

Bad Credit Prevention

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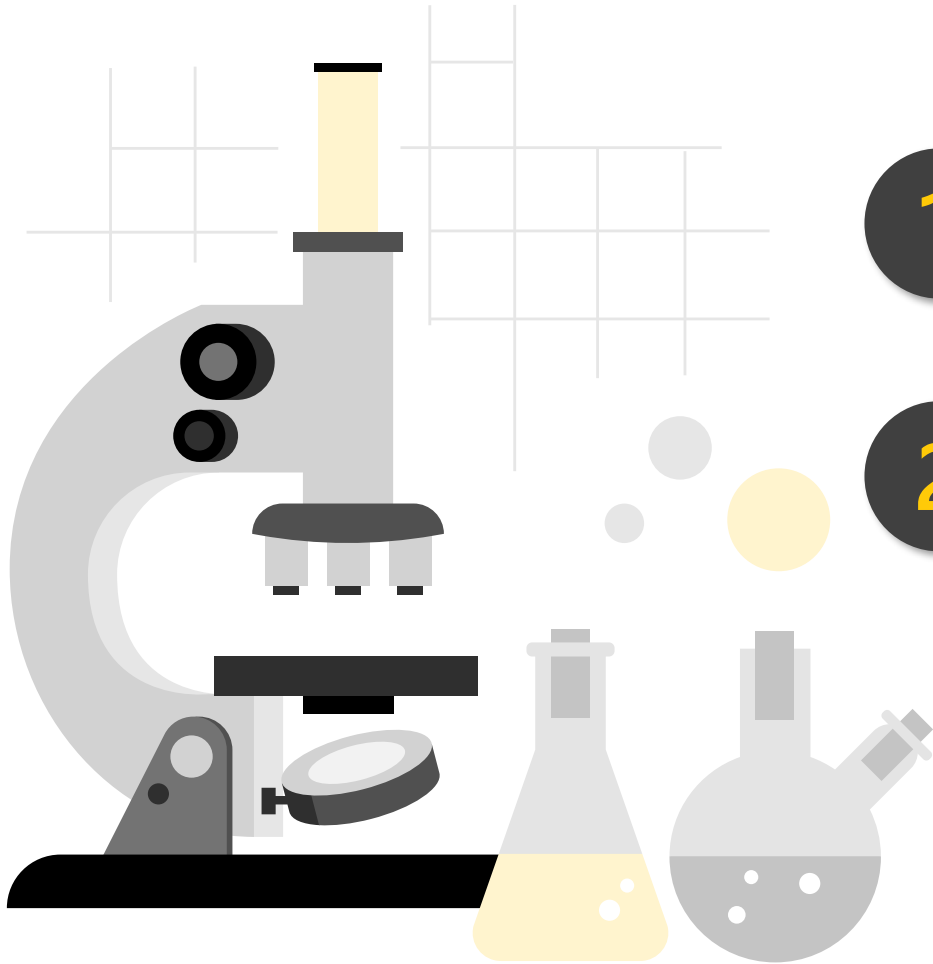
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Objective

What we are looking for



Objective



1

What does a **Poor credit scorer** look like?

2

What can we do to **avoid low** credit scoring customers?

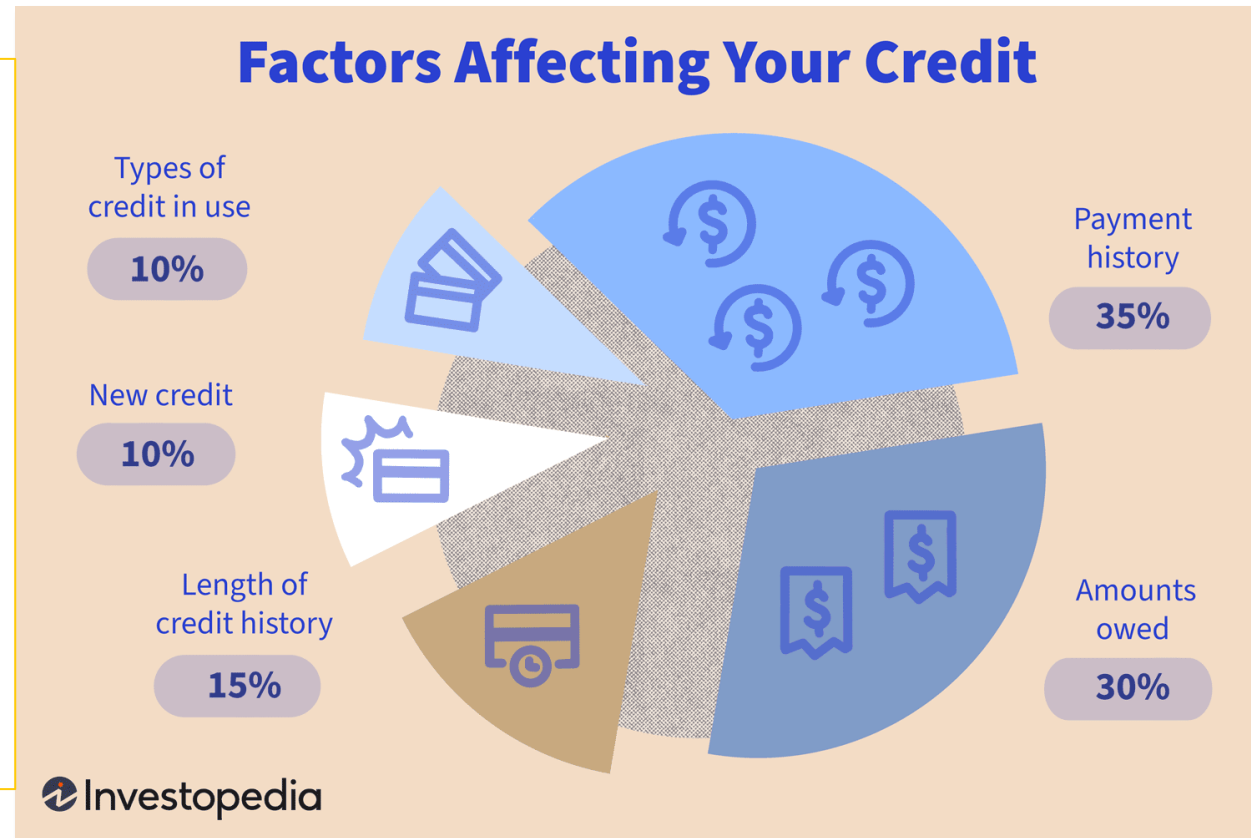
Analysis

What we found



FICO Score 8

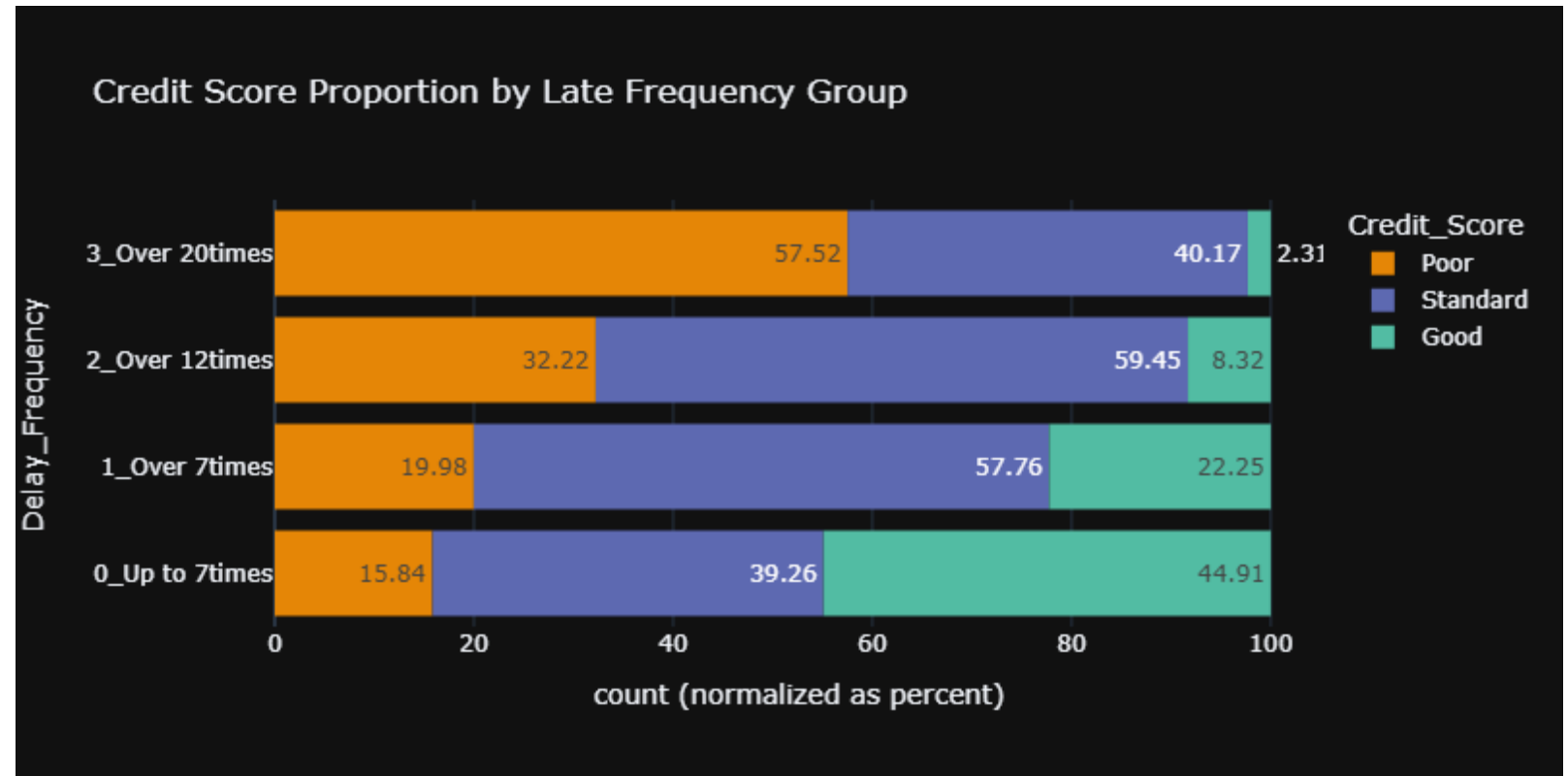
1. Late Payment
2. Loans Amount & Types
3. Credit Age
4. Payment Behavior
5. Income
6. Age



