Loan Approval Prediction System

In [1]:
```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, classification_report
```

In [2]:
```
data = pd.read_csv('loan_data.csv')

data
```

Out[2]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapplic
0	LP001002	Male	No	0	Graduate	No	5849	
1	LP001003	Male	Yes	1	Graduate	No	4583	
2	LP001005	Male	Yes	0	Graduate	Yes	3000	
3	LP001006	Male	Yes	0	Not Graduate	No	2583	
4	LP001008	Male	No	0	Graduate	No	6000	
...	...	...	...	...	...	...	...	
609	LP002978	Female	No	0	Graduate	No	2900	
610	LP002979	Male	Yes	3+	Graduate	No	4106	
611	LP002983	Male	Yes	1	Graduate	No	8072	
612	LP002984	Male	Yes	2	Graduate	No	7583	
613	LP002990	Female	No	0	Graduate	Yes	4583	

614 rows × 13 columns

In [3]:
```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()

categorical_cols = ['Gender', 'Married', 'Education', 'Self_Employed', 'Property_

for col in categorical_cols:
    data[col] = le.fit_transform(data[col].astype(str))
data
```

Out[3]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapplic
0	LP001002	1	0	0	0	0	5849	
1	LP001003	1	1	1	0	0	4583	
2	LP001005	1	1	0	0	1	3000	
3	LP001006	1	1	0	1	0	2583	
4	LP001008	1	0	0	0	0	6000	
...	...	...	...	...	...	...	...	
609	LP002978	0	0	0	0	0	2900	
610	LP002979	1	1	3+	0	0	4106	
611	LP002983	1	1	1	0	0	8072	
612	LP002984	1	1	2	0	0	7583	
613	LP002990	0	0	0	0	1	4583	

614 rows × 13 columns

In [4]:
```
# Replace '3+' with 3 in Dependents column
data['Dependents'] = data['Dependents'].replace('3+', 3)
```

In [5]:
```
print(data.isnull().sum())
```

```
Loan_ID               0
Gender                0
Married               0
Dependents           15
Education             0
Self_Employed         0
ApplicantIncome       0
CoapplicantIncome     0
LoanAmount           22
Loan_Amount_Term     14
Credit_History       50
Property_Area         0
Loan_Status           0
dtype: int64
```

In [6]:
```
data['Dependents'] = pd.to_numeric(data['Dependents'])
```

In [7]:
```
numeric_cols = ['Dependents','LoanAmount', 'Loan_Amount_Term', 'Credit_History']
for col in numeric_cols:
    data[col].fillna(data[col].mean(), inplace=True)
```

In [8]:
```
print(data.isnull().sum())
```

```
Loan_ID              0
Gender               0
Married              0
Dependents           0
Education            0
Self_Employed        0
ApplicantIncome      0
CoapplicantIncome    0
LoanAmount           0
Loan_Amount_Term     0
Credit_History       0
Property_Area        0
Loan_Status          0
dtype: int64
```

In [9]:
```
X = data.drop(['Loan_ID', 'Loan_Status'], axis=1)
y = data['Loan_Status']
```

In [10]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_s
```

In [11]:
```
model = DecisionTreeClassifier()
model.fit(X_train, y_train)
```

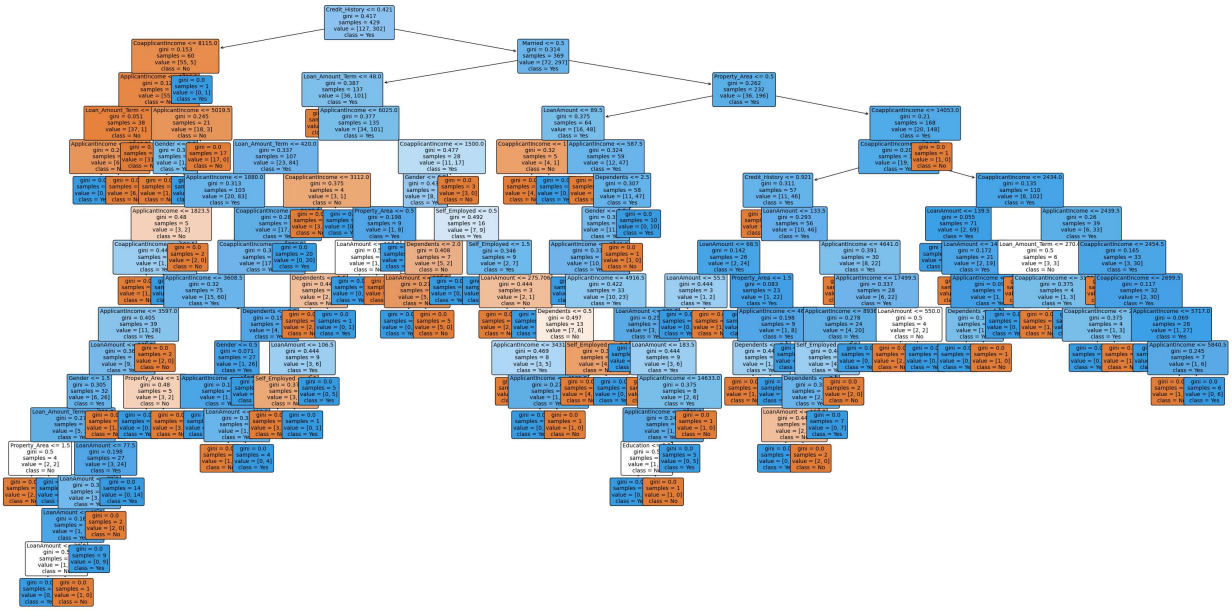
Out[11]:
```
DecisionTreeClassifier()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

