some models that have been test for classification

Number	Model Type	Algorithm/Math Function	Type Of Inputs	Overall Accuracy	Accuracy In Minority Class	Accuracy In Majority Class	Comment	Input Features	Acceptance/Decline
1	Logistic regression	fitLifetimePDModel	Conventional Financial ratio	73٪	not available as out put	not available as out put	Without feature optimization	All independent features	not enough accuracy in minority class
2	Logistic regression	fitLifetimePDModel	Conventional Financial ratio	72٪	not available as out put	not available as out put	With feature optimization	EBITDA_Interest ICR ROA NetDebt_EBITDA NetProfittoEBITratio EBITtoDebt CurrentRatio Industry	not enough accuracy in minority class
3	Decision tree	fitctree	Conventional Financial ratio	85٪	20٪	92٪	Without feature optimization	All independent features	not enough accuracy in minority class

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4	SVM	fitcsvm	Conventional Financial ratio	70%	25%	75%	Without feature optimization	All independent features	not enough accuracy in minority class
									Outputs are not stable with random sampling
5	ensemble	Fitcensemble Bag	Conventional Financial ratio	83%	4%	99%	Without feature optimization	All independent features	not enough accuracy in minority class
6	ensemble	Fitcensemble AdaBoostM1	Conventional Financial ratio	90%	12%	98%	Without feature optimization	All independent features	not enough accuracy in minority class
7	ensemble	Fitcensemble Gentleboost	Conventional Financial ratio	89%	16%	97%	Without feature optimization	All independent features	not enough accuracy in minority class
8	ensemble cost function	Fitcensemble Gentleboost / With cost matrix	Conventional Financial ratio	77%	51%	79%	With penalizing for minority class error	All independent features	Relatively fair accuracy in minority class

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9	ensemble cost function optimization	Fitcensemble Gentleboost With cost matrix Surrogate Optimization	Conventional Financial ratio	70٪	63٪	71٪	With feature optimization + penalizing for minority class erro	{'AccrProfLoss_Capital' 'Cashconversioncycle' 'Industry' 'ICR'} {'assetturnover' 'CurrentRatio' 'EBITDA_Interest' 'WCTurnover'}	Relatively fair accuracy in minority class
10	ensemble cost function	Error-Correcting Output Codes (ECOC) Model + fitcecoc	Conventional Financial ratio	66٪	65٪	60٪	With feature optimization +	{NetDebt_EBITDA ROIC Industry Debt_EBITDA EquitytoAssets Currentliabilities_equity Assetturnover ROA WCTurnover ROCE} {CFO_Debt Debt_BookCapitalization EBITtoDebt Quickratio Debt_EBITDA ROA WCTurnover ROCE CurrentRatio}	Relatively fair accuracy in minority class -

							penalizing for minority class error		Not Stable with random sampling
*11	Ensemble for imbalance classification	Fitcensemble RusBoost + Learning Rate analysis	Conventional Financial ratio	70%	68%	70%		All independent features	Best accuracy in minority class
12	Ensemble for imbalance classification	Fitcensemble RusBoost +surrogate optimization +optimizing learning rate	Conventional Financial ratio	69%	62%	74%	With feature optimization Needs translator to convert output to probability of default	{'EquitytoAssets' 'EBITDA_Interest' 'assetturnover' 'WCTurnover'} {'Industry' 'ICR' 'assetturnover' 'WCTurnover'}	
13	Ensemble for imbalance classification	بFitcensemble RusBoost	Non-dimensional FS ratio	74%	71%	79%	Improving accuracy in minority class	With feature optimization	Stable output

