CUSTOMER SATISFACTION IN THE AIR

Presented by: Alexis Hitchens

FUN FACT

TSA ✔
@TSA

BREAKING NEWS: Yesterday (Nov. 26), TSA screened just over 2.9M individuals at airports nationwide, which represents an agency record – the busiest day ever for air travel.

As #HolidayTravel season continues, we remind passengers to please arrive at the airport early.

8:49 AM · Nov 27, 2023 · **609K** Views

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68

BUSINESS OPPORTUNITY

- CUSTOMIZED SERVICES
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- LOYALTY PROGRAMS
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- PARTNERSHIPS AND ALLIANCES
- MARKETING AND COMMUNICATION

DATA SET

Customer Satisfaction in Airline

Customer satisfaction in Invistico Airline

Data Card   Code (9)   Discussion (1)

About Dataset

The data is for a sample size of 129,880 customers. It includes data points such as class, flight distance, and inflight entertainment to be used
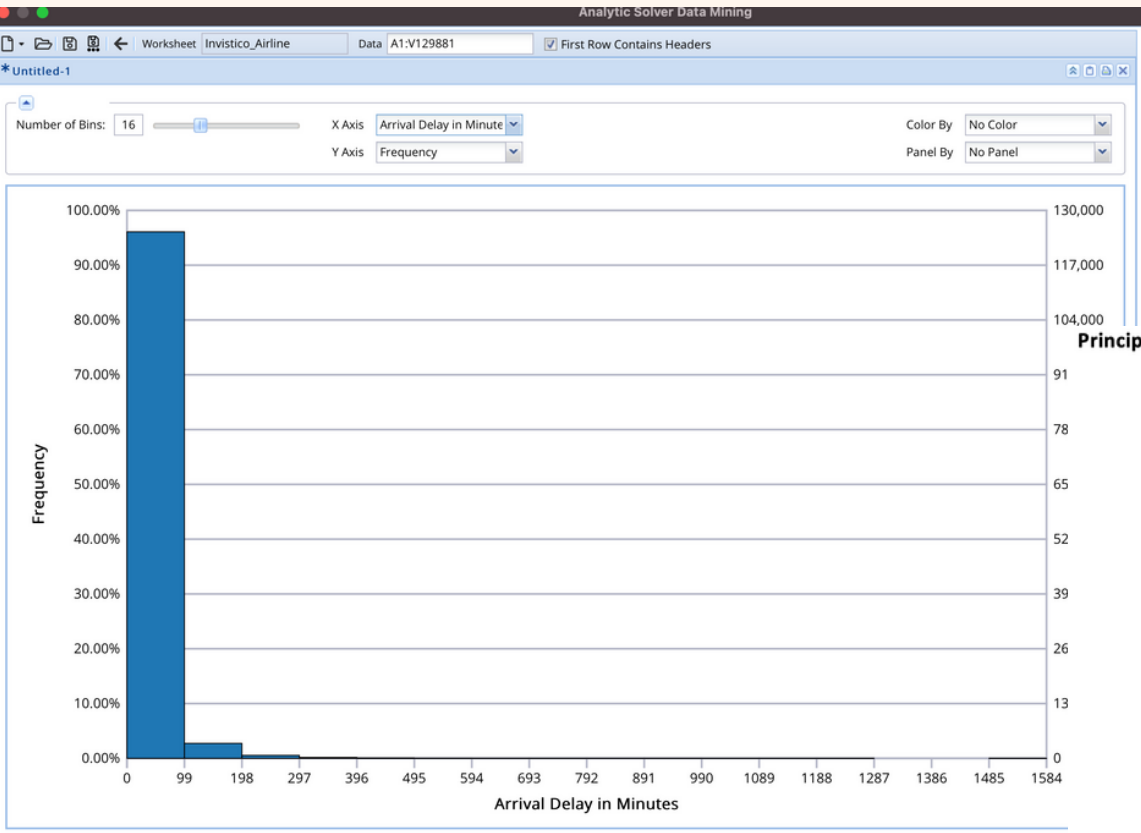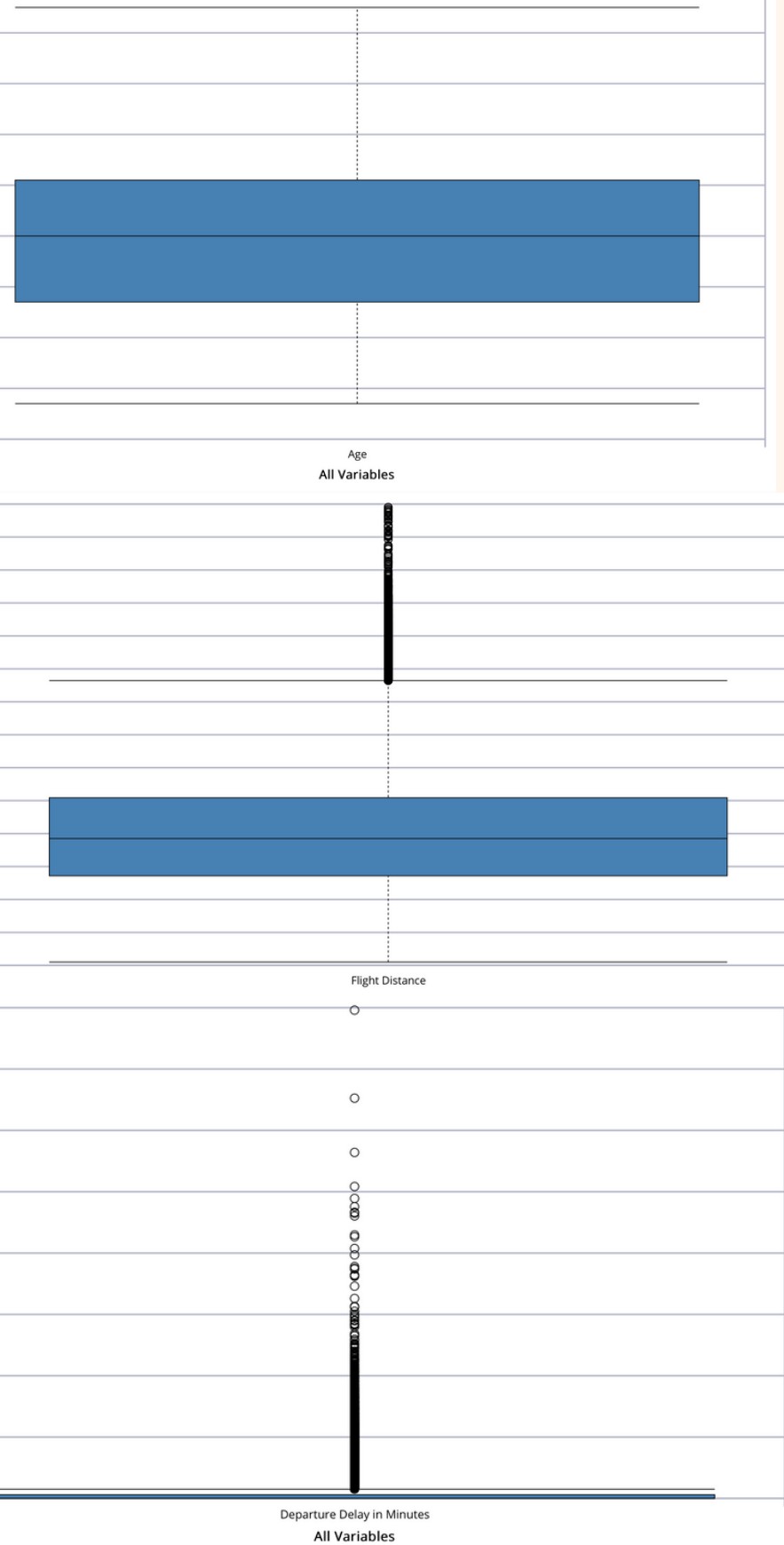
Invistico_Airline.csv (11.96 MB)