<https://www.investopedia.com/articles/pf/10/credit-score-factors.asp>

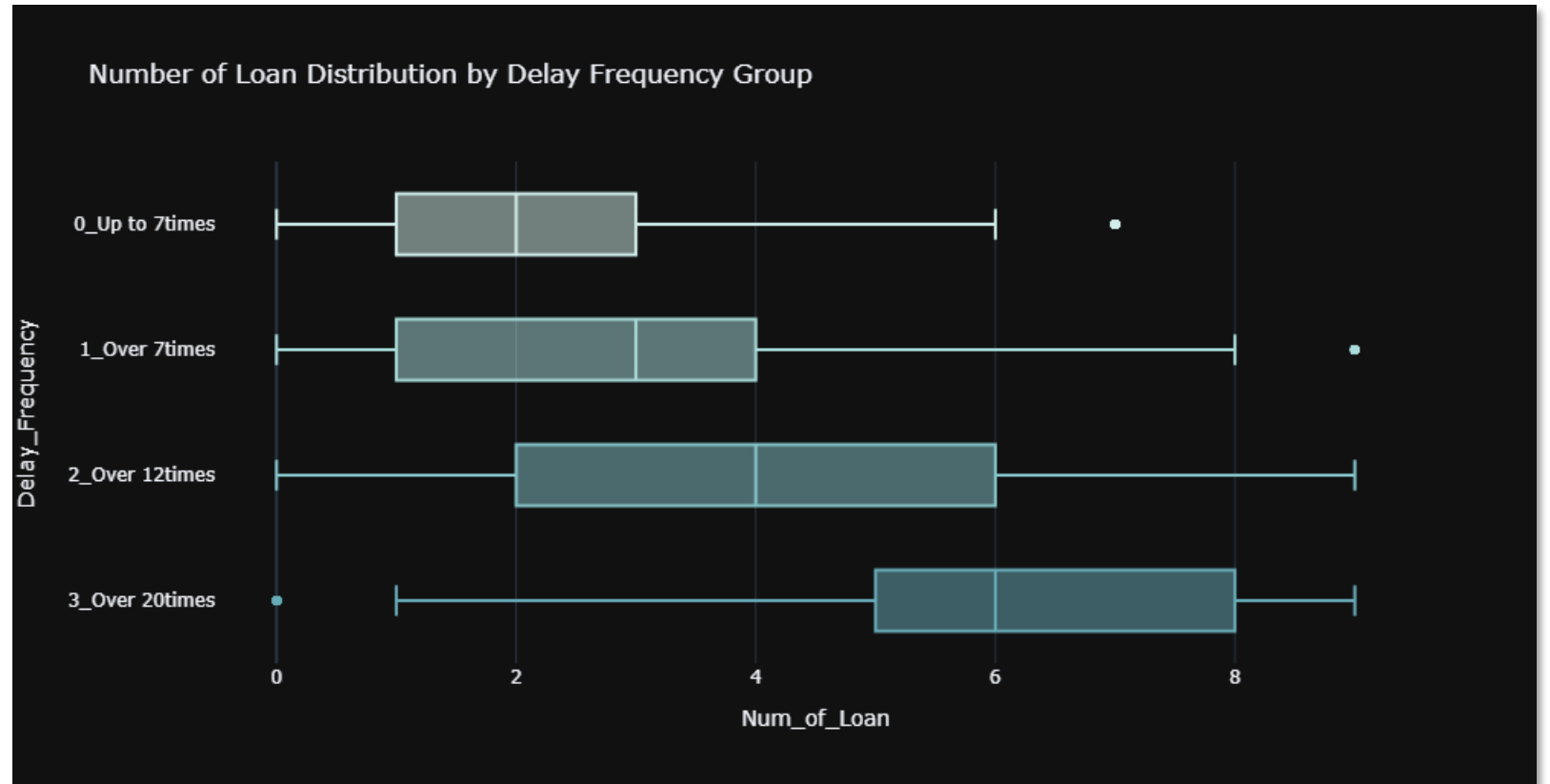
Late Frequency

- **Negative Correlation** between Credit Score and late debt payment.
 - Poor scorer increase when late over **12 times**.
- Auto-pay, change due date and refinance.



Late Frequency

- **More** loans means more **late** payment.
- Late payment is **dependent** on number of loans.



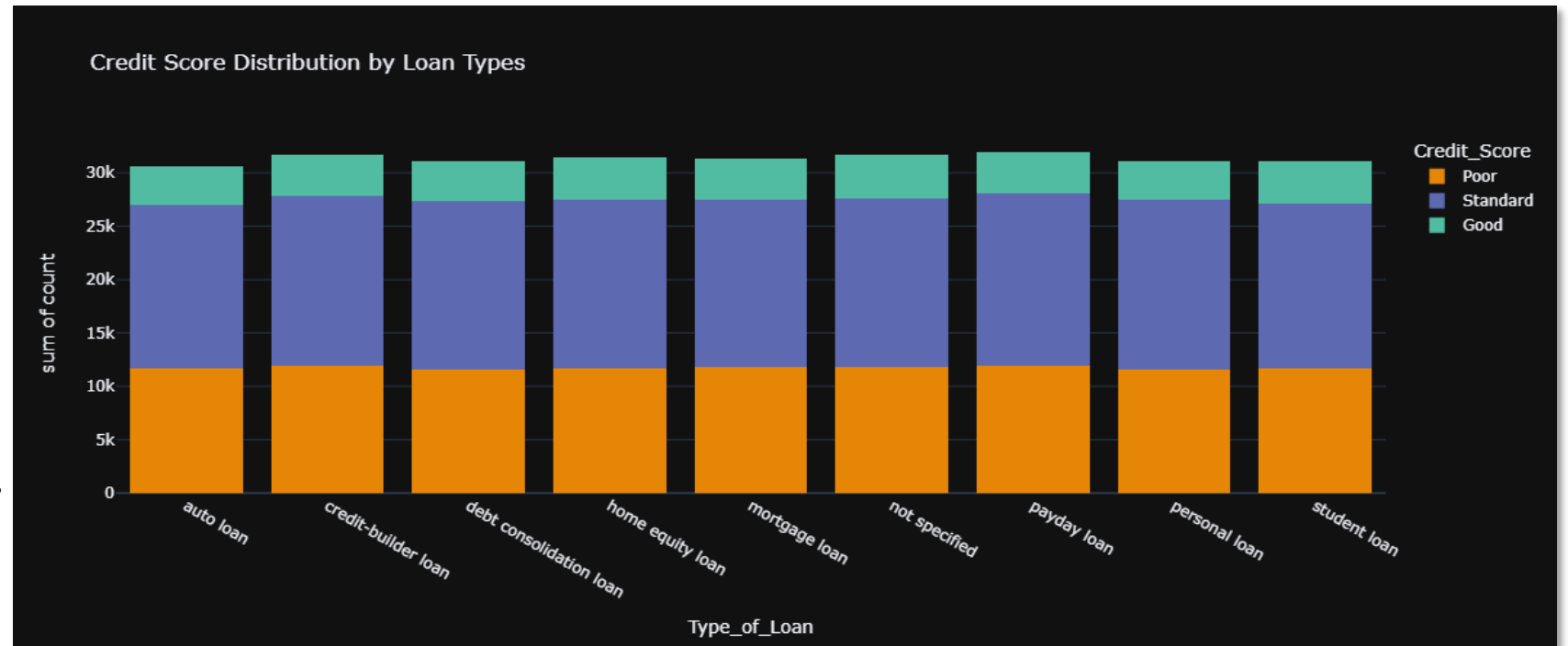
Loans

- **Large** number of loans correlates with **lower** Credit Scores.
 - Risk in ability to pay and on time.
- No more than around 3 loans.



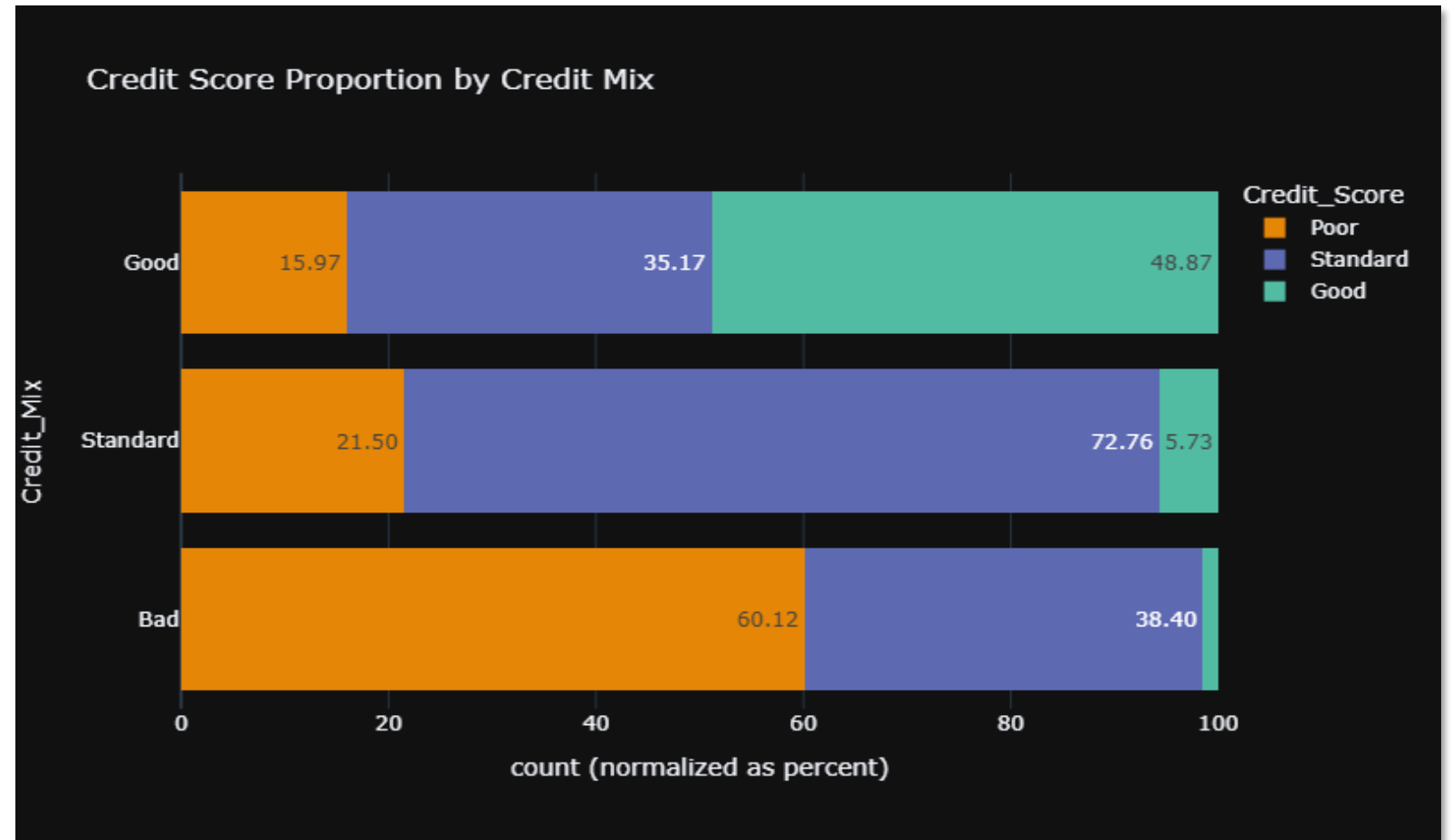
Loan Types

- **No correlation** between Loan types and Credit Score.
- E.g., Personal loans are usually unsecured.