14	Ensemble for imbalance classification	Fitcensemble RusBoost	Non-dimensional FS ratio	74%	68%	80%	Improving accuracy in minority class	All independent features	Stable output
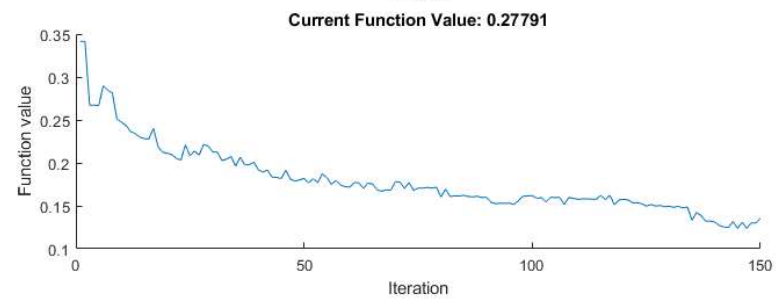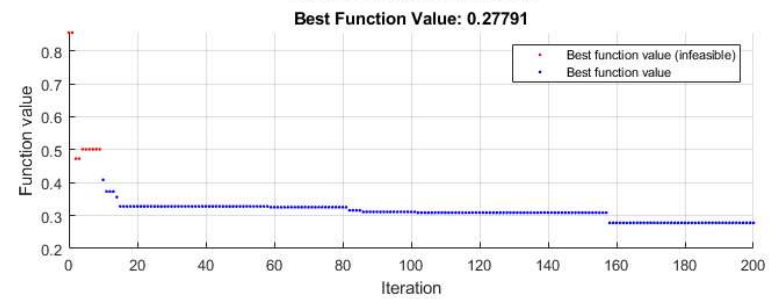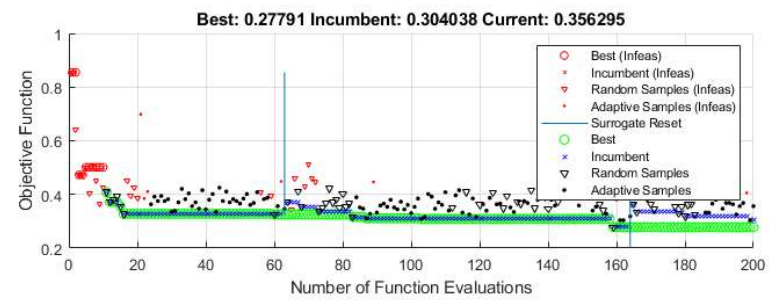
Surrogate optimization output
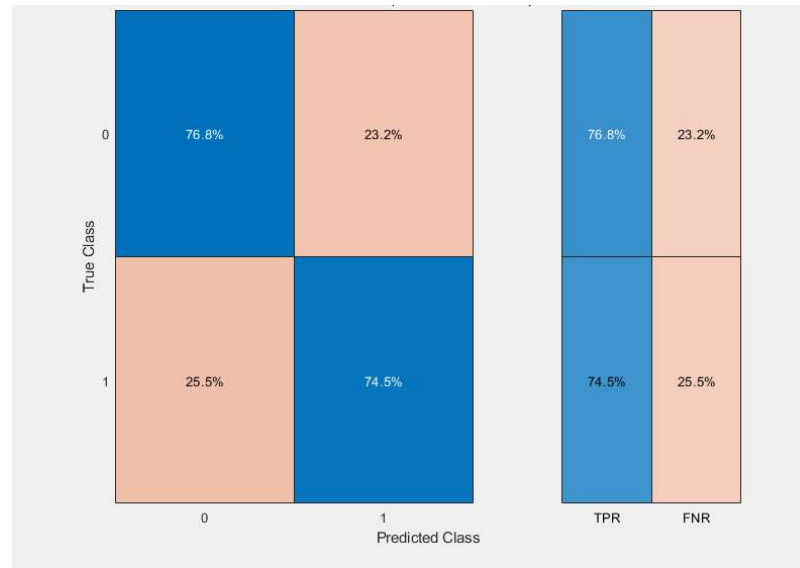
Result on test data set

Result on all data set

Default probability mapping results

Rate	% Default Rate in Model	% Default Rate in Reference	Square of Difference	Value of Difference
AA	0.0%	0.0%	0.0%	0.0%
A	0.0%	0.1%	0.0%	0.1%
BBB+	0.0%	0.2%	0.0%	0.2%
BBB	0.0%	0.4%	0.0%	0.4%
BBB-	0.0%	0.6%	0.0%	0.6%
BB+	0.4%	1.1%	0.0%	0.7%
BB	0.7%	1.9%	0.0%	1.2%
BB-	0.6%	2.6%	0.0%	2.1%
B+	2.8%	4.5%	0.0%	1.7%
B	2.8%	7.5%	0.2%	4.7%
B-	9.4%	10.5%	0.0%	1.1%

