

Motivation

- Credit Score: score used by creditors to determine credit behavior
- Factors that generally affect credit score
 - Payment History
 - Amount Owed / Credit Utilization
 Ratio
- Some aspects of our lives can indirectly affect credit score
 - Lifestyle Choices
- Hard Inquiries will lower one's credit scores





Data Overview

Credit Score Classification:

https://www.kaggle.com/datasets/pa risrohan/credit-score-classification?s elect=train.csv

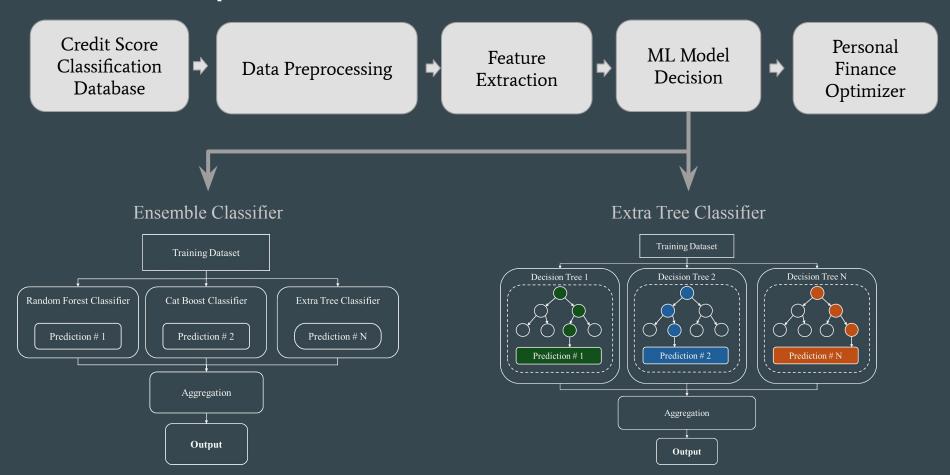
- 100,000 data points
- 28 features
- Basic bank details and credit-related information



Dataset Features:

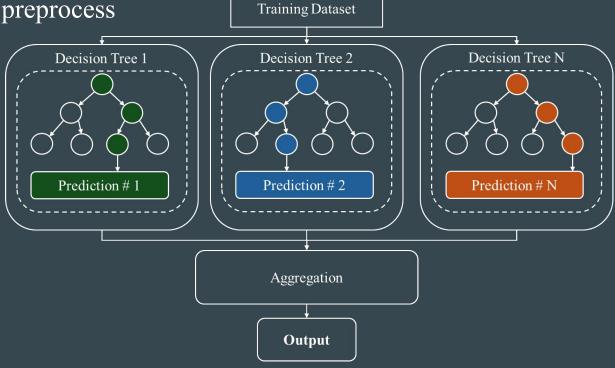
- Name, Age, Occupation
- Annual Income, Monthly In-Hand Salary
- Number of Bank Accounts, Credit Mix
- Outstanding Debt, Credit Utilization Ratio
- Credit History Age, Payment of Min Amount
- EMI per Month, Amount Invested Monthly
- Payment Behavior, Monthly Balance
- Credit Score

The Project Pipeline



Methodology

- Data cleaning and data preprocess
- Modeling
- Reverse optimization



What Can't People Change?

- Name, Age, Occupation
- Annual/Monthly Income

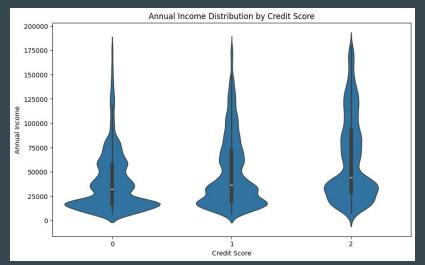
Extra Tree Classifier

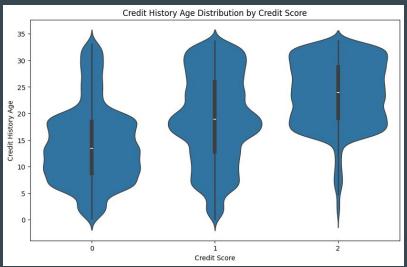
Data Analysis (1): Feature Selection

What are the some of the most important features?

