**MLA0201-Fundamentals of Machine Learning**

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Experiment 3:

Demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

**Code:**

import pandas as pd

import matplotlib.pyplot as plt

from sklearn.tree import DecisionTreeClassifier

from sklearn.preprocessing import LabelEncoder

from sklearn.model\_selection import train\_test\_split

from sklearn.metrics import accuracy\_score

from sklearn.tree import plot\_tree

data = pd.read\_csv("car\_data.csv")

X = data.iloc[:, :-1].copy()

y = data.iloc[:, -1]

encoders = {}

for column in X.columns:

encoders[column] = LabelEncoder()

X[column] = encoders[column].fit\_transform(X[column])

target\_encoder = LabelEncoder()

y = target\_encoder.fit\_transform(y)

X\_train, X\_test, y\_train, y\_test = train\_test\_split(

X, y, test\_size=0.3, random\_state=1

)

model = DecisionTreeClassifier(criterion='entropy')

model.fit(X\_train, y\_train)

print("ID3 Decision Tree trained successfully")

new\_sample = pd.DataFrame([{

'Brand': 'Toyota',

'Fuel': 'Petrol',

'Transmission': 'Automatic',

'EngineCC': 2000,

'Mileage': 15,

'Seats': 5

}])

for column in new\_sample.columns:

new\_sample[column] = encoders[column].transform(new\_sample[column])

prediction = model.predict(new\_sample)

predicted\_class = target\_encoder.inverse\_transform(prediction)

print("Predicted Class for new sample:", predicted\_class[0])

y\_pred = model.predict(X\_test)

accuracy = accuracy\_score(y\_test, y\_pred)

print("Model Accuracy:", accuracy)

plt.figure(figsize=(20, 10))

plot\_tree(

model,

feature\_names=X.columns,

class\_names=target\_encoder.classes\_,

filled=True

)

plt.title("ID3 Decision Tree (Car Dataset)")

plt.show()

plt.figure()

plt.bar(['ID3 Accuracy'], [accuracy])

plt.ylim(0, 1)

