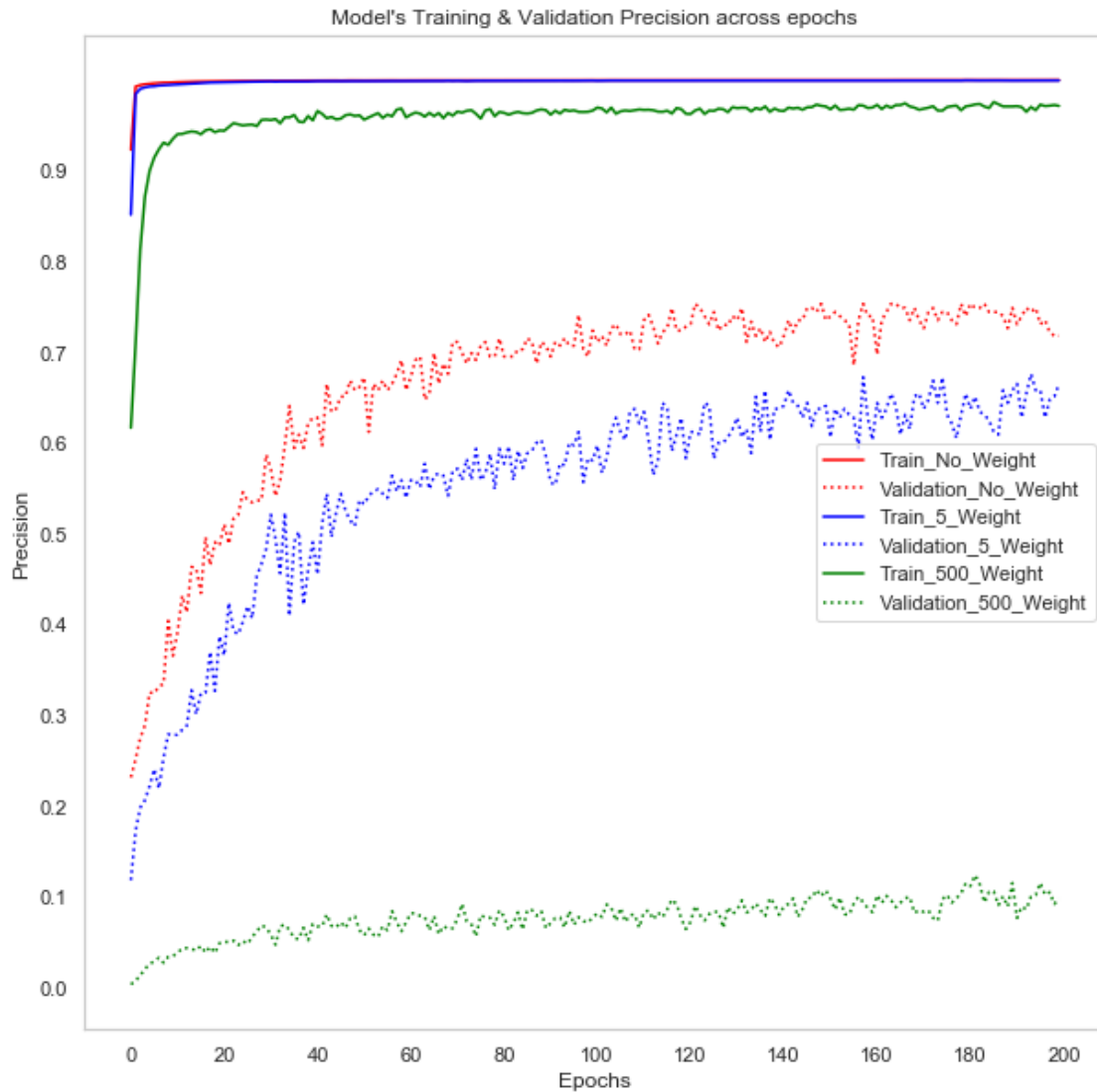
0.6.5 Training & Validation Recall (Sensitivity)

```
[1316]: plot_data(run_data,'recall','val_recall',20,0.75,1,0.01,"Model's Training &␣
       ↪Validation recall (sensitivity) across epochs",'Recall␣
       ↪(Sensitivity)','Epochs',['Train_No_Weight','Validation_No_Weight','Train_5_Weight','Validat
       ↪right')
```

