

# Health Insurance Cross Sell Prediction

## Predict Health Insurance Owners' who will be interested in Vehicle Insurance

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<https://www.kaggle.com/anmolkumar/health-insurance-cross-sell-prediction?select=train.csv>

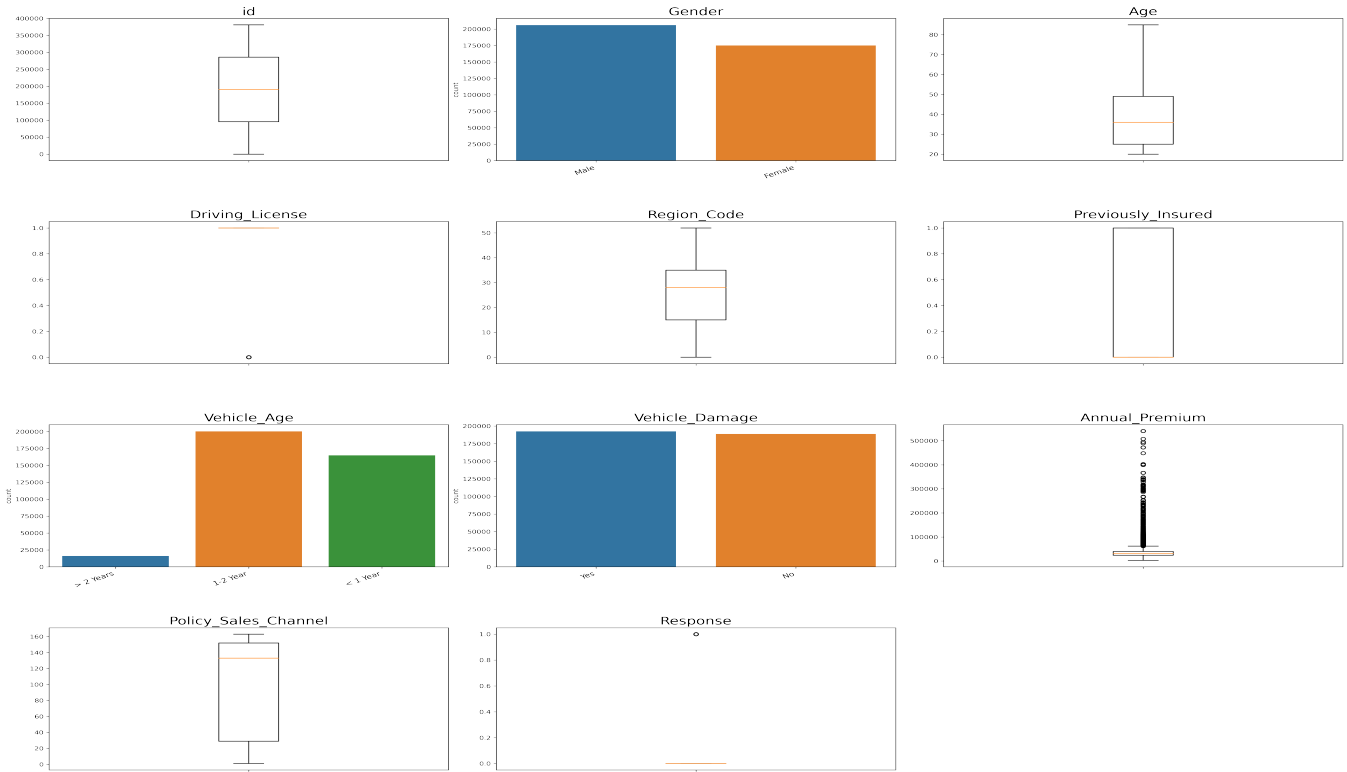
### Description

index	0
id	Unique ID for the customer
Gender	Gender of the customer
Age	Age of the customer
Driving_License	0 : Customer does not have DL
Region_Code	Unique code for the region of the customer
Previously_Insured	1 : Customer already has Vehicle Insurance
Vehicle_Age	Age of the Vehicle
Vehicle_Damage	1 : Customer got his/her vehicle damaged in the past.
Annual_Premium	The amount customer needs to pay as premium in the year
PolicySalesChannel	Anonymized Code for the channel of outreaching to the customer ie.
Vintage	Number of Days, Customer has been associated with the company
Response	1 : Customer is interested, 0 : Customer is not interested

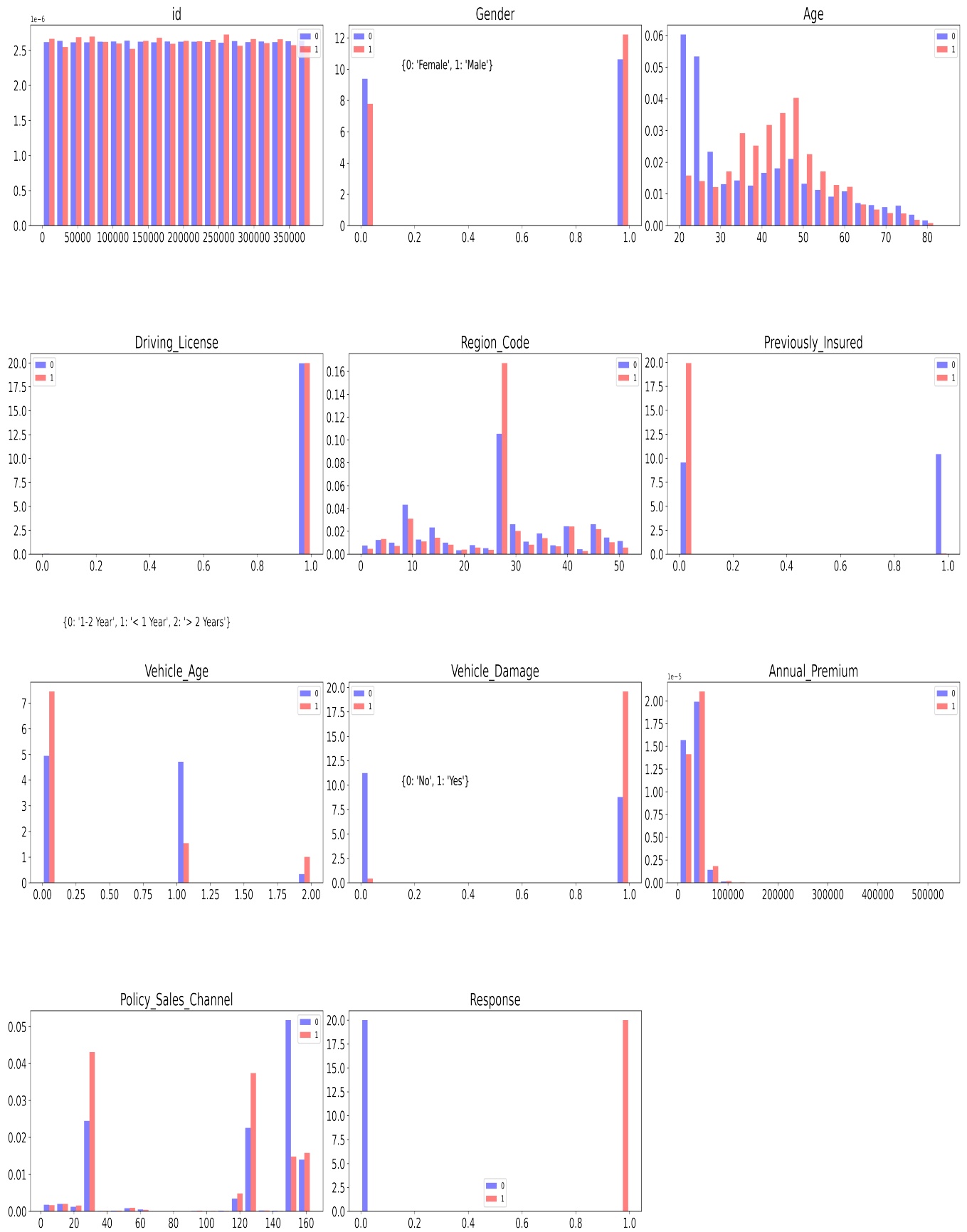
## Data Characteristics

index	NaN	NaN %	Unique	type	memory	values
id	0	0.0	381109	int64	3048872	[1, 2, 3, '...']
Gender	0	0.0	2	object	23597689	['Male', 'Female']
Age	0	0.0	66	int64	3048872	[44, 76, 47, '...']
Driving_License	0	0.0	2	int64	3048872	[1, 0]
Region_Code	0	0.0	53	float64	3048872	[28.0, 3.0, 11.0, '...']
Previously_Insured	0	0.0	2	int64	3048872	[0, 1]
Vehicle_Age	0	0.0	3	object	24788092	['> 2 Years', '1-2 Year', '< 1 Year']
Vehicle_Damage	0	0.0	2	object	22677844	['Yes', 'No']
Annual_Premium	0	0.0	48838	float64	3048872	[40454.0, 33536.0, 38294.0, '...']
Policy_Sales_Channel	0	0.0	155	float64	3048872	[26.0, 152.0, 160.0, '...']
Vintage	0	0.0	290	int64	3048872	[217, 183, 27, '...']
Response	0	0.0	2	int64	3048872	[1, 0]

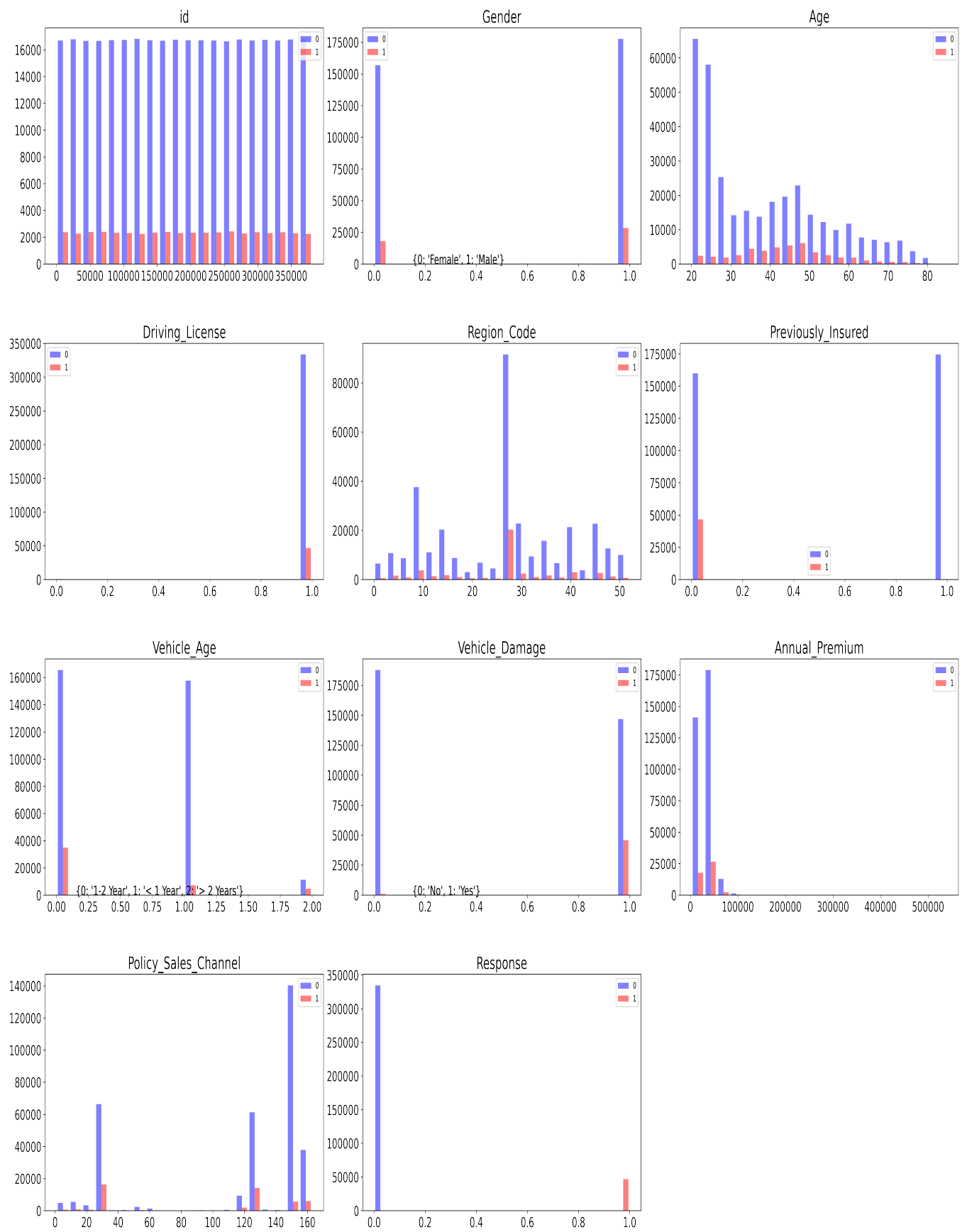
Box Plot



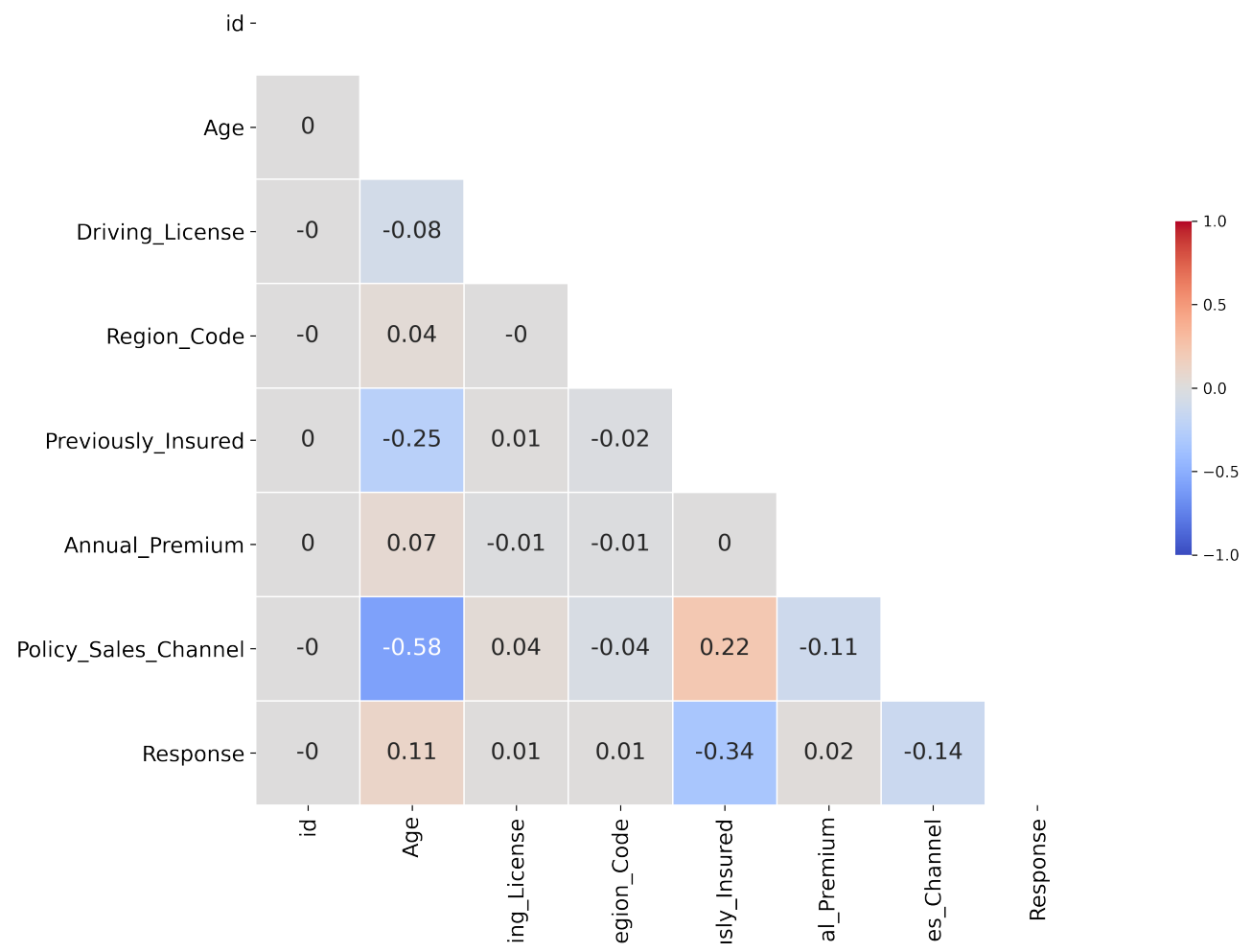
# Density Histogram Plot



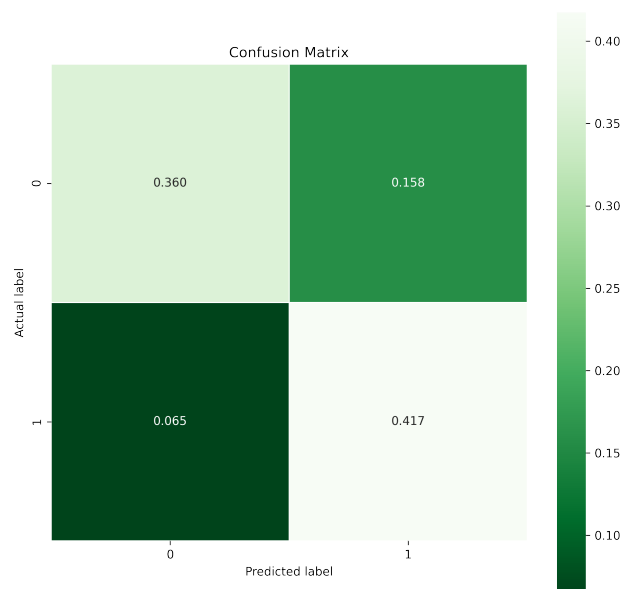
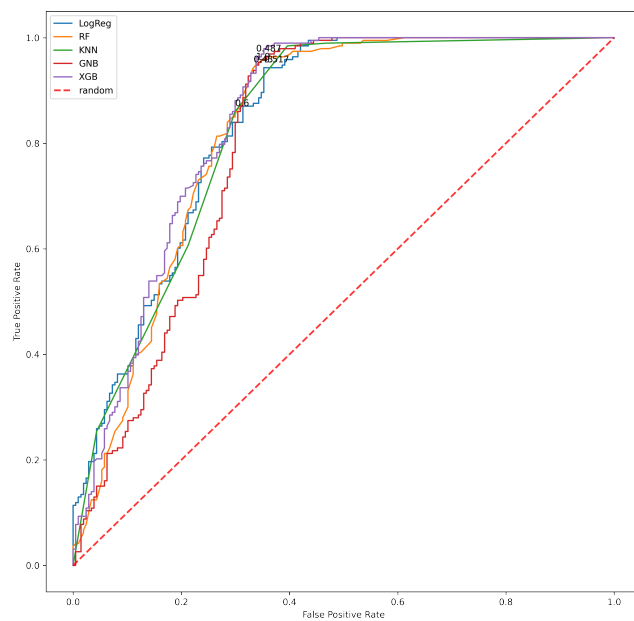
# Count Histogram Plot

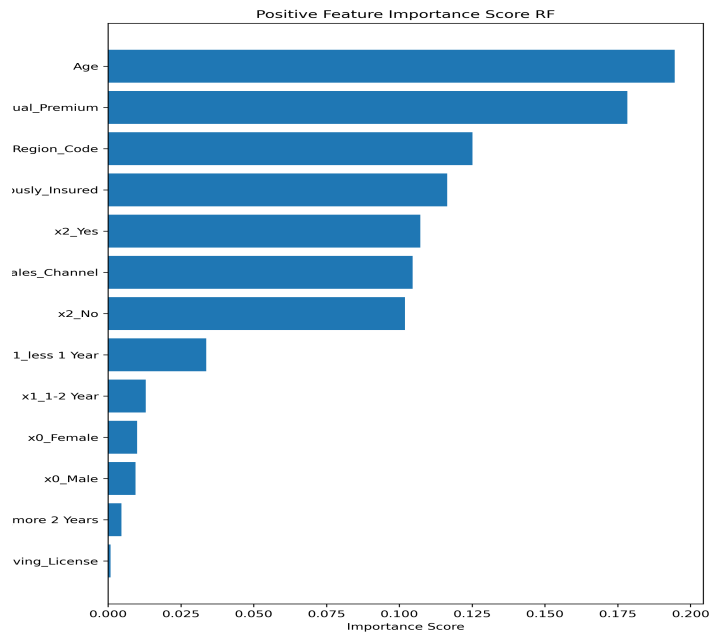
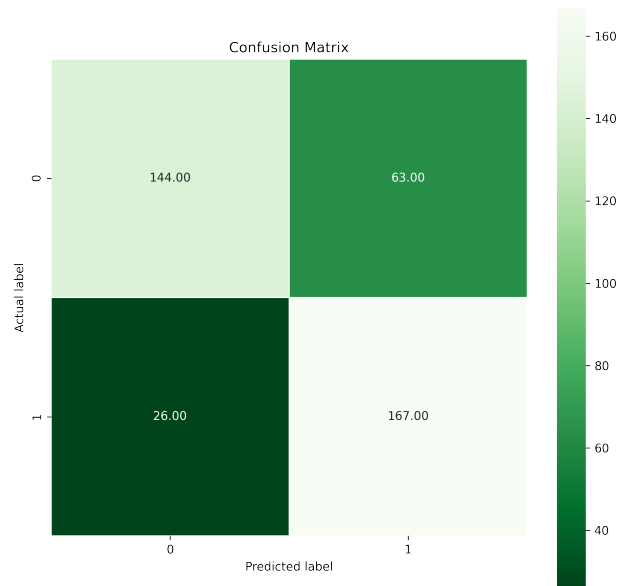


Correlation Heatmap



## ML Results





## Basic ML Results

model	acc	precision	recall	f1	dtype	fit_tm	score_tm
XGB	0.802	0.724	0.953	0.823	test	nan	nan
LogReg	0.79	0.714	0.943	0.812	test	nan	nan
GNB	0.775	0.686	0.984	0.809	test	nan	nan
RF	0.778	0.726	0.865	0.79	test	nan	nan
KNN	0.778	0.728	0.86	0.789	test	nan	nan



GNB	0.781	0.703	0.978	0.818	cv	0.003	0.004
XGB	0.794	0.74	0.914	0.817	cv	0.097	0.005
LogReg	0.781	0.719	0.932	0.811	cv	0.037	0.004
RF	0.772	0.736	0.856	0.791	cv	0.22	0.019
KNN	0.772	0.734	0.858	0.791	cv	0.006	0.02