In [2]:

```
import pandas as pd
import numpy as np
import plotly.express as px
import plotly.graph_objects as go
import plotly.io as pio
pio.templates.default = "plotly_white"

data = pd.read_csv("train.csv")
print(data.head())
```

```
     ID  Customer_ID  Month           Name   Age          SSN Occupation  \
0  5634         3392      1  Aaron Maashoh  23.0  821000265.0  Scientist   
1  5635         3392      2  Aaron Maashoh  23.0  821000265.0  Scientist   
2  5636         3392      3  Aaron Maashoh  23.0  821000265.0  Scientist   
3  5637         3392      4  Aaron Maashoh  23.0  821000265.0  Scientist   
4  5638         3392      5  Aaron Maashoh  23.0  821000265.0  Scientist   

   Annual_Income  Monthly_Inhand_Salary  Num_Bank_Accounts  ...  Credit_Mix  \
0       19114.12            1824.843333                3.0  ...        Good   
1       19114.12            1824.843333                3.0  ...        Good   
2       19114.12            1824.843333                3.0  ...        Good   
3       19114.12            1824.843333                3.0  ...        Good   
4       19114.12            1824.843333                3.0  ...        Good   

   Outstanding_Debt  Credit_Utilization_Ratio Credit_History_Age  \
0            809.98                 26.822620              265.0   
1            809.98                 31.944960              266.0   
2            809.98                 28.609352              267.0   
3            809.98                 31.377862              268.0   
4            809.98                 24.797347              269.0   

   Payment_of_Min_Amount  Total_EMI_per_month  Amount_invested_monthly  \
0                     No            49.574949                 21.46538   
1                     No            49.574949                 21.46538   
2                     No            49.574949                 21.46538   
3                     No            49.574949                 21.46538   
4                     No            49.574949                 21.46538   

                  Payment_Behaviour Monthly_Balance  Credit_Score
0   High_spent_Small_value_payments       312.494089          Good
1    Low_spent_Large_value_payments       284.629162          Good
2   Low_spent_Medium_value_payments       331.209863          Good
3    Low_spent_Small_value_payments       223.451310          Good
4  High_spent_Medium_value_payments       341.489231          Good

[5 rows x 28 columns]
```

In [3]:
```
print(data.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100000 entries, 0 to 99999
Data columns (total 28 columns):
 #   Column                    Non-Null Count   Dtype  
---  ------                    --------------   -----  
 0   ID                        100000 non-null  int64  
 1   Customer_ID               100000 non-null  int64  
 2   Month                     100000 non-null  int64  
 3   Name                      100000 non-null  object 
 4   Age                       100000 non-null  float64
 5   SSN                       100000 non-null  float64
 6   Occupation                100000 non-null  object 
 7   Annual_Income             100000 non-null  float64
 8   Monthly_Inhand_Salary     100000 non-null  float64
 9   Num_Bank_Accounts         100000 non-null  float64
 10  Num_Credit_Card           100000 non-null  float64
 11  Interest_Rate             100000 non-null  float64
 12  Num_of_Loan               100000 non-null  float64
 13  Type_of_Loan              100000 non-null  object 
 14  Delay_from_due_date       100000 non-null  float64
 15  Num_of_Delayed_Payment    100000 non-null  float64
 16  Changed_Credit_Limit      100000 non-null  float64
 17  Num_Credit_Inquiries      100000 non-null  float64
 18  Credit_Mix                100000 non-null  object 
 19  Outstanding_Debt          100000 non-null  float64
 20  Credit_Utilization_Ratio  100000 non-null  float64
 21  Credit_History_Age        100000 non-null  float64
 22  Payment_of_Min_Amount     100000 non-null  object 
 23  Total_EMI_per_month       100000 non-null  float64
 24  Amount_invested_monthly   100000 non-null  float64
 25  Payment_Behaviour         100000 non-null  object 
 26  Monthly_Balance           100000 non-null  float64
 27  Credit_Score              100000 non-null  object 
dtypes: float64(18), int64(3), object(7)
memory usage: 21.4+ MB
None
```

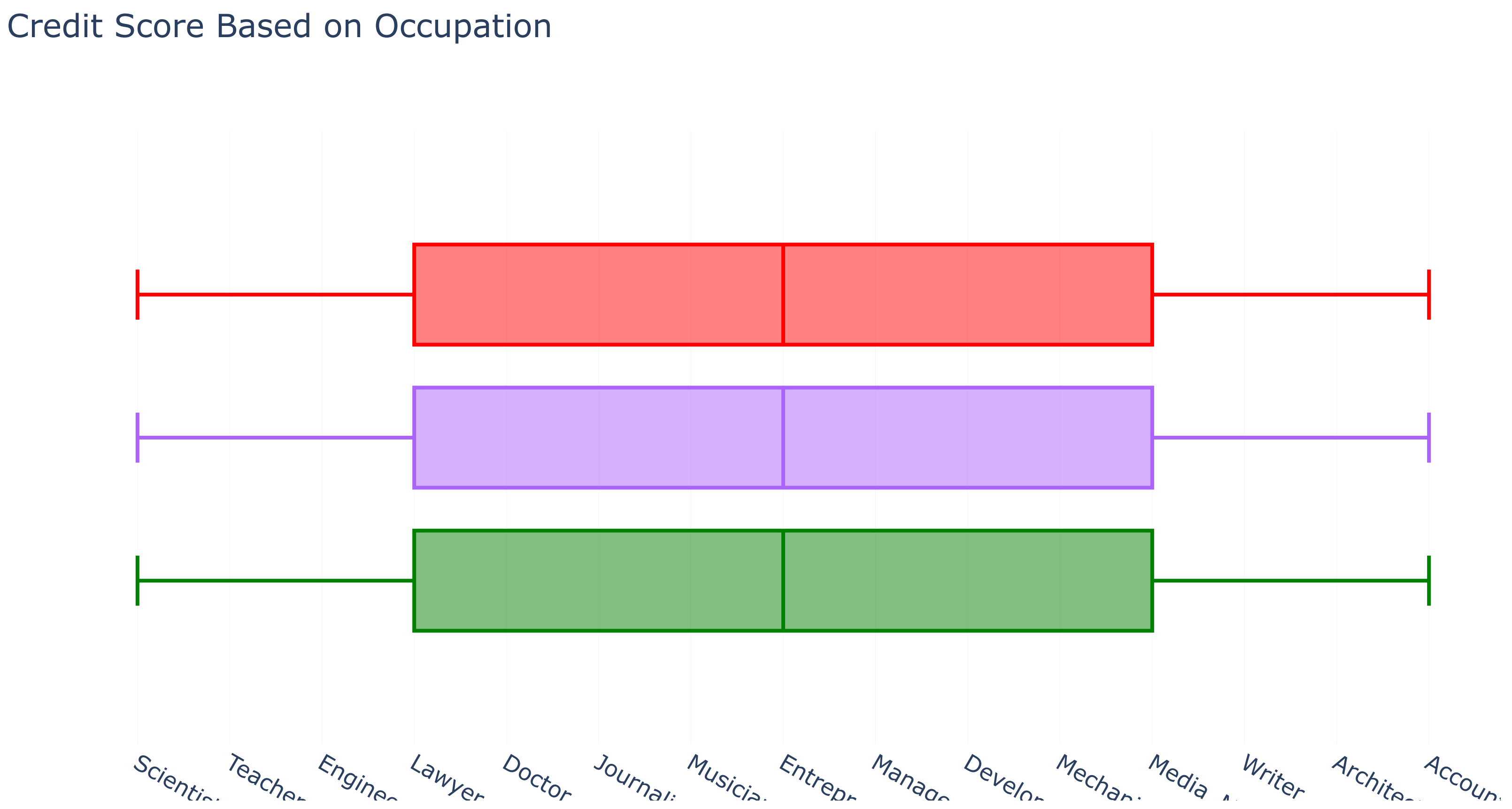
In [4]:
```
print(data.isnull().sum())
```

```
ID                          0
Customer_ID                 0
Month                       0
Name                        0
Age                         0
SSN                         0
Occupation                  0
Annual_Income               0
Monthly_Inhand_Salary       0
Num_Bank_Accounts           0
Num_Credit_Card             0
Interest_Rate               0
Num_of_Loan                 0
Type_of_Loan                0
Delay_from_due_date         0
Num_of_Delayed_Payment      0
Changed_Credit_Limit        0
Num_Credit_Inquiries        0
Credit_Mix                  0
Outstanding_Debt            0
Credit_Utilization_Ratio    0
Credit_History_Age          0
Payment_of_Min_Amount       0
Total_EMI_per_month         0
Amount_invested_monthly     0
Payment_Behaviour           0
Monthly_Balance             0
Credit_Score                0
dtype: int64
```