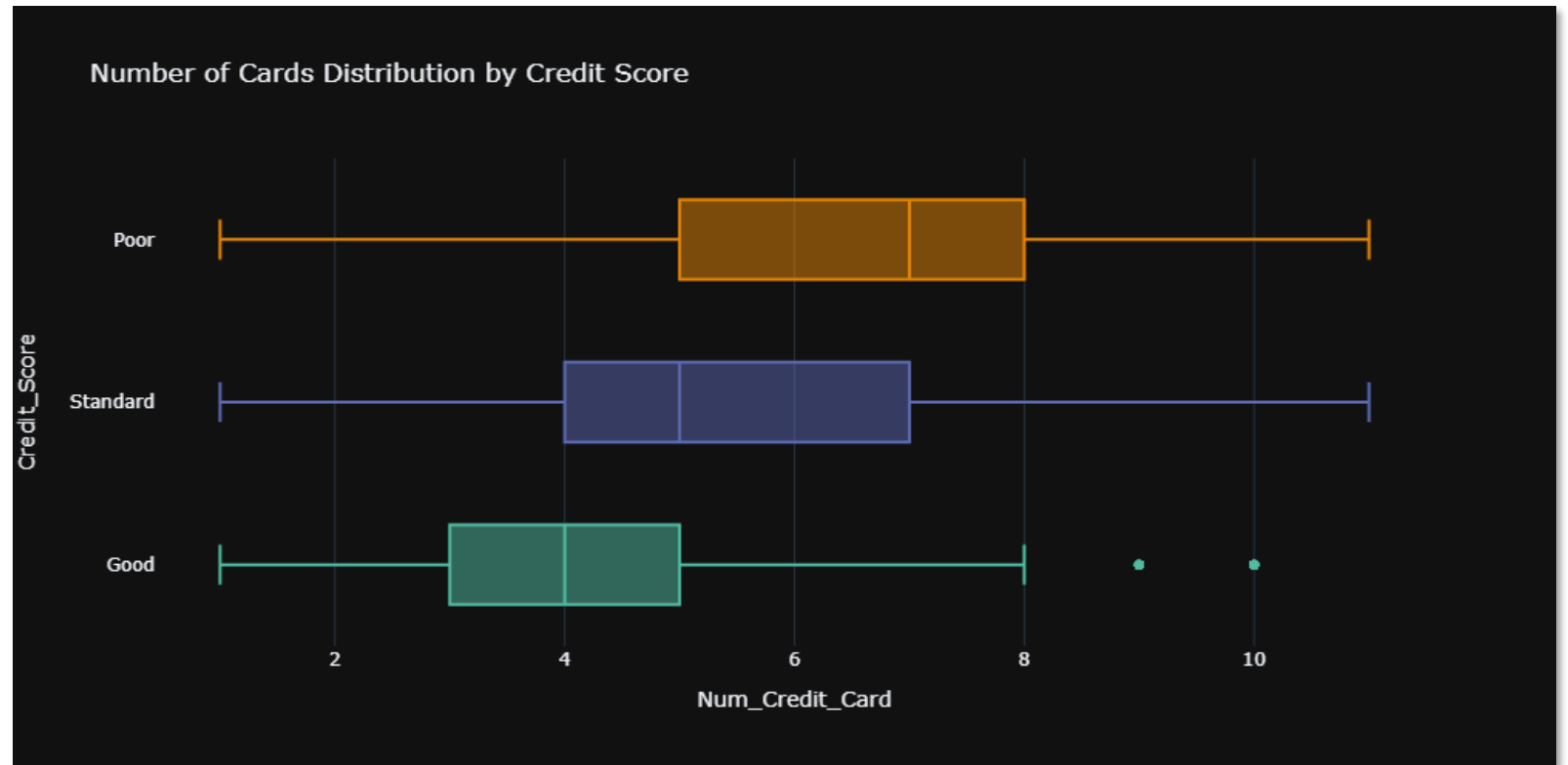
Credit Mix

- **Greater** Credit Mix are like to have **better** Scores.
 - Shows ability to manage different accounts.
- Incentivize loans for different purposes (e.g., business loan discount for high value mortgage).



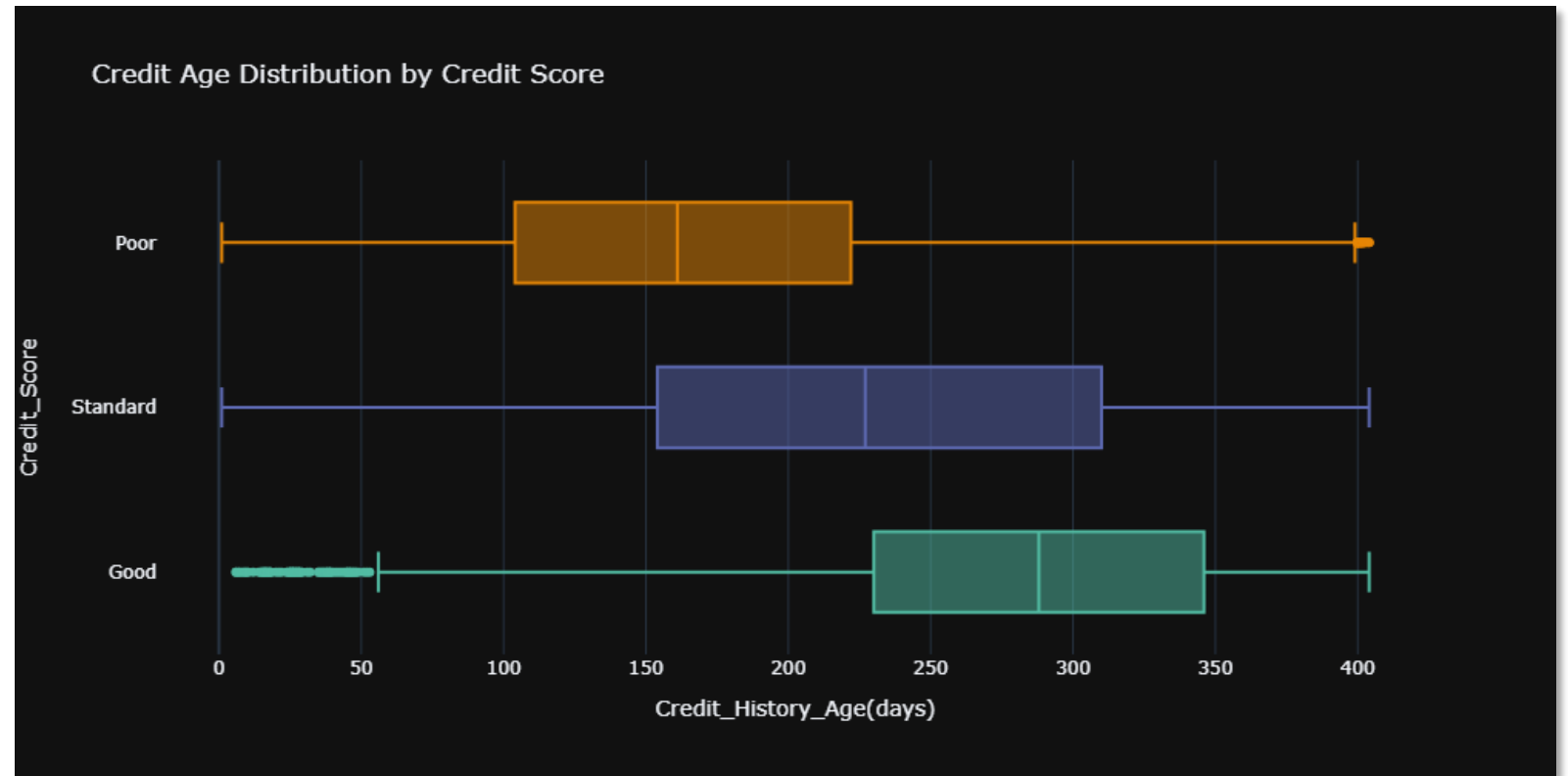
Credit Accounts

- **More** credit accounts results in low Credit Scores.
 - Hard to manage and keep track of due dates.
- Less than 5 credit accounts.



