Prediction of Customer Satisfaction and Evaluating the Significance of Services and Performance

CME 4434 DATA WAREHOUSES AND BUSINESS INTELLIGENCE

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06.01.2025
İzmir

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Results
Demo
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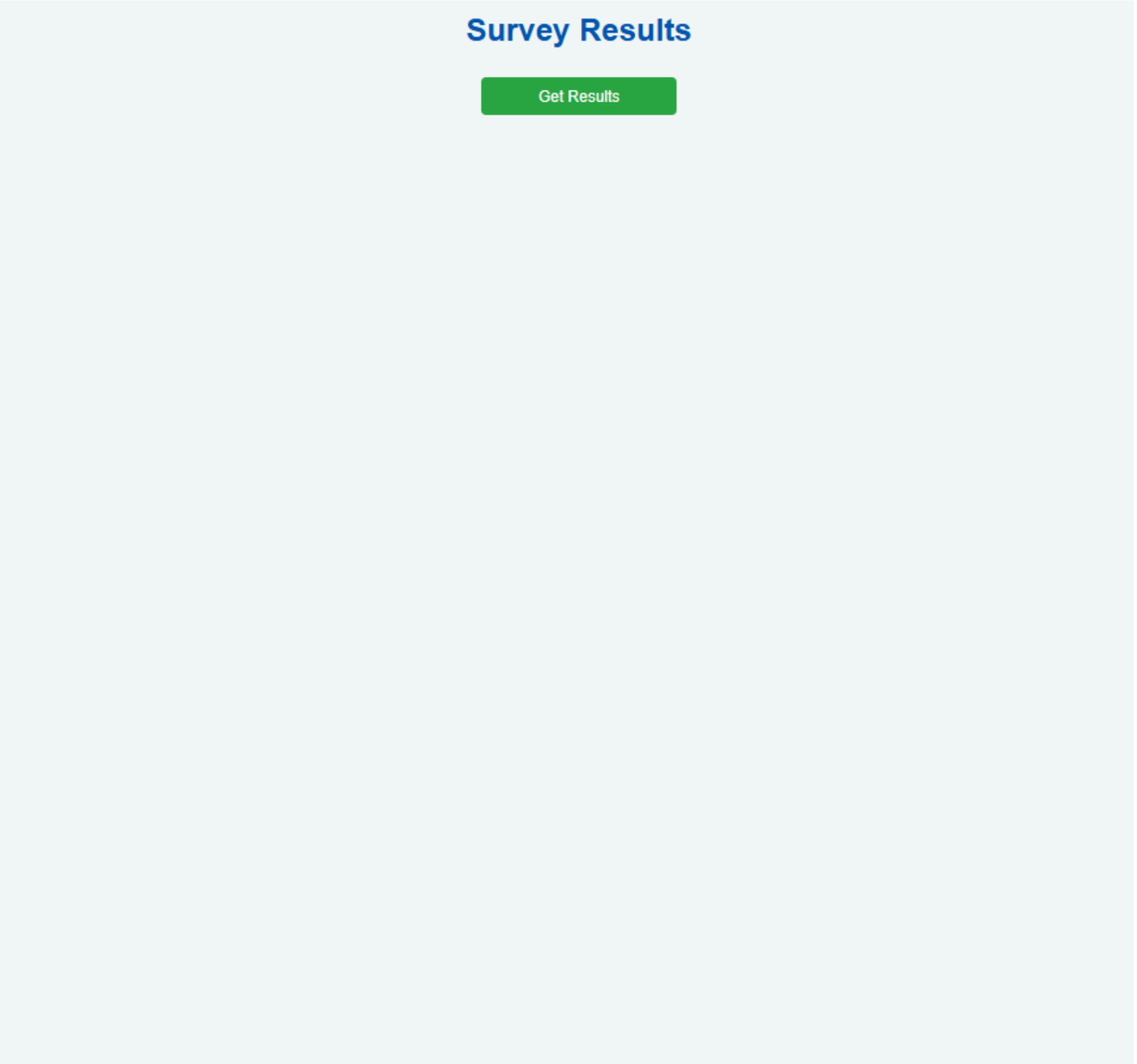
INTRODUCTION

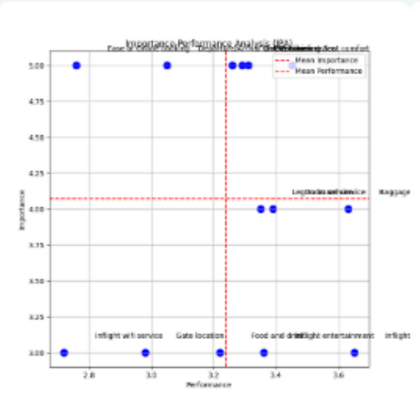
PROJECT OVERVIEW

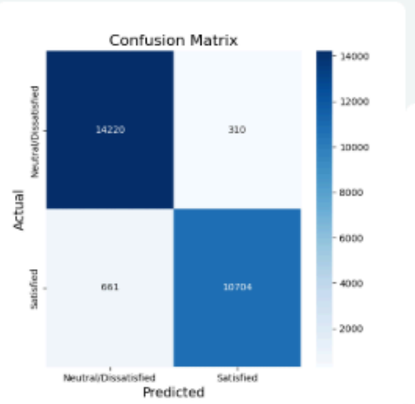

Survey Results
Get Results

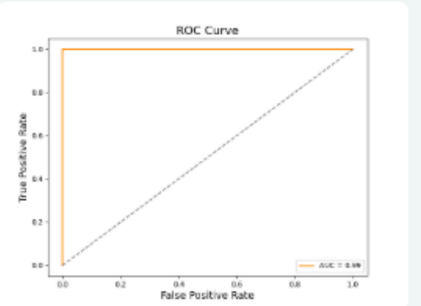
Survey Results

Get Results

accuracy: 0.9625024135933578
auc: 0.9937778536087025
f1: 0.9566111086286251
kappa: 0.9236105489620673
precision: 0.9718540039949156
recall: 0.9418389793224813