In [5]:
```
data["Credit_Score"].value_counts()
```

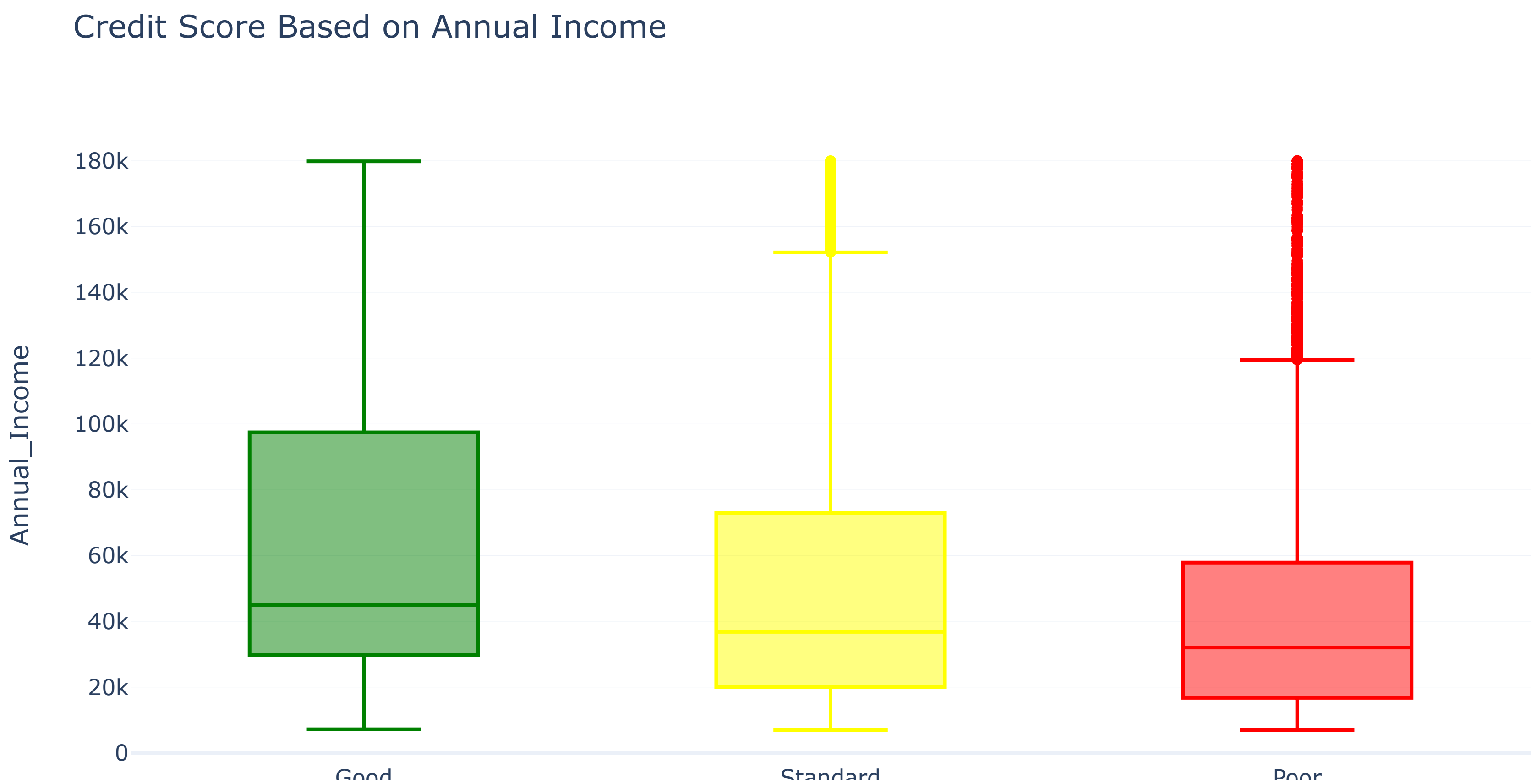
Out[5]:
```
Credit_Score
Standard    53174
Poor        28998
Good        17828
Name: count, dtype: int64
```

In [6]:
```
fig = px.box(data,
            x="Occupation",
            color="Credit_Score",
            title="Credit Score Based on Occupation",
            color_discrete_map={'Poor' : 'red',
                                'Stendard' : 'yellow',
                                'Good' : 'green'})
fig.show()
```

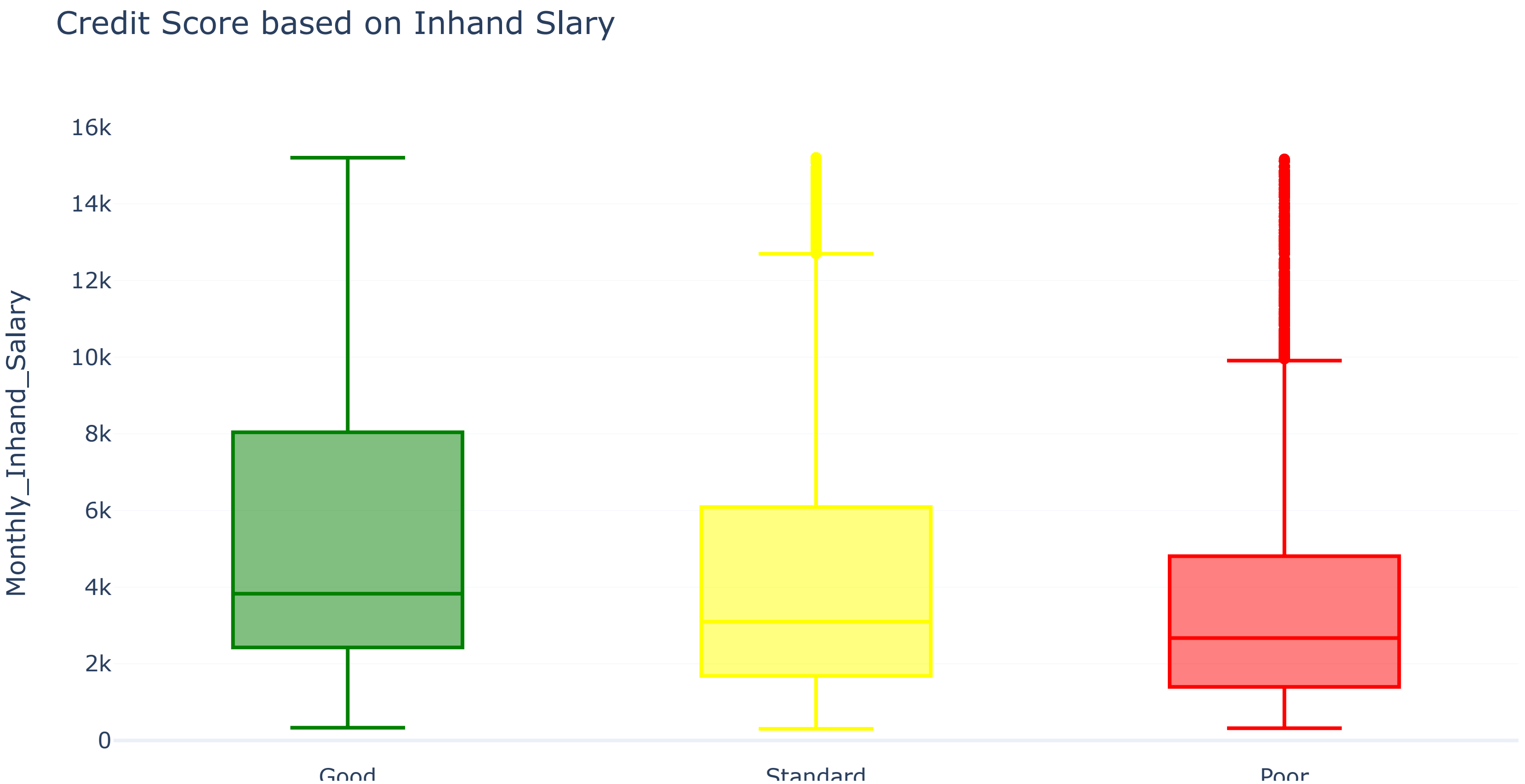


In [7]:

```
fig = px.box(data,
             x='Credit_Score',
             y='Annual_Income',
             color='Credit_Score',
             title="Credit Score Based on Annual Income",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod='exclusive')
fig.show()
```