Model's Training & Validation recall (sensitivity) across epochs
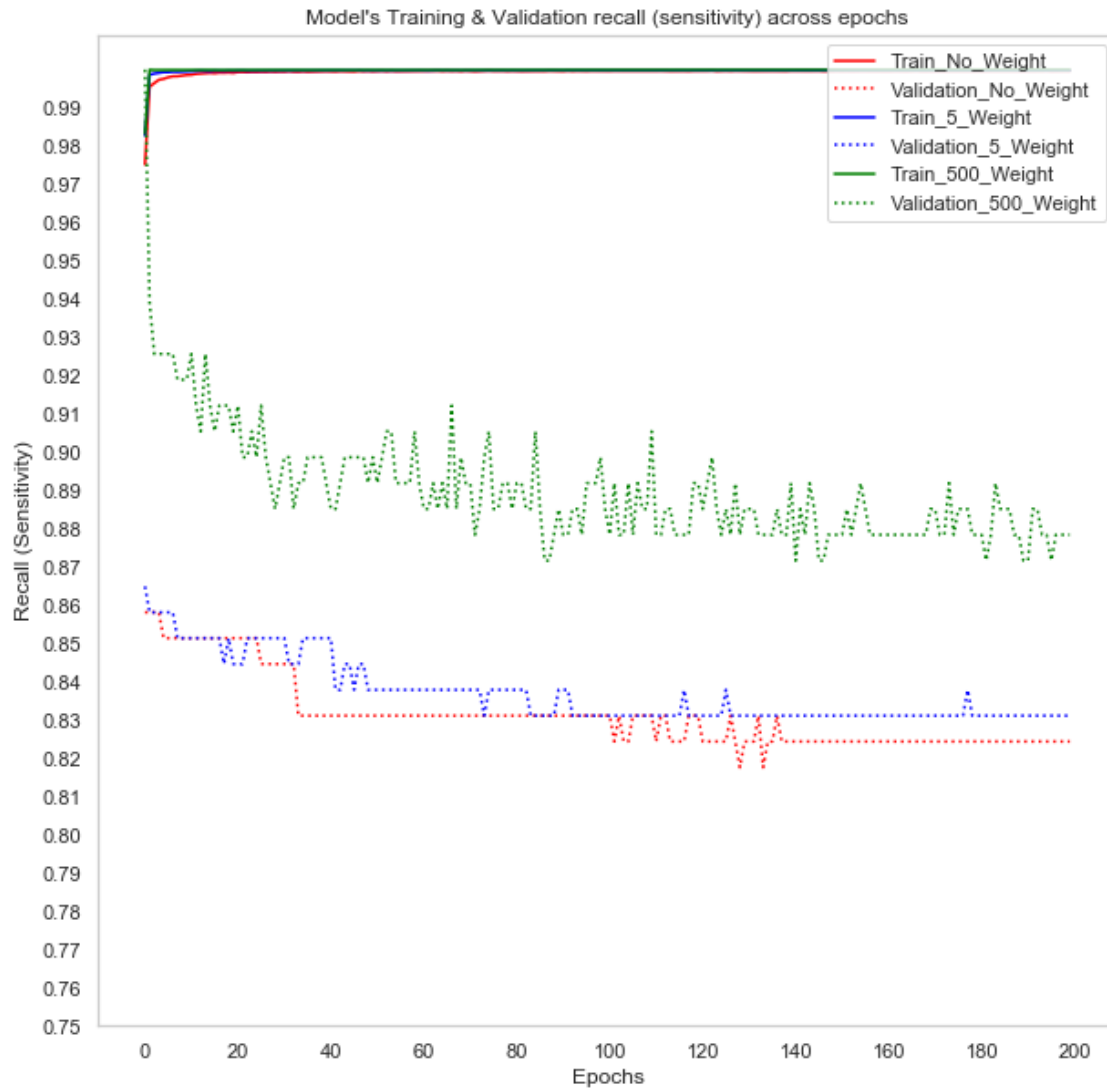
0.6.6 Training & Validation Specificity

```
[1317]: plot_data(run_data,'specificity','val_specificity',20,0.97,1,0.005,"Model's␣
        ↪Training & Validation Specificity across␣
        ↪epochs",'Specificity','Epochs',['Train_No_Weight','Validation_No_Weight','Train_5_Weight','↪
        ↪right')
```