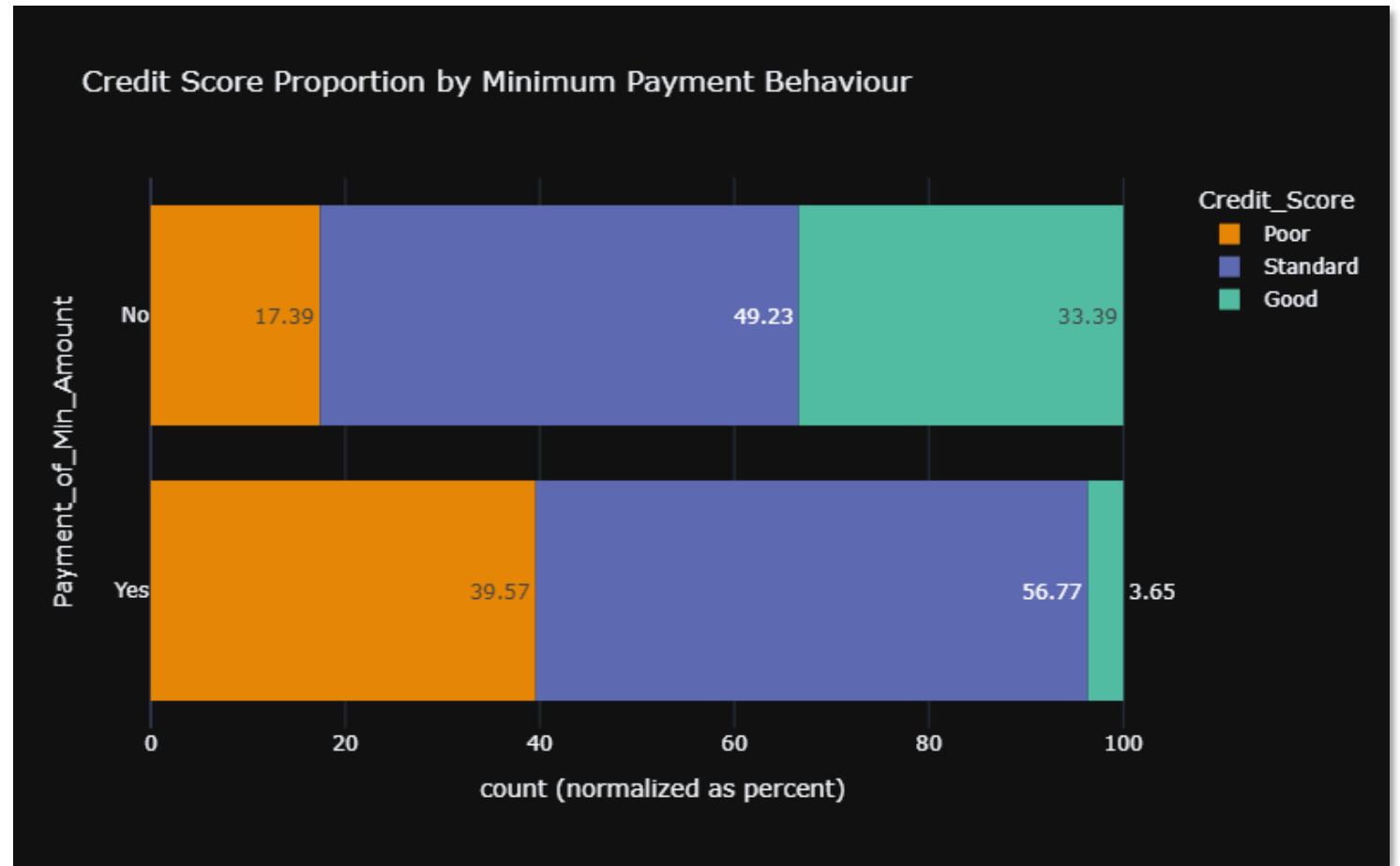
Credit Age

- **Longer** Credit History allows **Higher** Credit Score.
- Larger information on credit user.

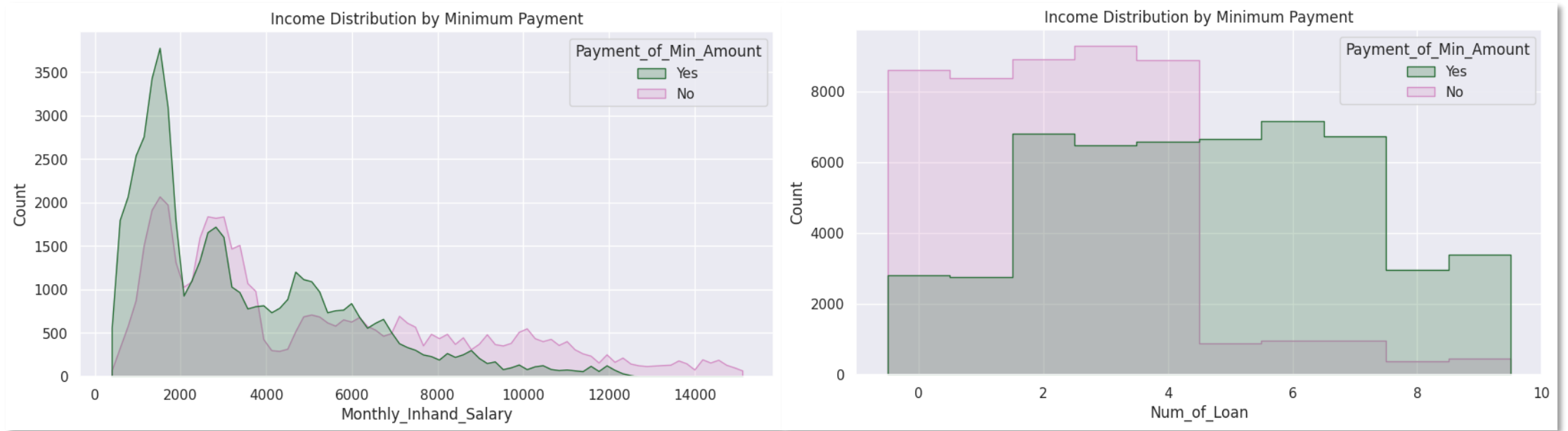


Minimum Payment Behaviors

- Paying the **minimum** amount signify **low** Credit Score.
- This should not affect score.



Minimum Payment Behaviors



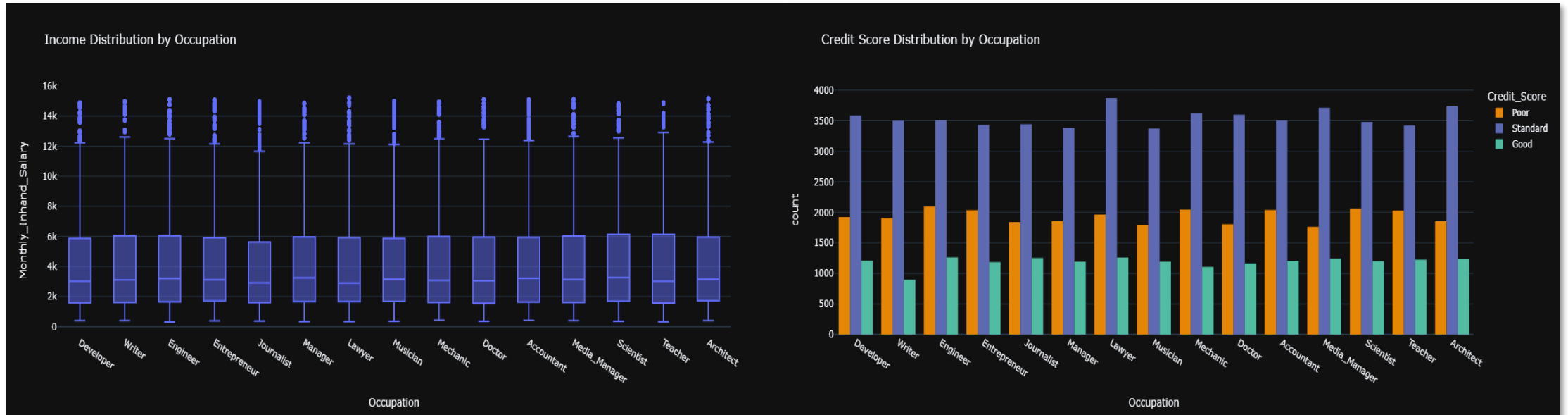
- Minimum payment is an **indicator** for lower income and higher debt.

Income

- **Positive correlation** between Income and Credit Score.
- Higher income allows more debt and better financial management.



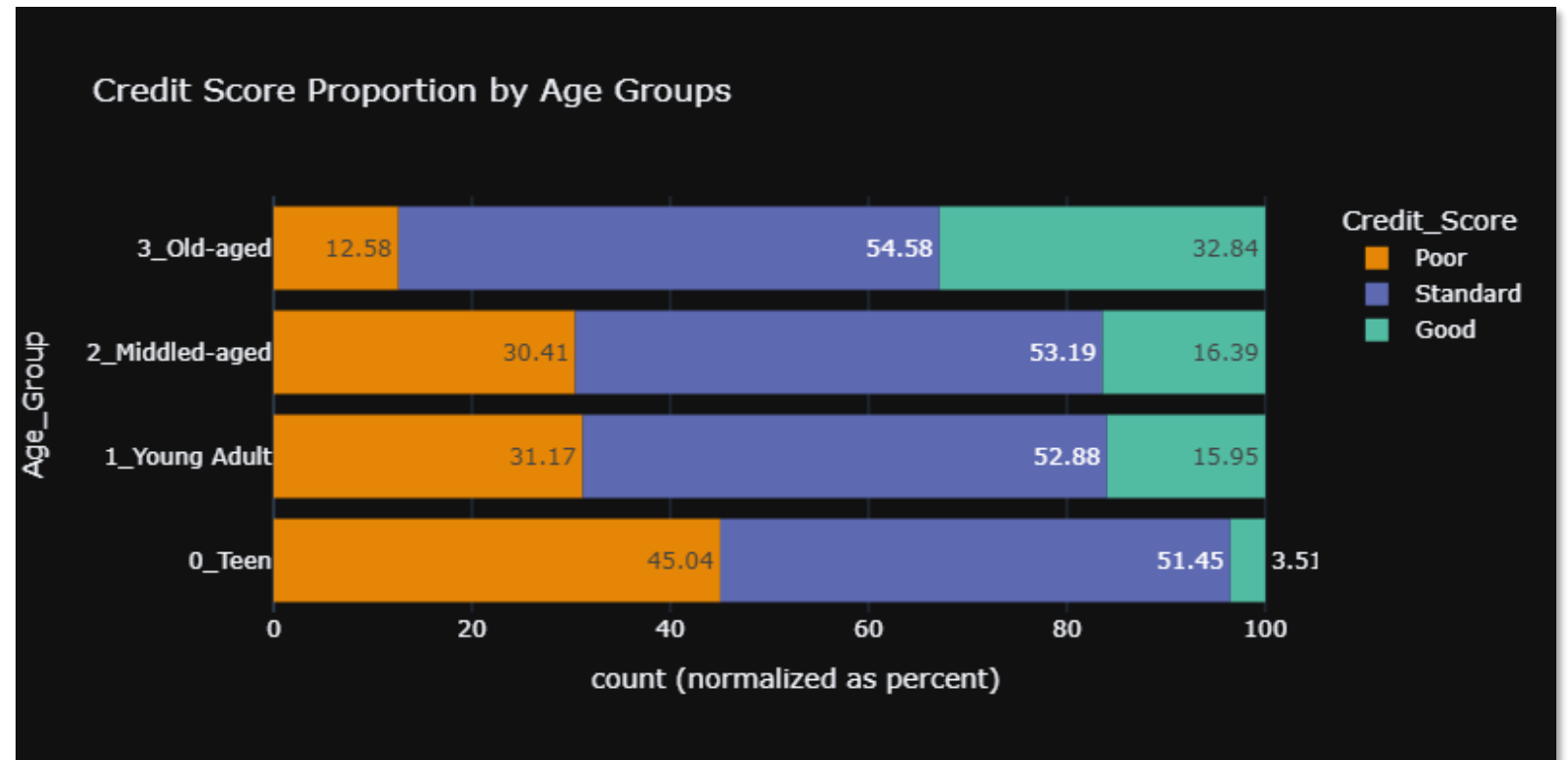
Occupation



- Income are **even** across jobs (no bias).
- Occupation has **no effect** on Credit Score.