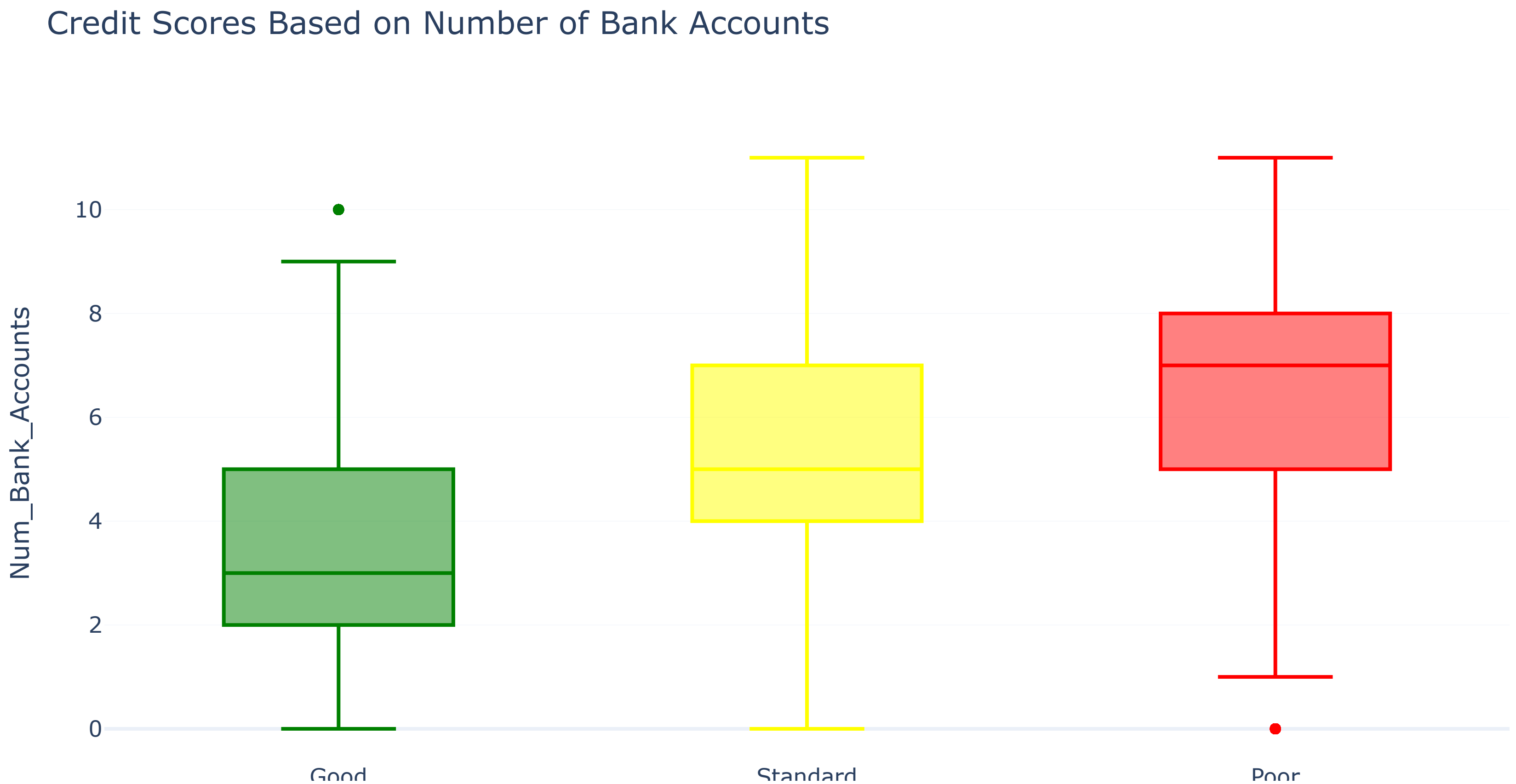

Credit Score Based on Annual Income
Annual_Income
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Good
Standard
Poor

```
In [8]: fig = px.box(data,
                     x='Credit_Score',
                     y='Monthly_Inhand_Salary',
                     color='Credit_Score',
                     title='Credit Score based on Inhand Slary',
                     color_discrete_map={'Poor':'red',
                                         'Standard':'yellow',
                                         'Good':'green'})
        fig.update_traces(quartilemethod="exclusive")
        fig.show()
```

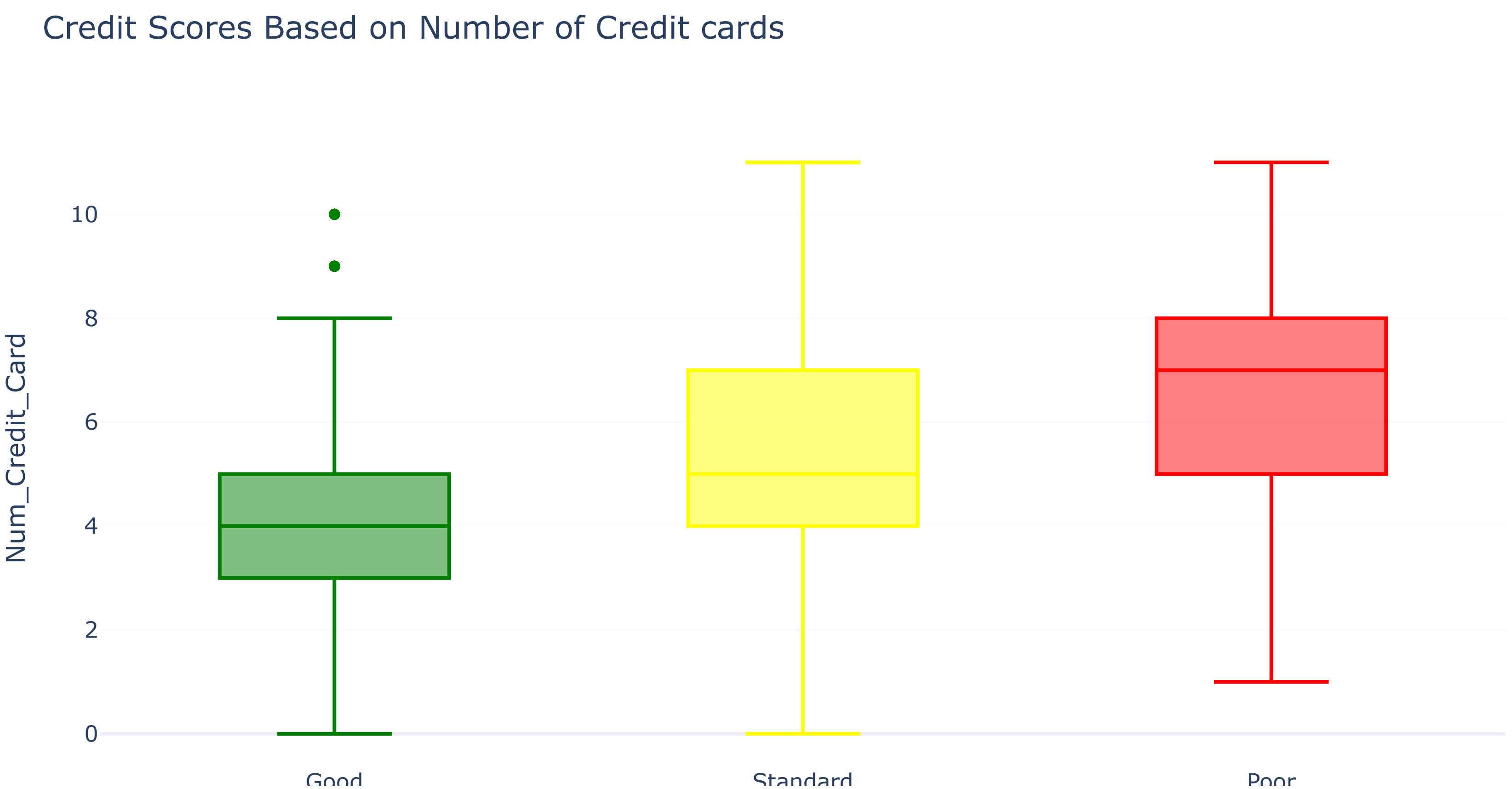

Credit Score based on Inhand Slary

In [9]:

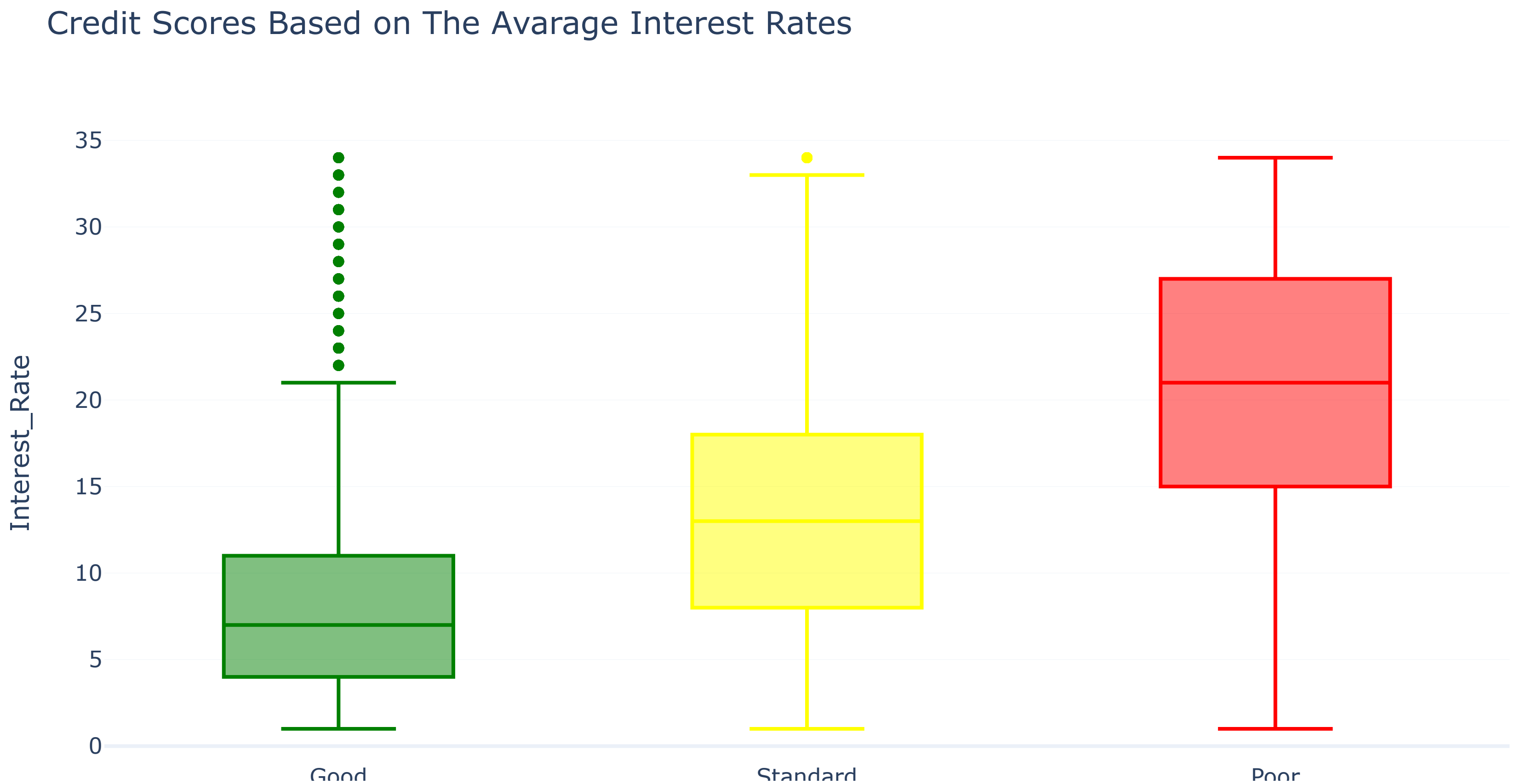
```
fig = px.box(data,
             x="Credit_Score",
             y="Num_Bank_Accounts",
             color="Credit_Score",
             title="Credit Scores Based on Number of Bank Accounts",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```



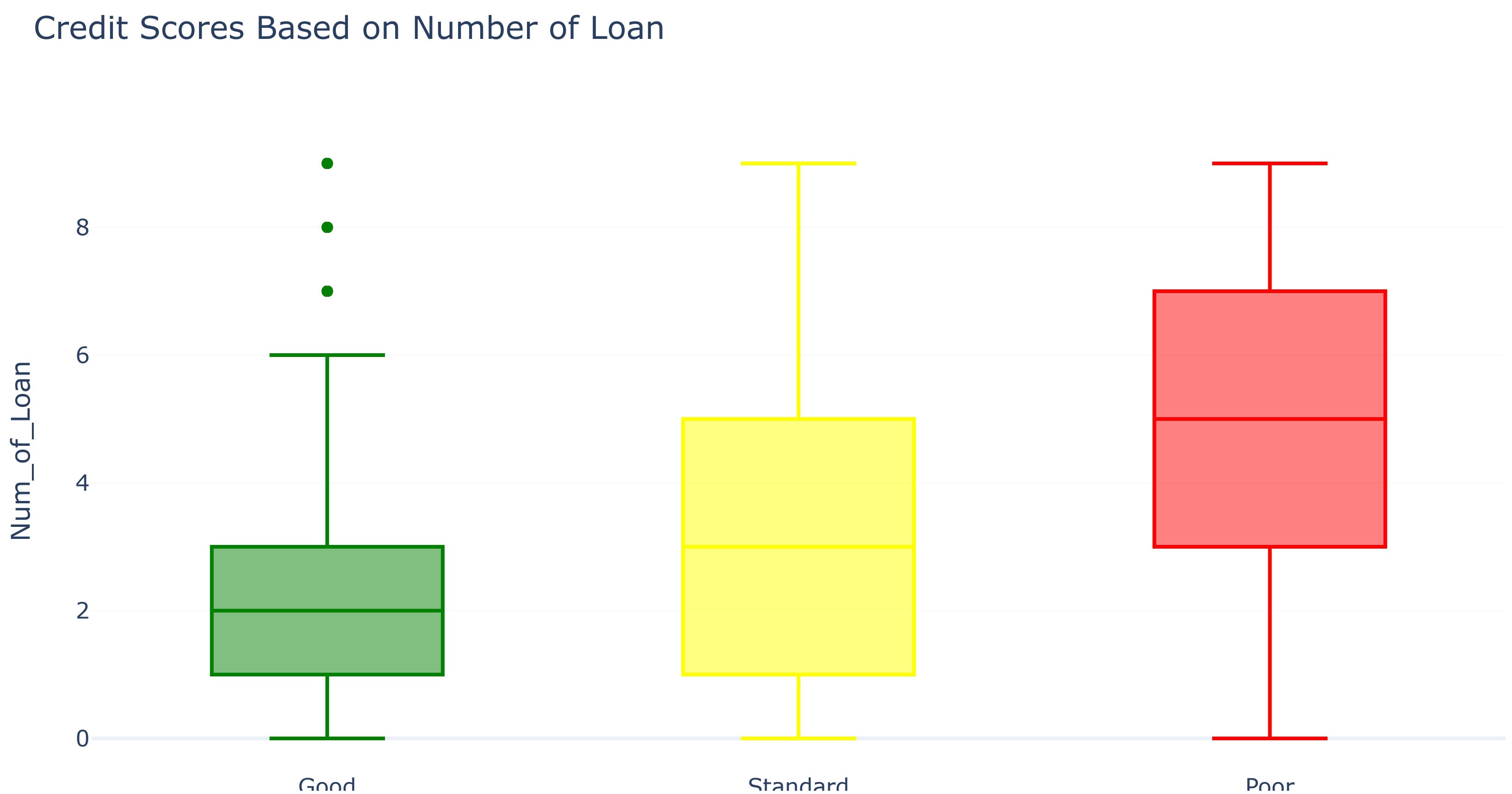
In [10]:
```
fig = px.box(data,
             x="Credit_Score",
             y="Num_Credit_Card",
             color="Credit_Score",
             title="Credit Scores Based on Number of Credit cards",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```