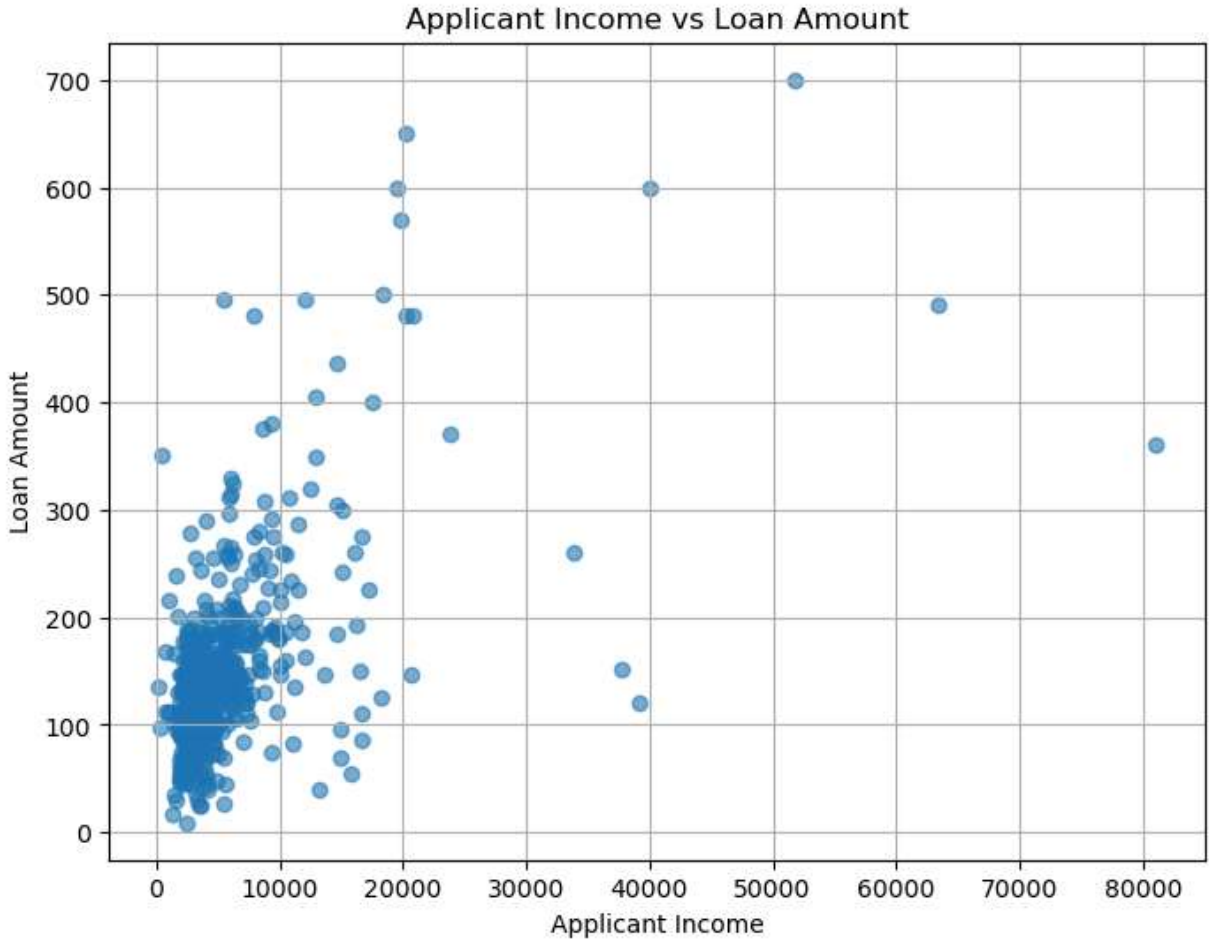
In [12]:
```
y_pred = model.predict(X_test)

print("Accuracy:", accuracy_score(y_test, y_pred)*100)
print("Classification Report:\n", classification_report(y_test, y_pred))
```

```
Accuracy: 65.94594594594595
Classification Report:
              precision    recall  f1-score   support

           0       0.52      0.52      0.52        65
           1       0.74      0.73      0.74       120

    accuracy                           0.66       185
   macro avg       0.63      0.63      0.63       185
weighted avg       0.66      0.66      0.66       185
```

