Distinction Task 6.2D: LogisticRegression and Decision tree

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]: #importing libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.tree import DecisionTreeClassifier

# Load the dataset
data = pd.read_csv('payment_fraud.csv')

# Convert categorical variable into dummy variables
data = pd.get_dummies(data, columns=['paymentMethod'])

# Splitting the data using train_test_split
X_train, X_test, y_train, y_test = train_test_split(
    data.drop('label', axis=1), data['label'], test_size=0.33, stratify=data['label'], random_state=17
)

# Initialize Logistic Regression models with different C parameters
logreg1 = LogisticRegression(C=1, max_iter=10000, random_state=42)
logreg100 = LogisticRegression(C=100, max_iter=10000, random_state=42)
logreg10 = LogisticRegression(C=10, max_iter=10000, random_state=42)
logreg001 = LogisticRegression(C=0.01, max_iter=10000, random_state=42)
logreg0001 = LogisticRegression(C=0.001, max_iter=10000, random_state=42)

# Fit the models
logreg1.fit(X_train, y_train)
logreg100.fit(X_train, y_train)
logreg10.fit(X_train, y_train)
logreg001.fit(X_train, y_train)
logreg0001.fit(X_train, y_train)

# Plotting the graph for coefficients
plt.subplots(figsize=(7, 7), dpi=100)
plt.plot(logreg1.coef_.T, 'o', label="C=1")
plt.plot(logreg100.coef_.T, '^', label="C=100")
plt.plot(logreg10.coef_.T, '*', label="C=10")
plt.plot(logreg001.coef_.T, 's', label="C=0.01")
plt.plot(logreg0001.coef_.T, 'v', label="C=0.001")
plt.xticks(range(X_train.shape[1]), X_train.columns, rotation=90)
xlims = plt.xlim()
plt.hlines(0, xlims[0], xlims[1])
plt.xlim(xlims)
plt.ylim(-5, 5)
plt.xlabel("Feature")
plt.ylabel("Coefficient magnitude")
plt.legend()
plt.show()

# Decision tree learning algorithm
tree = DecisionTreeClassifier(max_depth=4, random_state=0)
tree.fit(X_train, y_train)

# Plotting the decision tree for feature importance
plt.subplots(figsize=(7, 7), dpi=100)
n_features = X_train.shape[1]
plt.barh(np.arange(n_features), tree.feature_importances_, align='center')
plt.yticks(np.arange(n_features), X_train.columns)
plt.xlabel("Feature importance")
plt.ylabel("Feature")
plt.ylim(-1, n_features)
plt.show()
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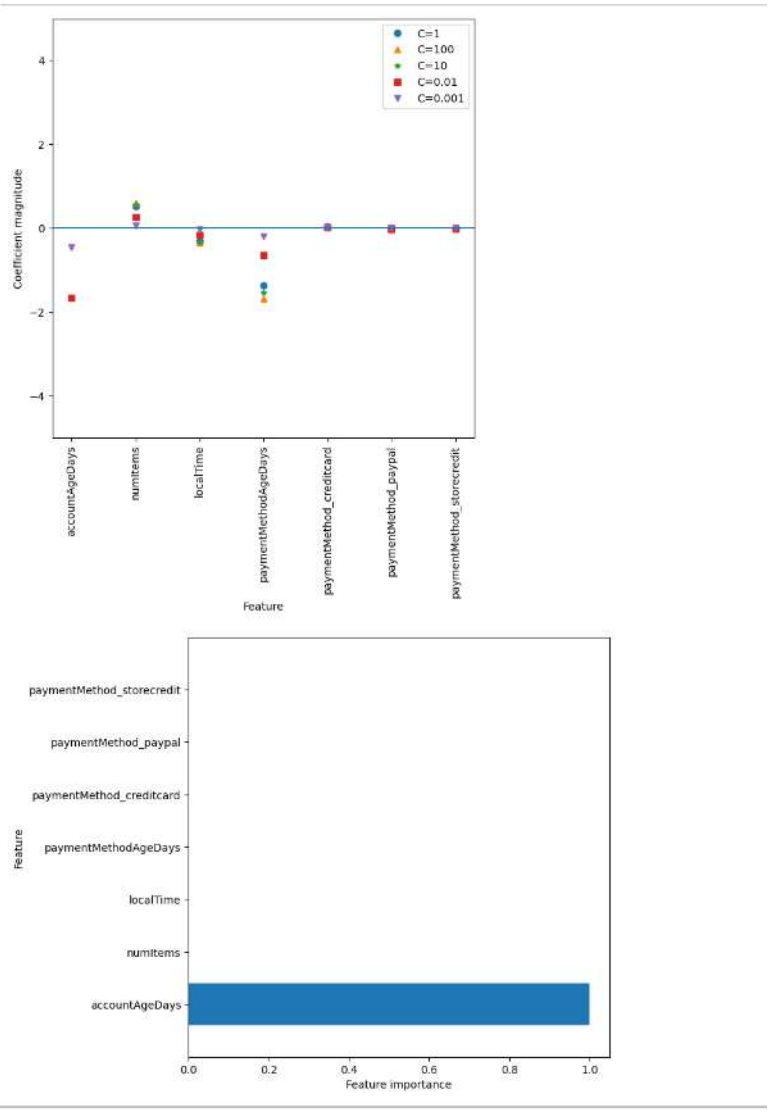

This Python script uses Decision Tree and Logistic Regression classifiers on a payment fraud dataset. The data is first loaded, preprocessed, and divided into training and test sets. Categorical variables are then changed into dummy variables. Plotting the coefficients of trained logistic regression models with varying regularization strengths (C values) allows one to see the impact of features. After training a Decision Tree classifier, the most significant characteristics for fraud prediction are shown in a bar plot showing feature importance. This script illustrates the importance of features in classification as well as model behavior.