Model's Training & Validation Specificity across epochs
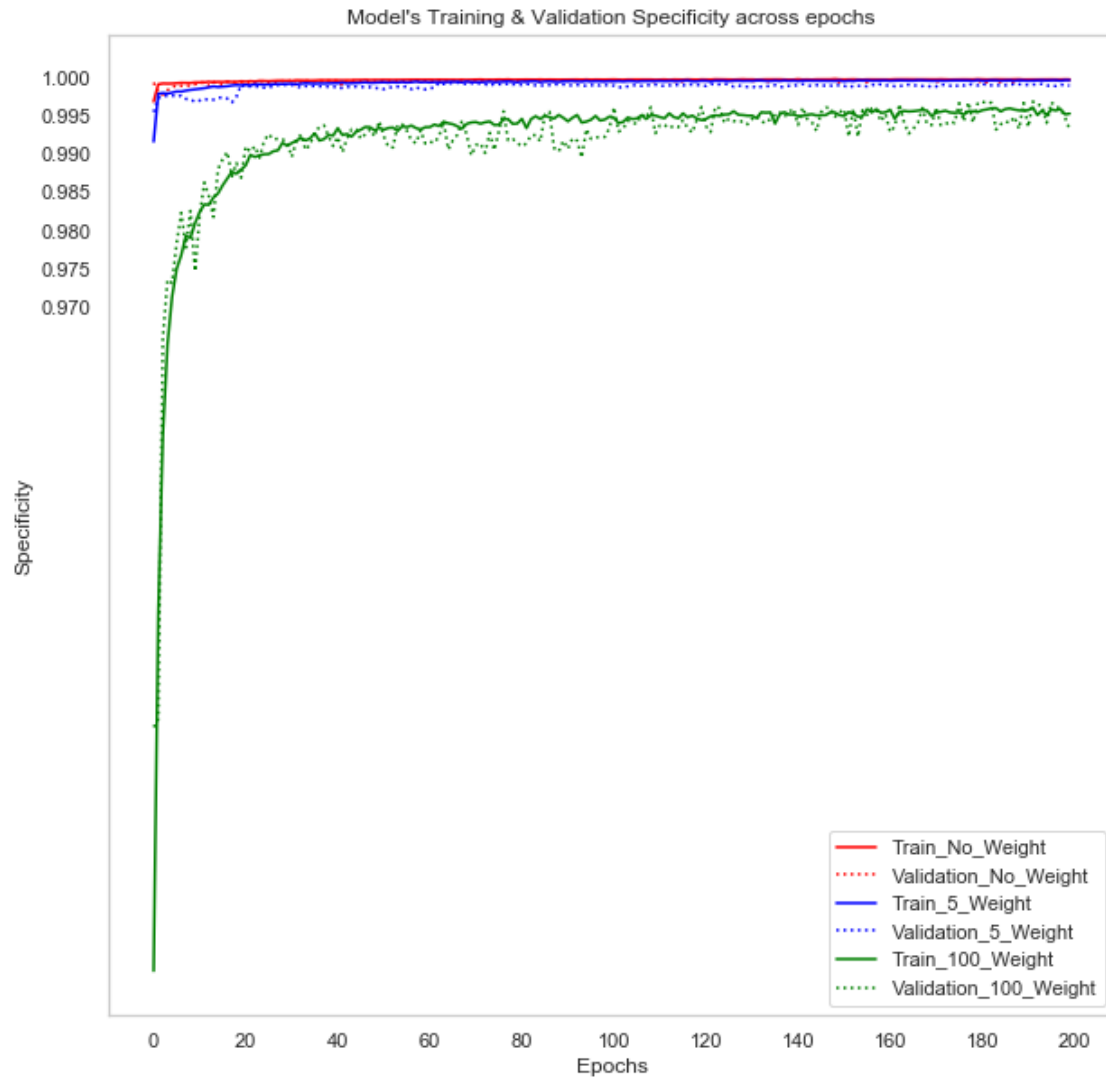

```
[1318]:  from sklearn import metrics
         from sklearn.metrics import accuracy_score
         from sklearn.metrics import precision_score
         from sklearn.metrics import recall_score
         from sklearn.metrics import f1_score
         from sklearn.metrics import roc_auc_score
         from sklearn.metrics import roc_curve
         from sklearn.metrics import confusion_matrix
         from sklearn.metrics import fbeta_score
         from sklearn.metrics import auc
         from sklearn.metrics import precision_recall_curve
         import matplotlib.pyplot as plt

         def calculate_and_plot_neural_network(model,color_index,title,label,algorithm):
```

```python
    # predict probabilities for test set
    yhat_probs = model.predict(testX, verbose=0)
    # predict crisp classes for test set
    yhat_classes = model.predict_classes(testX, verbose=0)
    # reduce to 1d array
    yhat_probs = yhat_probs[:, 0]
    yhat_classes = yhat_classes[:, 0]

    fig, (ax1, ax2) = plt.subplots(1, 2)
    fig.set_size_inches(15, 6)

    calculate_and_print_scores(testy, yhat_classes,yhat_probs)

    plot_roc_auc(ax1,testy, yhat_probs,label)

    plot_cm(ax2,testy, yhat_classes,color_index,title)

    create_barchart_label(label,algorithm)

    create_table_label(label,algorithm)
```

```python
[1319]: def plot_roc_auc_neural_network(ax, testy, yhat_probs,label):
    #Show ROC-AUC Plot
    fig = plt.figure(figsize=(5,5))
    # plot no skill roc curve
    plt.plot([0, 1], [0, 1], linestyle='--', label='No Skill')
    # calculate roc curve for model
    fpr, tpr, _ = roc_curve(testy, yhat_probs)
    # plot model roc curve
    plt.plot(fpr, tpr, marker='.', label = label)
    # axis labels
    plt.xlabel('False Positive Rate')
    plt.xlim(0,1)
    plt.ylabel('True Positive Rate')
    plt.ylim(0,1)
    plt.xticks(np.arange(0, 1, step=0.1))
    plt.yticks(np.arange(0, 1, step=0.1))
    #fig.suptitle('Receiver Operating Characteristics (ROC) Curve', fontsize=20)
    # show the legend
    plt.legend()
    # show the plot
```