In [11]:
```
fig = px.box(data,
             x="Credit_Score",
             y="Interest_Rate",
             color="Credit_Score",
             title="Credit Scores Based on The Avarage Interest Rates",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```

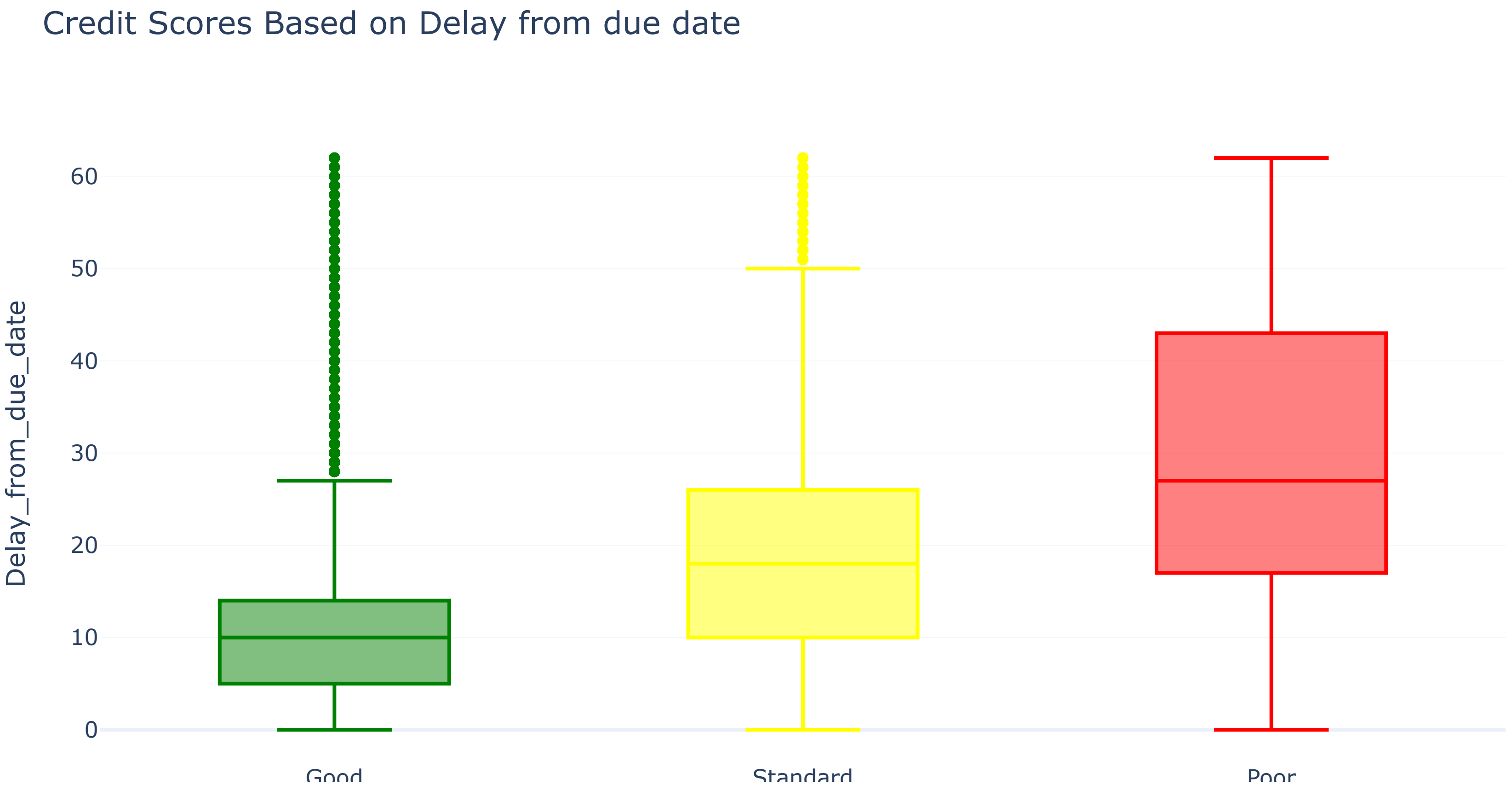


In [12]:
```
fig = px.box(data,
             x="Credit_Score",
             y="Num_of_Loan",
             color="Credit_Score",
             title="Credit Scores Based on Number of Loan",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```

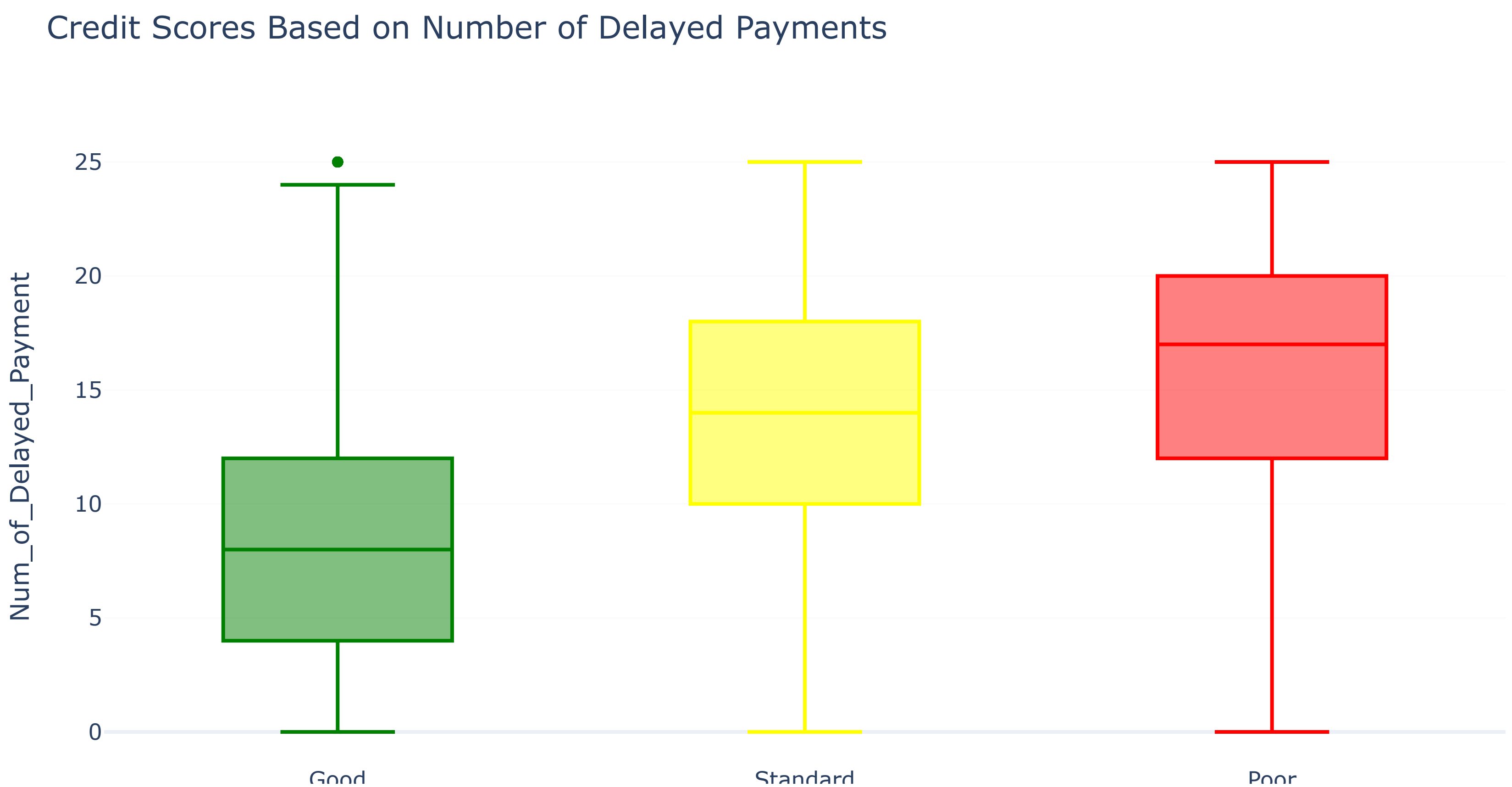


In [13]:

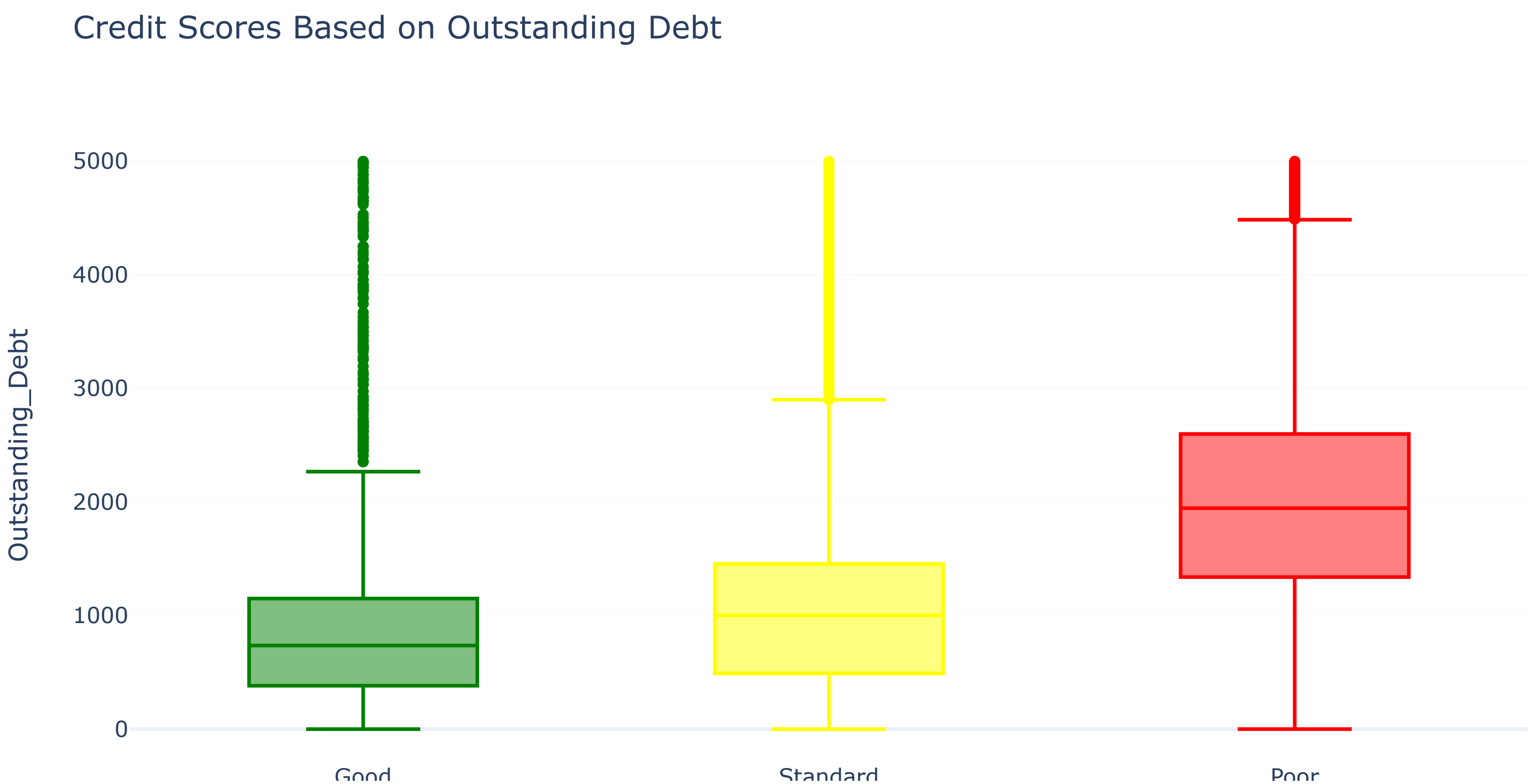
```
fig = px.box(data,
             x="Credit_Score",
             y="Delay_from_due_date",
             color="Credit_Score",
             title="Credit Scores Based on Delay from due date",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```



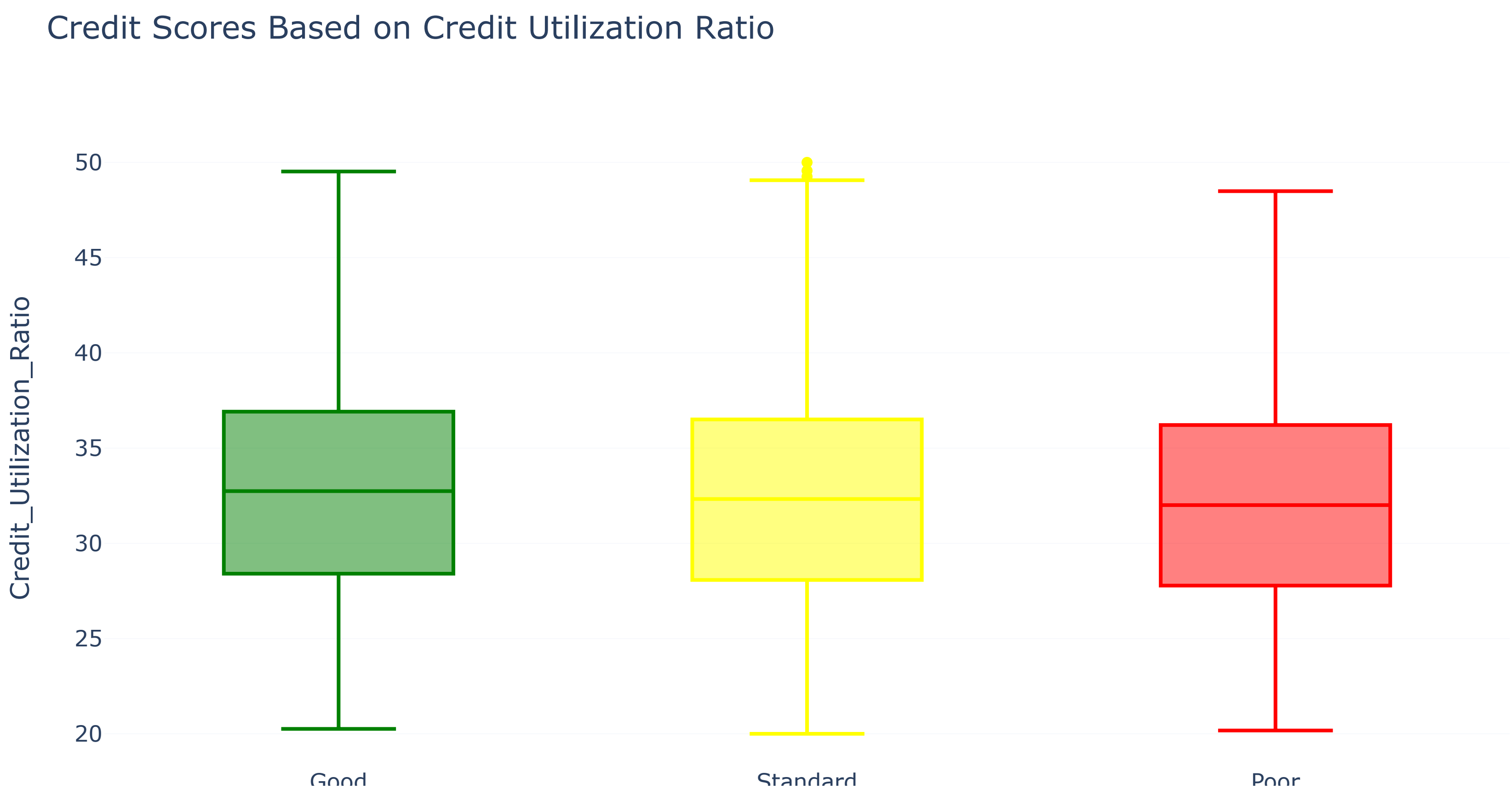
```
In [14]: fig = px.box(data,
                      x="Credit_Score",
                      y="Num_of_Delayed_Payment",
                      color="Credit_Score",
                      title="Credit Scores Based on Number of Delayed Payments",
                      color_discrete_map={'Poor':'red',
                                          'Standard':'yellow',
                                          'Good':'green'})
         fig.update_traces(quartilemethod="exclusive")
         fig.show()
```



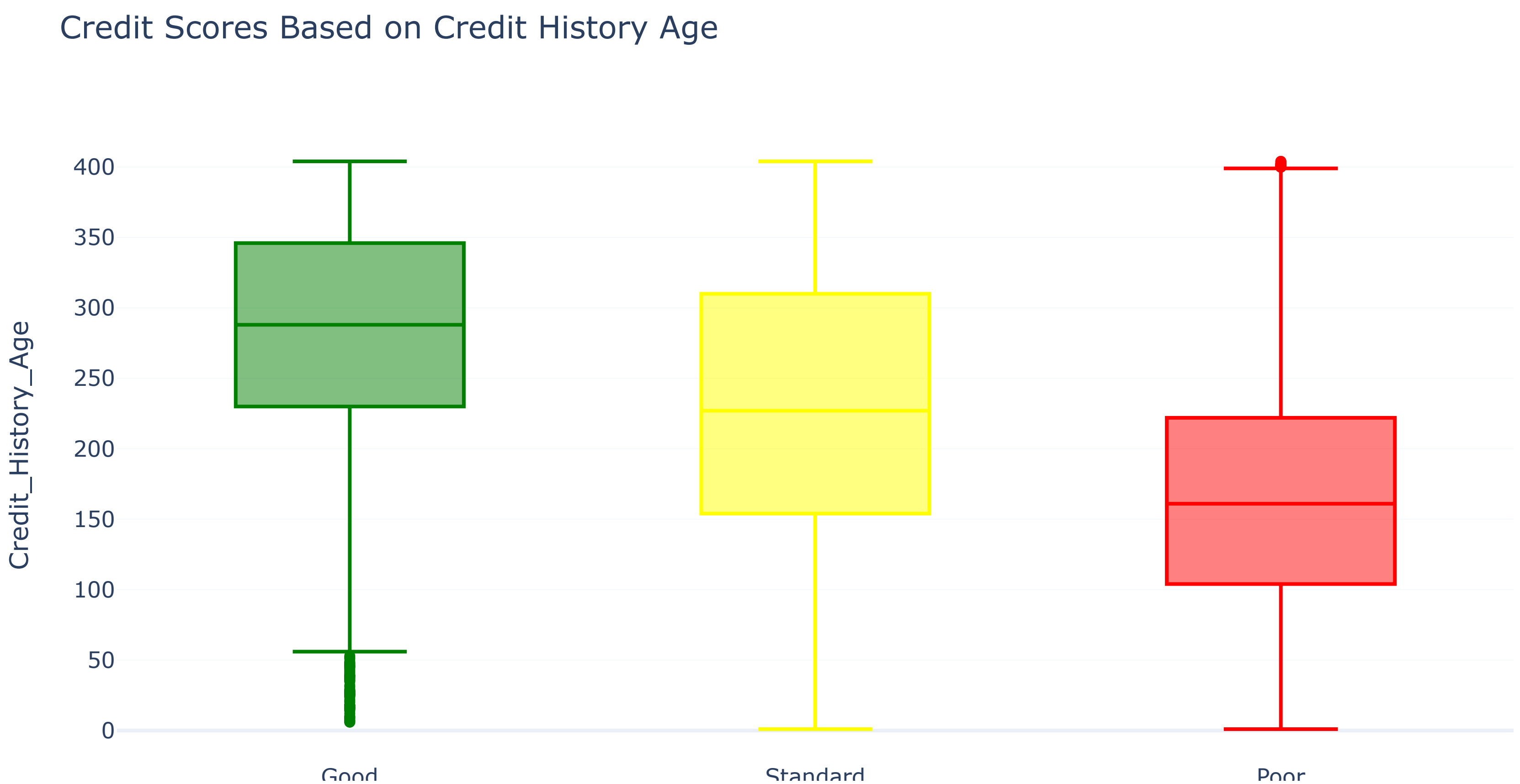
In [15]:
```
fig = px.box(data,
             x="Credit_Score",
             y="Outstanding_Debt",
             color="Credit_Score",
             title="Credit Scores Based on Outstanding Debt",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```



```
In [16]: fig = px.box(data,
                      x="Credit_Score",
                      y="Credit_Utilization_Ratio",
                      color="Credit_Score",
                      title="Credit Scores Based on Credit Utilization Ratio",
                      color_discrete_map={'Poor':'red',
                                          'Standard':'yellow',
                                          'Good':'green'})
         fig.update_traces(quartilemethod="exclusive")
         fig.show()
```

