SRI RAMACHANDRA
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Category - I Deemed to be University) Porur, Chennai
SRI RAMACHANDRA ENGINEERING AND TECHNOLOGY

LUNG CANCER PREDICTION

CA 4 REPORT

Quarter IV (Year 1)

Submitted by

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In partial fulfillment of the award of the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

(Artificial Intelligence & Machine Learning)

Sri Ramachandra Engineering and Technology

Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai -600116

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BONAFIDE CERTIFICATE

Certified that this project report **“Lung Cancer Prediction”** is the bonafide work of **Joselyn Diana Cindrella M, Keerthivasan S R Reg No. E0120017, E0220201**who carried out the internship work under my supervision.

Signature of Faculty Mentor Signature of Vice-Principal
Chennai-600116

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Porur

Evaluation Date:
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Vice-Principal

Sri Ramachandra Engineering and Technology

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Chennai-600116

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I am grateful to the Department of Computer Science and Engineering, Sri Ramachandra Engineering and Technology, our beloved parents, and friends for extending support, who helped us to overcome obstacles in the study.

1. INTRODUCTION:

Lung cancer, also known as lung carcinoma, is a malignant lung tumor characterized by uncontrolled cell growth in tissues of the lung. This growth can spread beyond the lung by the process of metastasis into nearby tissue or other parts of the body.

In this study, we tried to predict Lung Cancer using 6 different algorithms:

1)Logistic regression classification

2)Naive Bayes classification

3)Decision tree classification

4)Random forest classification

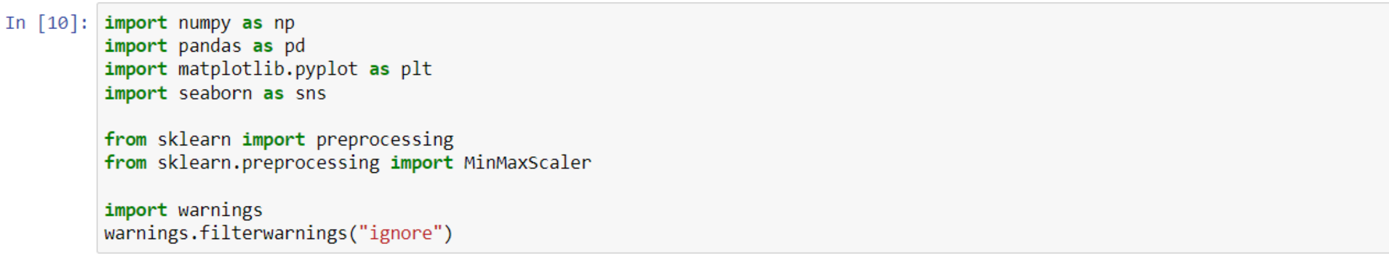
5)K-Nearest Neighbor classification

2. ABOUT THE DATASET:

This Dataset is taken from Kaggle
https://www.kaggle.com/datasets/yusufdede/lung-cancer-dataset
The dataset has 7 columns and 59 rows
The columns include Name, Surname, Age, Smoking Status, Area Q, Alcohol, and Result.

3. CODE:

Importing the Required Libraries



```
In [10]: import numpy as np
         import pandas as pd
         import matplotlib.pyplot as plt
         import seaborn as sns

         from sklearn import preprocessing
         from sklearn.preprocessing import MinMaxScaler

         import warnings
         warnings.filterwarnings("ignore")
```

Reading the dataset

In [11]:
```
data = pd.read_csv('C:/Users/Joselyn Cindrella M/Desktop/lung_cancer_examples.csv')
data.head()
```

Out[11]:

	Name	Surname	Age	Smokes	AreaQ	Alkhol	Result
0	John	Wick	35	3	5	4	1
1	John	Constantine	27	20	2	5	1
2	Camela	Anderson	30	0	5	2	0
3	Alex	Telles	28	0	8	1	0
4	Diego	Maradona	68	4	5	6	1