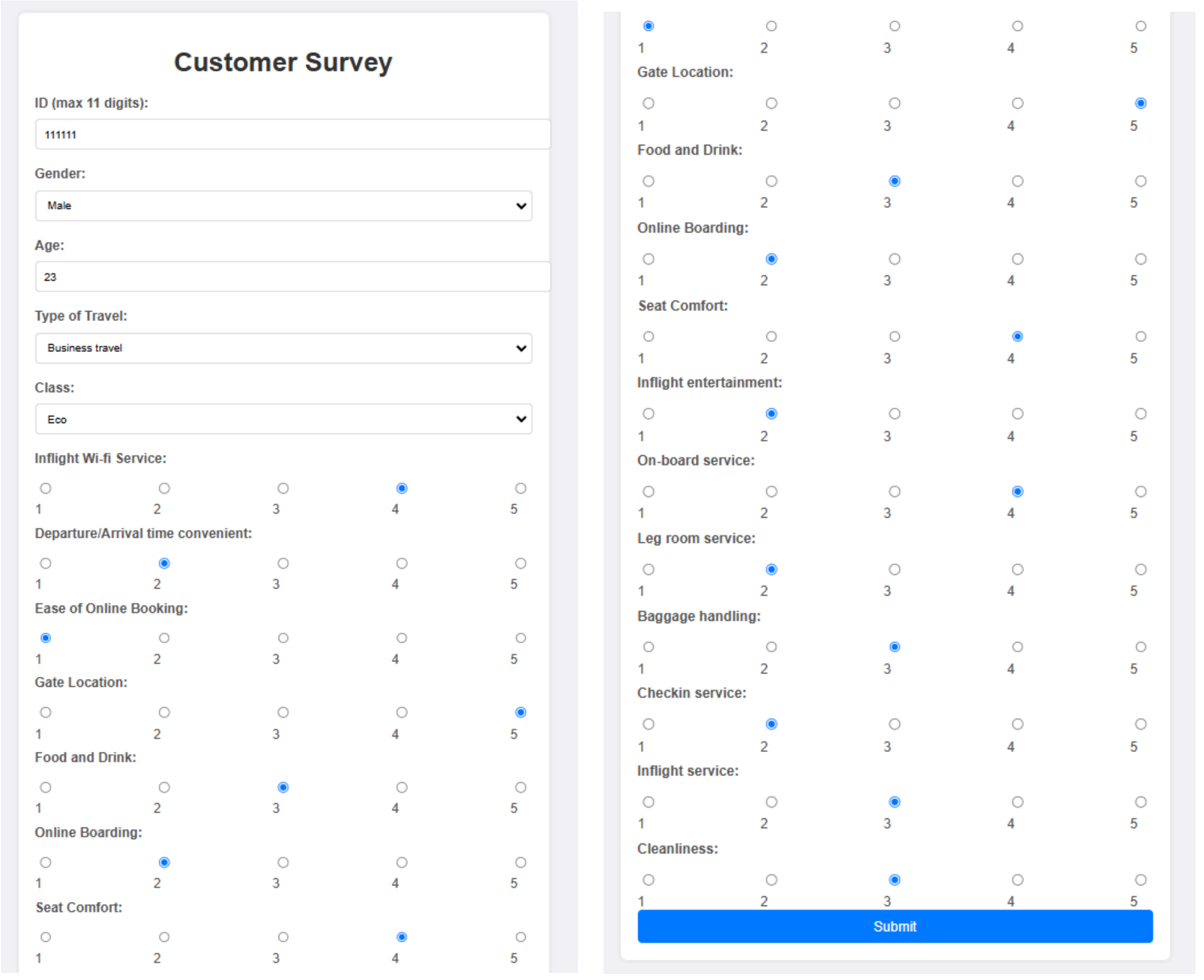




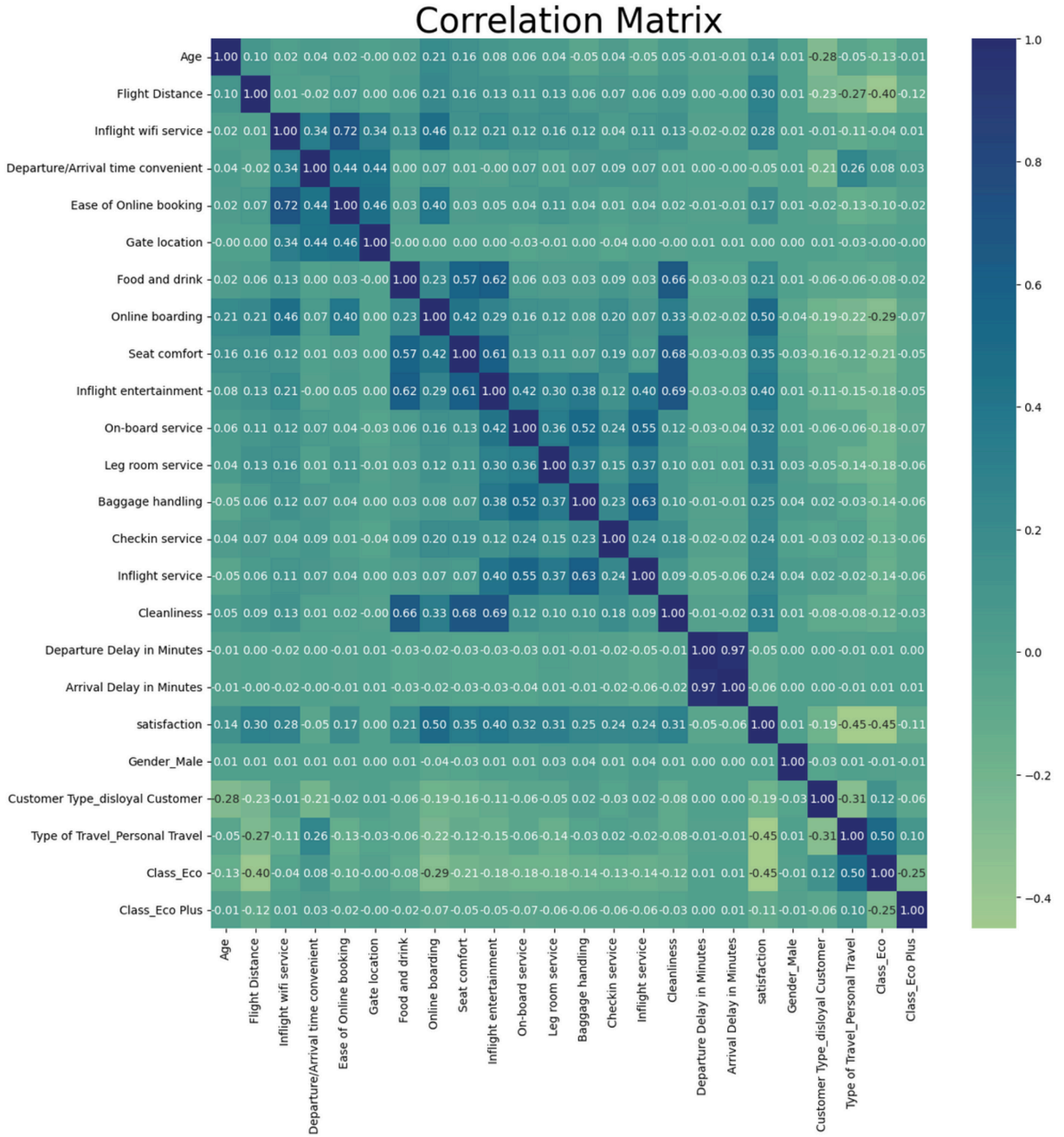


importance mean: 4.07
performance mean: 3.24

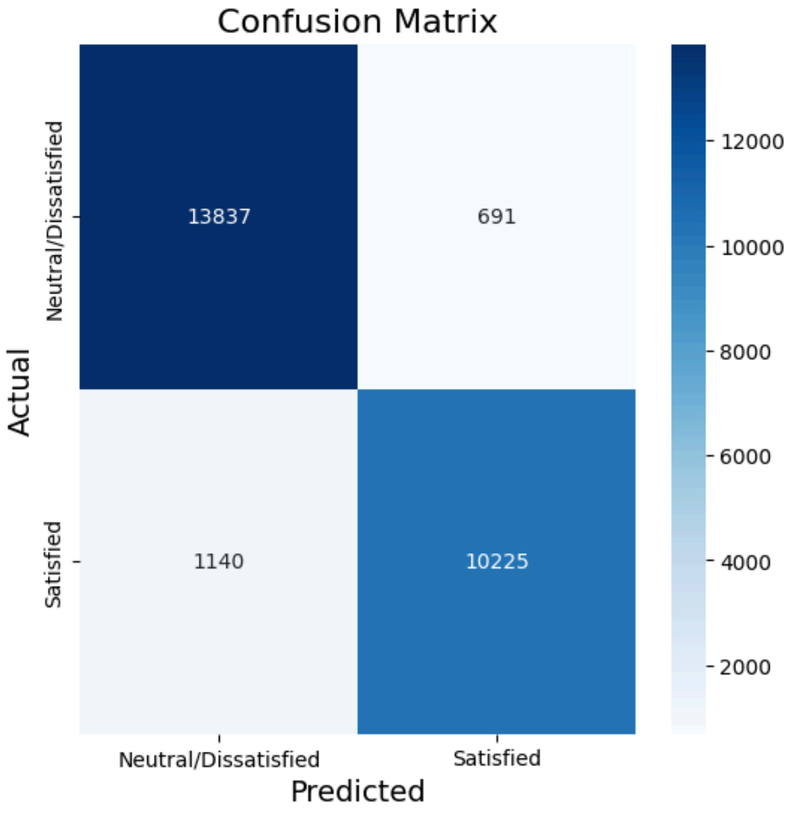
Attribute	Importance	Performance	Quadrant
Inflight wifi service	3	2.72	Low Priority
Departure/Arrival time convenient	5	3.05	Concentrate Here
Ease of Online booking	5	2.76	Concentrate Here
Gate location	3	2.98	Low Priority
Food and drink	3	3.22	Low Priority
Online boarding	5	3.26	Good Work
Seat comfort	5	3.45	Good Work
Inflight entertainment	3	3.36	Possible Overkill
On-board service	4	3.39	Possible Overkill
Leg room service	4	3.35	Possible Overkill
Baggage handling	4	3.63	Possible Overkill
Checkin service	5	3.31	Good Work
Inflight service	3	3.65	Possible Overkill
Cleanliness	5	3.29	Good Work


Customer Survey
ID (max 11 digits):
111111
Gender:
Male
Age:
23
Type of Travel:
Business travel
Class:
Eco
Inflight Wi-fi Service:
1 2 3 4 5
Departure/Arrival time convenient:
1 2 3 4 5
Ease of Online Booking:
1 2 3 4 5
Gate Location:
1 2 3 4 5
Food and Drink:
1 2 3 4 5
Online Boarding:
1 2 3 4 5
Seat Comfort:
1 2 3 4 5
1 2 3 4 5
Gate Location:
1 2 3 4 5
Food and Drink:
1 2 3 4 5
Online Boarding:
1 2 3 4 5
Seat Comfort:
1 2 3 4 5
Inflight entertainment:
1 2 3 4 5
On-board service:
1 2 3 4 5
Leg room service:
1 2 3 4 5
Baggage handling:
1 2 3 4 5
Checkin service:
1 2 3 4 5
Inflight service:
1 2 3 4 5
Cleanliness:
1 2 3 4 5
Submit