Detail   Compact   Column

22 of 22 columns

# Flight Distance	# Seat comfort	# Departure/Arrival...	# Food and drink	# Gate location	# Inflight wifi service	# Inflight entertain...
265	0	0	0	2	2	4
2464	0	0	0	3	0	2
2138	0	0	0	3	2	0
623	0	0	0	3	3	4
354	0	0	0	3	4	3
1894	0	0	0	3	2	0
227	0	0	0	3	2	5
1812	0	0	0	3	3	3
73	0	0	0	5	1	3
1556	0	0	0	3	2	0
104	0	0	0	3	3	3
3633	0	0	0	4	2	2

DATA EXPLORATION

Descriptive Statistics (Part 1)

Statistic	Satisfaction	Class	Age	Flight Distance	Seat comfort	Departure/Arrival time convenient	Food and drink	Gate location	Inflight wifi service
Mean	0.28627015	0.281267371	38.27404113	1860.940523	0.848804892	2.757087271	0.857142857		2.865480823
Standard Error	0.010660072	0.015203623	0.427356848	21.38331607	0.039154342	0.039154342	0.031780142	0.031718849	0.024385385
Median	0	0	38	1850		3	0	3	3
Mode	0	0	9	1844	4	4	0	4	3
Standard Deviation	0.452142885	0.644855879	18.12617834	906.965228	1.660716562	1.347942636	1.345342916	1.034296835	1.034296835
Sample Variance	0.204433188	0.415839105	328.5583413	822585.9247	2.757979498	1.81694935	1.809947561	1.634692191	
Kurtosis	-1.105442431	2.536879583	-1.183075568	1.077366142	-1.437742165	1.302417551	1.313024051	-0.529880844	
Skewness	0.946460648	2.049539761	0.008590638	0.428173574	1.656872111	-0.084063428	1.634692191	-0.196960092	
Range	1	2	63	6742	5	4	5	5	4
Minimum	0	0	7	50	0	0	0	0	1
Maximum	1	2	70	6792	5	4	5	5	5
Sum	515	506	68855	3347832	4960	1527	1542	5155	5155
Count	1799	1799	1799	1799	1799	1799	1799	1799	1799

Descriptive Statistics (Part 2)

Statistic	Inflight entertainment	Online support	Ease of Online booking	On-board service	Leg room service	Baggage handling	Checkin service	Cleanliness	Online boarding
Mean	1.578098944		3.171206328	2.961089494	3.057809894	2.624235686	3.336853808	3.175097276	3.356864925
Standard Error	0.041035467		0.032465357	0.032872318	0.030158519	0.039198283	0.029431561	0.030085459	0.028454334
Median	1		3	3	3	3	4	3	4
Mode	1		4	4	4	4	4	4	4
Standard Deviation	1.740503727		1.377005764	1.394266877	1.279162113	1.662580269	1.248328491	1.276085665	1.206879778
Sample Variance	3.029353225		1.896144873	1.943980125	1.636255712	2.76417315	1.558324023	1.628389521	1.456558798
Kurtosis	-1.01926763		-1.24456975	-1.285432653	-1.066403422	-1.456558798	-0.940098773	-0.940098773	-0.76409342
Skewness	0.724857222		-0.211135687	0.025085587	-0.148061034	-0.158462877	-0.333801097	-0.246684138	-0.3856401
Range	5		4	4	4	5	4	4	4
Minimum	1		1	1	1	1	1	1	1
Maximum	5		5	5	5	5	5	5	5
Sum	2839		5705	5327	5501	4721	6003	5712	6039
Count	1799		1799	1799	1799	1799	1799	1799	1799

Descriptive Statistics (Part 3)

Statistic	Cleanliness	Online boarding	Departure Delay in Minutes
Mean	3.356864925	3.066703724	11.3229572
Standard Error	0.028454334	0.03236391	0.76398849
Median	4	4	0
Mode	4	4	0
Standard Deviation	1.206879778	1.372702966	32.4042816
Sample Variance	1.456558798	1.884313433	1050.03746
Kurtosis	-0.76409342	-1.2315539	39.9589929
Skewness	-0.3856401	-0.09568523	5.43963032
Range	4	4	427
Minimum	1	1	0
Maximum	5	5	427
Sum	6039	5517	20370
Count	1799	1799	1799

Analytic Solver Data Mining

Worksheet: Invistico_Airline — Data: A1:V129881 — ☑ First Row Contains Headers

Number of Bins: 16

X Axis: Arrival Delay in Minute — Color By: No Color

Y Axis: Frequency — Panel By: No Panel

Histogram — X: Arrival Delay in Minutes, Y: Frequency

Box Plots

- Age — All Variables
- Flight Distance
- Departure Delay in Minutes — All Variables