In [12]:
```
print('Dataset :',data.shape)
```

```
Dataset : (59, 7)
```

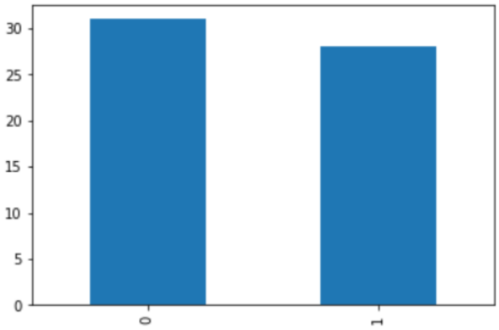
In [13]:
```
data[0:10]
```

Out[13]:

	Name	Surname	Age	Smokes	AreaQ	Alkhol	Result
0	John	Wick	35	3	5	4	1
1	John	Constantine	27	20	2	5	1
2	Camela	Anderson	30	0	5	2	0
3	Alex	Telles	28	0	8	1	0
4	Diego	Maradona	68	4	5	6	1
5	Cristiano	Ronaldo	34	0	10	0	0
6	Mihail	Tal	58	15	10	0	0
7	Kathy	Bates	22	12	5	2	0
8	Nicole	Kidman	45	2	6	0	0
9	Ray	Milland	52	18	4	5	1

Distribution of Diagnosis

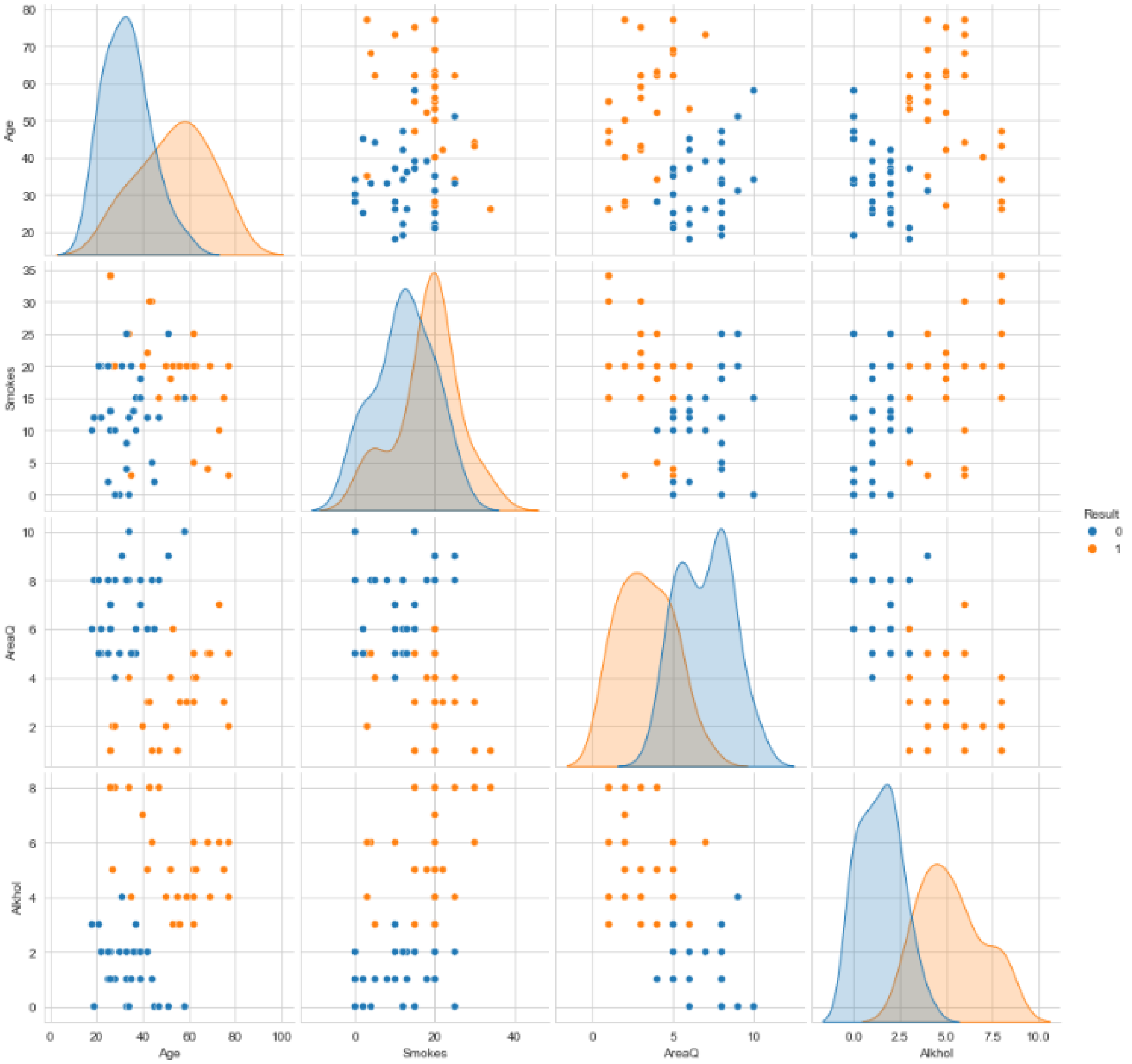
In [14]:
```
data.Result.value_counts()[0:30].plot(kind='bar')
plt.show()
```