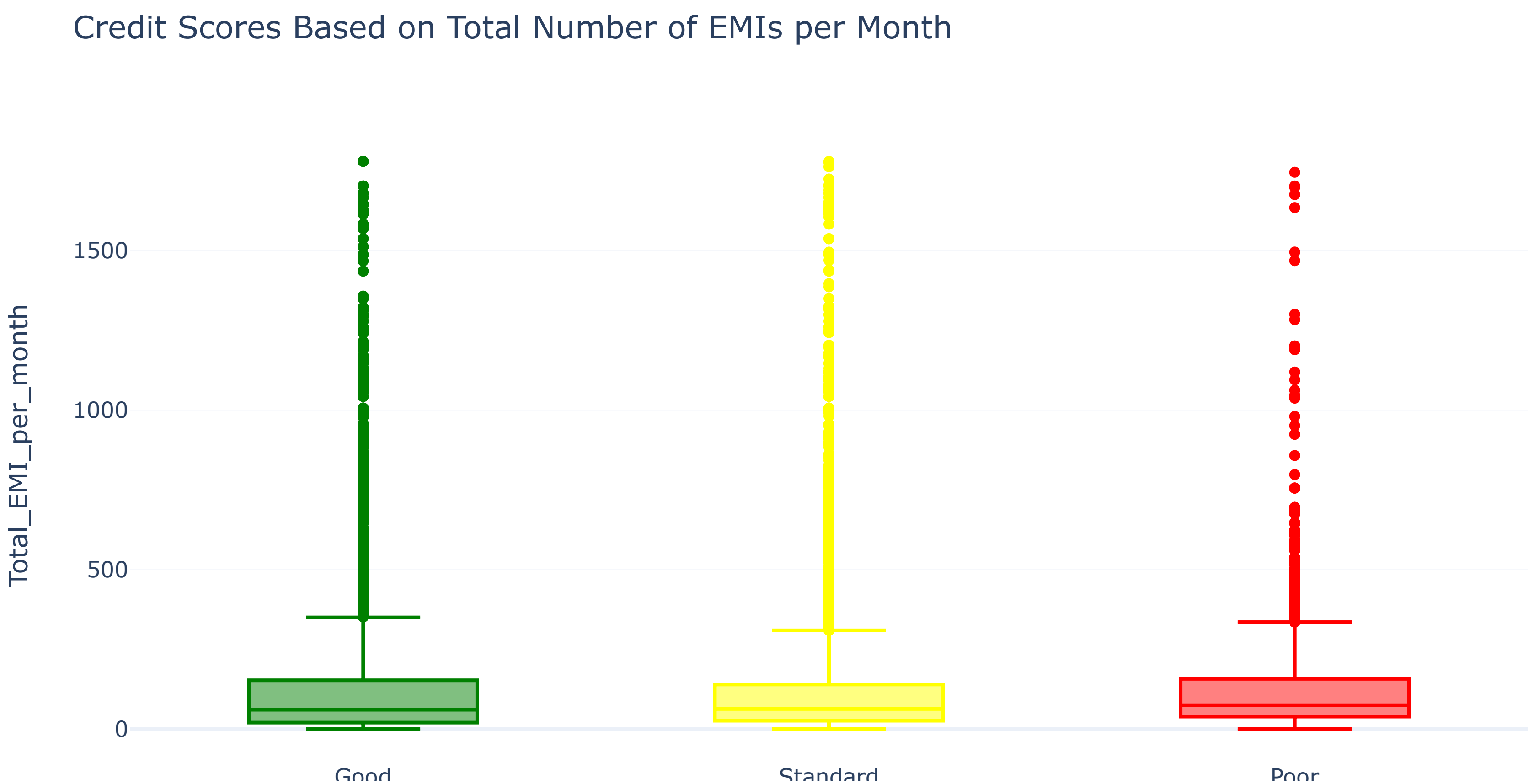


In [17]:
```
fig = px.box(data,
             x="Credit_Score",
             y="Credit_History_Age",
             color="Credit_Score",
             title="Credit Scores Based on Credit History Age",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```

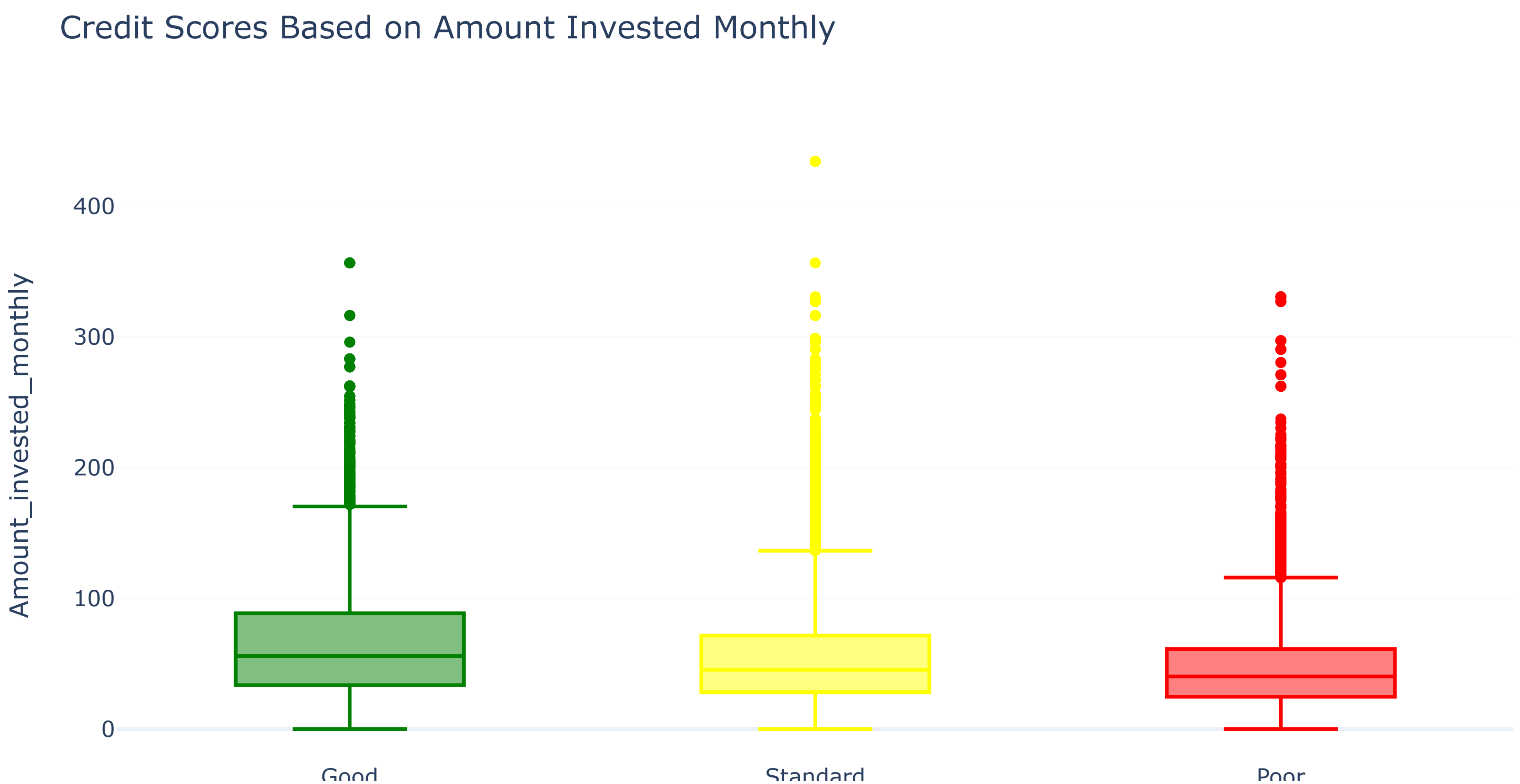


In [18]:

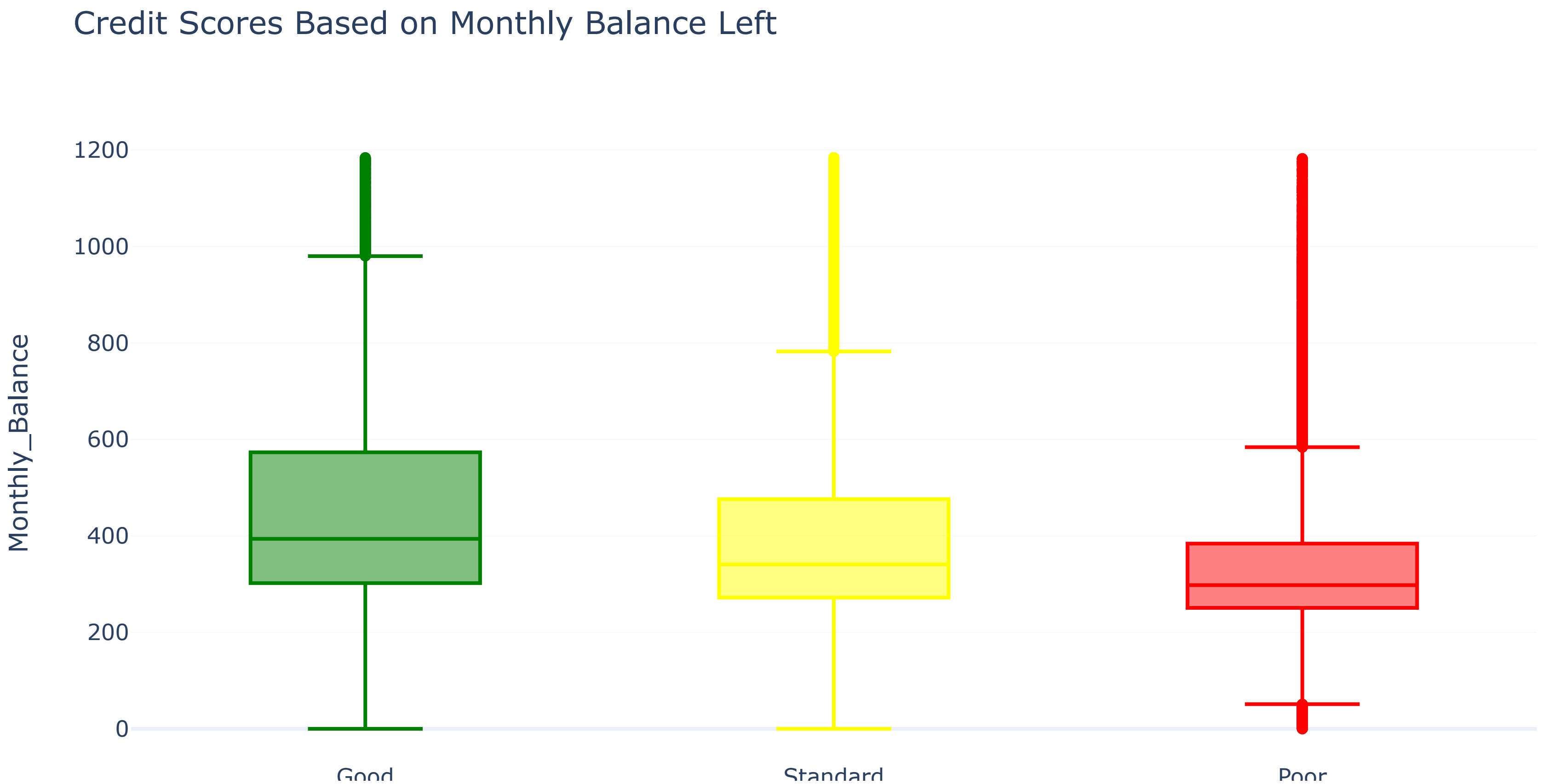
```
fig = px.box(data,
             x="Credit_Score",
             y="Total_EMI_per_month",
             color="Credit_Score",
             title="Credit Scores Based on Total Number of EMIs per Month",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```



In [19]:
```
fig = px.box(data,
             x="Credit_Score",
             y="Amount_invested_monthly",
             color="Credit_Score",
             title="Credit Scores Based on Amount Invested Monthly",
             color_discrete_map={'Poor':'red',
                                 'Standard':'yellow',
                                 'Good':'green'})
fig.update_traces(quartilemethod="exclusive")
fig.show()
```



```
In [20]: fig = px.box(data,
                      x="Credit_Score",
                      y="Monthly_Balance",
                      color="Credit_Score",
                      title="Credit Scores Based on Monthly Balance Left",
                      color_discrete_map={'Poor':'red',
                                          'Standard':'yellow',
                                          'Good':'green'})
         fig.update_traces(quartilemethod="exclusive")
         fig.show()
```



In [21]:

```
data["Credit_Mix"] = data["Credit_Mix"].map({'Standard':1,