0.6.7 Results for model with no weight

```
[1320]: calculate_and_plot_neural_network(model_no_weight,0,'Confusion Matrix for No␣
        ↪Weight','Class Weight 1','Neural Network')
```

```
Accuracy: 0.999134
Precision: 0.717647
Sensitivity AKA Recall: 0.824324
F1 score: 0.767296
F2-Measure: 0.800525
ROC AUC: 0.962304
Legitimate Transactions Detected (True Negatives):  85247
Legitimate Transactions Incorrectly Detected (False Positives):  48
Fraudulent Transactions Missed (False Negatives):  26
Fraudulent Transactions Detected (True Positives):  122
Total Fraudulent Transactions in validation dataset:  148
```
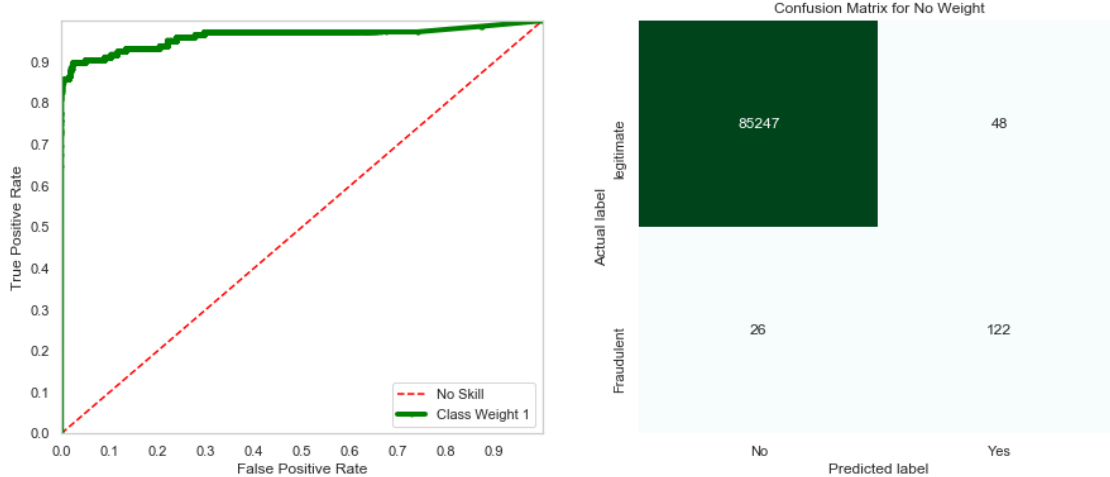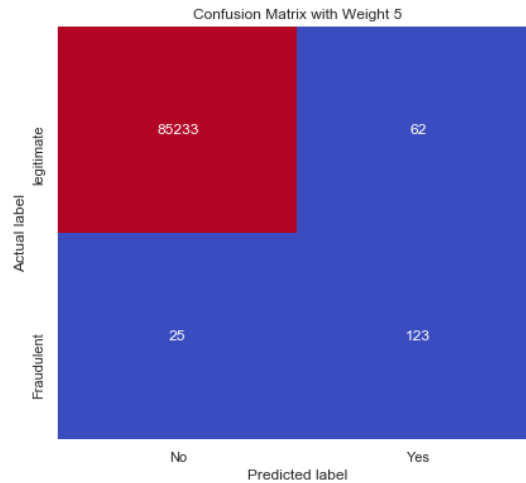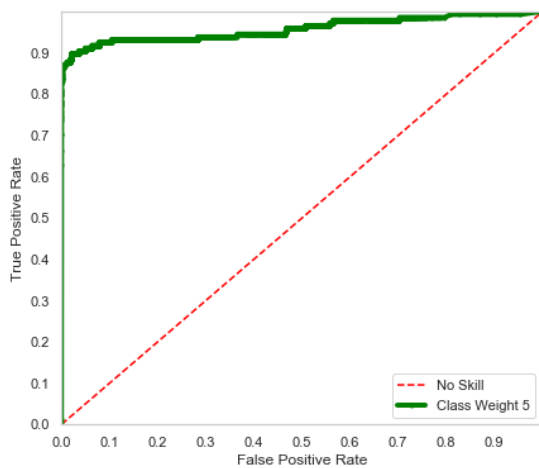