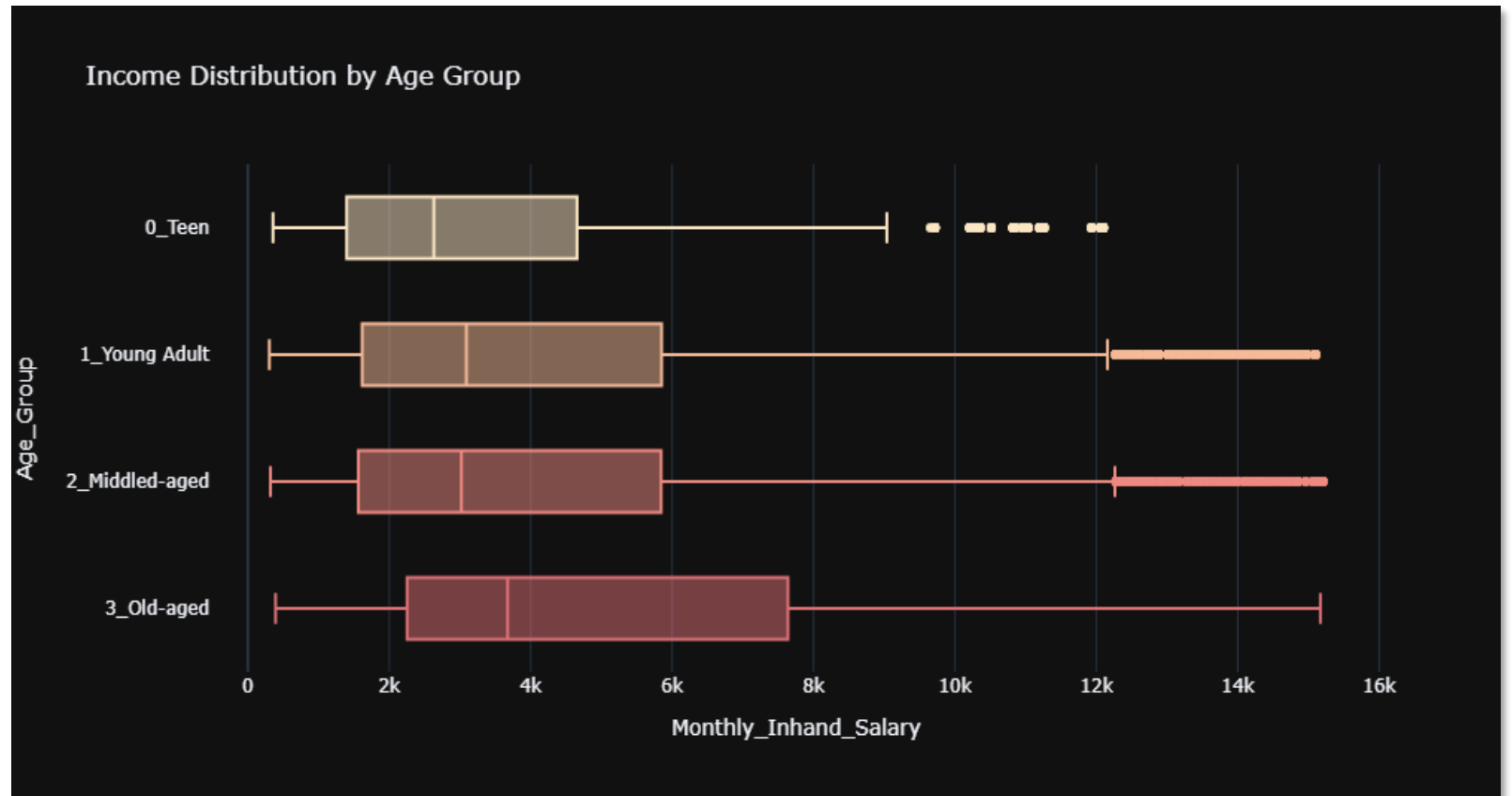
Age

- **Positive correlation** between Age and Credit Score.
- Does age explain Credit Score?



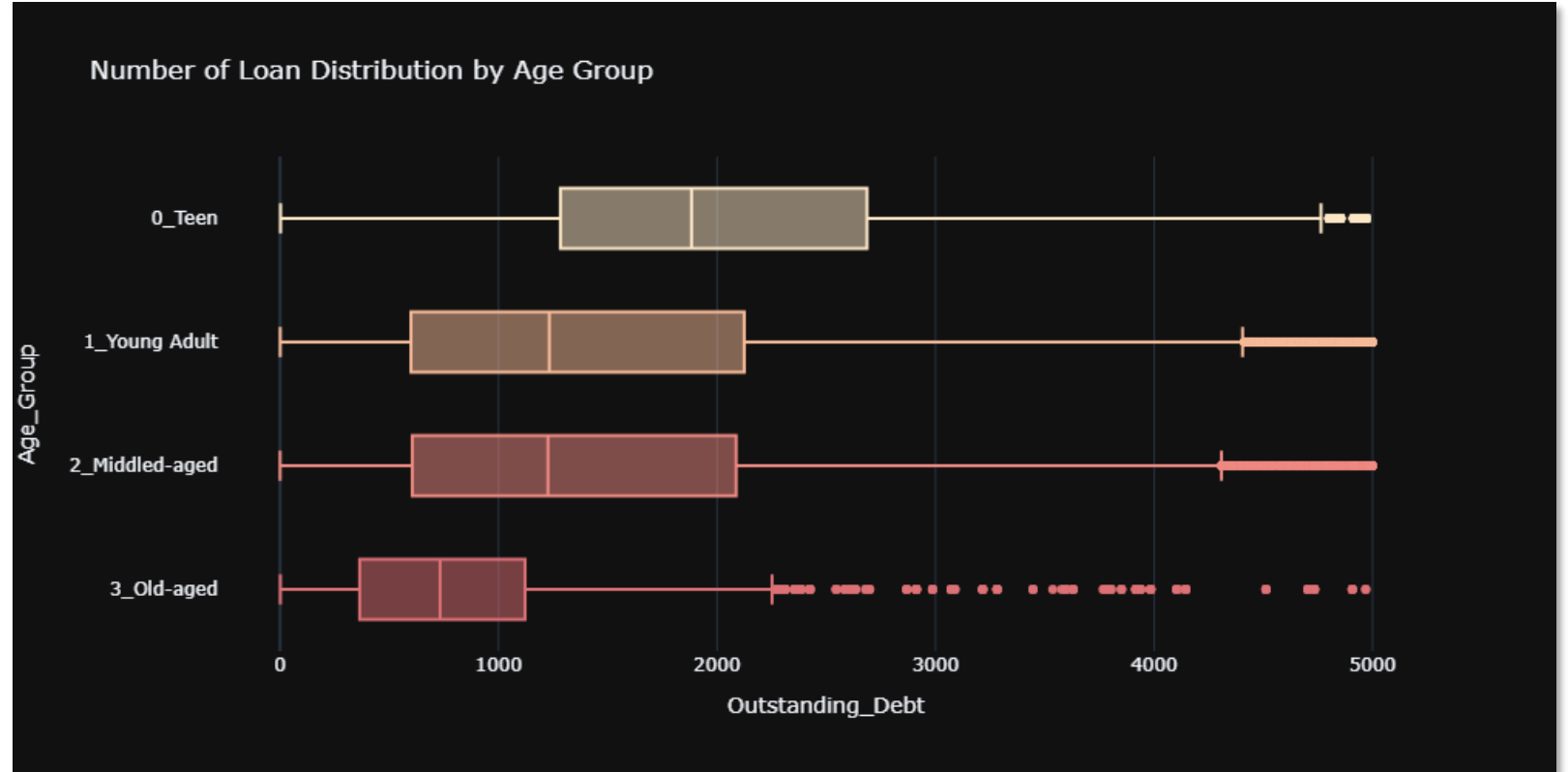
Age

- **Positive correlation** between Age and Income.
- Older people have higher positions in their career.



Age

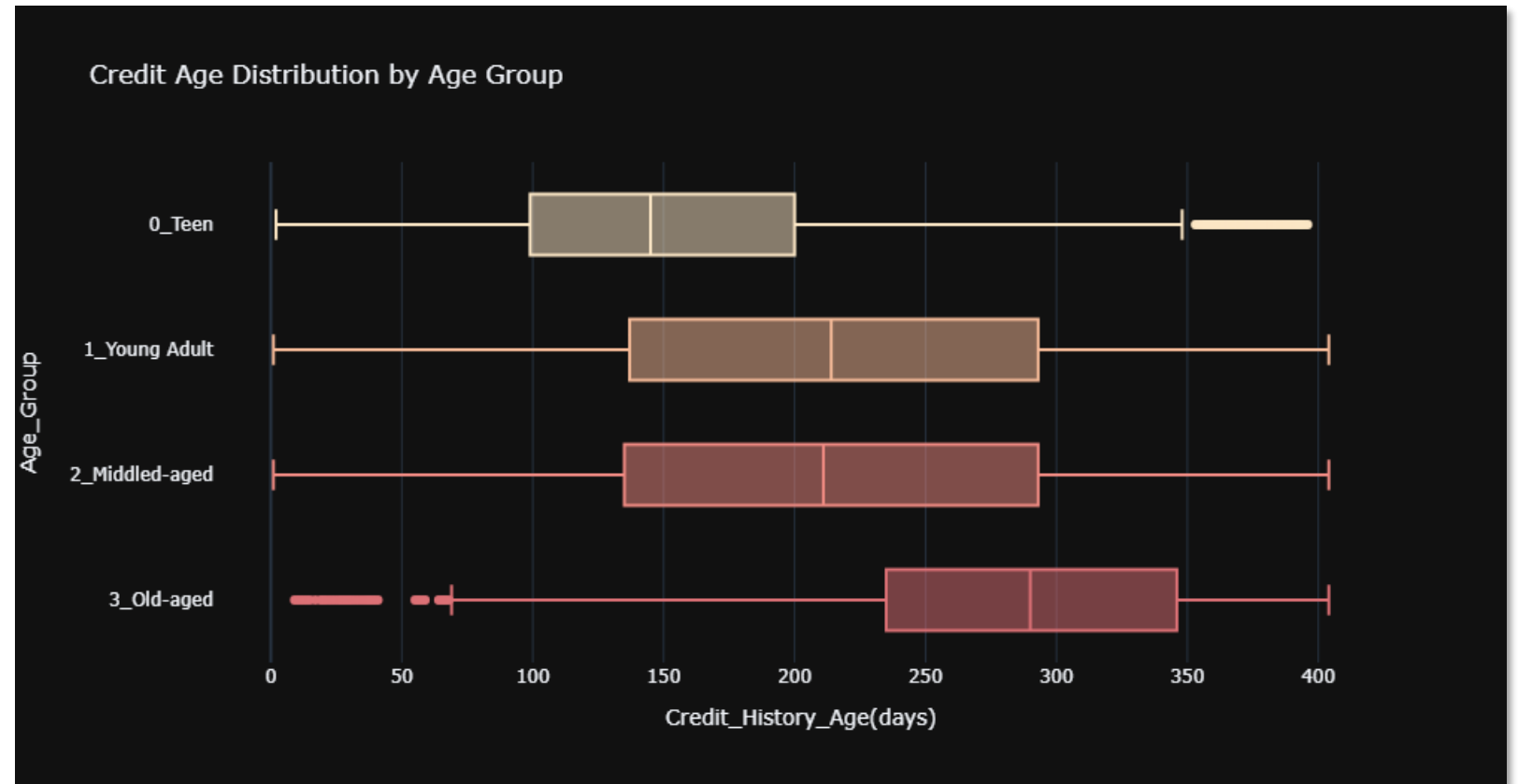
- **Negative correlation** between Age and Debt.
- Working-age is from 15-64.