Visualizing the data

In [15]:

```
sns.set_style("whitegrid")
sns.pairplot(data,hue="Result",size=3);
plt.show()
```



Removing irrelevant variables

In [17]:

```
data1 = data.drop(columns=['Name','Surname'],

                  axis=1)
data1 = data1.dropna(how='any')
print(data1.shape)
data1.head()
```

```
(59, 5)
```

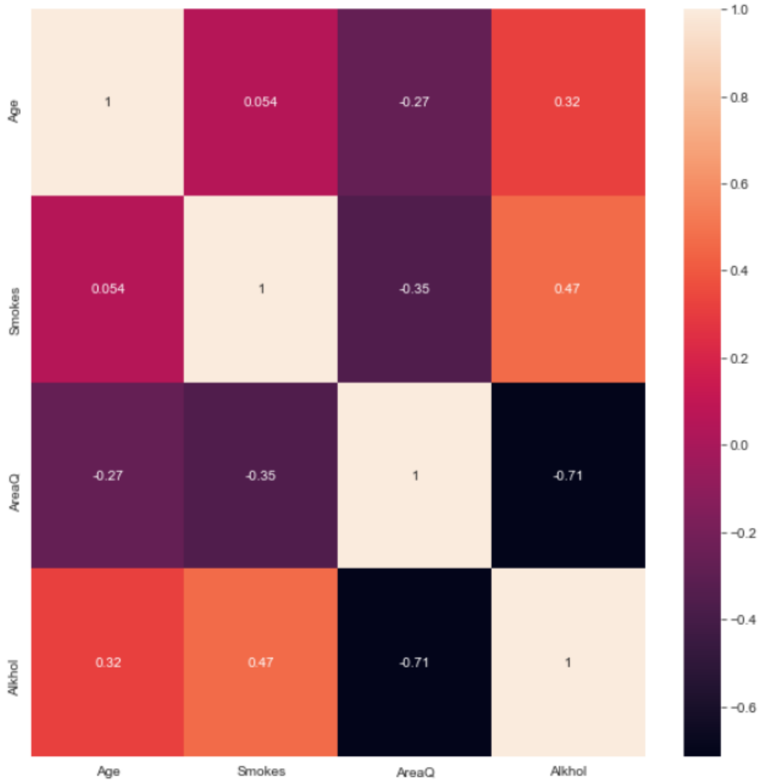
Out[17]:

	Age	Smokes	AreaQ	Alkhol	Result
0	35	3	5	4	1
1	27	20	2	5	1
2	30	0	5	2	0
3	28	0	8	1	0
4	68	4	5	6	1

Observations

In [18]:

```
correlation = data1.drop(['Result'], axis=1).corr()
plt.figure(figsize=(10, 10))
sns.heatmap(correlation, annot=True)
plt.show()
```



Data Training and Testing

In [32]:

```
from sklearn.model_selection import train_test_split
Y = data1['Result']
X = data1.drop(columns=['Result'])
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.50, random_state=9)
```

In [33]:

```
print('X train shape: ', X_train.shape)
print('Y train shape: ', Y_train.shape)
print('X test shape: ', X_test.shape)
print('Y test shape: ', Y_test.shape)
```

```
X train shape:  (29, 4)
Y train shape:  (29,)
X test shape:  (30, 4)
Y test shape:  (30,)
```