0.6.8 Results for model with 5 weight for fraud class

```
[1321]: calculate_and_plot_neural_network(model_5_weight,1,'Confusion Matrix with␣
        ↪Weight 5','Class Weight 5','Neural Network')
```

```
Accuracy: 0.998982
Precision: 0.664865
Sensitivity AKA Recall: 0.831081
F1 score: 0.738739
F2-Measure: 0.791506
ROC AUC: 0.958601
Legitimate Transactions Detected (True Negatives):  85233
Legitimate Transactions Incorrectly Detected (False Positives):  62
Fraudulent Transactions Missed (False Negatives):  25
```

Fraudulent Transactions Detected (True Positives): 123
Total Fraudulent Transactions in validation dataset: 148

0.6.9 Results for model with 500 weight for fraud class

```
[1322]: calculate_and_plot_neural_network(model_500_weight,2,'Confusion Matrix with␣
         ↪Weight 500','Class Weight 500','Neural Network')
```

Accuracy: 0.985768
Precision: 0.097892
Sensitivity AKA Recall: 0.878378
F1 score: 0.176152
F2-Measure: 0.338542
ROC AUC: 0.972720
Legitimate Transactions Detected (True Negatives): 84097
Legitimate Transactions Incorrectly Detected (False Positives): 1198
Fraudulent Transactions Missed (False Negatives): 18
Fraudulent Transactions Detected (True Positives): 130
Total Fraudulent Transactions in validation dataset: 148
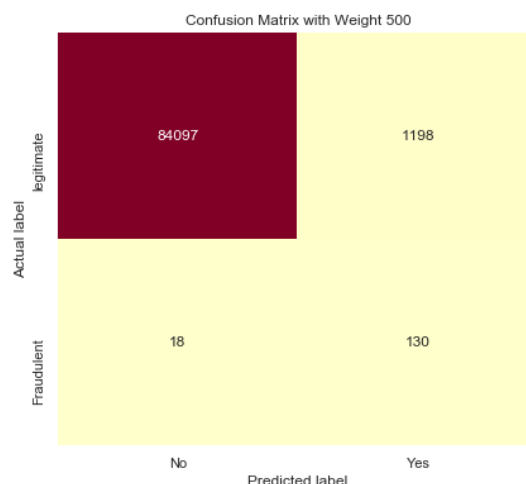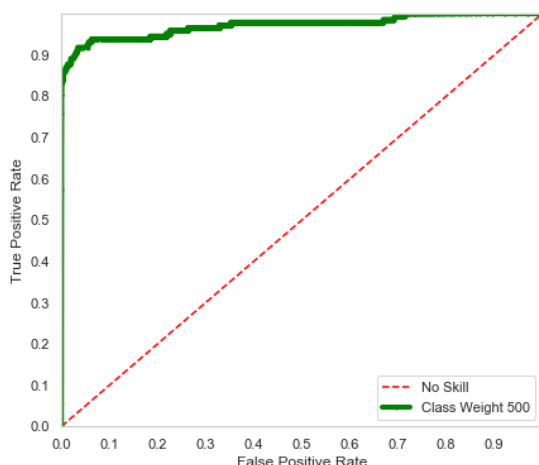
Summarizing the Results

```python
[1323]: import matplotlib.pyplot as plt

def plot_summary_barcharts():
    #colors=['blue', 'yellow', 'green']
    colors=['lightskyblue', 'cornflowerblue', 'blue']
    edgecolor="grey"
    label_font = {'family': 'serif', 'color':  'darkblue', 'weight': 'normal',
 'size': 12 }
    title_font = {'family': 'serif', 'color':  'black', 'weight': 'normal',
 'size': 18 }
    footer_font = {'family': 'serif', 'color':  'black', 'weight': 'normal',
 'size': 15 }
    fig, (ax1, ax2, ax3) = plt.subplots(3, 1)
    fig.set_size_inches(15, 50)

    #ax1 = fig.add_subplot(1,1,1)
    ax1.set_xlim(left=0.7, right=1)
