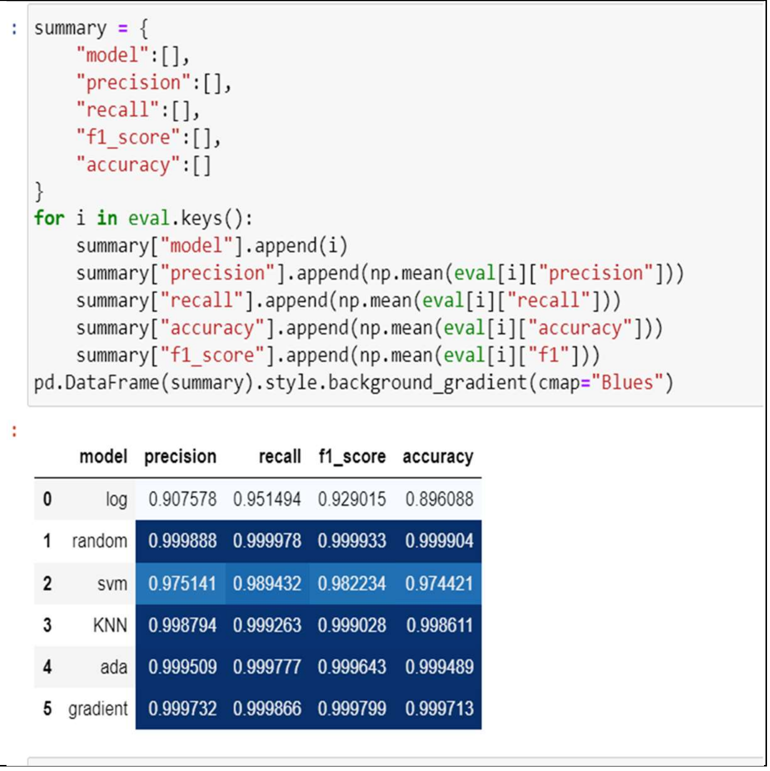
Project Development Phase
Model Performance Test

Date	14 November 2023
Team ID	Team-592631
Project Name	Detection of Smoke using Machine Learning
Maximum Marks	10 Marks

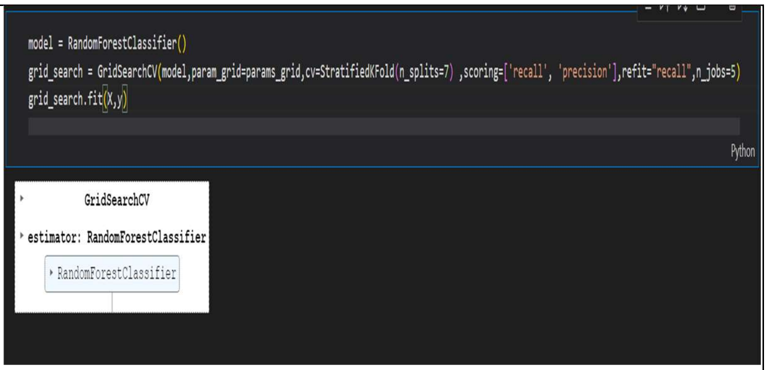
Model Performance Testing:

S.No.	Parameter	Values	Screenshot
1.	Model Summary	**Classification Model:** Accuray Score,F1-score,precision,recall & Classification Report -	

```
: summary = {
      "model":[],
      "precision":[],
      "recall":[],
      "f1_score":[],
      "accuracy":[]
  }
  for i in eval.keys():
      summary["model"].append(i)
      summary["precision"].append(np.mean(eval[i]["precision"]))
      summary["recall"].append(np.mean(eval[i]["recall"]))
      summary["accuracy"].append(np.mean(eval[i]["accuracy"]))
      summary["f1_score"].append(np.mean(eval[i]["f1"]))
  pd.DataFrame(summary).style.background_gradient(cmap="Blues")
```