- Payment of Min Amount
- Number of Credit Card Inquiries
- Delay from Due Date
- Number of Credit Cards

Note: Some features like Annual Income cannot be easily changed



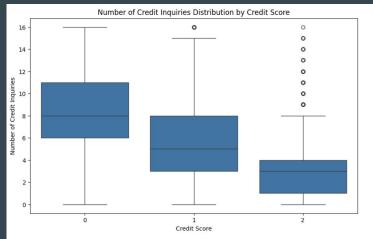


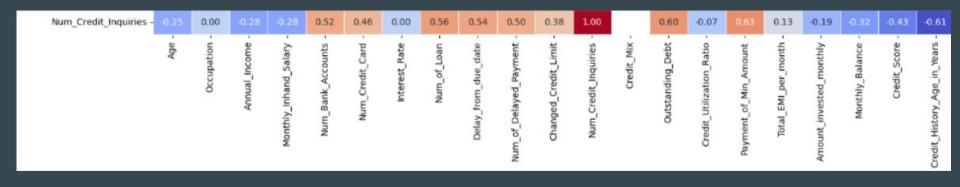
										Correla	ation ne	atmap											1.0
Age -	1.00	-0.01	0.09	0.09	-0.19	-0.15	-0.00	-0.21	-0.17	-0.18	-0.16	0.25		-0.20	0.02	-0.27	-0.06	0.07	0.11	0.16	0.23		
Occupation -	-0.01	1.00	0.00	-0.00	0.01	0.01	0.00	-0.01	0.01	-0.01	-0.00	0.00		0.00	-0.00	-0.00	-0.00	0.01	-0.00	-0.01	-0.00		
Annual_Income -	0.09	0.00	1.00	0.99		-0.22	-0.00				-0.17	-0.28		-0.27	0.19	-0.31	0.45	0.62	0.71	0.20	0.27	-	0.8
Monthly_Inhand_Salary -	0.09	-0.00	0.99	1.00		-0.21	-0.00		-0.25		-0.17	0.28		-0.27	0.18	-0.31	0.44	0.62	0.71	0.20	0.27		
Num_Bank_Accounts -	-0.19	0.01			1.00	0.44	0.00	0.47	0.56	0.60	0.33	0.52		0.50	-0.07	0.58	0.07	-0.19	-0.30	-0.38	-0.48		
Num_Credit_Card -	-0.15	0.01	-0.22	-0.21	0.44	1.00	0.01	0.42	0.47	0.42	0.25	0.46		0.49	-0.06	0.41	0.08	-0.15	-0.24	-0.40	-0.41		0.6
interest_Rate -	-0.00	0.00	-0.00	-0.00	0.00	0.01	1.00	-0.00	0.01	0.00	-0.00	0.00		0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00		
Num_of_Loan -	-0.21	-0.01	0.26	0.26	0.47	0.42	-0.00	1.00	0.50	0.47	0.37	0.56		0.64	-0.10	0.51	0.40	-0.19	0.44	0.35	0.60	- 2	0.4
Delay_from_due_date -	-0.17	0.01		-0.25	0.56	0.47	0.01	0.50	1.00	0.54	0.29	0.54		0.57	-0.07	0.50	0.10	-0.17	0.28	-0.43	-0.49		
Num_of_Delayed_Payment -	-0.18	-0.01			0.60	0.42	0.00	0.47	0.54	1.00	0.32	0.50		0.50	-0.07	0.58	0.08	-0.19	0.30		-0.48		
Changed_Credit_Limit -	-0.16	-0.00	-0.17	-0.17	0.33	0.25	-0.00	0.37	0.29	0.32	1.00	0.38		0.45	-0.05	0.51	0.09	-0.12	-0.20	-0.16	-0.42	let	0.2
Num_Credit_Inquiries -	-0.25	0.00	-0.28	-0.28	0.52	0.46	0.00	0.56	0.54	0.50	0.38	1.00		0.60	-0.07	0.63	0.13	-0.19	-0.32	-0.43	-0.61		
Credit_Mix -												0.0											
Outstanding_Debt -	-0.20	0.00	-0.27	-0.27	0.50	0.49	0.00	0.64	0.57	0.50	0.45	0.60		1.00	-0.07	0.49	0.14	-0.19	-0.32	-0.38	-0.63		
Credit_Utilization_Ratio -	0.02	-0.00	0.19	0.18	-0.07	-0.06	0.00	-0.10	-0.07	-0.07	-0.05	-0.07		-0.07	1.00	-0.08	0.02	0.01	0.25	0.04	0.07		
Payment_of_Min_Amount -	-0.27	-0.00		-0.31	0.58	0.41	0.00	0.51	0.50	0.58	0.51	0.63		0.49	-0.08	1.00	0.09	-0.20	-0.34	-0.44	-0.59	-	-0.2
Total_EMI_per_month -	-0.06	0.00	0.45	0.44	0.07	0.08	0.00	0.40	0.10	0.08	0.09	0.13		0.14	0.02	0.09	1.00	0.26	0.06	0.01	0.15		
Amount_invested_monthly -	0.07	0.01	0.62	0.62	-0.19	-0.15	-0.00	-0.19	-0.17	-0.19	-0.12	-0.19		-0.19	0.01	-0.20	0.26	1.00	-0.02	0.15	0.19		
Monthly_Balance -	0.11	-0.00		0.71		-0.24	-0.00	-0:44			-0.20			0.32	0.25	-0.34	0.06	-0.02	1.00	0.20	0.33		-0.4
Credit_Score -	0.16	-0.01	0.20	0.20	-0.38	-0.40	-0.00	-0.35		-0.36	-0.16	-0.43		-0.38	0.04	-0.44	-0.01	0.15	0.20	1.00	0.38		
Credit_History_Age_in_Years -	0.23	-0.00	0.27	0.27	-0.48	-0.41	-0.00	-0.60	-0.49	-0.48	-0.42	-0.61		-0.63	0.07	-0.59	-0.15	0.19	0.33	0.38	1.00		-0.6
Correlation	Age	Occupation	Annual Income	Monthly_Inhand_Salary	Num_Bank_Accounts -	Num_Credit_Card -	Interest_Rate	Num_of_Loan	Delay_from_due_date -	Num_of_Delayed_Payment -	ged_Credit_Limit	Num_Credit_Inquiries	Credit_Mix	Outstanding_Debt -	Credit_Utilization_Ratio	of Min_Amount	lotal_EMI_per_month -	Amount_invested_manthly .	Monthly_Balance	Credit_Score	ory_Age_in_Years		
Heatmap				Monthi	Num	*			Delay	Num_of_D	Changed	Mum		0	Credit	Payment of Min	Total	Amount_ir	-		Credit_History		