    ax1.barh(np.arange(len(arr_roc_auc)), arr_roc_auc,
 align='center',edgecolor=edgecolor, color=colors )
    ax1.set_xlabel('AUC Value',fontdict=footer_font)
    ax1.set_yticks(np.arange(len(arr_roc_auc)))
    ax1.set_yticklabels(arr_barchart_labels,fontdict=label_font)
    ax1.set_title('AUC across Algoritms',fontdict=title_font)
    ax1.set_facecolor('w')

    #ax2 = fig.add_subplot(2,1,2)
    ax2.set_xlim(left=0.97, right=1)
```

```python
    ax2.barh(np.arange(len(arr_accuracy)), arr_accuracy,␣
↪align='center',edgecolor=edgecolor, color=colors )
    ax2.set_xlabel('Accuracy Value',fontdict=footer_font)
    ax2.set_yticks(np.arange(len(arr_accuracy)))
    ax2.set_yticklabels(arr_barchart_labels,fontdict=label_font)
    ax2.set_title('Accuracy across Algoritms',fontdict=title_font)
    ax2.set_facecolor('w')

    ax3.set_xlim(left=0.75, right=0.9)
    ax3.barh(np.arange(len(arr_recall)), arr_recall,␣
↪align='center',edgecolor=edgecolor, color=colors )
    ax3.set_xlabel('Recall Value',fontdict=footer_font)
    ax3.set_yticks(np.arange(len(arr_recall)))
    ax3.set_yticklabels(arr_barchart_labels,fontdict=label_font)
    ax3.set_title('Sensitivity AKA Recall across Algoritms',fontdict=title_font)
    ax3.set_facecolor('w')

    plt.show()
```

```
[1324]: plot_summary_barcharts()
```

AUC across Algoritms

Algorithm	
NEURAL NETWORK -> Class Weight 500	
NEURAL NETWORK -> Class Weight 5	
NEURAL NETWORK -> Class Weight 1	
XGBOOST -> Class Weight 1000	
XGBOOST -> Class Weight 50	
XGBOOST -> Class Weight 1	
DECISION TREE -> Class Weight 1000	
DECISION TREE -> Class Weight 100	
DECISION TREE -> Class Weight 1	
LOGISTIC REGRESSION -> Class Weight 1000	
LOGISTIC REGRESSION -> Class Weight 100	
LOGISTIC REGRESSION -> Class Weight 1	
RANDOM FOREST -> Class Weight 1000	
RANDOM FOREST -> Class Weight 100	
RANDOM FOREST -> Class Weight 1	
BAGGING -> Sampling Straegy : 1	
BAGGING -> Sampling Straegy : 0.1	
BAGGING -> Sampling Straegy : 0.01	