CCC+	16.2%	16.7%	0.0%	0.4%
CCC	19.2%	26.0%	0.5%	6.8%
CCC-	35.6%	35.3%	0.0%	0.3%
CC	57.5%	50.0%	0.6%	7.5%
C	74.3%	70.0%	0.2%	4.3%

	AA	A	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC	C	
AA	33.3%	66.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.1%**
A	1.7%	41.7%	41.7%	1.7%	1.7%	5.0%	3.3%	1.7%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**1.2%**
BBB+	0.5%	8.7%	42.1%	18.8%	9.4%	5.3%	5.5%	4.1%	0.7%	2.2%	0.2%	0.0%	0.2%	0.2%	0.0%	2.2%	**8.0%**
BBB	0.2%	1.5%	23.8%	25.9%	15.2%	8.1%	11.1%	2.7%	4.2%	1.9%	2.3%	1.0%	0.4%	0.0%	0.2%	1.5%	**9.2%**
BBB-	0.0%	0.4%	11.5%	17.8%	16.1%	17.2%	11.9%	6.0%	5.3%	4.2%	4.3%	2.1%	1.3%	0.4%	0.9%	0.6%	**10.2%**
BB+	0.0%	0.4%	6.4%	12.5%	15.6%	19.3%	18.7%	7.3%	7.3%	4.0%	2.9%	1.7%	1.2%	0.6%	0.6%	1.5%	**10.0%**
BB	0.0%	0.0%	3.1%	7.2%	11.1%	15.4%	19.2%	11.8%	9.5%	8.2%	6.0%	2.7%	1.5%	1.4%	0.5%	2.4%	**12.6%**
BB-	0.0%	0.0%	2.4%	4.9%	11.6%	10.0%	20.5%	16.8%	10.0%	10.0%	6.2%	2.7%	1.1%	0.3%	0.3%	3.2%	**7.1%**
B+	0.0%	0.0%	2.5%	7.1%	7.4%	7.1%	13.2%	12.2%	11.9%	10.2%	11.2%	4.6%	4.1%	2.3%	1.3%	5.1%	**7.6%**
B	0.0%	0.0%	2.2%	3.8%	2.7%	8.8%	12.1%	10.2%	13.7%	12.9%	12.4%	9.1%	4.4%	2.2%	0.8%	4.7%	**7.0%**
B-	0.0%	0.0%	1.9%	2.2%	4.6%	7.8%	8.6%	5.7%	10.0%	14.8%	16.4%	6.7%	8.1%	4.3%	2.4%	6.5%	**7.1%**
CCC+	0.4%	0.0%	1.7%	2.1%	4.3%	6.0%	7.3%	4.3%	9.0%	12.4%	17.1%	13.7%	6.8%	6.4%	0.9%	7.7%	**4.5%**
CCC	0.0%	0.0%	0.0%	3.3%	3.3%	8.2%	6.6%	5.5%	2.7%	8.2%	13.7%	11.5%	6.0%	9.3%	4.9%	16.5%	**3.5%**
CCC-	0.0%	0.0%	1.6%	2.3%	6.3%	1.6%	7.8%	3.9%	4.7%	3.9%	8.6%	13.3%	13.3%	8.6%	6.3%	18.0%	**2.5%**
CC	0.0%	0.0%	1.4%	1.4%	1.4%	4.2%	4.2%	2.8%	5.6%	11.1%	11.1%	5.6%	8.3%	11.1%	8.3%	23.6%	**1.4%**
C	0.0%	0.0%	0.9%	3.5%	6.8%	3.7%	4.7%	3.7%	6.5%	3.5%	8.2%	3.0%	5.1%	4.7%	2.1%	43.5%	**8.2%**

Migration matrix of credit rate class