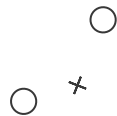
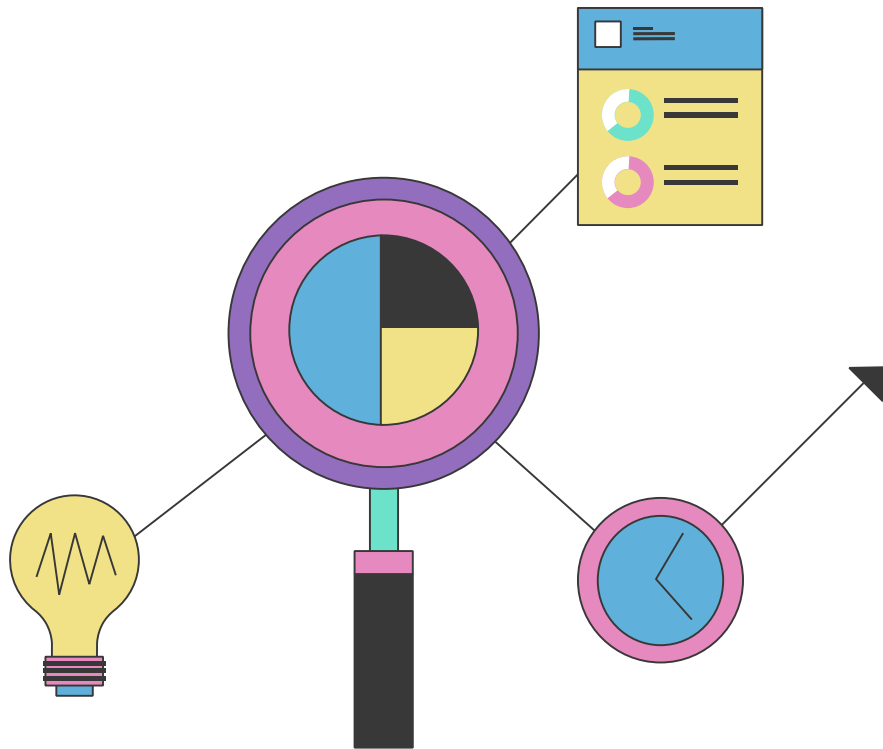


# Data Prediction with Machine Learning Model



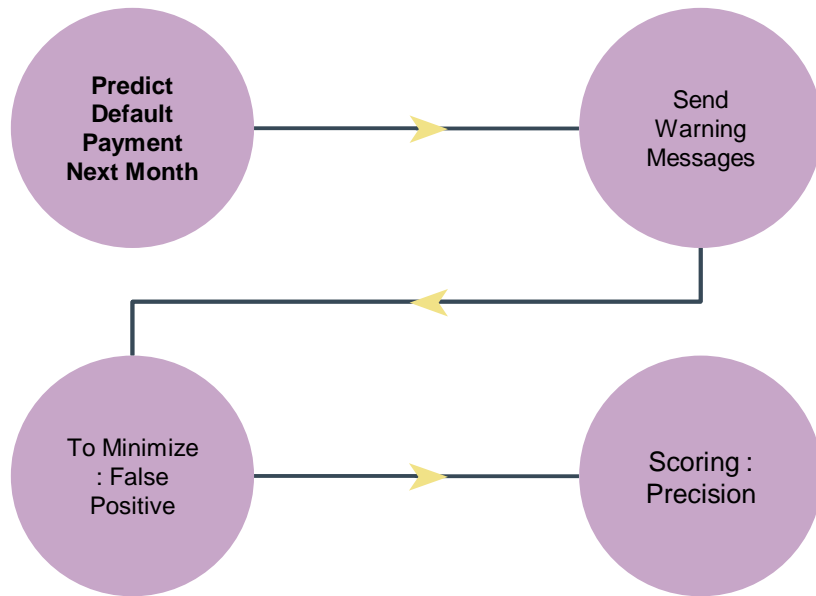
01

# Introduction





## Objective



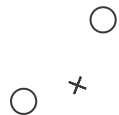
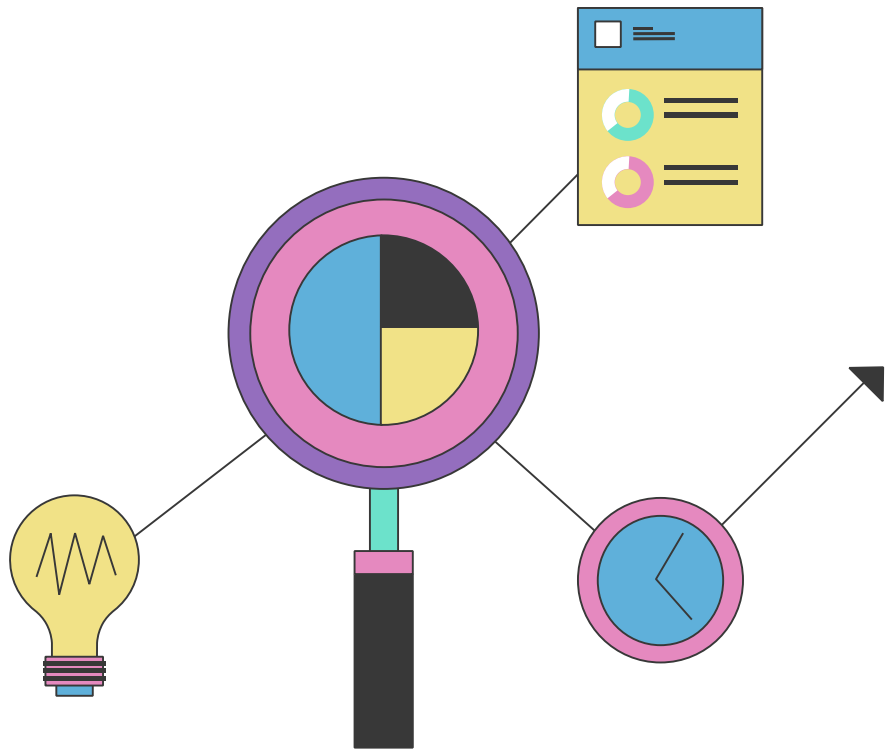
## Dataset

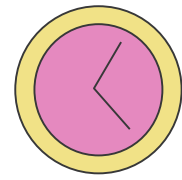
ABC Bank's CC  
Holder Demography  
and Payment Status



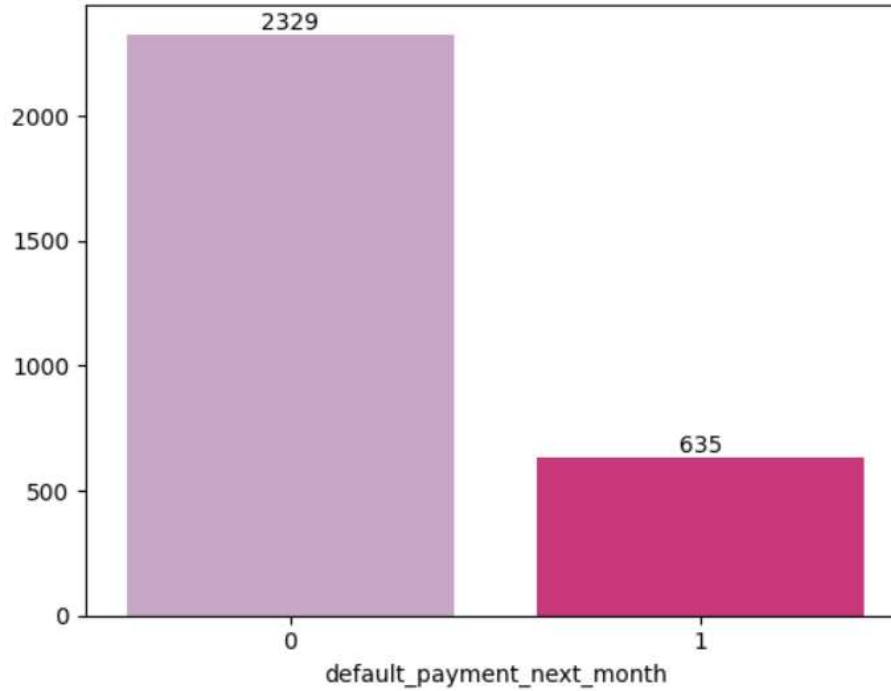
02

# Exploratory Data Analysis



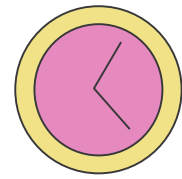


## Default Payment Distribution

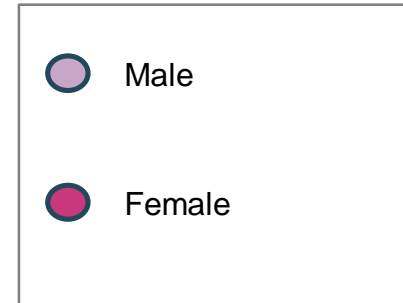
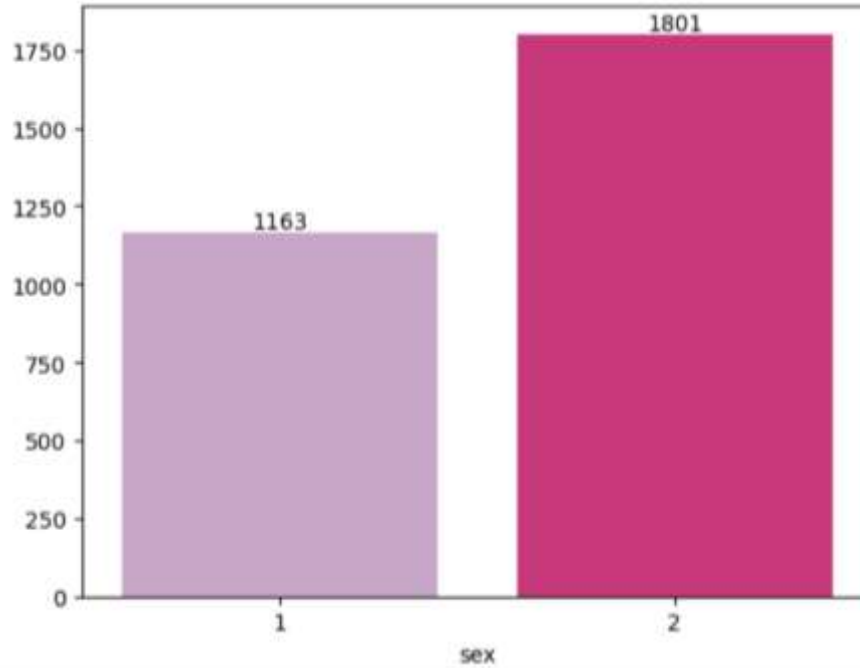


x

○ x

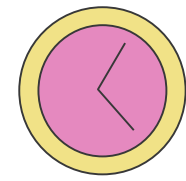


## CC Holder with Warning Message by Sex

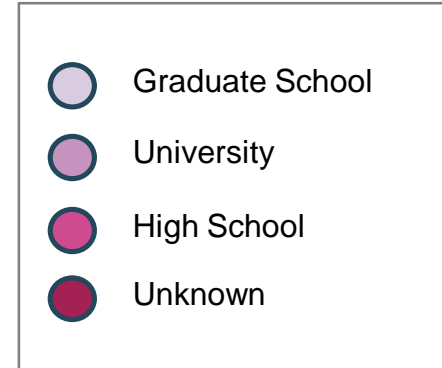
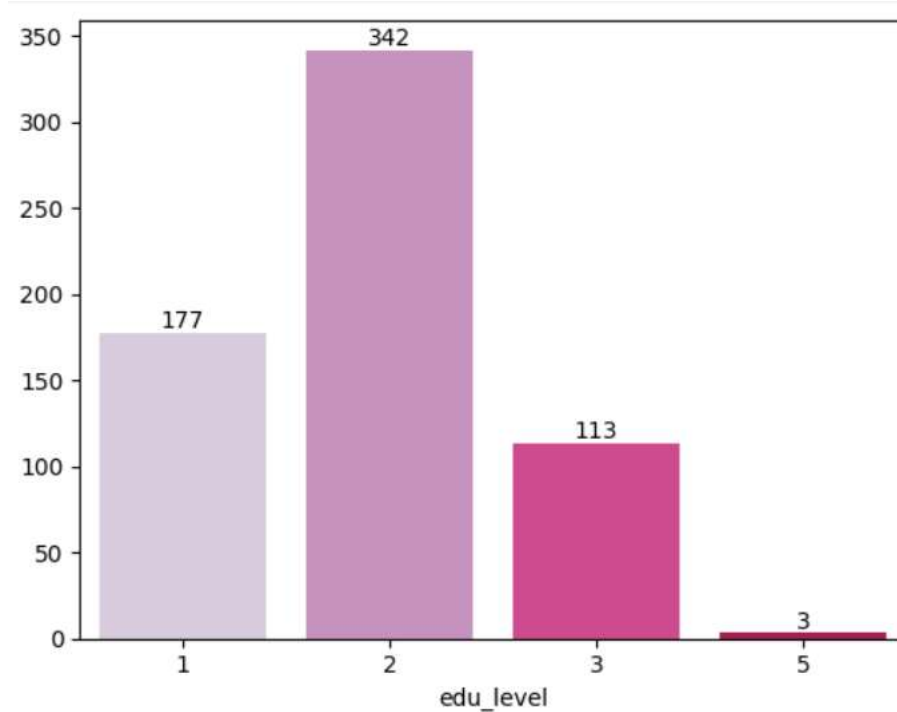


x

○ x



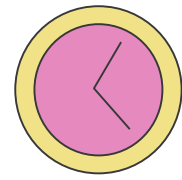
## CC Holder with Warning Message by Educational Level



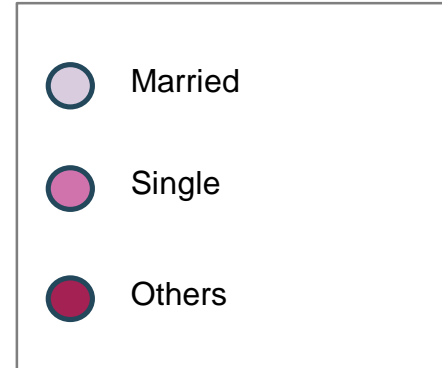
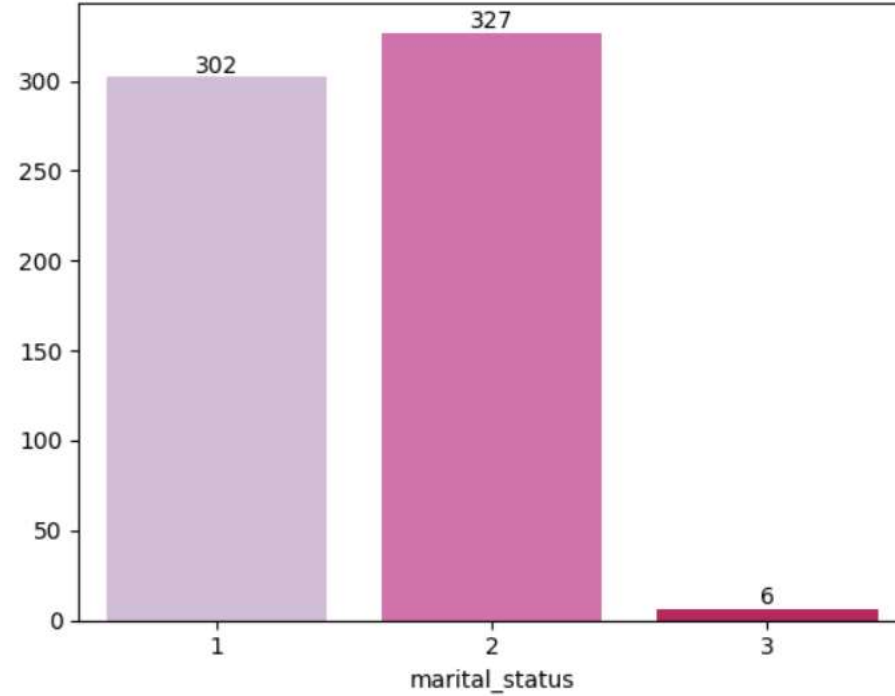
x



x



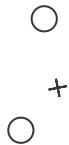
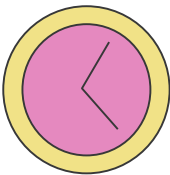
## CC Holder with Warning Message by Marital Status



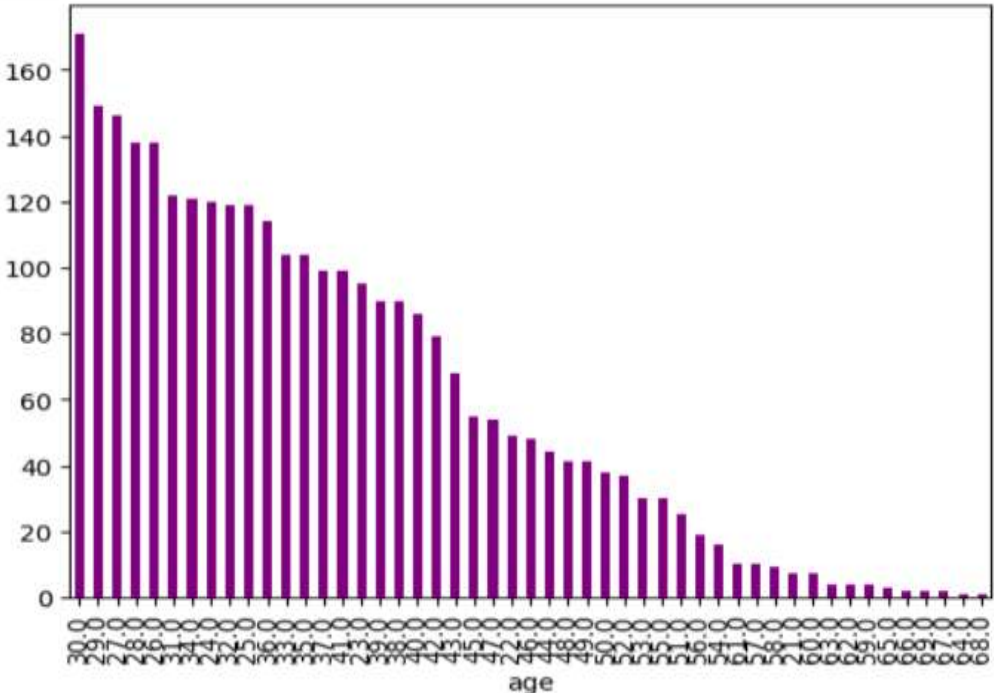
x







# CC Holder with Warning Message by Age



Top 5 :  
26-30 years old



x

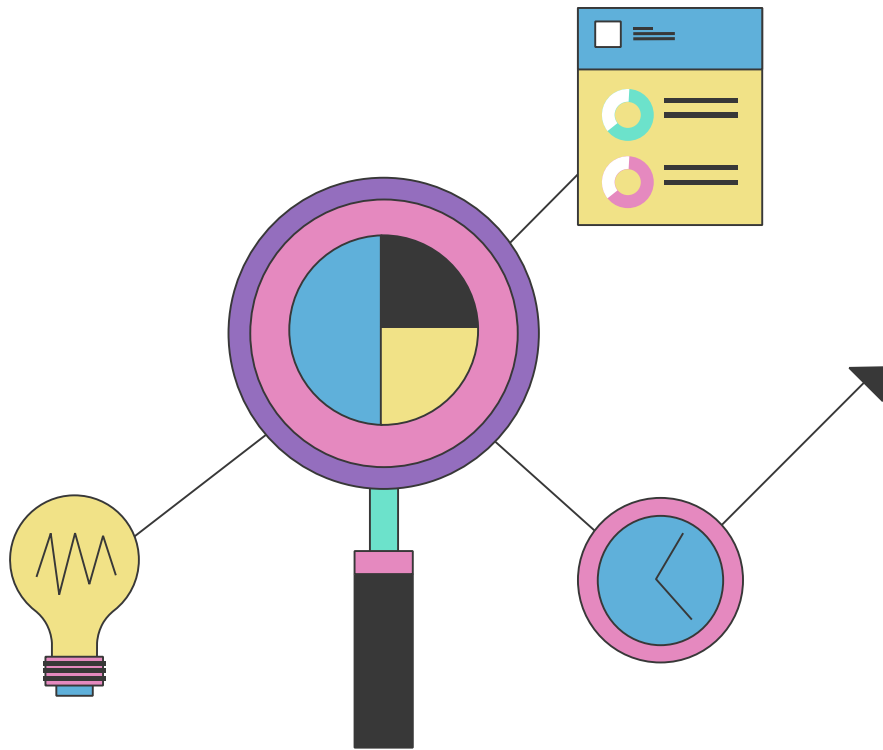
○ x

## Significance of the coefficients

default_payment_n...	55.16	0.66	1.29	2.37	3.31	1.35	2.01	-0.49	0.20	2.35	1.85	1.64	1.94	13.58	14.73	14.83	15.78	16.99	22.08	1.50	0.62	4.21	0.74	7.23
pay_amt_6	0.66	28.53	2.82	4.50	5.01	2.50	4.51	1.47	2.25	1.72	2.02	1.80	3.13	2.49	1.02	2.48	3.72	4.36	5.21	0.56	0.26	0.75	-1.08	5.13
pay_amt_5	1.29	2.82	25.67	4.27	3.39	0.75	3.46	9.56	0.93	0.79	0.61	0.72	1.70	5.07	0.66	0.71	1.15	0.53	1.84	0.25	0.85	0.03	0.67	4.07
pay_amt_4	2.37	4.50	4.27	33.57	7.26	3.37	4.45	5.65	9.26	1.28	3.06	3.17	3.79	-1.11	5.91	2.06	1.37	1.88	2.62	0.91	-1.84	1.33	0.58	5.64
pay_amt_3	3.31	5.01	3.39	7.26	37.59	5.59	6.58	4.90	6.23	11.07	2.43	2.41	3.19	0.25	-0.41	4.27	2.53	2.01	1.85	2.12	-0.42	1.95	0.73	7.27
pay_amt_2	1.35	2.50	0.75	3.37	5.59	14.68	4.37	3.57	3.33	5.01	6.85	2.70	1.90	-0.40	-0.37	-0.07	2.93	2.36	1.29	-0.58	-0.25	0.91	0.56	2.86
pay_amt_1	2.01	4.51	3.46	4.45	6.58	4.37	26.45	4.93	4.81	5.44	7.44	11.15	0.64	0.86	-0.46	0.14	0.21	4.92	1.65	1.41	-0.11	-0.56	-0.06	3.34
bill_amt_6	-0.49	1.47	9.56	5.65	4.90	3.57	4.93	80.60	56.11	52.89	50.64	45.15	42.31	27.63	24.94	24.55	23.31	21.48	19.83	5.45	0.53	-0.27	0.05	22.59
bill_amt_5	0.20	2.25	0.93	9.26	6.23	3.33	4.81	56.11	88.77	63.50	52.57	49.40	46.03	40.07	36.51	33.33	30.44	28.18	23.98	7.25	1.14	4.25	-0.37	26.67
bill_amt_4	2.35	1.72	0.79	1.28	11.07	5.01	5.44	52.89	63.50	88.62	55.50	52.79	48.88	36.30	40.37	38.67	35.56	32.78	28.40	6.95	0.97	4.54	2.37	28.21
bill_amt_3	1.85	2.02	0.61	3.06	2.43	6.85	7.44	50.64	52.57	55.50	80.50	58.41	51.62	25.86	25.76	29.04	27.99	25.01	23.36	4.95	0.44	0.02	2.03	24.89
bill_amt_2	1.64	1.80	0.72	3.17	2.41	2.70	11.15	45.15	49.40	52.79	58.41	77.49	61.18	22.34	21.25	23.80	25.72	23.09	21.85	4.86	1.24	1.36	1.46	24.82
bill_amt_1	1.94	3.13	1.70	3.79	3.19	1.90	0.64	42.31	46.03	48.88	51.62	61.18	75.98	19.82	19.35	21.59	22.98	23.26	22.28	5.28	1.03	1.63	2.30	23.99
pay_6	13.58	2.49	5.07	-1.11	0.25	-0.40	0.86	27.63	40.07	36.30	25.86	22.34	19.82	83.71	59.15	49.46	44.60	41.57	38.20	3.12	1.91	6.08	1.90	10.48
pay_5	14.73	1.02	0.66	5.91	-0.41	-0.37	-0.46	24.94	36.51	40.37	25.76	21.25	19.35	59.15	82.71	59.40	49.04	44.06	40.32	3.88	1.13	6.18	1.59	11.64
pay_4	14.83	2.48	0.71	2.06	4.27	-0.07	0.14	24.55	33.33	38.67	29.04	23.80	21.59	49.46	59.40	83.15	58.37	48.86	44.46	3.98	1.32	6.61	2.74	12.29
pay_3	15.78	3.72	1.15	1.37	2.53	2.93	0.21	23.31	30.44	35.56	27.99	25.72	22.98	44.60	49.04	58.37	84.19	60.68	51.34	4.05	0.60	7.83	4.25	13.80
pay_2	16.99	4.36	0.53	1.88	2.01	2.36	4.92	21.48	28.18	32.78	25.01	23.09	23.26	41.57	44.06	48.86	60.68	84.49	66.87	4.07	2.04	7.66	3.82	14.44
pay_0	22.08	5.21	1.84	2.62	1.85	1.29	1.65	19.83	23.98	28.40	23.36	21.85	22.28	38.20	40.32	44.46	51.34	66.87	89.31	2.78	1.32	6.97	2.41	11.51
age	1.50	0.56	0.25	0.91	2.12	-0.58	1.41	5.45	7.25	6.95	4.95	4.86	5.28	3.12	3.88	3.98	4.05	4.07	2.78	05.09	25.19	13.04	6.40	15.85
marital_status	0.62	0.26	0.85	-1.84	-0.42	-0.25	-0.11	0.53	1.14	0.97	0.44	1.24	1.03	1.91	1.13	1.32	0.60	2.04	1.32	25.19	66.40	9.58	-1.07	3.86
edu_level	4.21	0.75	0.03	1.33	1.95	0.91	-0.56	-0.27	4.25	4.54	0.02	1.36	1.63	6.08	6.18	6.61	7.83	7.66	6.97	13.04	9.58	79.50	1.64	12.19
sex	0.74	-1.08	0.67	0.58	0.73	0.56	-0.06	0.05	-0.37	2.37	2.03	1.46	2.30	1.90	1.59	2.74	4.25	3.82	2.41	6.40	-1.07	1.64	52.72	3.57
limit_balance	7.23	5.13	4.07	5.64	7.27	2.86	3.34	22.59	26.67	28.21	24.89	24.82	23.99	10.48	11.64	12.29	13.80	14.44	11.51	15.85	3.86	12.19	3.57	96.17
	t_n...	mt_6	mt_5	mt_4	mt_3	mt_2	mt_1	mt_6	mt_5	mt_4	mt_3	mt_2	mt_1	pay_6	pay_5	pay_4	pay_3	pay_2	pay_0	age	tatus	level	sex	lance

03

# Model





# Model Comparison

## Logistic Regression

Precision Train : 0.72  
Precision Test : 0.70

Cross validation

Score : 0.69

## SVM

Precision Train : 0.75  
Precision Test : 0.62

Cross validation

Score : 0.7

## Logistic Regression

Precision Train : 0.72

False Positive : 26

Precision Test : 0.70

Cross validation

Score : 0.69

Score : 0.68

Score : 0.68

Score : 0.64

## Naive Bayes

Sensitivity : 26  
Precision Train : 0.54  
Precision Test : 0.54

Cross validation

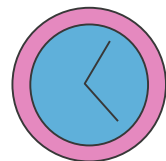
Score : 0.54

## Bagging Classifier

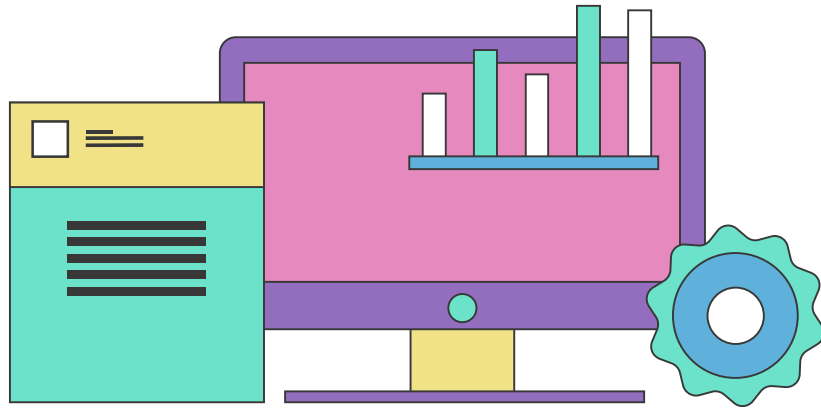
Precision Train : 0.78  
Precision Test : 0.61

Cross validation

Score : 0.68



# Hyperparameter Tuning



## Parameter

Solver = Saga  
Penalty = L1  
C = 0,1



**Score = 0,72**

x

○

x

# Conclusion



## Correlation

Demography is not correlated to Default Payment. Status Payment History is correlated to Default Payment.



## Best Model

Logistic Regression



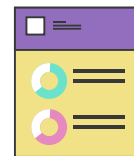
## Prediction Score

72% Predict True Values



## Improvement

Preprocessing



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# Thank You!