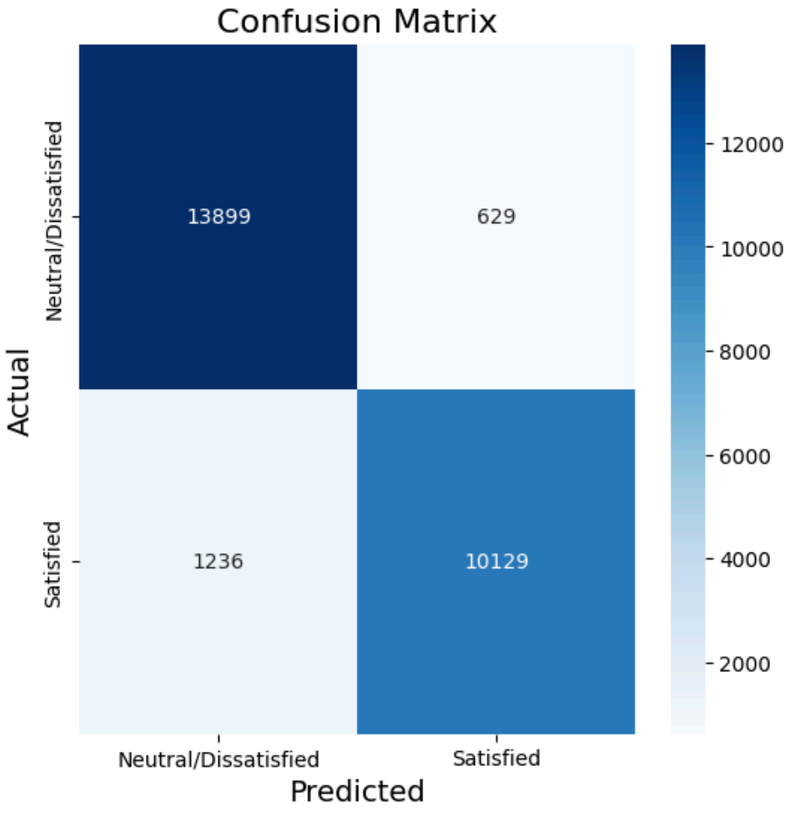
RESULTS


Correlation Matrix
Age 1.00 0.10 0.02 0.04 0.02 -0.00 0.02 0.21 0.16 0.08 0.06 0.04 -0.05 0.04 -0.05 0.05 -0.01 -0.01 0.14 0.01 -0.28 -0.05 -0.13 -0.01
Flight Distance 0.10 1.00 0.01 -0.02 0.07 0.00 0.06 0.21 0.16 0.13 0.11 0.13 0.06 0.07 0.06 0.09 0.00 -0.00 0.30 0.01 -0.23 -0.27 -0.40 -0.12
Inflight wifi service 0.02 0.01 1.00 0.34 0.72 0.34 0.13 0.46 0.12 0.21 0.12 0.16 0.12 0.04 0.11 0.13 -0.02 -0.02 0.28 0.01 -0.01 -0.11 -0.04 0.01
Departure/Arrival time convenient 0.04 -0.02 0.34 1.00 0.44 0.44 0.00 0.07 0.01 -0.00 0.07 0.01 0.07 0.09 0.07 0.01 0.00 -0.00 -0.05 0.01 -0.21 0.26 0.08 0.03
Ease of Online booking 0.02 0.07 0.72 0.44 1.00 0.46 0.03 0.40 0.03 0.05 0.04 0.11 0.04 0.01 0.04 0.02 -0.01 -0.01 0.17 0.01 -0.02 -0.13 -0.10 -0.02
Gate location -0.00 0.00 0.34 0.44 0.46 1.00 -0.00 0.00 0.00 0.00 -0.03 -0.01 0.00 -0.04 0.00 -0.00 0.01 0.01 0.00 0.00 0.01 -0.03 -0.00 -0.00
Food and drink 0.02 0.06 0.13 0.00 0.03 -0.00 1.00 0.23 0.57 0.62 0.06 0.03 0.03 0.09 0.03 0.66 -0.03 -0.03 0.21 0.01 -0.06 -0.06 -0.08 -0.02
Online boarding 0.21 0.21 0.46 0.07 0.40 0.00 0.23 1.00 0.42 0.29 0.16 0.12 0.08 0.20 0.07 0.33 -0.02 -0.02 0.50 -0.04 -0.19 -0.22 -0.29 -0.07
Seat comfort 0.16 0.16 0.12 0.01 0.03 0.00 0.57 0.42 1.00 0.61 0.13 0.11 0.07 0.19 0.07 0.68 -0.03 -0.03 0.35 -0.03 -0.16 -0.12 -0.21 -0.05
Inflight entertainment 0.08 0.13 0.21 -0.00 0.05 0.00 0.62 0.29 0.61 1.00 0.42 0.30 0.38 0.12 0.40 0.69 -0.03 -0.03 0.40 0.01 -0.11 -0.15 -0.18 -0.05
On-board service 0.06 0.11 0.12 0.07 0.04 -0.03 0.06 0.16 0.13 0.42 1.00 0.36 0.52 0.24 0.55 0.12 -0.03 -0.04 0.32 0.01 -0.06 -0.06 -0.18 -0.07
Leg room service 0.04 0.13 0.16 0.01 0.11 -0.01 0.03 0.12 0.11 0.30 0.36 1.00 0.37 0.15 0.37 0.10 0.01 0.01 0.31 0.03 -0.05 -0.14 -0.18 -0.06
Baggage handling -0.05 0.06 0.12 0.07 0.04 0.00 0.03 0.08 0.07 0.38 0.52 0.37 1.00 0.23 0.63 0.10 -0.01 -0.01 0.25 0.04 0.02 -0.03 -0.14 -0.06
Checkin service 0.04 0.07 0.04 0.09 0.01 -0.04 0.09 0.20 0.19 0.12 0.24 0.15 0.23 1.00 0.24 0.18 -0.02 -0.02 0.24 0.01 -0.03 0.02 -0.13 -0.06
Inflight service -0.05 0.06 0.11 0.07 0.04 0.00 0.03 0.07 0.07 0.40 0.55 0.37 0.63 0.24 1.00 0.09 -0.05 -0.06 0.24 0.04 0.02 -0.02 -0.14 -0.06
Cleanliness 0.05 0.09 0.13 0.01 0.02 -0.00 0.66 0.33 0.68 0.69 0.12 0.10 0.10 0.18 0.09 1.00 -0.01 -0.02 0.31 0.01 -0.08 -0.08 -0.12 -0.03
Departure Delay in Minutes -0.01 0.00 -0.02 0.00 -0.01 0.01 -0.03 -0.02 -0.03 -0.03 -0.03 0.01 -0.01 -0.02 -0.05 -0.01 1.00 0.97 -0.05 0.00 0.00 -0.01 0.01 0.00
Arrival Delay in Minutes -0.01 -0.00 -0.02 -0.00 -0.01 0.01 -0.03 -0.02 -0.03 -0.03 -0.04 0.01 -0.01 -0.02 -0.06 -0.02 0.97 1.00 -0.06 0.00 0.00 -0.01 0.01 0.01
satisfaction 0.14 0.30 0.28 -0.05 0.17 0.00 0.21 0.50 0.35 0.40 0.32 0.31 0.25 0.24 0.24 0.31 -0.05 -0.06 1.00 0.01 -0.19 -0.45 -0.45 -0.11
Gender_Male 0.01 0.01 0.01 0.01 0.01 0.00 0.01 -0.04 -0.03 0.01 0.01 0.03 0.04 0.01 0.04 0.01 0.00 0.00 0.01 1.00 -0.03 0.01 -0.01 -0.01
Customer Type_disloyal Customer -0.28 -0.23 -0.01 -0.21 -0.02 0.01 -0.06 -0.19 -0.16 -0.11 -0.06 -0.05 0.02 -0.03 0.02 -0.08 0.00 0.00 -0.19 -0.03 1.00 -0.31 0.12 -0.06
Type of Travel_Personal Travel -0.05 -0.27 -0.11 0.26 -0.13 -0.03 -0.06 -0.22 -0.12 -0.15 -0.06 -0.14 -0.03 0.02 -0.02 -0.08 -0.01 -0.01 -0.45 0.01 -0.31 1.00 0.50 0.10
Class_Eco -0.13 -0.40 -0.04 0.08 -0.10 -0.00 -0.08 -0.29 -0.21 -0.18 -0.18 -0.18 -0.14 -0.13 -0.14 -0.12 0.01 0.01 -0.45 -0.01 0.12 0.50 1.00 -0.25
Class_Eco Plus -0.01 -0.12 0.01 0.03 -0.02 -0.00 -0.02 -0.07 -0.05 -0.05 -0.07 -0.06 -0.06 -0.06 -0.06 -0.03 0.00 0.01 -0.11 -0.01 -0.06 0.10 -0.25 1.00
Age
Flight Distance
Inflight wifi service
Departure/Arrival time convenient
Ease of Online booking
Gate location
Food and drink
Online boarding
Seat comfort
Inflight entertainment
On-board service
Leg room service
Baggage handling
Checkin service
Inflight service
Cleanliness
Departure Delay in Minutes
Arrival Delay in Minutes
satisfaction
Gender_Male
Customer Type_disloyal Customer
Type of Travel_Personal Travel
Class_Eco
Class_Eco Plus
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4