                                             'Good':2,
                                             "Bad":0})
```

In [22]:

```
from sklearn.model_selection import train_test_split
x = np.array(data[["Annual_Income", "Monthly_Inhand_Salary",
                   "Num_Bank_Accounts", "Num_Credit_Card",
                   "Interest_Rate", "Num_of_Loan",
                   "Delay_from_due_date", "Num_of_Delayed_Payment",
                   "Credit_Mix", "Outstanding_Debt",
                   "Credit_History_Age", "Monthly_Balance"]])
y = np.array(data[["Credit_Score"]])
y = np.ravel(y)
```

In [23]:

```
xtrain, xtest, ytrain, ytest = train_test_split(x,y,
                                                test_size=0.33,
                                                random_state=42)
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier()
model.fit(xtrain, ytrain)
```

Out[23]:

```
▾ RandomForestClassifier
RandomForestClassifier()
```

In [*]:

```
print("Credit Score Prediction : ")
a = float(input("Annual Income: "))
b = float(input("Monthly Inhand Salary: "))
c = float(input("Number of Bank Accounts: "))
d = float(input("Number of Credit cards: "))
e = float(input("Interest rate: "))
f = float(input("Number of Loans: "))
g = float(input("Average number of days delayed by the person: "))
h = float(input("Number of delayed payments: "))
i = input("Credit Mix (Bad: 0, Standard: 1, Good: 3) : ")
j = float(input("Outstanding Debt: "))
k = float(input("Credit History Age: "))
l = float(input("Monthly Balance: "))

features = np.array([[a, b, c, d, e, f, g, h, i, j, k, l]])
print("Predicted Credit Score = ", model.predict(features))
```

In [ ]:

In [ ]: