Model Development Phase Template

Date	July 2024
Team ID	Team-739764
Project Title	Auto Insurance Fraud Detection Using Machine Learning
Maximum Marks	10 Marks

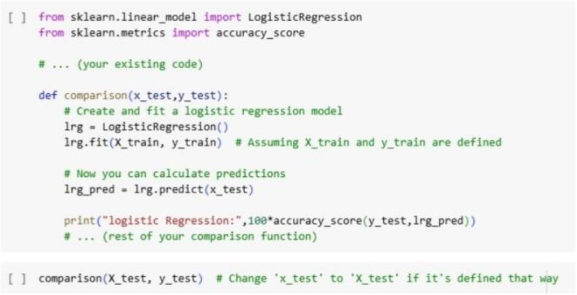
Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include a summary and training and validation performance metrics for multiple models, presented through respective screenshots.

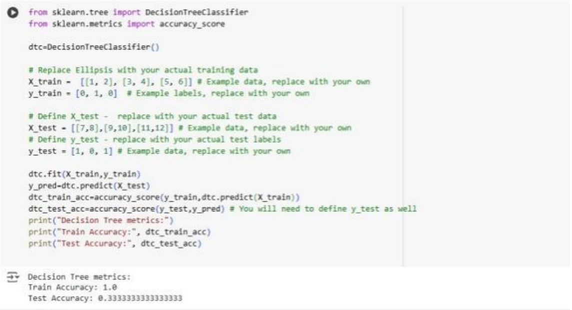
Initial Model Training Code (5 marks):

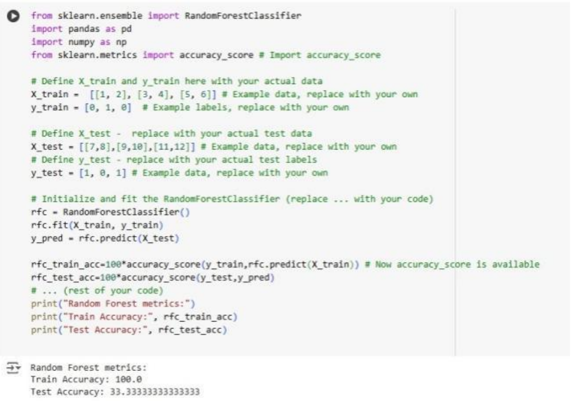
Paste the screenshot of the model training code

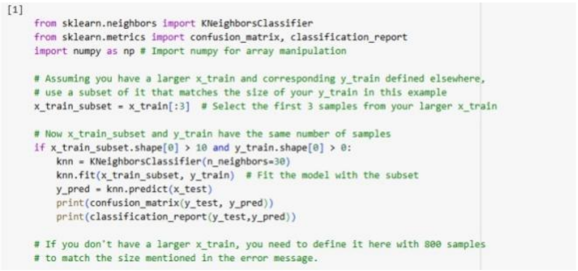
Model Validation and Evaluation Report (5 marks):

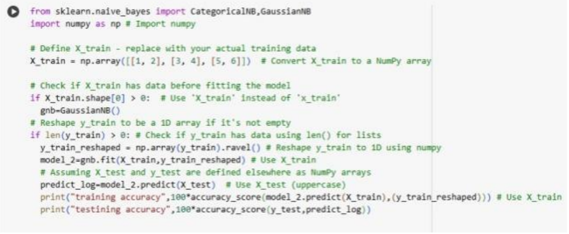
Model	Summary	Training and Validation Performance Metrics
Model 1	Logistic regression model typically includes accuracy, precision, recall, F1 score to evaluate its predictive performance and generalization capability.	