Data Analysis (2): Correlations

How do credit inquiries indicate financial behavior?

- Bad behaviors have positive correlation
- Hard Inquiries lower credit score

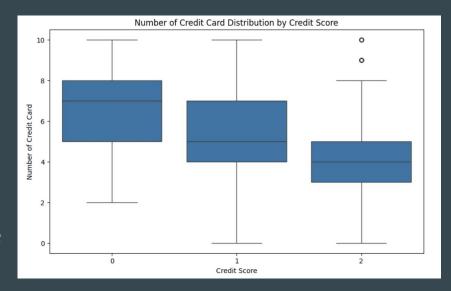


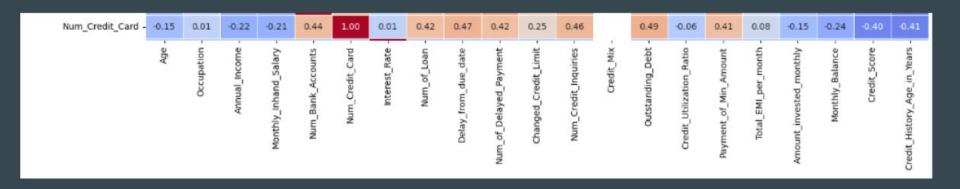


Data Analysis (3): Correlations

How do number of credit cards indicate financial behavior?

- Bad Behaviors have positive correlation
- People with more credit cards tend to have bad credit scores



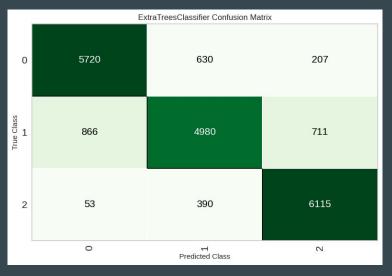


Data Analysis (4): Choosing the Best Model

How accurate is the best model?

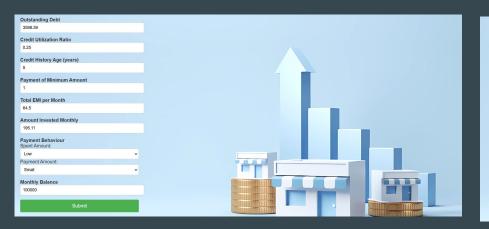
ExtraTreeClassifier performed the best

Accuracy and F1 score of over 85%



	Model	Accuracy	AUC	Recall	Prec.	F1	Kappa	мсс	TT (Sec)
et	Extra Trees Classifier	0.8527	0.9504	0.8527	0.8516	0.8514	0.7790	0.7797	8.2790

The Financial Optimizer Website for Users





Conclusions

- Many different features can negatively impact or positively affect one's credit score despite not having a direct relationship.
 - For example, number of credit cards does not always negatively impact credit score if one pays off all their credit card debt in time
 - Encourages bad practices (Increased credit inquiries, outstanding debt)
- Our goal is to use the data analysis on the features and give positive feedback on how to change different features to improve credit score
 - Decreasing Number of Credit Cards, Decreasing Outstanding Debt

Thank You! Any Questions?