Age

- **Longer** you've lived, **longer** Credit history you have.
- Age indirectly influence Credit Score.

→ Cooperate with top universities to educate young customers.



Conclusion

What we have learned



Conclusion

1

Low Credit Scorers tends to be **late for** their **payment** due to holding **too many loans**.

They don't manage **different type** of loans. Or managing **too many credit accounts**.

They have new accounts with **short history**.

Younger people inherently are **poorer**, has short **credit history** and is holding more **debts**.

Therefore, they tends to have **lower credit scores**.

Recommendation

2

Late frequency **7 times**

Auto-pay, change due date and refinance.

Loans **3 loans**

Disallow taking more loans.

Credit Mix

Incentivize loans for different purposes (e.g., business loan discount for high value mortgage).

Credit cards **5 accounts**

Disallow opening new credit accounts.

Credit Age

Cooperate with top universities to educate young customers.
Welcoming bonuses for opening accounts (e.g., cashback, points...).

Machine Learning

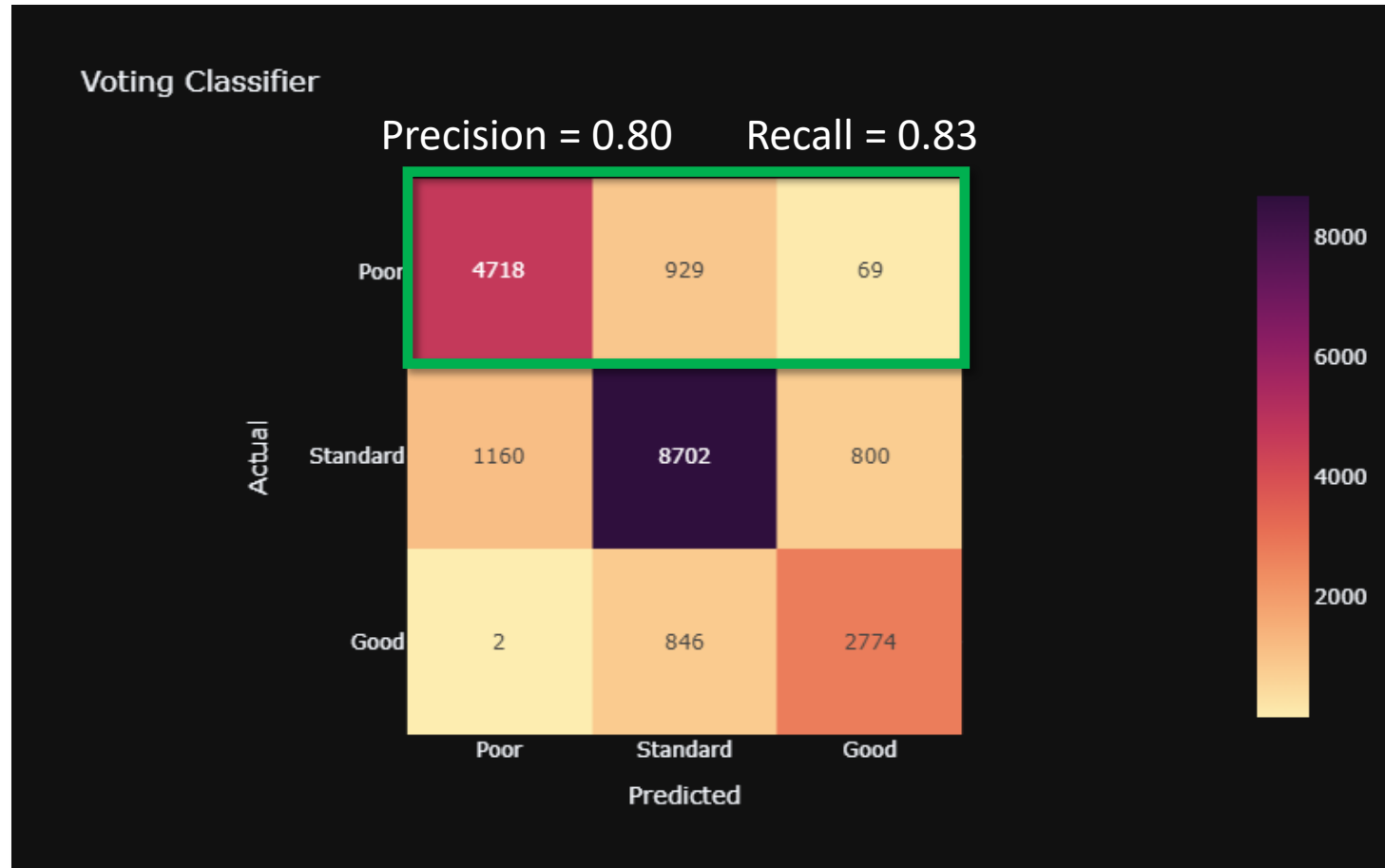
Predicting Credit Scores



Model

index	Model	Train_Accuracy	Test_Accuracy	Train_F1	Test_F1
0	VotingClassifier	0.89	0.81	0.89	0.8
1	RandomForestClassifier	0.94	0.8	0.94	0.79
2	KNeighborsClassifier	0.85	0.78	0.84	0.77
3	HistGradientBoostingClassifier	0.84	0.78	0.84	0.77

Confusion Matrix



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Thank You!

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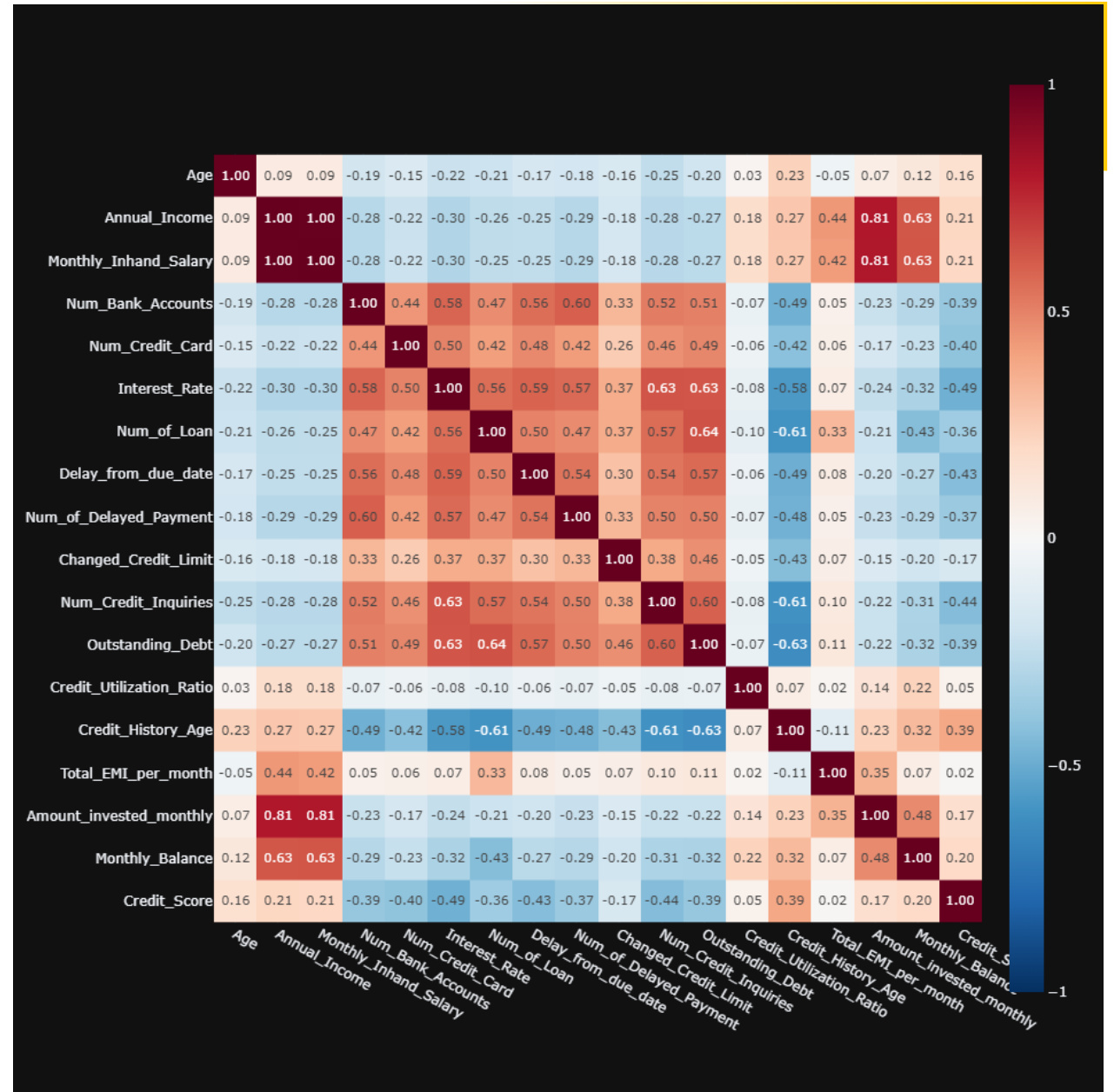