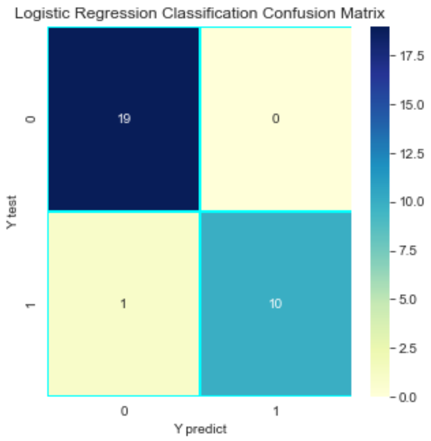
Logistic Regression Classification

In [34]:

```
from sklearn.linear_model import LogisticRegression
logreg = LogisticRegression(C=10)
logreg.fit(X_train, Y_train)
Y_predict1 = logreg.predict(X_test)
```

In [35]:

```
from sklearn.metrics import confusion_matrix
import seaborn as sns

logreg_cm = confusion_matrix(Y_test, Y_predict1)
f, ax = plt.subplots(figsize=(5,5))
sns.heatmap(logreg_cm, annot=True, linewidth=0.7, linecolor='cyan', fmt='g', ax=ax, cmap="YlGnBu")
plt.title('Logistic Regression Classification Confusion Matrix')
plt.xlabel('Y predict')
plt.ylabel('Y test')
plt.show()

score_logreg = logreg.score(X_test, Y_test)
print(score_logreg)
```

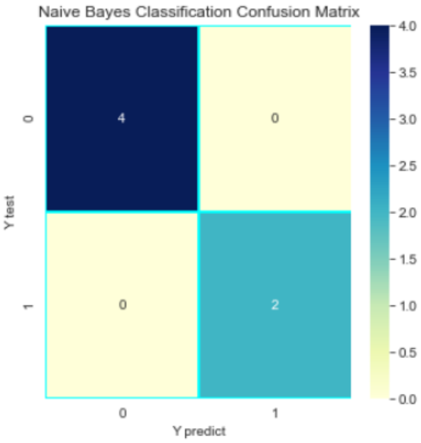


```
0.9666666666666667
```

Naive Bayes Classification

```
In [28]: from sklearn.naive_bayes import GaussianNB
         nbcla = GaussianNB()
         nbcla.fit(X_train, Y_train)
         Y_predict3 = nbcla.predict(X_test)
```

```
In [29]: nbcla_cm = confusion_matrix(Y_test, Y_predict3)
         f, ax = plt.subplots(figsize=(5,5))
         sns.heatmap(nbcla_cm, annot=True, linewidth=0.7, linecolor='cyan', fmt='g', ax=ax, cmap="YlGnBu")
         plt.title('Naive Bayes Classification Confusion Matrix')
         plt.xlabel('Y predict')
         plt.ylabel('Y test')
         plt.show()

         score_nbcla = nbcla.score(X_test, Y_test)
         print(score_nbcla)
```

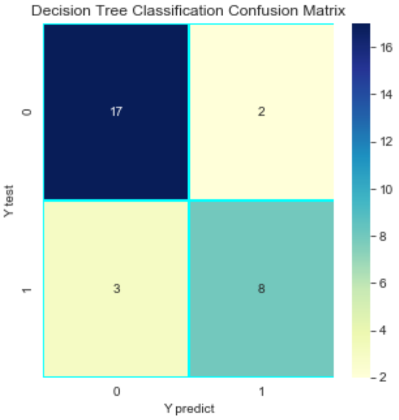


```
1.0
```

Decision Tree Classification

```
In [38]: from sklearn.tree import DecisionTreeClassifier
         dtcla = DecisionTreeClassifier(random_state=9)
         dtcla.fit(X_train, Y_train)
         Y_predict4 = dtcla.predict(X_test)
```

```
In [39]: dtcla_cm = confusion_matrix(Y_test, Y_predict4)
         f, ax = plt.subplots(figsize=(5,5))
         sns.heatmap(dtcla_cm, annot=True, linewidth=0.7, linecolor='cyan', fmt='g', ax=ax, cmap="YlGnBu")
         plt.title('Decision Tree Classification Confusion Matrix')
         plt.xlabel('Y predict')
         plt.ylabel('Y test')
         plt.show()

         score_dtcla = dtcla.score(X_test, Y_test)
         print(score_dtcla)
```



```
0.8333333333333334
```