Principal Components

Feature\Component	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Component 7	Component 8	Component 9
Satisfaction	0.086731053	0.203493152	0.072921461	-0.46776515	0.281863733	-0.183176099	-0.258134094	0.100877695	-0.085905089
Class	0.017407616	0.019596382	0.007495765	0.01275996	0.127353365	-0.429034303	0.555285685	0.679554356	0.002238941
Age	-0.073973958	0.094601255	-0.116713227	0.209448419	0.524392372	0.021817971	-0.387515418	0.112350428	-0.285979423
Flight Distance	0.093790778	-0.075644064	0.083346878	-0.390944055	-0.341351421	-0.135685744	0.77055324	-0.079764313	0.040325211
Seat comfort	0.027188088	0.352787089	0.486584474	0.139965454	-0.091974175	0.137743549	0.041997451	0.019012652	-0.002027056
Departure/Arrival time	-0.107215921	-0.295514885	-0.093179334	0.411574407	-0.335399441	0.022314316	0.08442973	-0.061397349	-0.002326309
Food and drink	0.029725801	0.355439597	0.495072389	0.151496664	-0.079014304	0.11017628	0.043635051	0.026932746	-0.014101853
Gate location	0.011508249	-0.033736386	-0.010928412	-0.110331359	0.358159233	0.288327286	0.632771303	-0.389064458	-0.422997963
Inflight wifi service	-0.47988599	0.071007256	-0.020719504	-0.113136892	-0.051874569	0.156639492	0.072736856	0.085094374	-0.05175909
Inflight entertainment	-0.100725605	0.335320643	0.109979388	0.41163578	0.10165408	-0.172113506	0.079730976	-0.129777532	0.118072425
Online support	-0.472556837	0.105922114	-0.050708023	-0.02718042	-0.063878945	-0.094048066	0.036515787	-0.041435354	-0.048359441
Ease of Online booking	-0.468660475	-0.047744475	0.145639491	-0.207738932	0.068576037	0.035757583	-0.005329094	0.005666679	0.138515682
On-board service	-0.089488985	-0.330971195	0.305794536	0.071908208	0.211797337	-0.063845012	-0.10777507	0.026531238	0.246756697
Leg room service	0.110189436	-0.095606044	0.362628297	-0.2224825	-0.262902267	0.077389176	-0.10639198	0.11083713	-0.433877717
Baggage handling	-0.04859008	-0.387206562	0.313042113	0.032462168	0.173670046	-0.023246383	0.004190668	-0.065431227	0.041943518
Checkin service	-0.091554112	-0.185921372	0.073390191	0.239172474	-0.145699004	-0.37322753	-0.154320121	0.024803244	-0.641916691
Cleanliness	-0.05882463	-0.396759618	0.330539665	0.003578569	0.23569597	0.039521418	0.022735111	0.031260279	0.12635218
Online boarding	-0.495603759	0.082404941	-0.020339854	-0.128422974	-0.102478487	-0.072980577	4.74086E-05	-0.027508088	-0.06861537
Departure Delay in Min	0.035915931	0.076837373	0.0950078	-0.068183504	0.064227156	-0.65396605	0.044404351	-0.55440561	0.091082269

Correlation Matrix (lower triangular)