AUC Value

Accuracy across Algoritms

Accuracy Value

Sensitivity AKA Recall across Algoritms

149

Recall Value

```
[1325]: arr_table_labels
```

```
[1325]: ['BAGGING -> Sampling Straegy : 0.01',
         'BAGGING -> Sampling Straegy : 0.1',
         'BAGGING -> Sampling Straegy : 1',
         'RANDOM FOREST -> Class Weight 1',
         'RANDOM FOREST -> Class Weight 100',
         'RANDOM FOREST -> Class Weight 1000',
         'LOGISTIC REGRESSION -> Class Weight 1',
         'LOGISTIC REGRESSION -> Class Weight 100',
         'LOGISTIC REGRESSION -> Class Weight 1000',
         'DECISION TREE -> Class Weight 1',
         'DECISION TREE -> Class Weight 100',
         'DECISION TREE -> Class Weight 1000',
         'XGBOOST -> Class Weight 1',
         'XGBOOST -> Class Weight 50',
         'XGBOOST -> Class Weight 1000',
         'NEURAL NETWORK -> Class Weight 1',
         'NEURAL NETWORK -> Class Weight 5',
         'NEURAL NETWORK -> Class Weight 500']
```

```python
[1327]: def plot_summary_table():
            #results=pd.
         →DataFrame(list(arr_table_labels,arr_accuracy,arr_roc_auc,arr_recall,arr_precision,arr_f1sco
            #results.columns =␣
         →['Algoritm','Accuracy','ROC-AUC','Recall','Precision','F1-Score','F2-Measure','TP','FN','TN

            results = pd.DataFrame({
            'Algoritm': arr_table_labels,
            'Accuracy': arr_accuracy,
            'ROC-AUC': arr_roc_auc,
            'Recall': arr_recall,
            'Precision': arr_precision,
            'F1-Score' : arr_f1score,
            'TP' : arr_tp,
            'FN' : arr_fn,
            'TN' : arr_tn,
            'FP' : arr_fp
            })

            return results
```

```
[1328]: plot_summary_table()
```

```
[1328]:                                  Algoritm  Accuracy    ROC-AUC    Recall  \
       0            BAGGING -> Sampling Straegy : 0.01  0.999122  0.937494  0.831081
       1             BAGGING -> Sampling Straegy : 0.1  0.996781  0.945874  0.837838
       2               BAGGING -> Sampling Straegy : 1  0.975235  0.961538  0.871622
       3               RANDOM FOREST -> Class Weight 1  0.999263  0.944639  0.824324
       4             RANDOM FOREST -> Class Weight 100  0.995681  0.957426  0.851351
       5            RANDOM FOREST -> Class Weight 1000  0.989490  0.966482  0.858108
       6         LOGISTIC REGRESSION -> Class Weight 1  0.994640  0.953544  0.844595
       7       LOGISTIC REGRESSION -> Class Weight 100  0.994640  0.953544  0.844595
       8      LOGISTIC REGRESSION -> Class Weight 1000  0.994640  0.953544  0.844595
       9                DECISION TREE -> Class Weight 1  0.999122  0.918620  0.837838
       10             DECISION TREE -> Class Weight 100  0.998912  0.905024  0.810811
       11            DECISION TREE -> Class Weight 1000  0.998876  0.905007  0.810811
       12                    XGBOOST -> Class Weight 1  0.999567  0.970665  0.790541
       13                   XGBOOST -> Class Weight 50  0.999146  0.974359  0.837838
       14                 XGBOOST -> Class Weight 1000  0.998853  0.957629  0.837838
       15              NEURAL NETWORK -> Class Weight 1  0.999134  0.962304  0.824324
       16              NEURAL NETWORK -> Class Weight 5  0.998982  0.958601  0.831081
       17            NEURAL NETWORK -> Class Weight 500  0.985768  0.972720  0.878378

           Precision  F1-Score   TP  FN     TN    FP
       0     0.710983  0.766355  123  25  85245    50
       1     0.330667  0.474187  124  24  85044   251
       2     0.057951  0.108677  129  19  83198  2097
       3     0.767296  0.794788  122  26  85258    37
       4     0.266385  0.405797  126  22  84948   347
       5     0.126494  0.220486  127  21  84418   877
       6     0.223214  0.353107  125  23  84860   435
       7     0.223214  0.353107  125  23  84860   435
       8     0.223214  0.353107  125  23  84860   435
       9     0.708571  0.767802  124  24  85244    51
       10    0.648649  0.720721  120  28  85230    65
       11    0.638298  0.714286  120  28  85227    68
       12    0.951220  0.863469  117  31  85289     6
       13    0.716763  0.772586  124  24  85246    49
       14    0.626263  0.716763  124  24  85221    74
       15    0.717647  0.767296  122  26  85247    48
       16    0.664865  0.738739  123  25  85233    62
       17    0.097892  0.176152  130  18  84097  1198

[ ]:
```