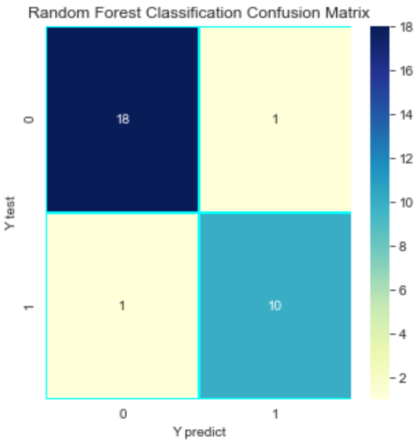
Random forest Classification

In [40]:

```
from sklearn.ensemble import RandomForestClassifier
rfcla = RandomForestClassifier(n_estimators=100,random_state=9,n_jobs=-1)
rfcla.fit(X_train, Y_train)
Y_predict5 = rfcla.predict(X_test)
```

In [41]:

```
rfcla_cm = confusion_matrix(Y_test, Y_predict5)
f, ax = plt.subplots(figsize=(5,5))
sns.heatmap(rfcla_cm, annot=True, linewidth=0.7, linecolor='cyan', fmt='g', ax=ax, cmap="YlGnBu")
plt.title('Random Forest Classification Confusion Matrix')
plt.xlabel('Y predict')
plt.ylabel('Y test')
plt.show()

score_rfcla = rfcla.score(X_test, Y_test)
print(score_rfcla)
```



```
0.9333333333333333
```

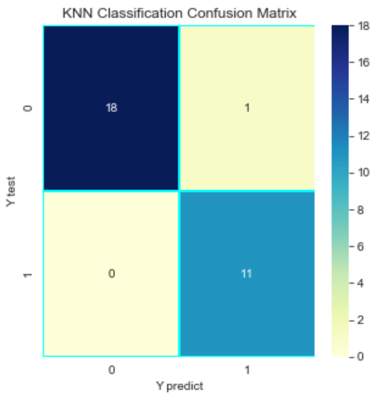
K Nearest Neighbor Classification

In [42]:

```
from sklearn.neighbors import KNeighborsClassifier
knncla = KNeighborsClassifier(n_neighbors=5,n_jobs=-1)
knncla.fit(X_train, Y_train)
Y_predict6 = knncla.predict(X_test)
```

In [43]:

```
knncla_cm = confusion_matrix(Y_test, Y_predict6)
f, ax = plt.subplots(figsize=(5,5))
sns.heatmap(knncla_cm, annot=True, linewidth=0.7, linecolor='cyan', fmt='g', ax=ax, cmap="YlGnBu")
plt.title('KNN Classification Confusion Matrix')
plt.xlabel('Y predict')
plt.ylabel('Y test')
plt.show()

score_knncla= knncla.score(X_test, Y_test)
print(score_knncla)
```



```
0.9666666666666667
```