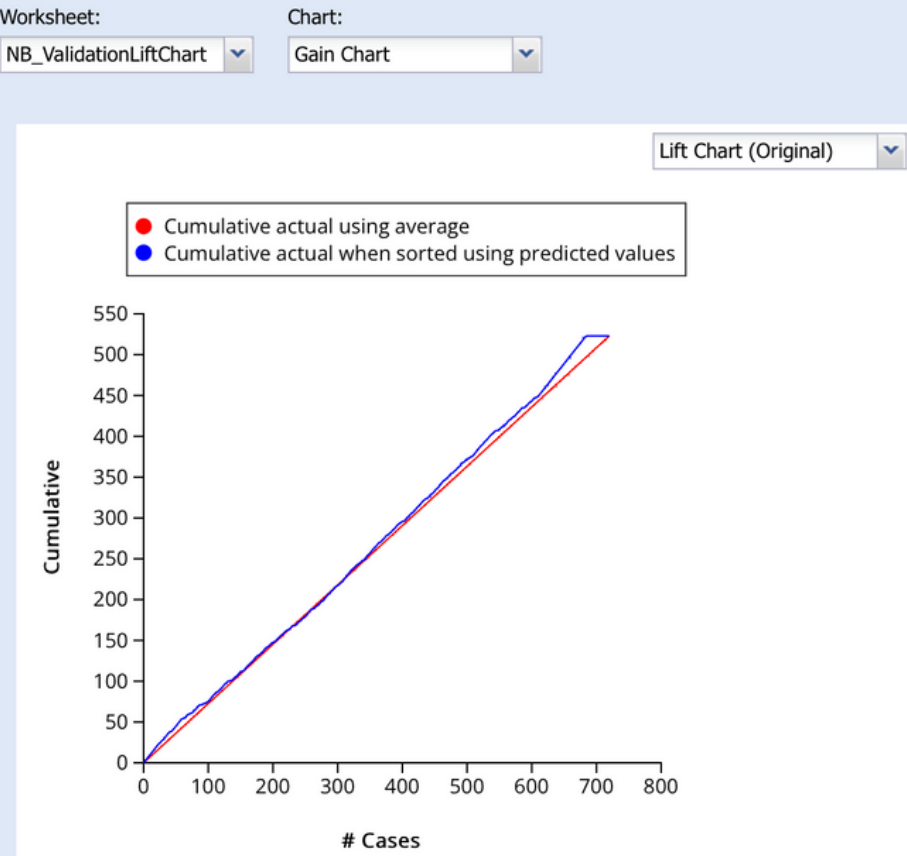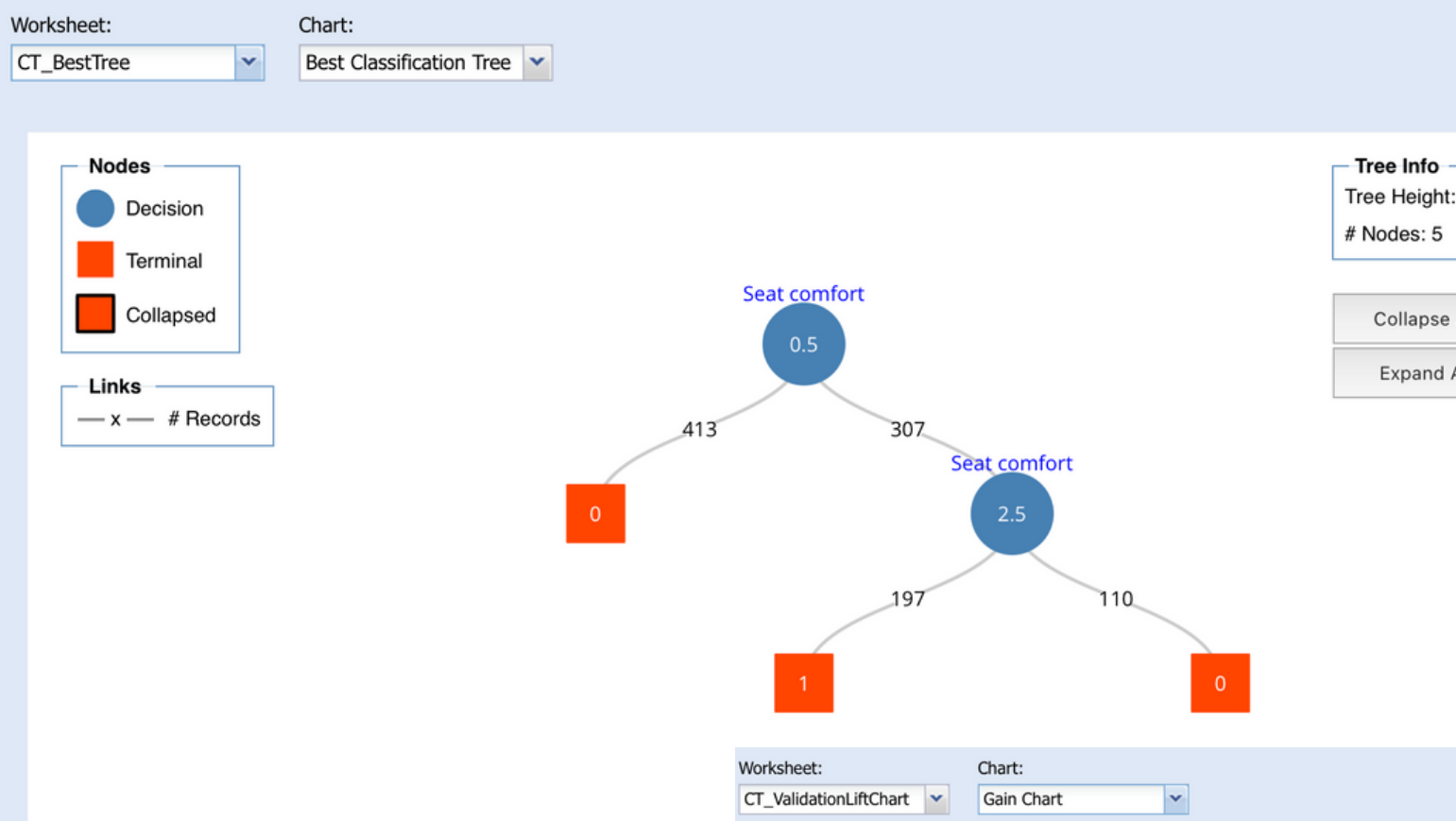|	Satisfaction	Class	Age	Flight Distance	Seat comfort	Arrival time	Food and drink	Gate location	Inflight wifi service	Inflight entertainment	Online support	Ease of Online booking	On-board service	Leg room service	Baggage handling	Checkin service	Cleanliness	Online boarding	Departure Delay in Minutes
Satisfaction	1																		
Class	0.03080151	1																	
Age	0.02068909	-0.0111658	1																
Flight Distance	0.24629283	-0.0096387	-0.2994947	1															
Seat comfort	0.07105721	-0.0079951	-0.0259605	-0.062331	1														
Departure/Arrival time	-0.6702544	-0.0358792	0.00960302	-0.1119535	-0.2134387	1													
Food and drink	0.08921221	0.00787617	-0.0185324	-0.0496263	0.92319408	-0.2144377	1												
Gate location	0.01222283	0.00339113	0.00235305	0.00857059	-0.050101	-0.1103443	-0.0501907	1											
Inflight wifi service	-0.0356445	-0.037522	0.05960066	-0.1095382	0.00964133	0.04370308	0.00411498	0.02174443	1										