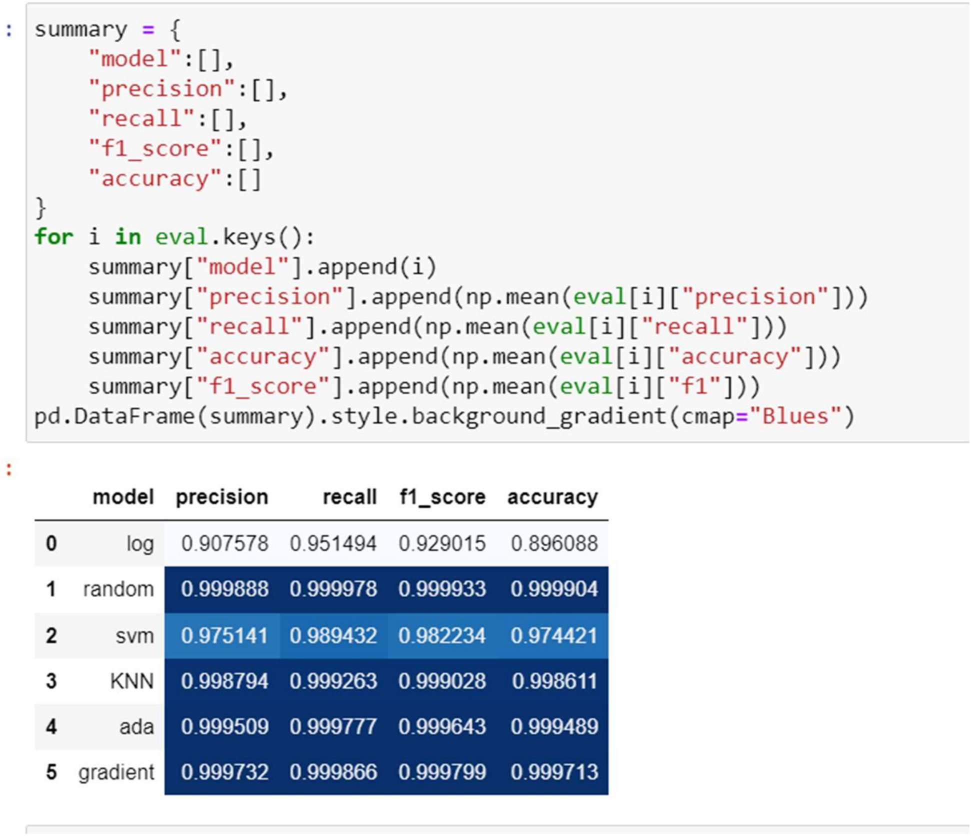
:

	model	precision	recall	f1_score	accuracy
0	log	0.907578	0.951494	0.929015	0.896088
1	random	0.999888	0.999978	0.999933	0.999904
2	svm	0.975141	0.989432	0.982234	0.974421
3	KNN	0.998794	0.999263	0.999028	0.998611
4	ada	0.999509	0.999777	0.999643	0.999489
5	gradient	0.999732	0.999866	0.999799	0.999713

2.	Tune the Model	Hyperparameter Tuning - Validation Method - GridSearchCV	

```
model = RandomForestClassifier()
grid_search = GridSearchCV(model,param_grid=params_grid,cv=StratifiedKFold(n_splits=7) ,scoring=['recall', 'precision'],refit="recall",n_jobs=5)
grid_search.fit(X,y)
```