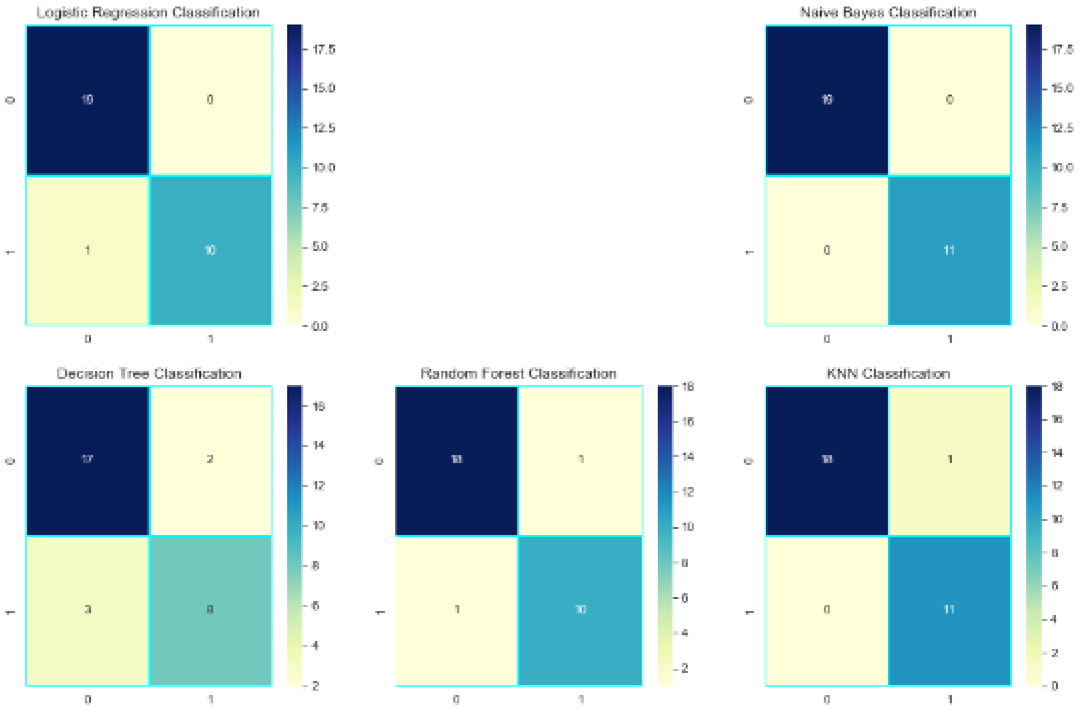
Test Score

In [44]:
```
Testscores = pd.Series([score_logreg, score_nbcla, score_dtcla, score_rfcla, score_knncla],
                        index=['Logistic Regression Score', 'Naive Bayes Score', 'Decision Tree Score', 'Random Forest Sc
print(Testscores)
```

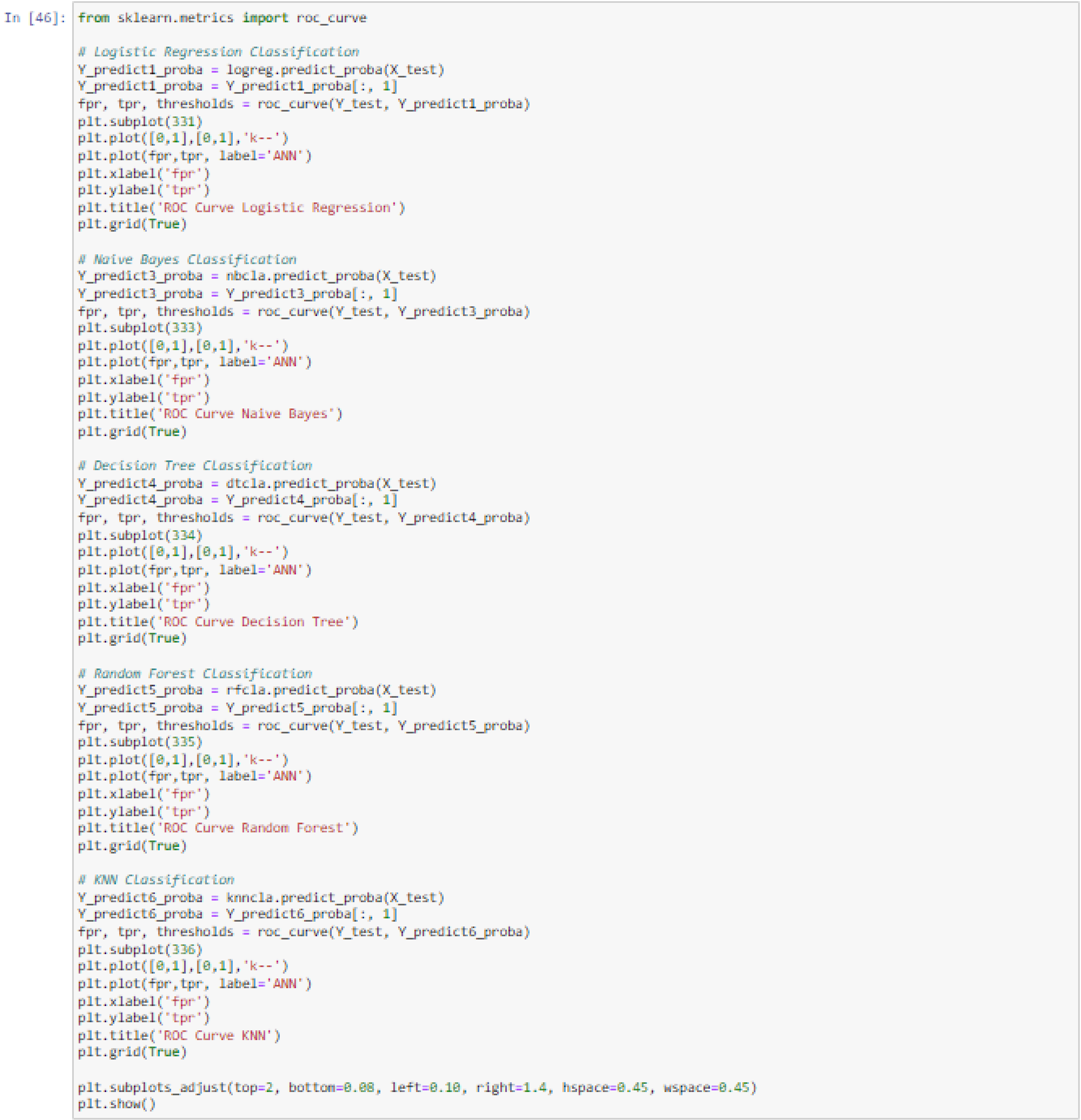
```
Logistic Regression Score    0.966667
Naive Bayes Score            1.000000
Decision Tree Score          0.833333
Random Forest Score          0.933333
K-Nearest Neighbour Score    0.966667
dtype: float64
```