Inflight entertainment	-0.1213621	0.05425193	0.22015163	-0.2682815	0.44075787	0.03571793	0.49774262	-0.0646018	0.04534438	1									
Online support	-0.0582177	0.00085787	0.0896121	-0.098282	-0.0199058	-0.0228168	-0.0201377	0.66581409	0.24945146	1									
Ease of Online booking	0.02826614	-0.028029	0.01732343	0.01916503	0.00929712	-0.0261825	-0.0035581	0.01488067	0.72964242	-0.0347294	0.62832607	1							
On-board service	-0.1074837	-0.0015183	-0.013061	0.0095622	0.20218754	0.20201937	-0.0163989	-0.0201377	-0.0772218	0.12947235	0.19287245	0.26258807	1						
Leg room service	0.12098157	-0.0175668	-0.1673297	0.22854707	0.23124657	-0.0642995	0.23309496	-0.0100053	-0.1190434	-0.3500351	-0.1577298	-0.0012725	0.12947235	1					
Baggage handling	-0.1295581	-0.0155095	-0.0715284	0.03436006	-0.0609416	-0.2603843	-0.0501483	-0.1820859	-0.0795135	0.19287245	0.44929803	0.17786039			1				
Checkin service	-0.1688604	0.02798189	0.01896375	-0.0576697	-0.0803092	0.2909231	-0.0566939	-0.0938129	0.22998777	0.09262733	0.10035768	-0.0099228	0.18255767	0.03863182	0.21852495	1			
Cleanliness	-0.1210692	0.01245346	-0.0598205	0.04538528	0.04139186	0.16204156	-0.0243089	-0.1922611	-0.076275	0.26837745	0.53639186	0.18910425	0.61529763	0.17177035			1		
Online boarding	0.00685302	-0.01995	0.04718885	-0.0261514	-0.0179918	0.05907746	-0.0282662	-0.0316745	0.76646457	0.11956597	0.75956087	0.74905727	-0.0088489	-0.1006247	-0.0397343	0.10223385	-0.0445908	1	
Departure Delay in Minutes	0.1358105	0.05407294	-0.0399563	0.06246671	0.05779387	-0.1105793	0.05543253	-0.0114802	-0.148731	0.11898734	0.01227159	0.00491921	-0.0015241	0.00557603	0.01395945	0.01680291	-0.0511736	0.02792336	1
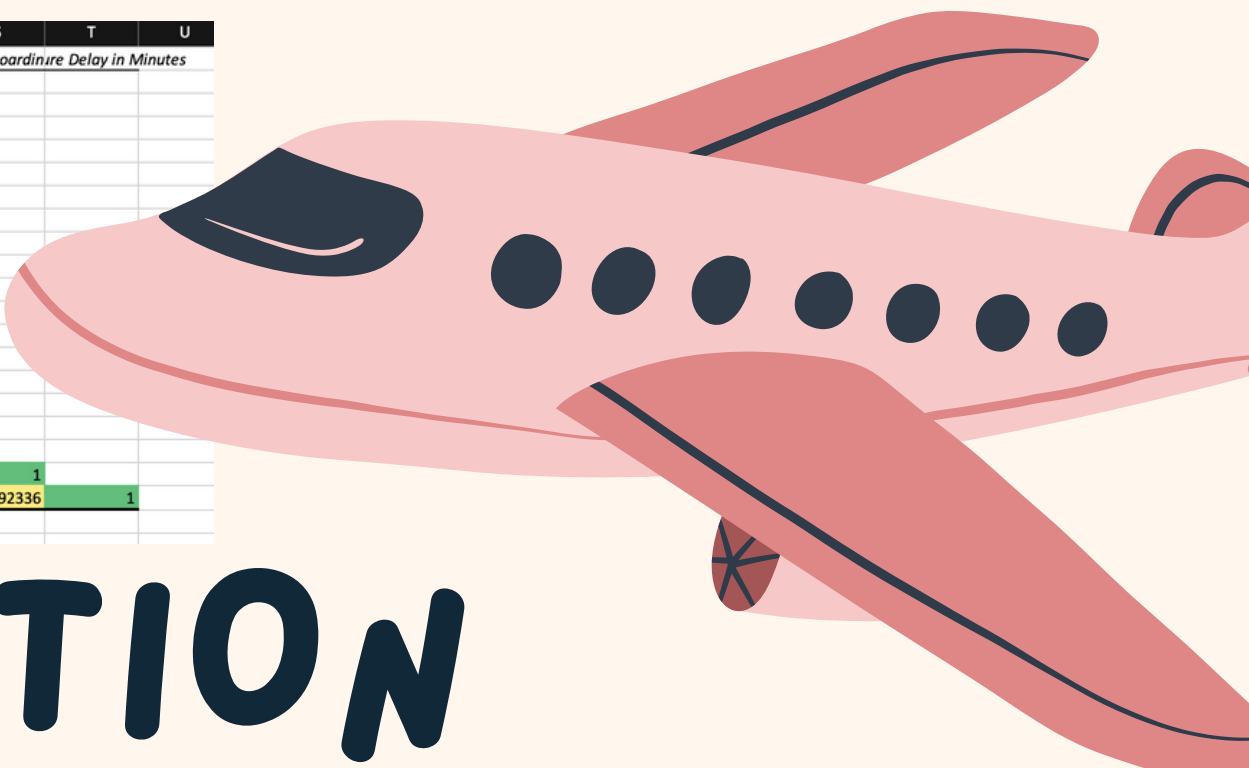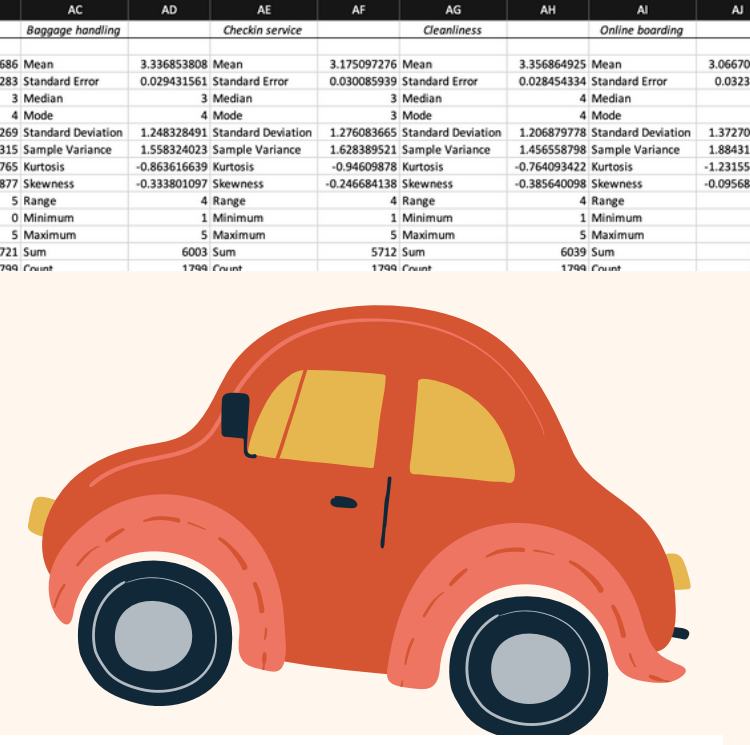
BAD MODELS
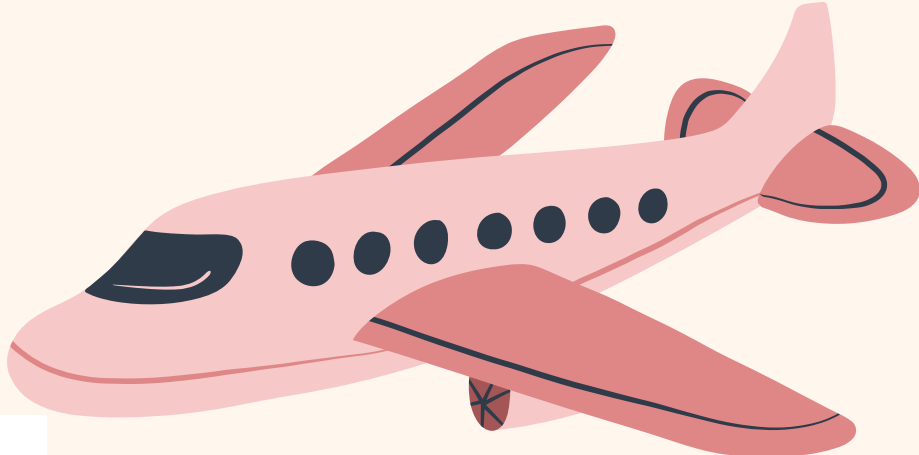
WARNING: One or more records in Validation partition cannot be classified. New records must have feature values that have appeared in the training partition.