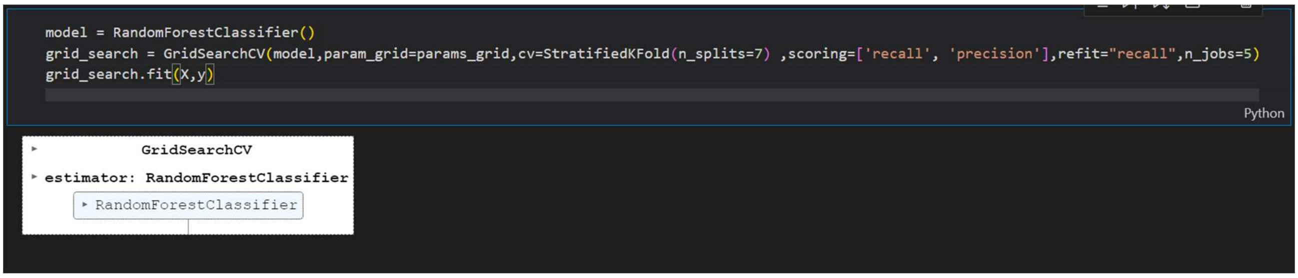
Model Summary :



```
summary = {
    "model":[],
    "precision":[],
    "recall":[],
    "f1_score":[],
    "accuracy":[]
}
for i in eval.keys():
    summary["model"].append(i)
    summary["precision"].append(np.mean(eval[i]["precision"]))
    summary["recall"].append(np.mean(eval[i]["recall"]))
    summary["accuracy"].append(np.mean(eval[i]["accuracy"]))
    summary["f1_score"].append(np.mean(eval[i]["f1"]))
pd.DataFrame(summary).style.background_gradient(cmap="Blues")
```

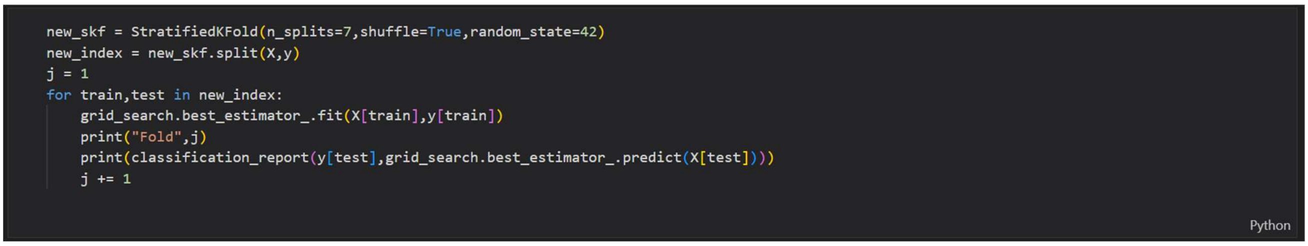
	model	precision	recall	f1_score	accuracy
0	log	0.907578	0.951494	0.929015	0.896088
1	random	0.999888	0.999978	0.999933	0.999904
2	svm	0.975141	0.989432	0.982234	0.974421
3	KNN	0.998794	0.999263	0.999028	0.998611
4	ada	0.999509	0.999777	0.999643	0.999489
5	gradient	0.999732	0.999866	0.999799	0.999713