The confusion matrix

In [45]:
```
fig = plt.figure(figsize=(15,15))
ax1 = fig.add_subplot(3, 3, 1)
ax1.set_title('Logistic Regression Classification')
ax2 = fig.add_subplot(3, 3, 3)
ax2.set_title('Naive Bayes Classification')
ax3 = fig.add_subplot(3, 3, 4)
ax3.set_title('Decision Tree Classification')
ax4 = fig.add_subplot(3, 3, 5)
ax4.set_title('Random Forest Classification')
ax5 = fig.add_subplot(3, 3, 6)
ax5.set_title('KNN Classification')
sns.heatmap(data=logreg_cm, annot=True, linewidth=0.7, linecolor='cyan',cmap="YlGnBu" ,fmt='g', ax=ax1)
sns.heatmap(data=nbcla_cm, annot=True, linewidth=0.7, linecolor='cyan',cmap="YlGnBu" ,fmt='g', ax=ax2)
sns.heatmap(data=dtcla_cm, annot=True, linewidth=0.7, linecolor='cyan',cmap="YlGnBu" ,fmt='g', ax=ax3)
sns.heatmap(data=rfcla_cm, annot=True, linewidth=0.7, linecolor='cyan',cmap="YlGnBu" ,fmt='g', ax=ax4)
sns.heatmap(data=knncla_cm, annot=True, linewidth=0.7, linecolor='cyan',cmap="YlGnBu" ,fmt='g', ax=ax5)
plt.show()
```