Appendix

Other findings

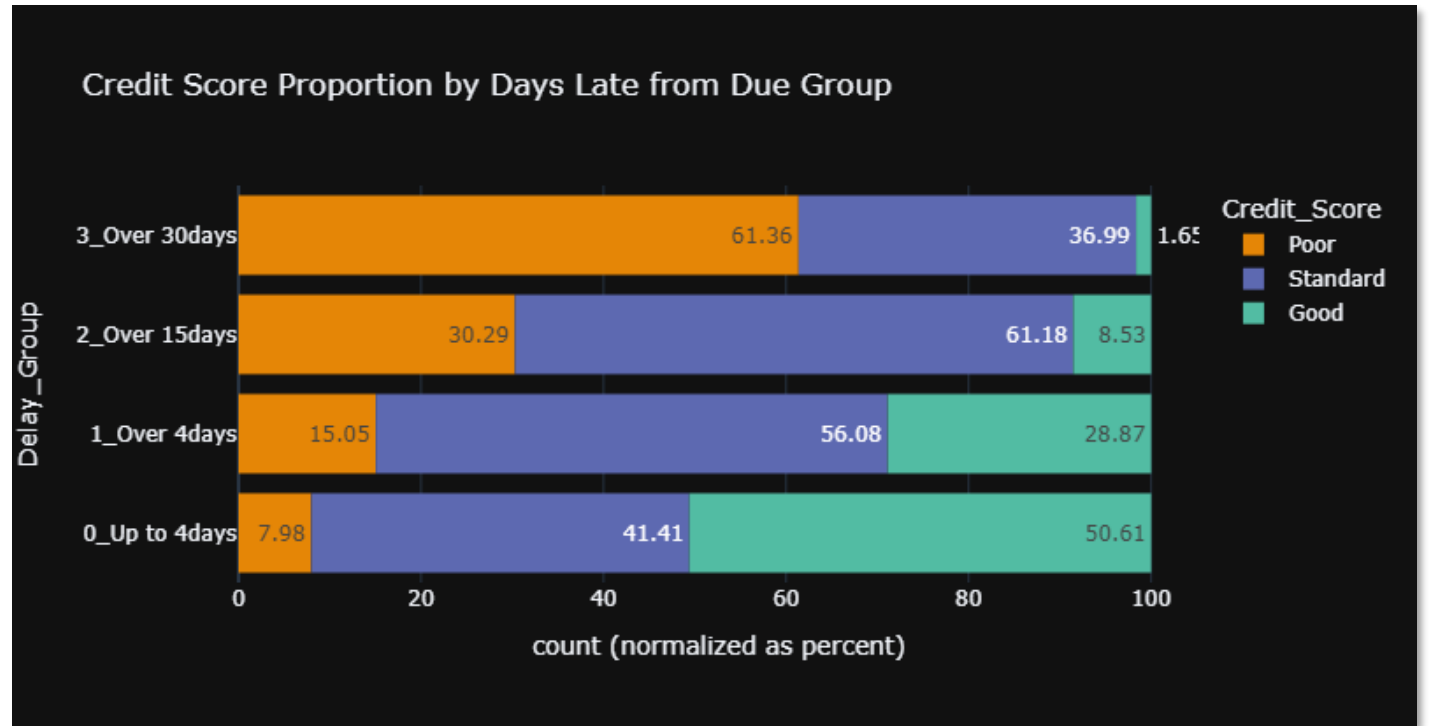


Features HeatMap



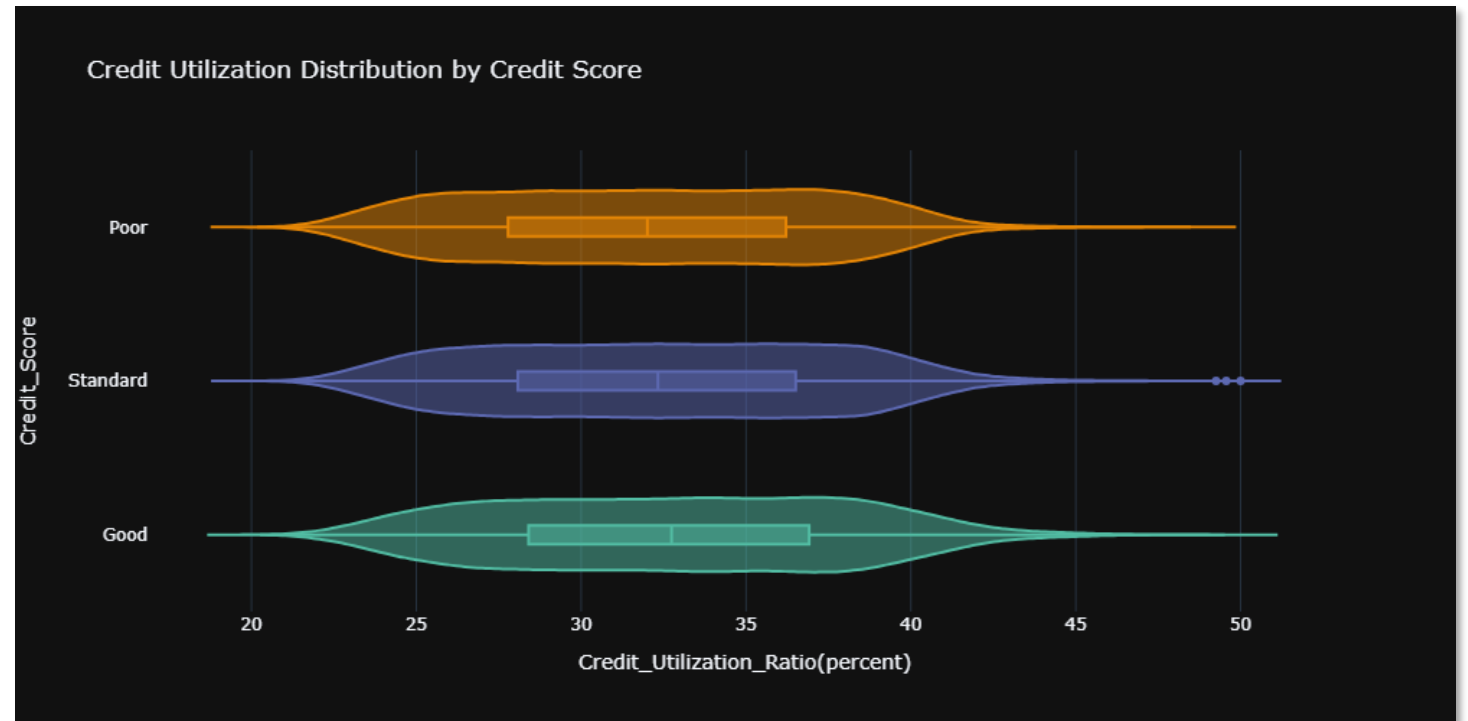
Late Payment

- **Negative Correlation** between Credit Score and late debt payment.
- Chance for lower Credit Score doubled after **30 days** late.