Tune the Model : Hyper Paramater Tuning – GridSearchCV

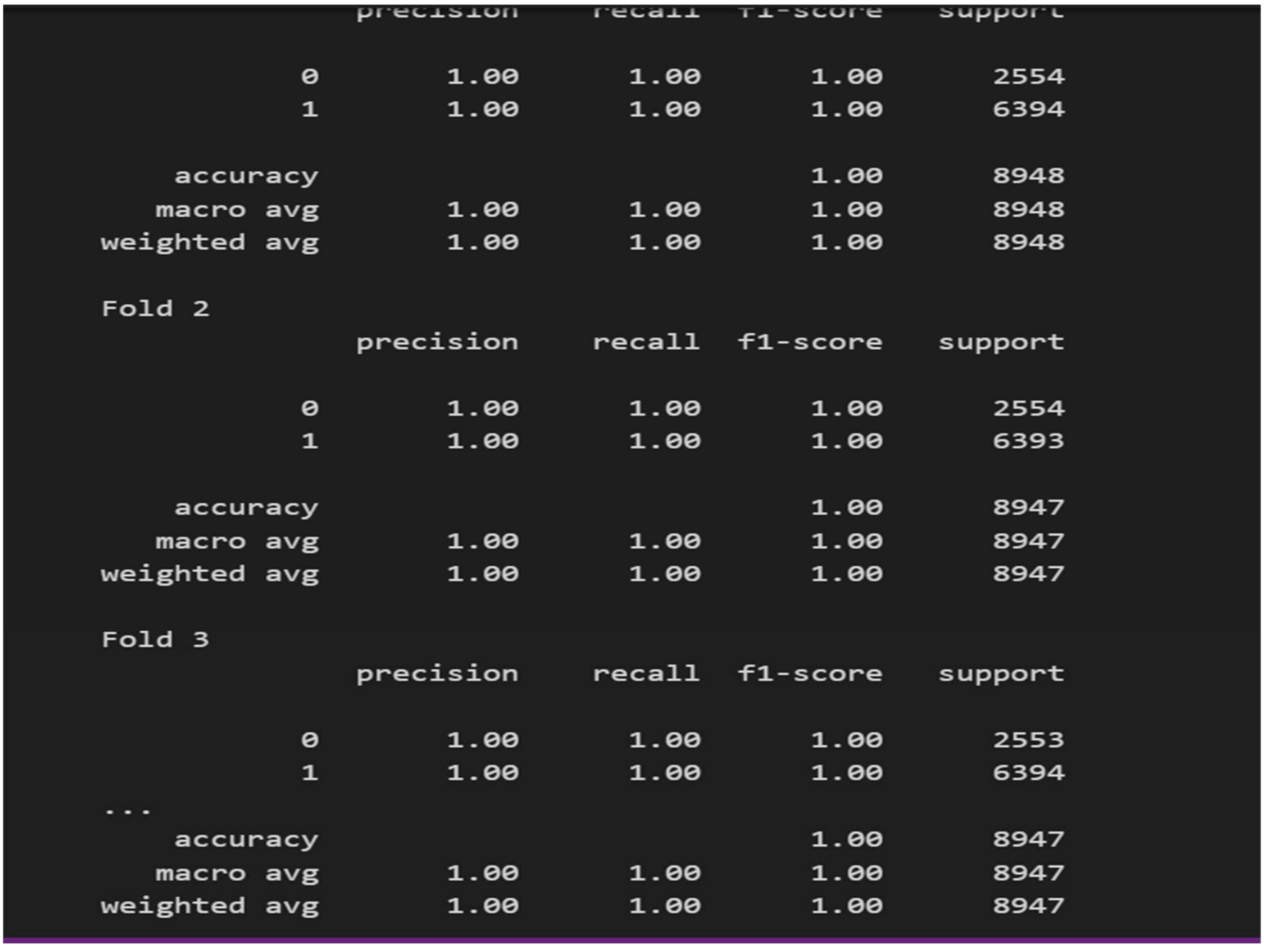


```
model = RandomForestClassifier()
grid_search = GridSearchCV(model,param_grid=params_grid,cv=StratifiedKFold(n_splits=7) ,scoring=['recall', 'precision'],refit="recall",n_jobs=5)
grid_search.fit(X,y)
```

Using Stratified K-Fold CV we brought the accuracy of the model to 1.00



```
new_skf = StratifiedKFold(n_splits=7,shuffle=True,random_state=42)
new_index = new_skf.split(X,y)
j = 1
for train,test in new_index:
    grid_search.best_estimator_.fit(X[train],y[train])
    print("Fold",j)
    print(classification_report(y[test],grid_search.best_estimator_.predict(X[test])))
    j += 1
```



```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      2554
           1       1.00      1.00      1.00      6394

    accuracy                           1.00      8948
   macro avg       1.00      1.00      1.00      8948
weighted avg       1.00      1.00      1.00      8948

Fold 2
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      2554
           1       1.00      1.00      1.00      6393

    accuracy                           1.00      8947
   macro avg       1.00      1.00      1.00      8947
weighted avg       1.00      1.00      1.00      8947

Fold 3
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      2553
           1       1.00      1.00      1.00      6394
...
    accuracy                           1.00      8947
   macro avg       1.00      1.00      1.00      8947
weighted avg       1.00      1.00      1.00      8947
```