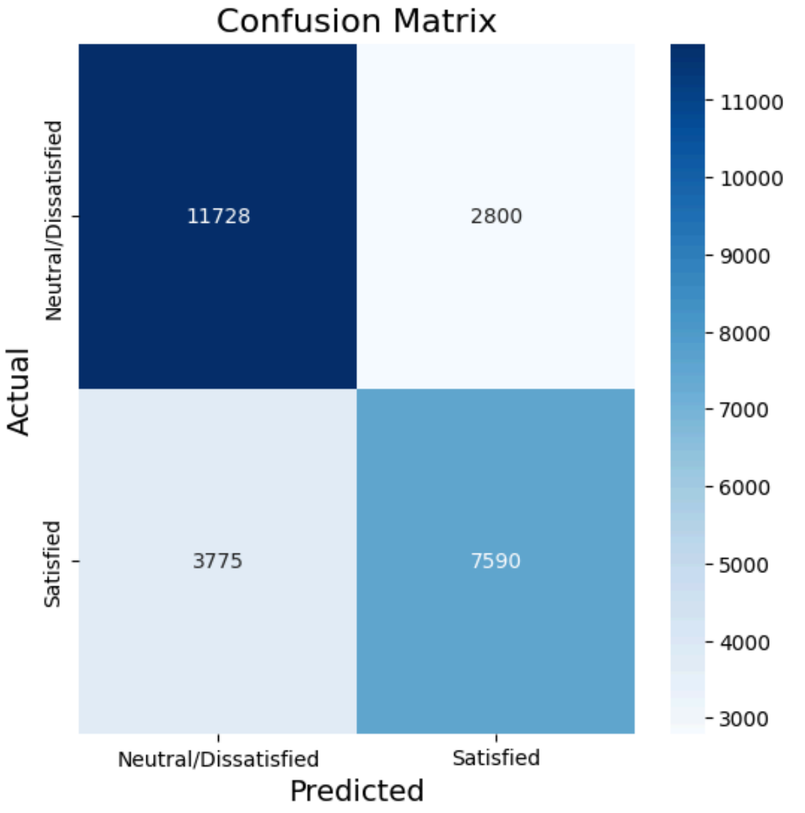
KNN



With feature selection

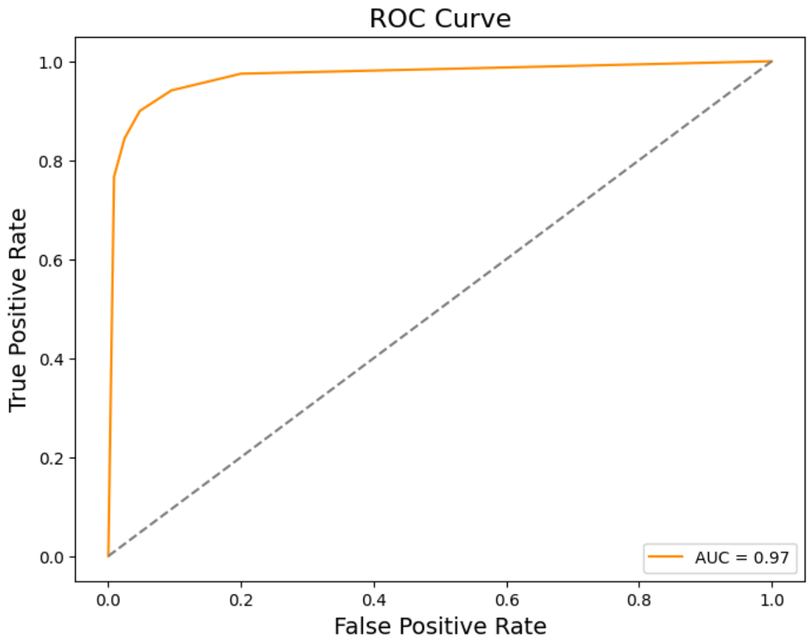


With normalization

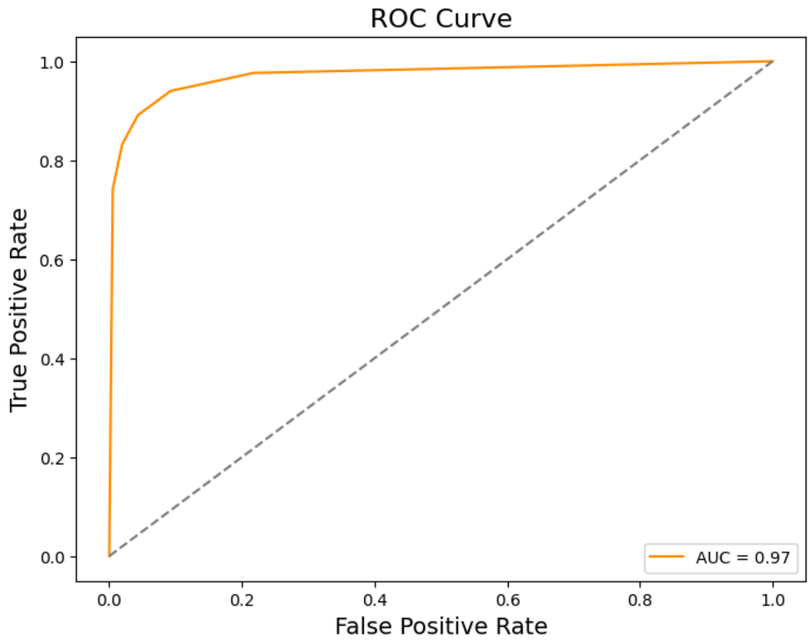


Without preprocessing

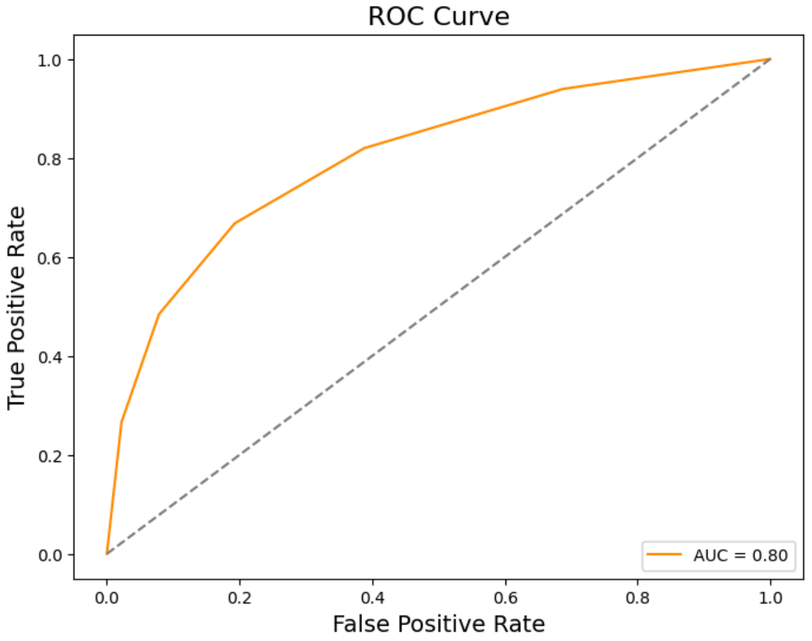
KNN



With feature selection



With normalization



Without preprocessing

KNN

Accuracy: 0.93

Precision: 0.94

Recall: 0.90

F1-Score: 0.92

AUC: 0.97

Cohen's Kappa: 0.86

With feature selection

Accuracy: 0.93

Precision: 0.94

Recall: 0.89

F1-Score: 0.92

AUC: 0.97

Cohen's Kappa: 0.85

With normalization

Accuracy: 0.75

Precision: 0.73

Recall: 0.67

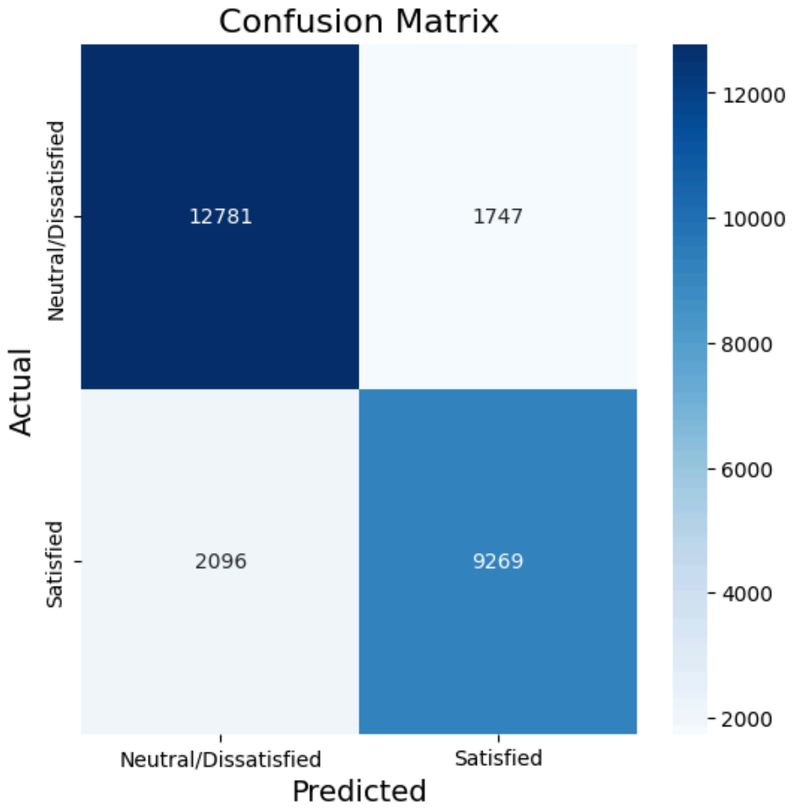
F1-Score: 0.70

AUC: 0.80

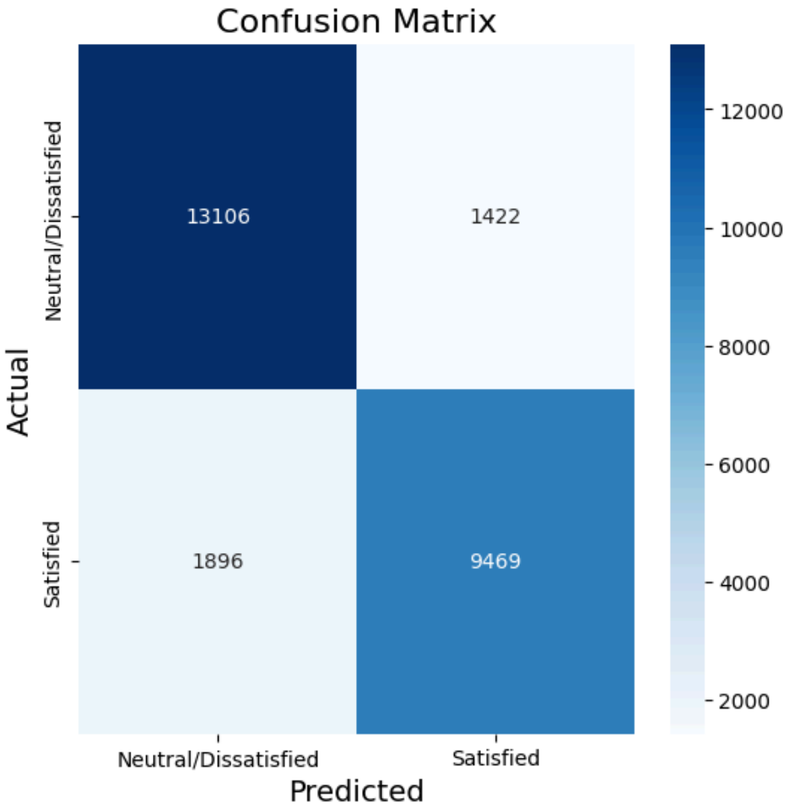
Cohen's Kappa: 0.48

Without preprocessing

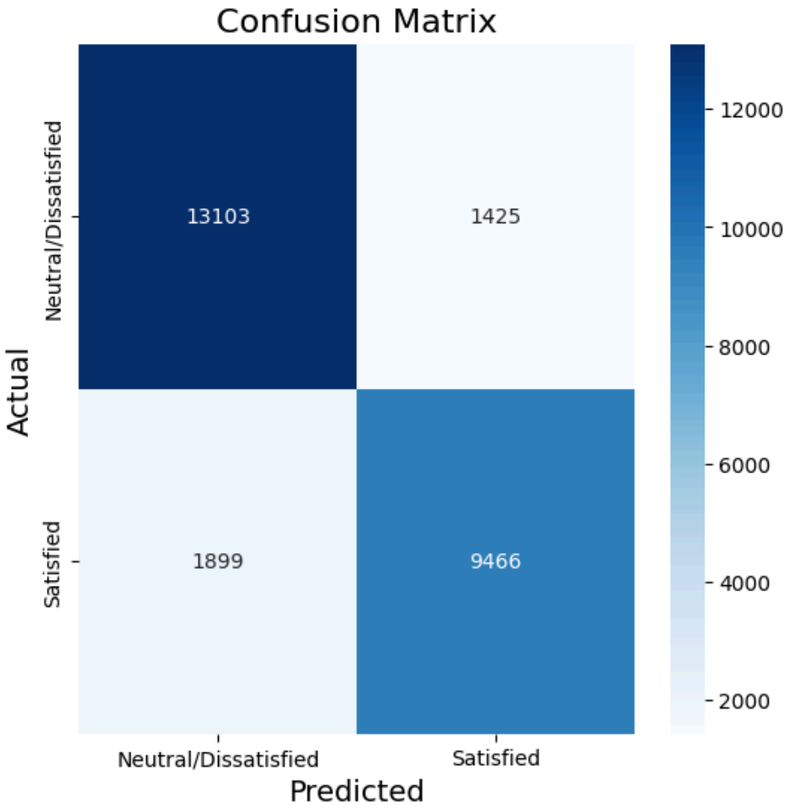
Logistic Regression



With feature selection