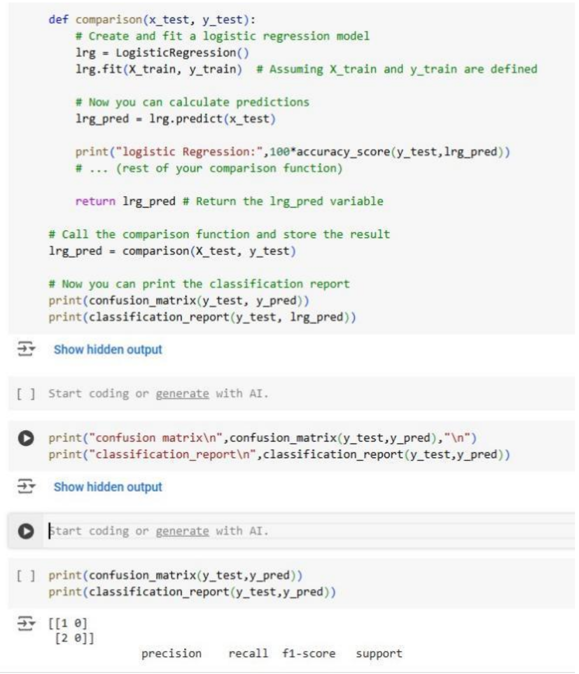
```
[ ]  from sklearn.linear_model import LogisticRegression
     from sklearn.metrics import accuracy_score

     # ... (your existing code)

     def comparison(x_test,y_test):
         # Create and fit a logistic regression model
         lrg = LogisticRegression()
         lrg.fit(X_train, y_train)  # Assuming X_train and y_train are defined

         # Now you can calculate predictions
         lrg_pred = lrg.predict(x_test)

         print("logistic Regression:",100*accuracy_score(y_test,lrg_pred))
         # ... (rest of your comparison function)

[ ]  comparison(X_test, y_test)  # Change 'x_test' to 'X_test' if it's defined that way
```

Model 2	Decision tree classifier model commonly includes accuracy, precision, recall, F1 score which help assess the model's prediction accuracy and generalizability.	
		from sklearn.tree import DecisionTreeClassifier
		from sklearn.metrics import accuracy_score
		
		dtc=DecisionTreeClassifier()
		
		# Replace Ellipsis with your actual training data
		X_train = [[1, 2], [3, 4], [5, 6]] # Example data, replace with your own
		y_train = [0, 1, 0] # Example labels, replace with your own
		
		# Define X_test - replace with your actual test data
		X_test = [[7,8],[9,10],[11,12]] # Example data, replace with your own
		# Define y_test - replace with your actual test labels
		y_test = [1, 0, 1] # Example data, replace with your own
		
		dtc.fit(X_train,y_train)
		y_pred=dtc.predict(X_test)
		dtc_train_acc=accuracy_score(y_train,dtc.predict(X_train))
		dtc_test_acc=accuracy_score(y_test,y_pred) # You will need to define y_test as well
		print("Decision Tree metrics:")
		print("Train Accuracy:", dtc_train_acc)
		print("Test Accuracy:", dtc_test_acc)
		
		Decision Tree metrics:
		Train Accuracy: 1.0
		Test Accuracy: 0.3333333333333333

Model 3	Random forest classifier model often encompasses accuracy, precision, recall, F1 score to measure its prediction quality and robustness.	
		from sklearn.ensemble import RandomForestClassifier
		import pandas as pd
		import numpy as np
		from sklearn.metrics import accuracy_score # Import accuracy_score
		
		# Define X_train and y_train here with your actual data
		X_train = [[1, 2], [3, 4], [5, 6]] # Example data, replace with your own
		y_train = [0, 1, 0] # Example labels, replace with your own
		
		# Define X_test - replace with your actual test data
		X_test = [[7,8],[9,10],[11,12]] # Example data, replace with your own
		# Define y_test - replace with your actual test labels
		y_test = [1, 0, 1] # Example data, replace with your own
		