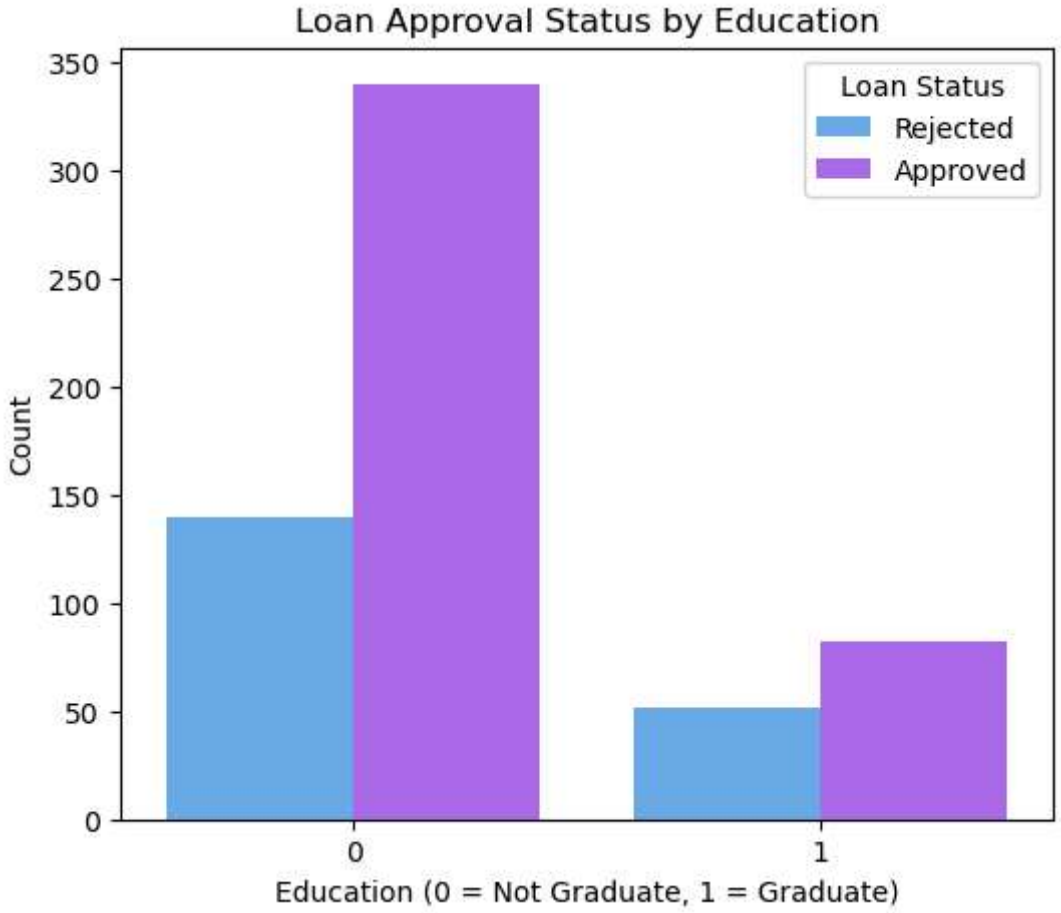
In [13]:
```
from sklearn import tree
import matplotlib.pyplot as plt

plt.figure(figsize=(40,20))
tree.plot_tree(model, feature_names=X.columns, class_names=['No', 'Yes'],filled=T
plt.show()
```