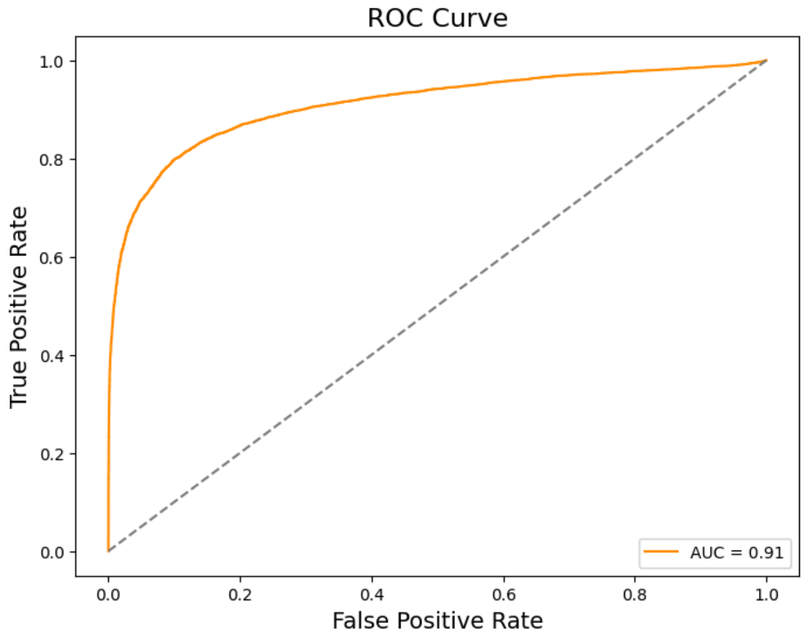


With normalization

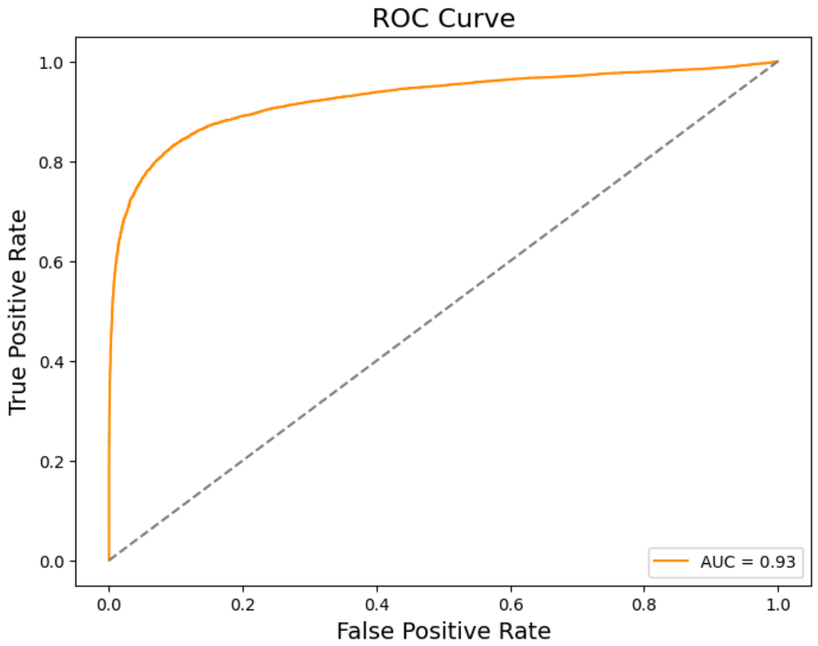


Without preprocessing

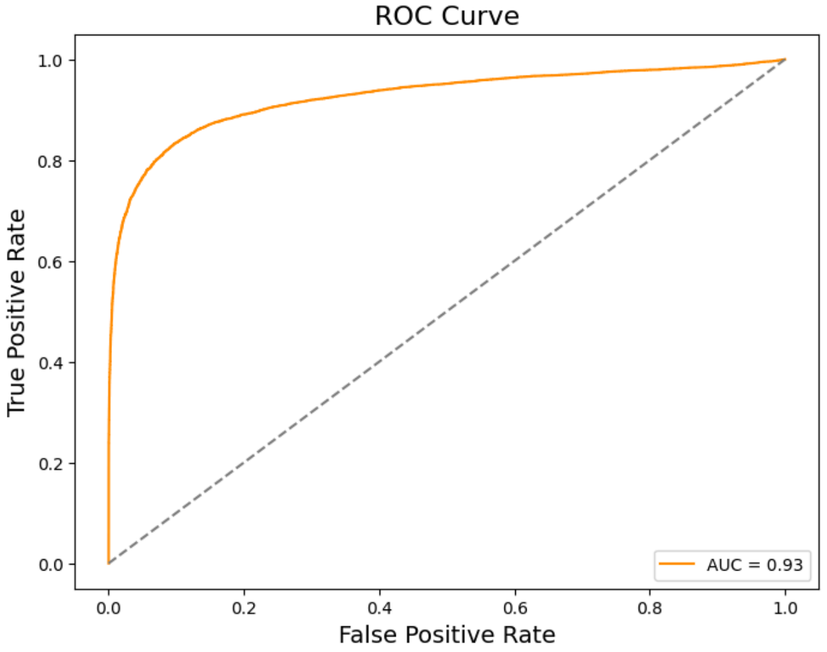
Logistic Regression



With feature selection



With normalization



Without preprocessing

Logistic Regression

Accuracy: 0.85

Precision: 0.84

Recall: 0.82

F1-Score: 0.83

AUC: 0.91

Cohen's Kappa: 0.70

With feature selection

Accuracy: 0.87

Precision: 0.87

Recall: 0.83

F1-Score: 0.85

AUC: 0.93

Cohen's Kappa: 0.74

With normalization

Accuracy: 0.87

Precision: 0.87

Recall: 0.83

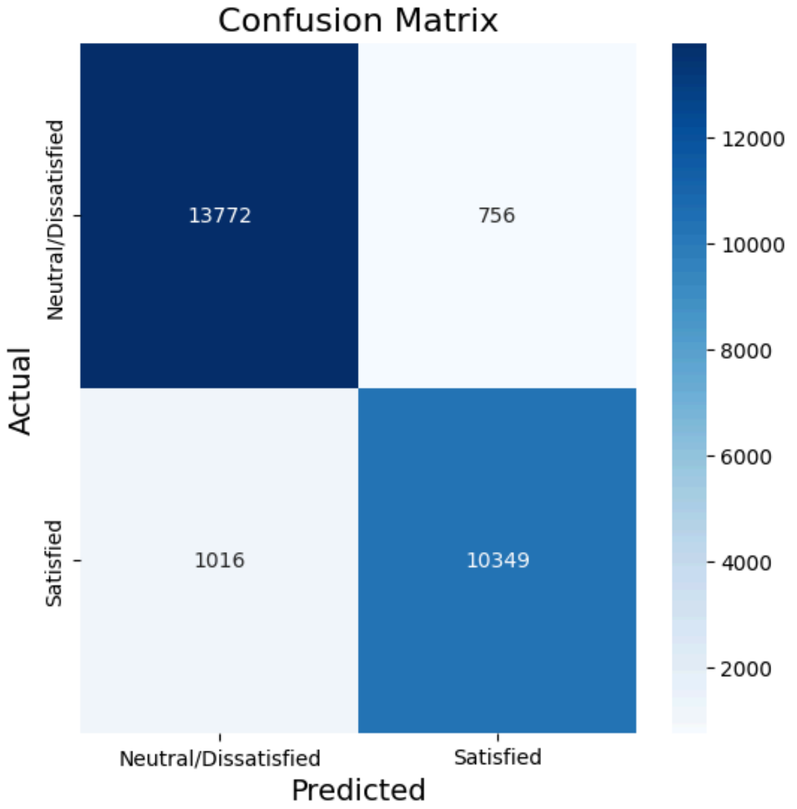
F1-Score: 0.85

AUC: 0.93

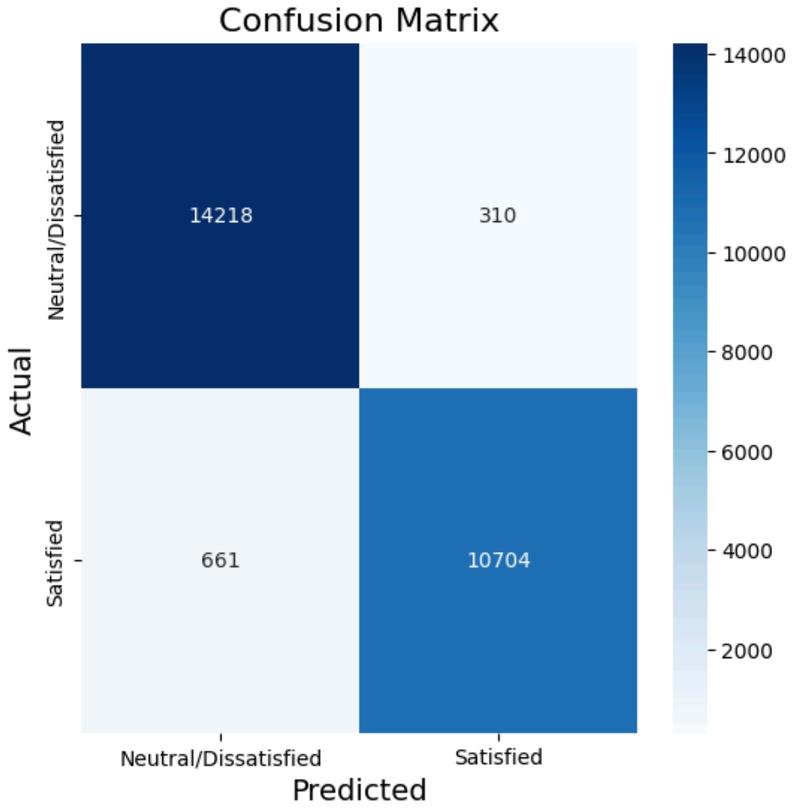
Cohen's Kappa: 0.74

Without preprocessing

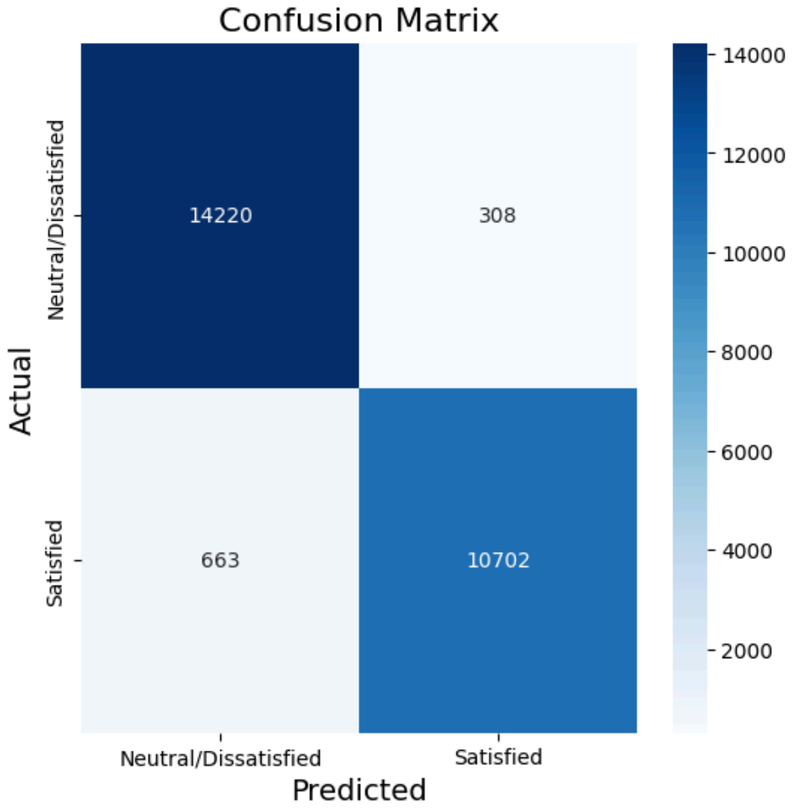
Random Forest



With feature selection

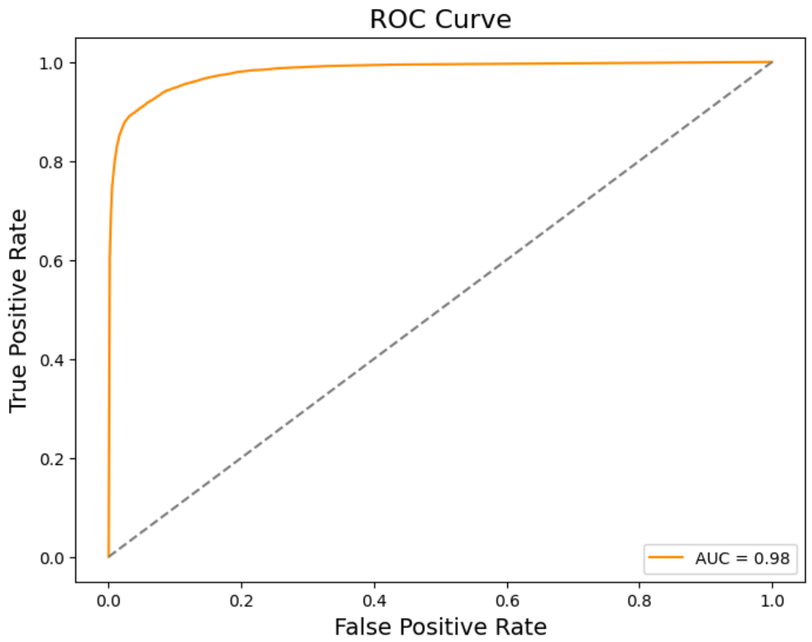


With normalization