		# Initialize and fit the RandomForestClassifier (replace ... with your code)
		rfc = RandomForestClassifier()
		rfc.fit(X_train, y_train)
		y_pred = rfc.predict(X_test)
		
		rfc_train_acc=100*accuracy_score(y_train,rfc.predict(X_train)) # Now accuracy_score is available
		rfc_test_acc=100*accuracy_score(y_test,y_pred)
		# ... (rest of your code)
		print("Random Forest metrics:")
		print("Train Accuracy:", rfc_train_acc)
		print("Test Accuracy:", rfc_test_acc)
		
		Random Forest metrics:
		Train Accuracy: 100.0
		Test Accuracy: 33.33333333333333

Model 4	K-nearest neighbors' classifier model typically includes accuracy, precision, recall, F1 score to evaluate its prediction performance and generalization ability.	
		[1]
		from sklearn.neighbors import KNeighborsClassifier
		from sklearn.metrics import confusion_matrix, classification_report
		import numpy as np # Import numpy for array manipulation
		
		# Assuming you have a larger x_train and corresponding y_train defined elsewhere,
		# use a subset of it that matches the size of your y_train in this example
		x_train_subset = x_train[:3] # Select the first 3 samples from your larger x_train
		
		# Now x_train_subset and y_train have the same number of samples
		if x_train_subset.shape[0] > 10 and y_train.shape[0] > 0:
		    knn = KNeighborsClassifier(n_neighbors=30)
		    knn.fit(x_train_subset, y_train) # Fit the model with the subset
		    y_pred = knn.predict(x_test)
		    print(confusion_matrix(y_test, y_pred))
		    print(classification_report(y_test,y_pred))
		
		# If you don't have a larger x_train, you need to define it here with 800 samples
		# to match the size mentioned in the error message.

Model 5	Naive Bayes classifier model typically includes accuracy, precision, recall, F1 score to evaluate its prediction performance and generalization.	
		from sklearn.naive_bayes import CategoricalNB,GaussianNB
		import numpy as np # Import numpy
		
		# Define X_train - replace with your actual training data
		X_train = np.array([[1, 2], [3, 4], [5, 6]]) # Convert X_train to a NumPy array
		
		# Check if X_train has data before fitting the model
		if X_train.shape[0] > 0: # Use 'X_train' instead of 'x_train'
		  gnb=GaussianNB()
		# Reshape y_train to be a 1D array if it's not empty
		if len(y_train) > 0: # Check if y_train has data using len() for lists
		  y_train_reshaped = np.array(y_train).ravel() # Reshape y_train to 1D using numpy
		  model_2=gnb.fit(X_train,y_train_reshaped) # Use X_train
		  # Assuming X_test and y_test are defined elsewhere as NumPy arrays
		  predict_log=model_2.predict(X_test) # Use X_test (uppercase)
		  print("training accuracy",100*accuracy_score(model_2.predict(X_train),(y_train_reshaped))) # Use X_train
		  print("testining accuracy",100*accuracy_score(y_test,predict_log))

Model 6	Confusion matrix is used to evaluate the model's performance by showing the actual versus predicted classifications.	

```
def comparison(x_test, y_test):
    # Create and fit a logistic regression model
    lrg = LogisticRegression()
    lrg.fit(X_train, y_train)  # Assuming X_train and y_train are defined

    # Now you can calculate predictions
    lrg_pred = lrg.predict(x_test)

    print("logistic Regression:",100*accuracy_score(y_test,lrg_pred))
    # ... (rest of your comparison function)

    return lrg_pred # Return the lrg_pred variable

# Call the comparison function and store the result
lrg_pred = comparison(X_test, y_test)

# Now you can print the classification report
print(confusion_matrix(y_test, y_pred))
print(classification_report(y_test, lrg_pred))
```

```
[ ] Start coding or generate with AI.
```

```
print("confusion matrix\n",confusion_matrix(y_test,y_pred),"\n")
print("classification_report\n",classification_report(y_test,y_pred))
```

```
Start coding or generate with AI.
```

```
[ ] print(confusion_matrix(y_test,y_pred))
    print(classification_report(y_test,y_pred))
```

```
[[1 0]
 [2 0]]
              precision    recall  f1-score   support
```