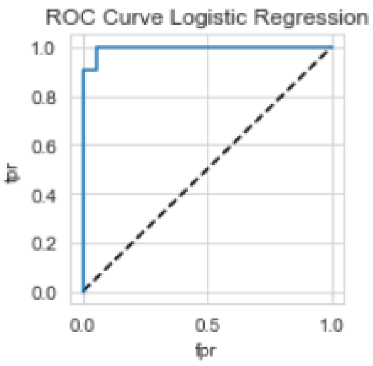


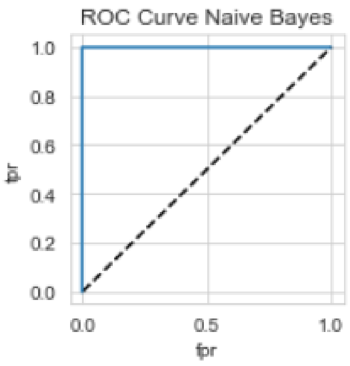
ROC Curve

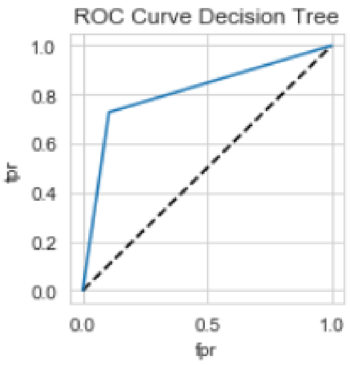


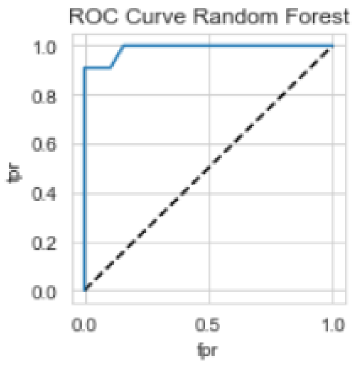
In [46]:

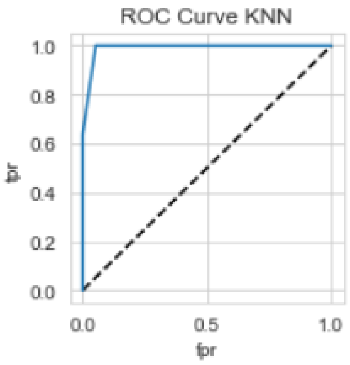
```
from sklearn.metrics import roc_curve

# Logistic Regression Classification
Y_predict1_proba = logreg.predict_proba(X_test)
Y_predict1_proba = Y_predict1_proba[:, 1]
fpr, tpr, thresholds = roc_curve(Y_test, Y_predict1_proba)
plt.subplot(331)
plt.plot([0,1],[0,1],'k--')
plt.plot(fpr,tpr, label='ANN')
plt.xlabel('fpr')
plt.ylabel('tpr')
plt.title('ROC Curve Logistic Regression')
plt.grid(True)

# Naive Bayes Classification
Y_predict3_proba = nbcla.predict_proba(X_test)
Y_predict3_proba = Y_predict3_proba[:, 1]
fpr, tpr, thresholds = roc_curve(Y_test, Y_predict3_proba)
plt.subplot(333)
plt.plot([0,1],[0,1],'k--')
plt.plot(fpr,tpr, label='ANN')
plt.xlabel('fpr')
plt.ylabel('tpr')
plt.title('ROC Curve Naive Bayes')
plt.grid(True)

# Decision Tree Classification
Y_predict4_proba = dtcla.predict_proba(X_test)
Y_predict4_proba = Y_predict4_proba[:, 1]
fpr, tpr, thresholds = roc_curve(Y_test, Y_predict4_proba)
plt.subplot(334)
plt.plot([0,1],[0,1],'k--')
plt.plot(fpr,tpr, label='ANN')
plt.xlabel('fpr')
plt.ylabel('tpr')
plt.title('ROC Curve Decision Tree')
plt.grid(True)

# Random Forest Classification
Y_predict5_proba = rfcla.predict_proba(X_test)
Y_predict5_proba = Y_predict5_proba[:, 1]
fpr, tpr, thresholds = roc_curve(Y_test, Y_predict5_proba)
plt.subplot(335)
plt.plot([0,1],[0,1],'k--')
plt.plot(fpr,tpr, label='ANN')
plt.xlabel('fpr')
plt.ylabel('tpr')
plt.title('ROC Curve Random Forest')
plt.grid(True)

# KNN Classification
Y_predict6_proba = knncla.predict_proba(X_test)
Y_predict6_proba = Y_predict6_proba[:, 1]
fpr, tpr, thresholds = roc_curve(Y_test, Y_predict6_proba)
plt.subplot(336)
plt.plot([0,1],[0,1],'k--')
plt.plot(fpr,tpr, label='ANN')
plt.xlabel('fpr')
plt.ylabel('tpr')
plt.title('ROC Curve KNN')
plt.grid(True)

plt.subplots_adjust(top=2, bottom=0.08, left=0.10, right=1.4, hspace=0.45, wspace=0.45)
plt.show()
```











The predicted Accuracy for each algorithm is

Logistic regression-96%

Naive Bayes-100%

Decision Tree-83%

Random Forest-93%

KNN-96%