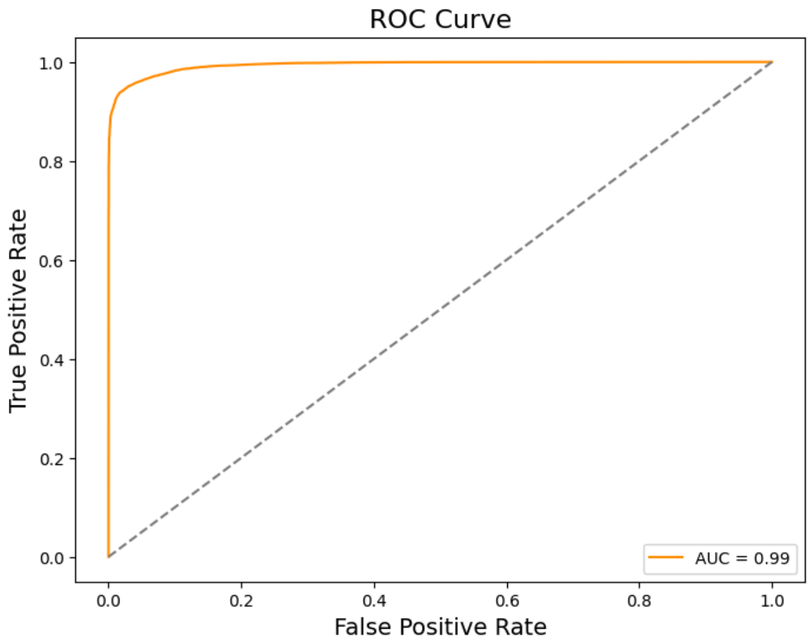


Without preprocessing

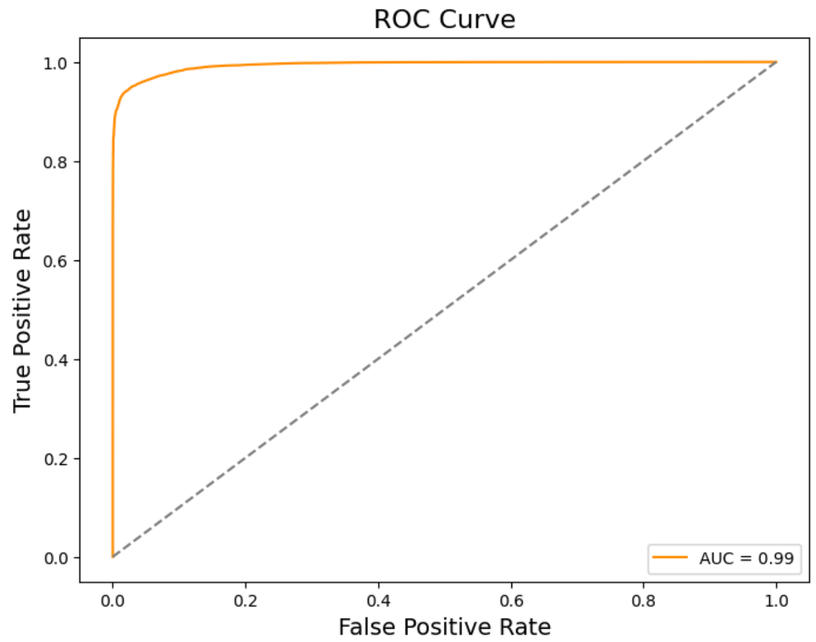
Random Forest



With feature selection



With normalization



Without preprocessing

Random Forest

Accuracy: 0.93

Precision: 0.93

Recall: 0.91

F1-Score: 0.92

AUC: 0.98

Cohen's Kappa: 0.86

With feature selection

Accuracy: 0.96

Precision: 0.97

Recall: 0.94

F1-Score: 0.96

AUC: 0.99

Cohen's Kappa: 0.92

With normalization

Accuracy: 0.96

Precision: 0.97

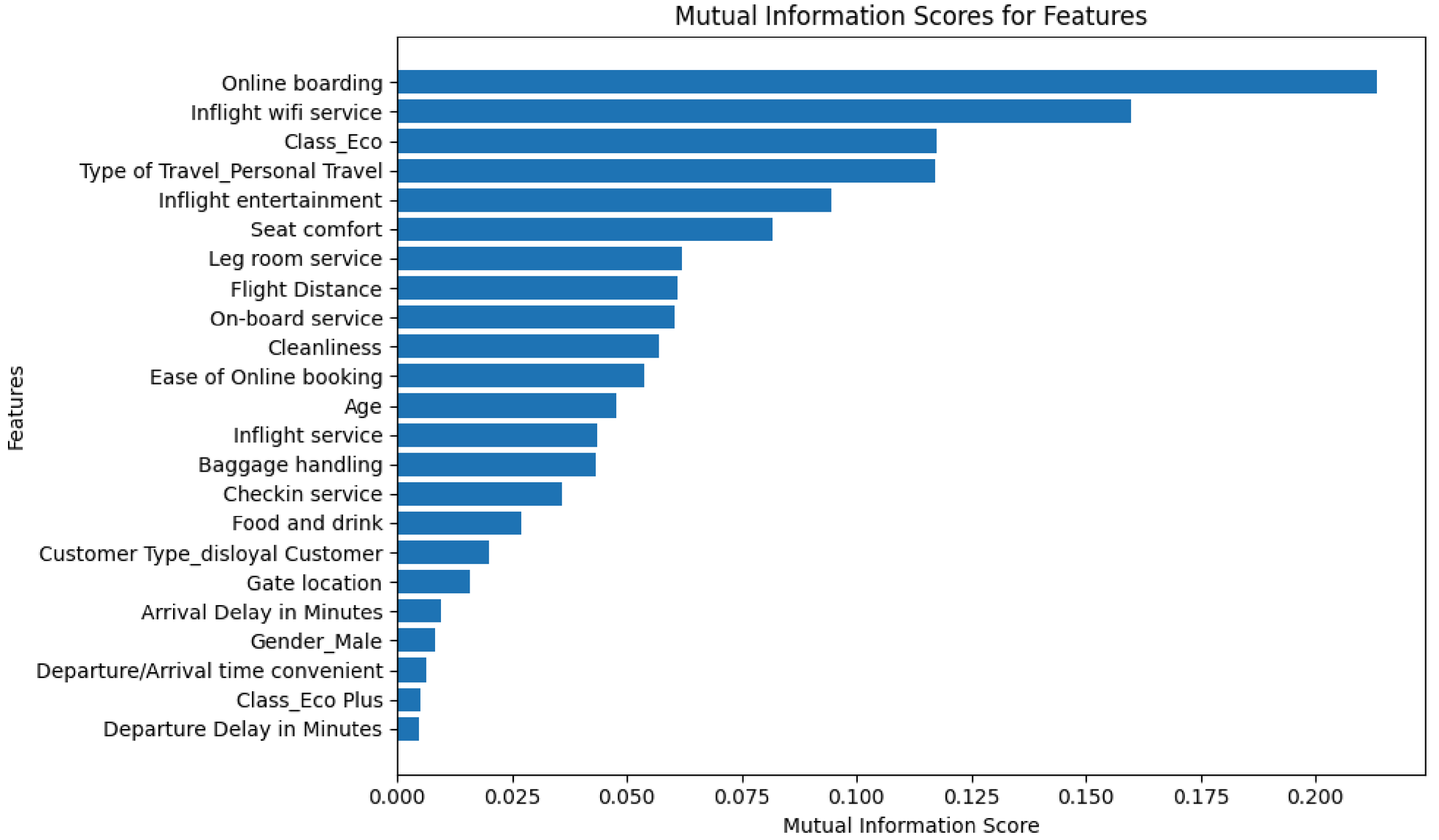
Recall: 0.94

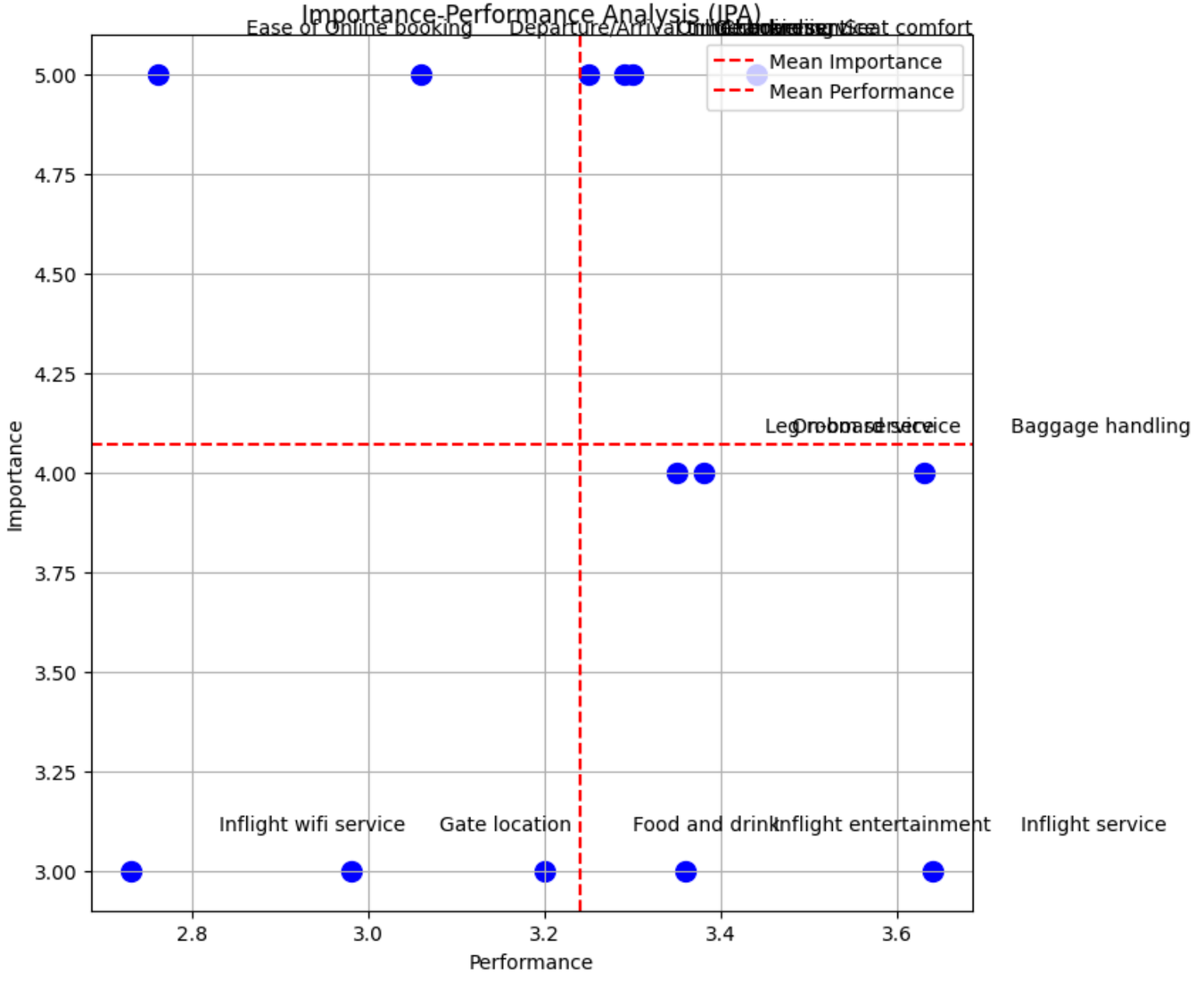
F1-Score: 0.96

AUC: 0.99

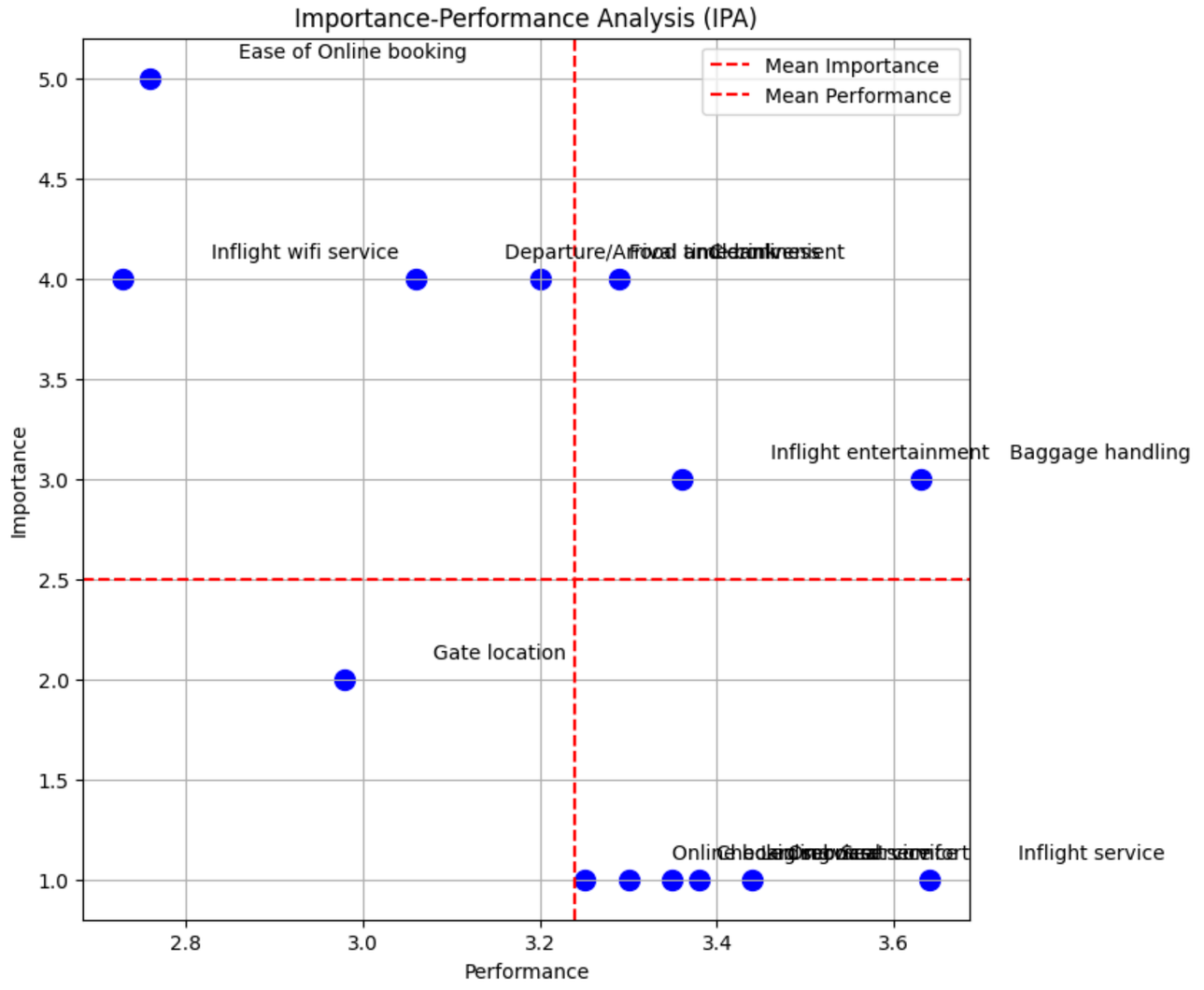
Cohen's Kappa: 0.92

Without preprocessing


Mutual Information Scores for Features
Online boarding
Inflight wifi service
Class_Eco
Type of Travel_Personal Travel
Inflight entertainment
Seat comfort
Leg room service
Flight Distance
On-board service
Cleanliness
Ease of Online booking
Age
Inflight service
Baggage handling
Checkin service
Food and drink
Customer Type_disloyal Customer
Gate location
Arrival Delay in Minutes
Gender_Male
Departure/Arrival time convenient
Class_Eco Plus
Departure Delay in Minutes
Features
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175
0.200
Mutual Information Score



	Attribute	Importance	Performance	Quadrant
0	Inflight wifi service	3	2.73	Low Priority
1	Departure/Arrival time convenient	5	3.06	Concentrate Here
2	Ease of Online booking	5	2.76	Concentrate Here
3	Gate location	3	2.98	Low Priority
4	Food and drink	3	3.20	Low Priority
5	Online boarding	5	3.25	Good Work
6	Seat comfort	5	3.44	Good Work
7	Inflight entertainment	3	3.36	Possible Overkill
8	On-board service	4	3.38	Possible Overkill
9	Leg room service	4	3.35	Possible Overkill
10	Baggage handling	4	3.63	Possible Overkill
11	Checkin service	5	3.30	Good Work
12	Inflight service	3	3.64	Possible Overkill
13	Cleanliness	5	3.29	Good Work



	Attribute	Importance	Performance	\
0	Inflight wifi service	4	2.73	
1	Departure/Arrival time convenient	4	3.06	
2	Ease of Online booking	5	2.76	
3	Gate location	2	2.98	
4	Food and drink	4	3.20	
5	Online boarding	1	3.25	
6	Seat comfort	1	3.44	
7	Inflight entertainment	3	3.36	
8	On-board service	1	3.38	
9	Leg room service	1	3.35	
10	Baggage handling	3	3.63	
11	Checkin service	1	3.30	
12	Inflight service	1	3.64	
13	Cleanliness	4	3.29	

	Quadrant
0	Concentrate Here
1	Concentrate Here
2	Concentrate Here
3	Low Priority
4	Concentrate Here
5	Possible Overkill
6	Possible Overkill
7	Good Work
8	Possible Overkill
9	Possible Overkill
10	Good Work
11	Possible Overkill
12	Possible Overkill
13	Good Work

DEMO

Q&A