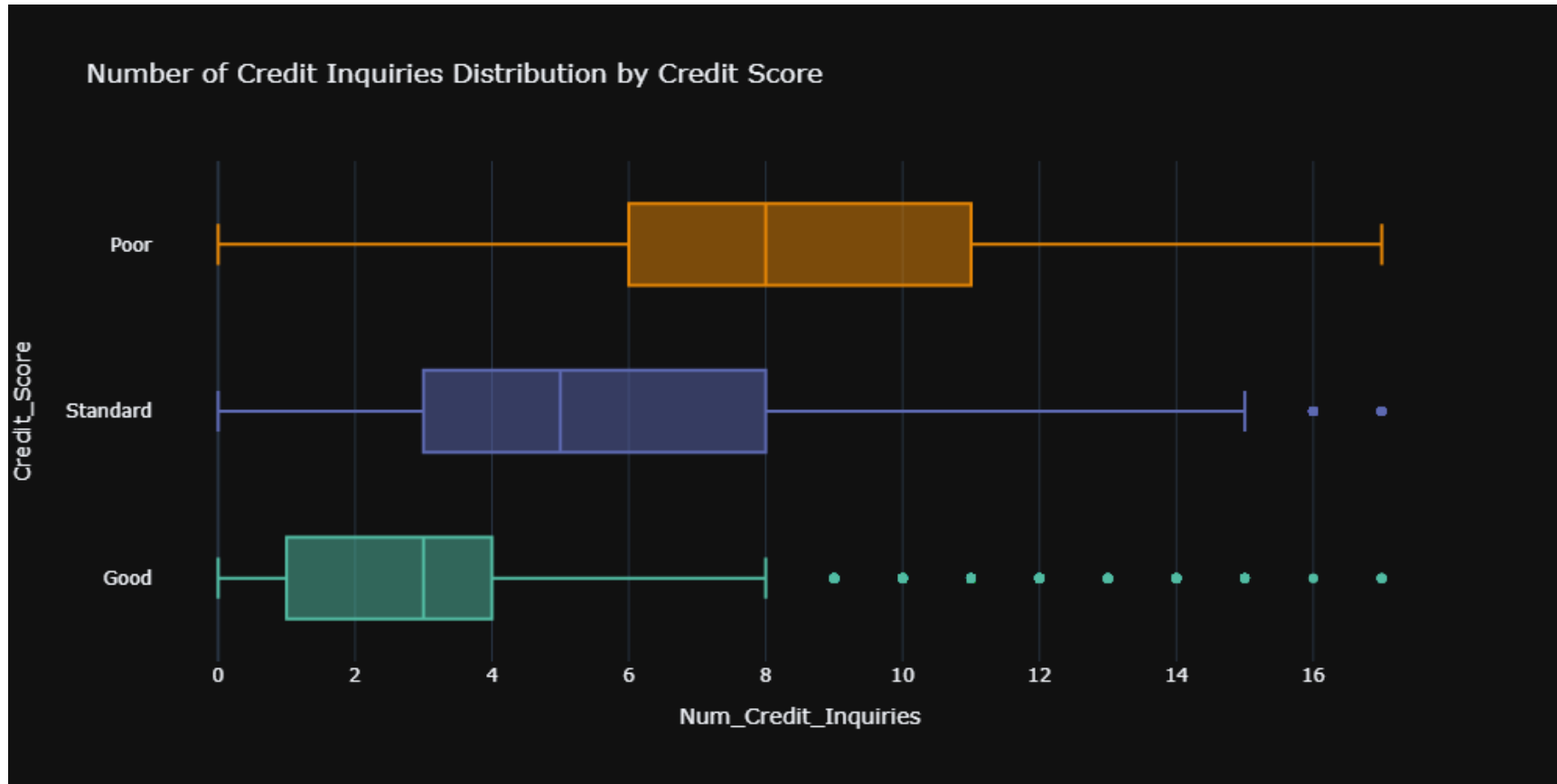


Credit Usage

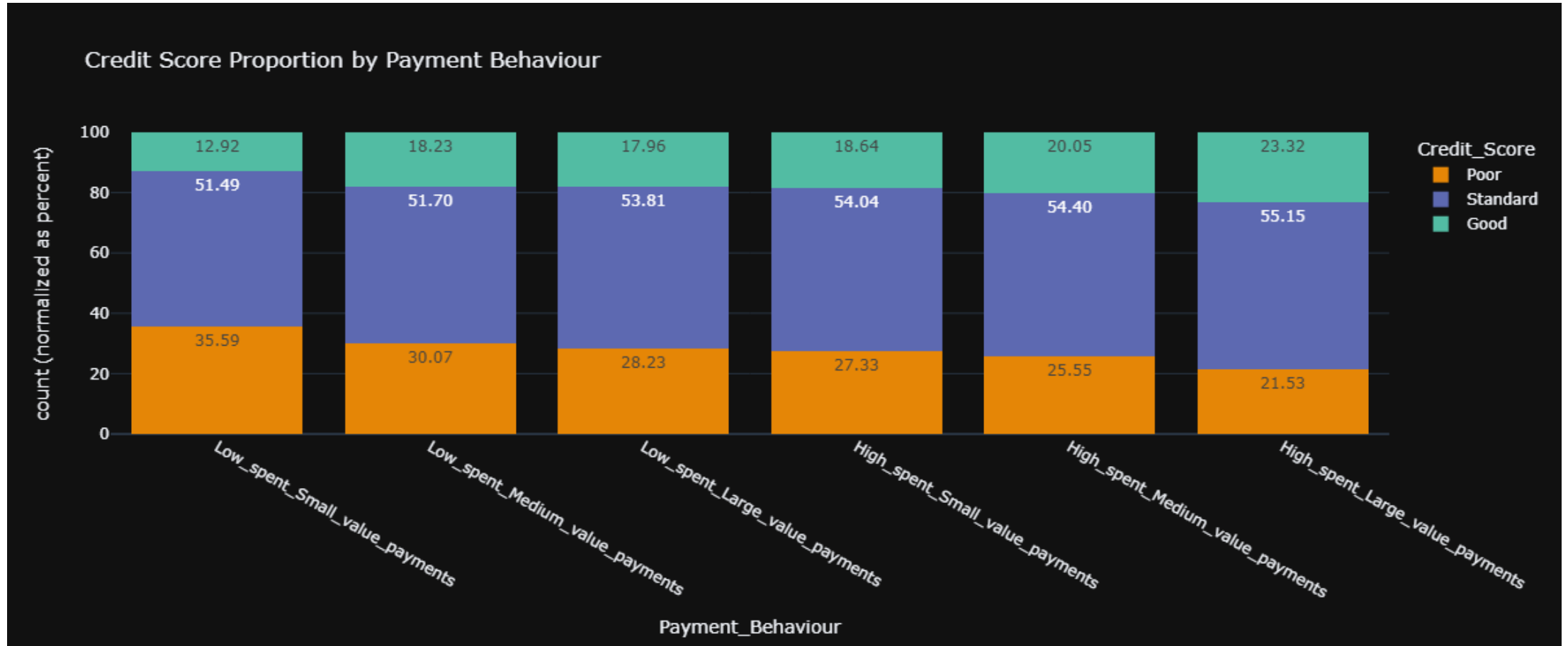
- **No visible effect** on Credit Score by Utilization ratio.
- This Bank does not place importance on utilization.



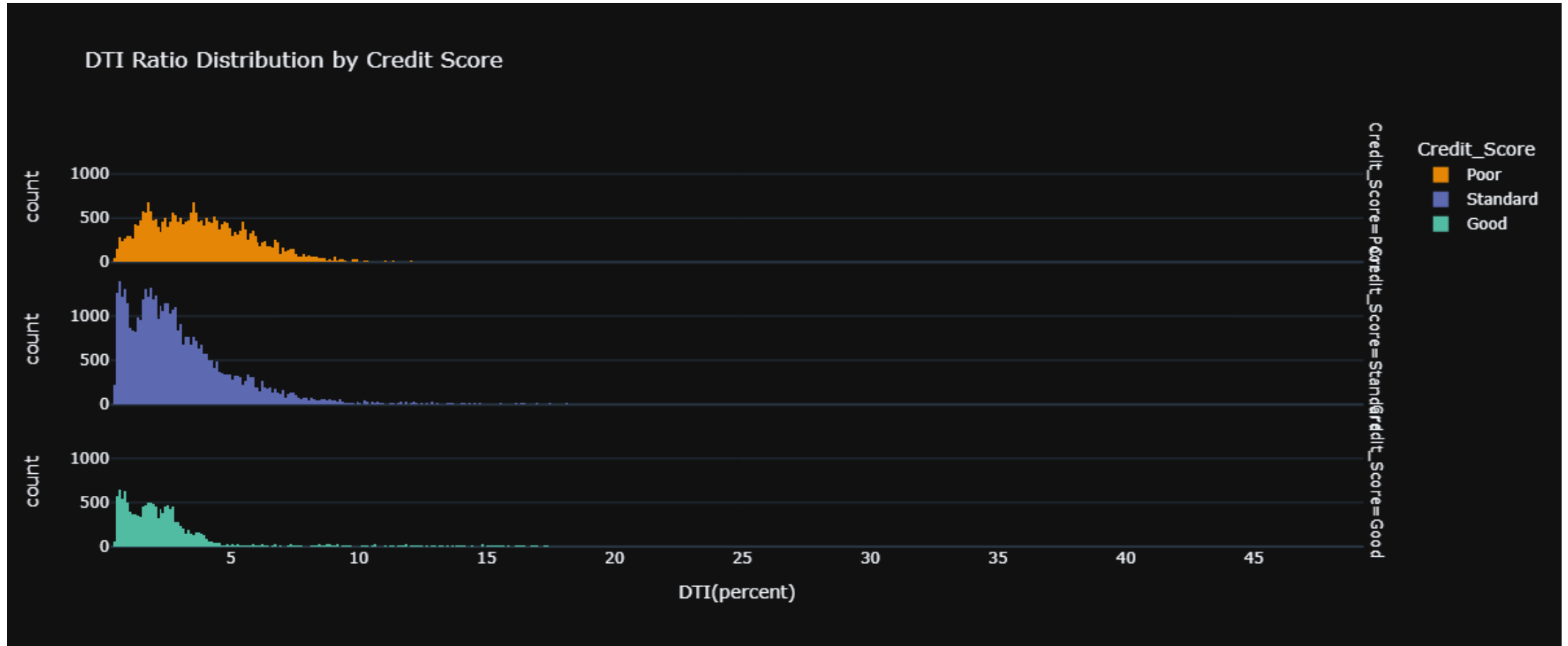
Credit Inquiries



Payment Behaviours

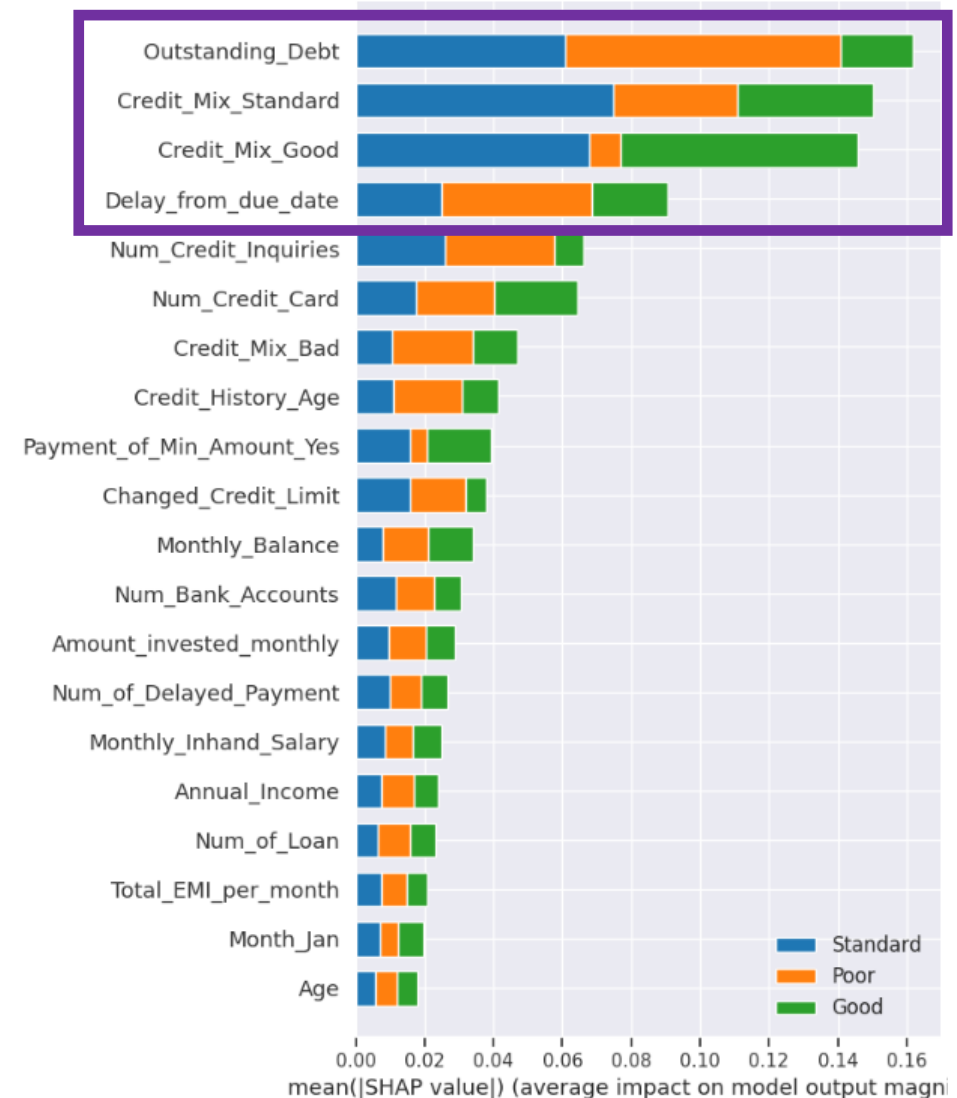


Debt to Income Ratio



Features Importance

- SHAP values as feature importance.
- Credit Score is explained by Debt, Credit Mix and Late Payment mostly.



* SHAP assume features are independent, and it explains the feature importance to the model not to the real world.

Features Importance by Class