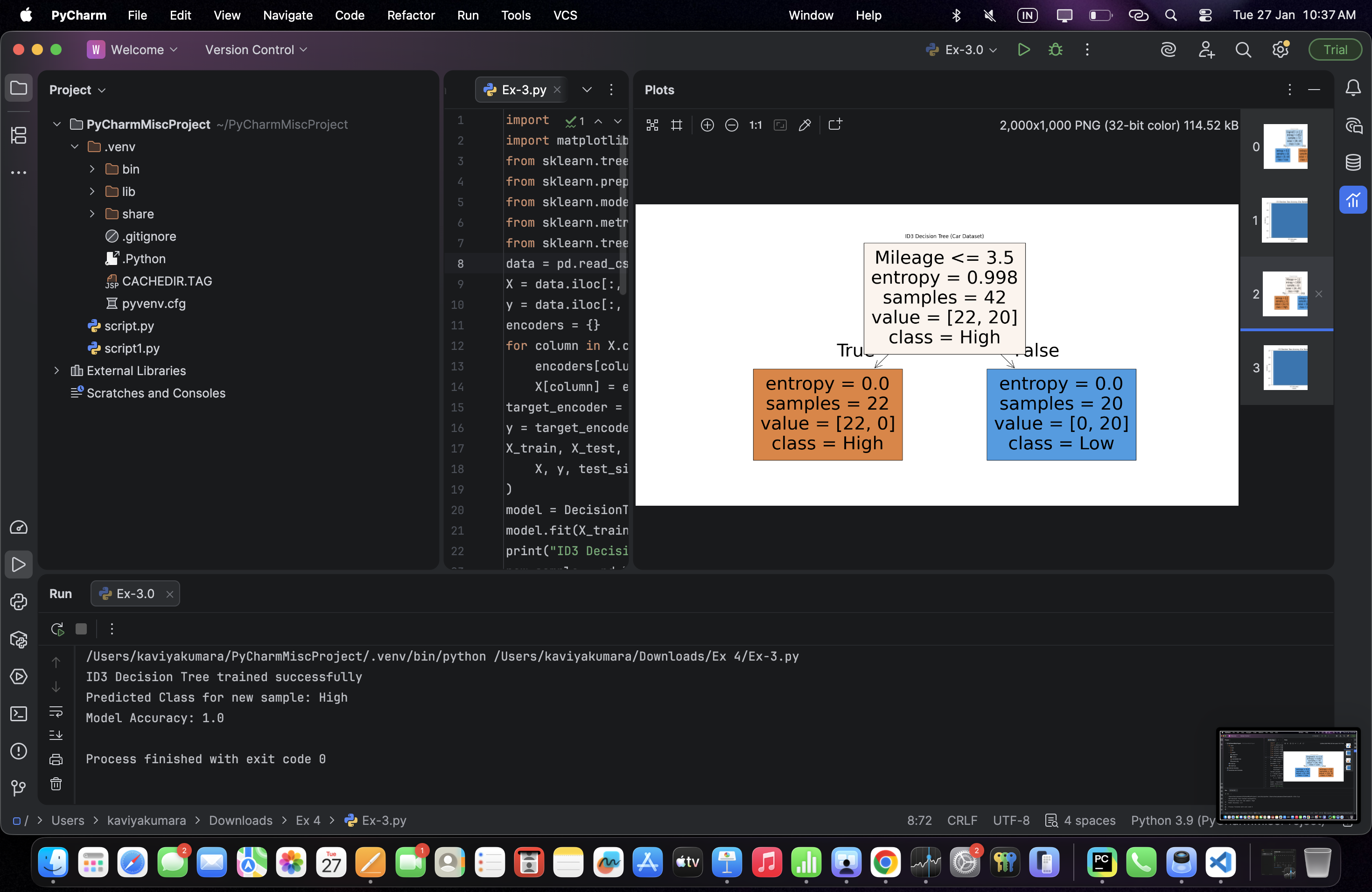
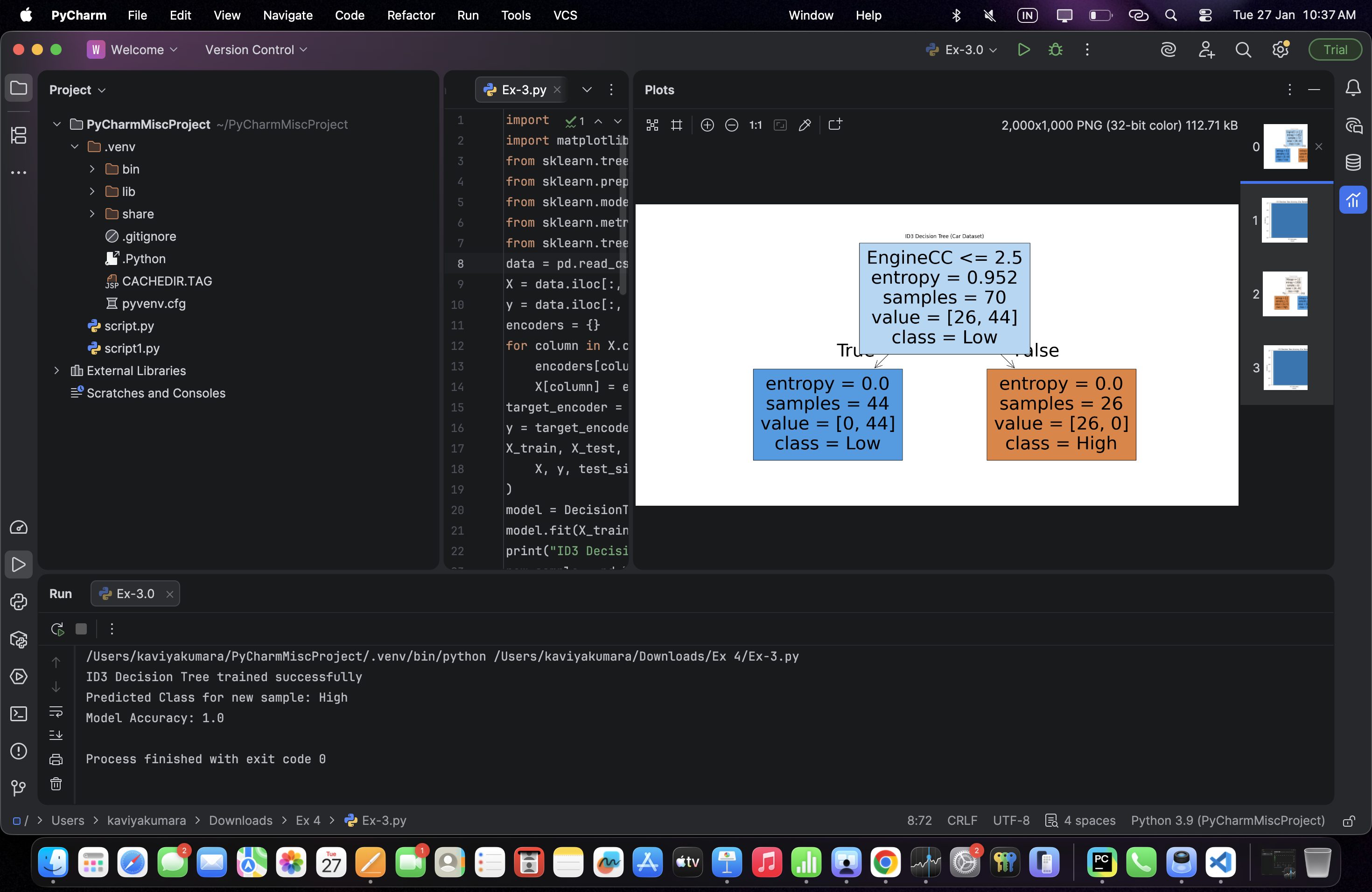
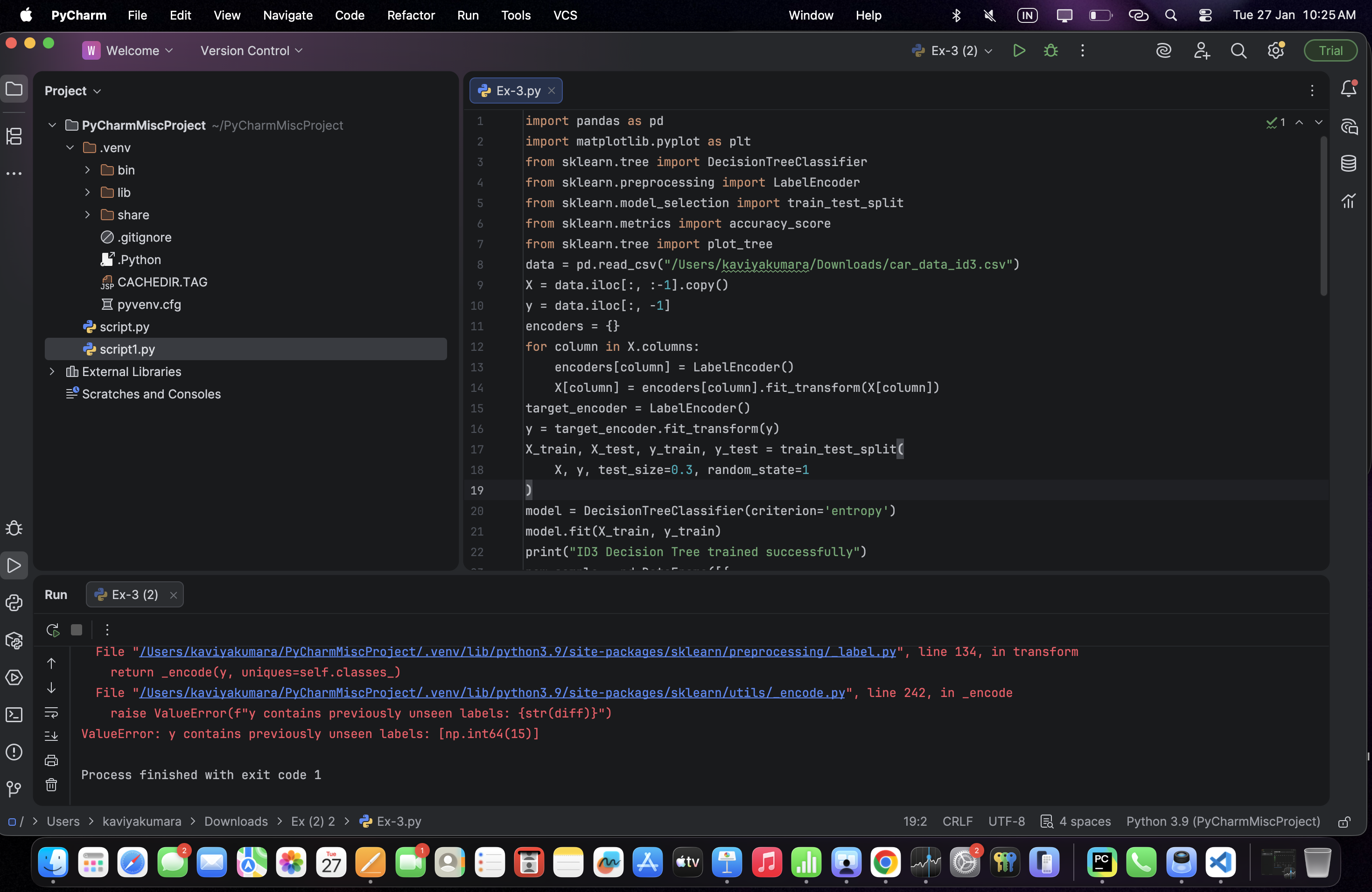
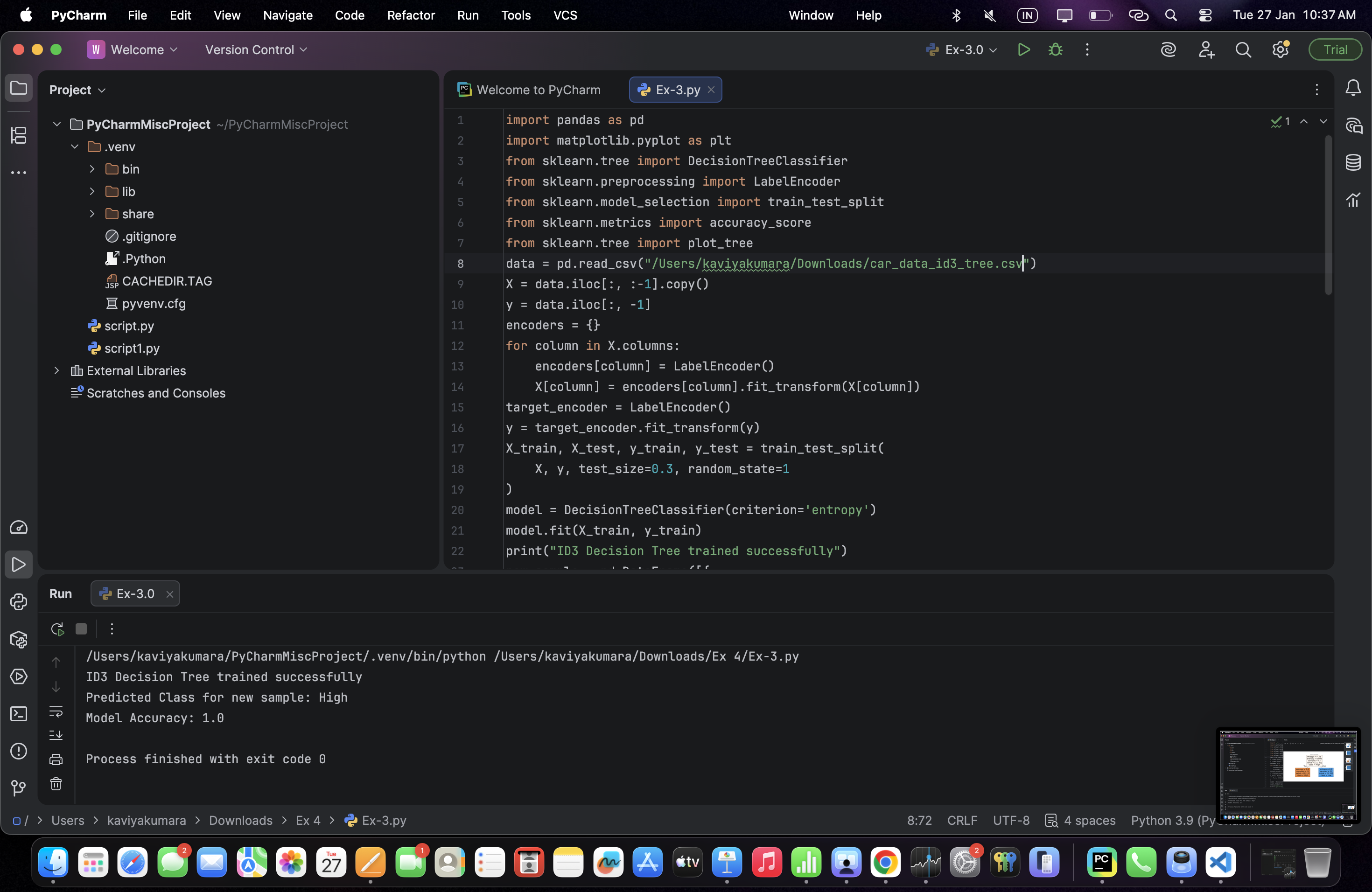
plt.xlabel("Model")

plt.ylabel("Accuracy")

plt.title("ID3 Decision Tree Accuracy (Car Dataset)")

plt.show()

**Output:**

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