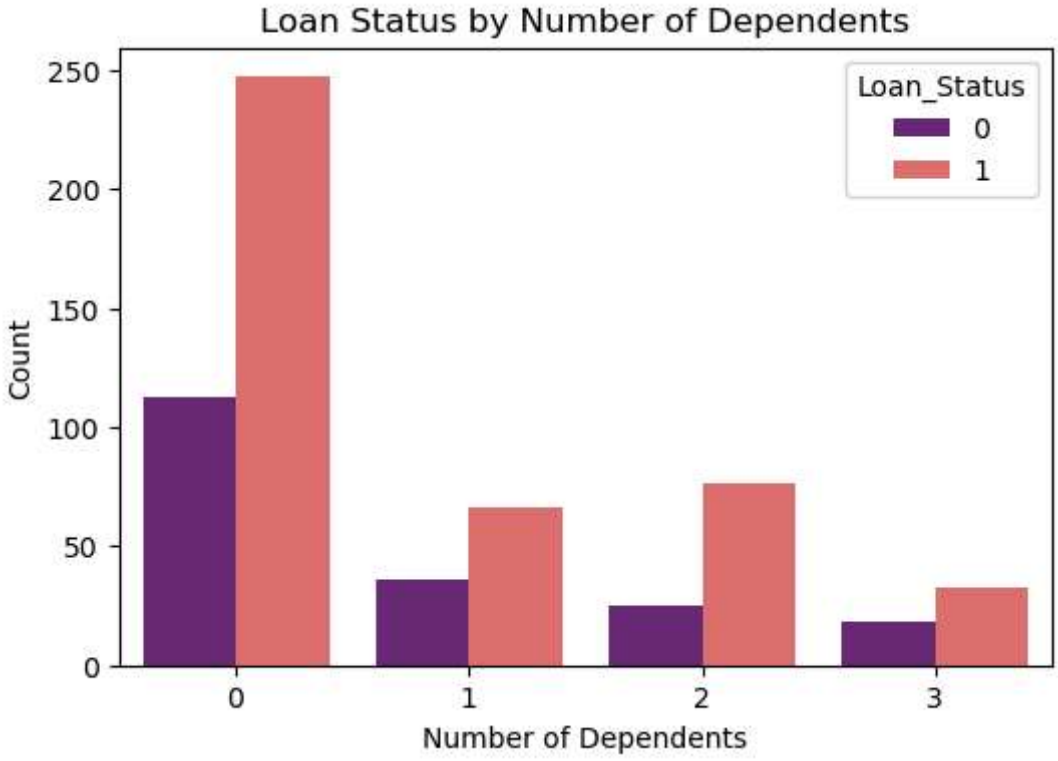
In [98]:
```
plt.figure(figsize=(8,6))
plt.scatter(data['ApplicantIncome'], data['LoanAmount'], alpha=0.6)
plt.xlabel('Applicant Income')
plt.ylabel('Loan Amount')
plt.title('Applicant Income vs Loan Amount')
plt.grid(True)
plt.show()
```



In [103]:
```
plt.figure(figsize=(6,5))
sns.countplot(data=data, x='Education', hue='Loan_Status', palette='cool')
plt.title('Loan Approval Status by Education')
plt.xlabel('Education (0 = Not Graduate, 1 = Graduate)')
plt.ylabel('Count')
plt.legend(title='Loan Status', labels=['Rejected', 'Approved'])
plt.show()
```



In [105]:
```
plt.figure(figsize=(6,4))
sns.countplot(x='Dependents', data=data, hue='Loan_Status', palette='magma')
plt.title('Loan Status by Number of Dependents')
plt.xlabel('Number of Dependents')
plt.ylabel('Count')
plt.show()
```



Logistic Regression

In [97]:
```
from sklearn.linear_model import LogisticRegression

lr_model = LogisticRegression(max_iter=1000)
lr_model.fit(X_train, y_train)
y_pred_lr = lr_model.predict(X_test)

print("Logistic Regression Accuracy:", accuracy_score(y_test, y_pred_lr)*100)
print("Logistic Regression Report:\n", classification_report(y_test, y_pred_lr))
```

```
Logistic Regression Accuracy: 78.37837837837837
Logistic Regression Report:
               precision    recall  f1-score   support

           0       0.93      0.42      0.57        65
           1       0.76      0.98      0.86       120

    accuracy                           0.78       185
   macro avg       0.84      0.70      0.71       185
weighted avg       0.82      0.78      0.76       185
```

In [ ]:
```

```