Validation: Classification Summary

Confusion Matrix

Actual\Predicted	0	1	nan
0	148	1	374
1	0	60	137
nan	0	0	0

Error Report

Class	# Cases	# Errors	% Error
0	523	375	71.701721
1	197	137	69.543147
N/A	0	0	Undefined
Overall	720	512	71.111111

Metrics

Metric	Value
Accuracy (#correct)	208
Accuracy (%correct)	28.888889
Specificity	#N/A
Sensitivity (Recall)	#N/A
Precision	#N/A
F1 score	#N/A
Success Class	0
Success Probability	0.5

Worksheet: NB_ValidationLiftChart
Chart: Gain Chart

Lift Chart (Original)

- Cumulative actual using average
- Cumulative actual when sorted using predicted values

Worksheet: CT_BestTree
Chart: Best Classification Tree

Nodes
- Decision
- Terminal
- Collapsed

Links
— x — # Records

Tree Info
Tree Height:
Nodes: 5

Collapse
Expand

Seat comfort
0.5

413   307

0

Seat comfort
2.5

197   110

1   0

Worksheet: CT_ValidationLiftChart
Chart: Gain Chart

Lift Chart (Original)

- Cumulative actual using average
- Cumulative actual when sorted using predicted values

Training Log (Growing the full tree using training data)   Prune Log (Using Validation Data)

# Decision Nodes	Error Rate
0	0.29471733
1	0.13253012
2	0

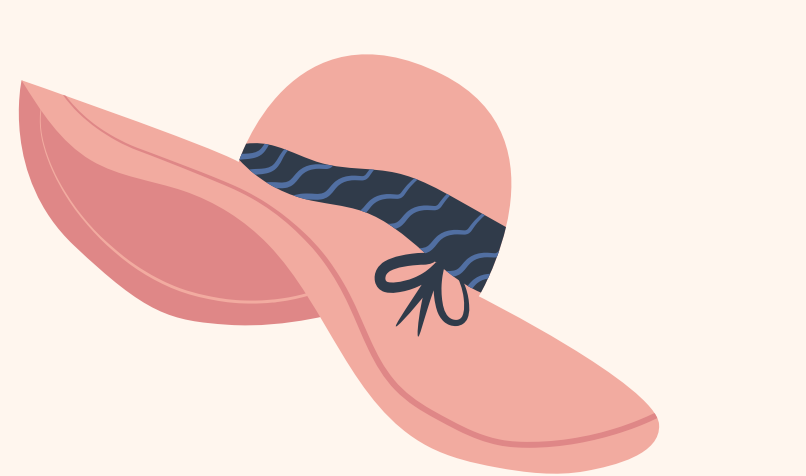| # Decision Nodes	Error Rate
0	0.27361111
1	0.15277778
2	0

Worksheet: LogReg_ValidationLiftCh
Chart: Gain Chart

Lift Chart (Original)

- ● Cumulative actual using average
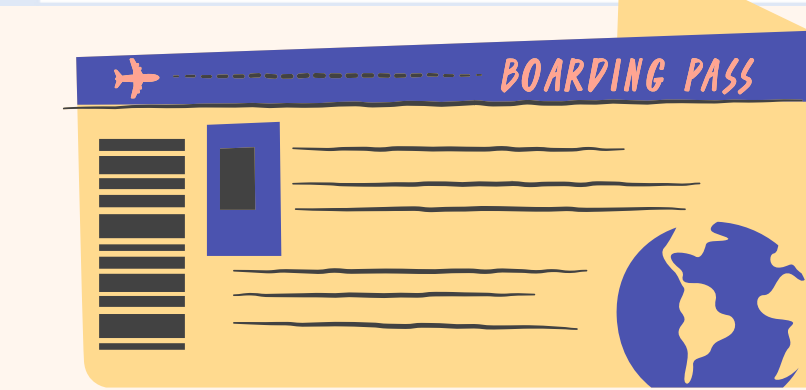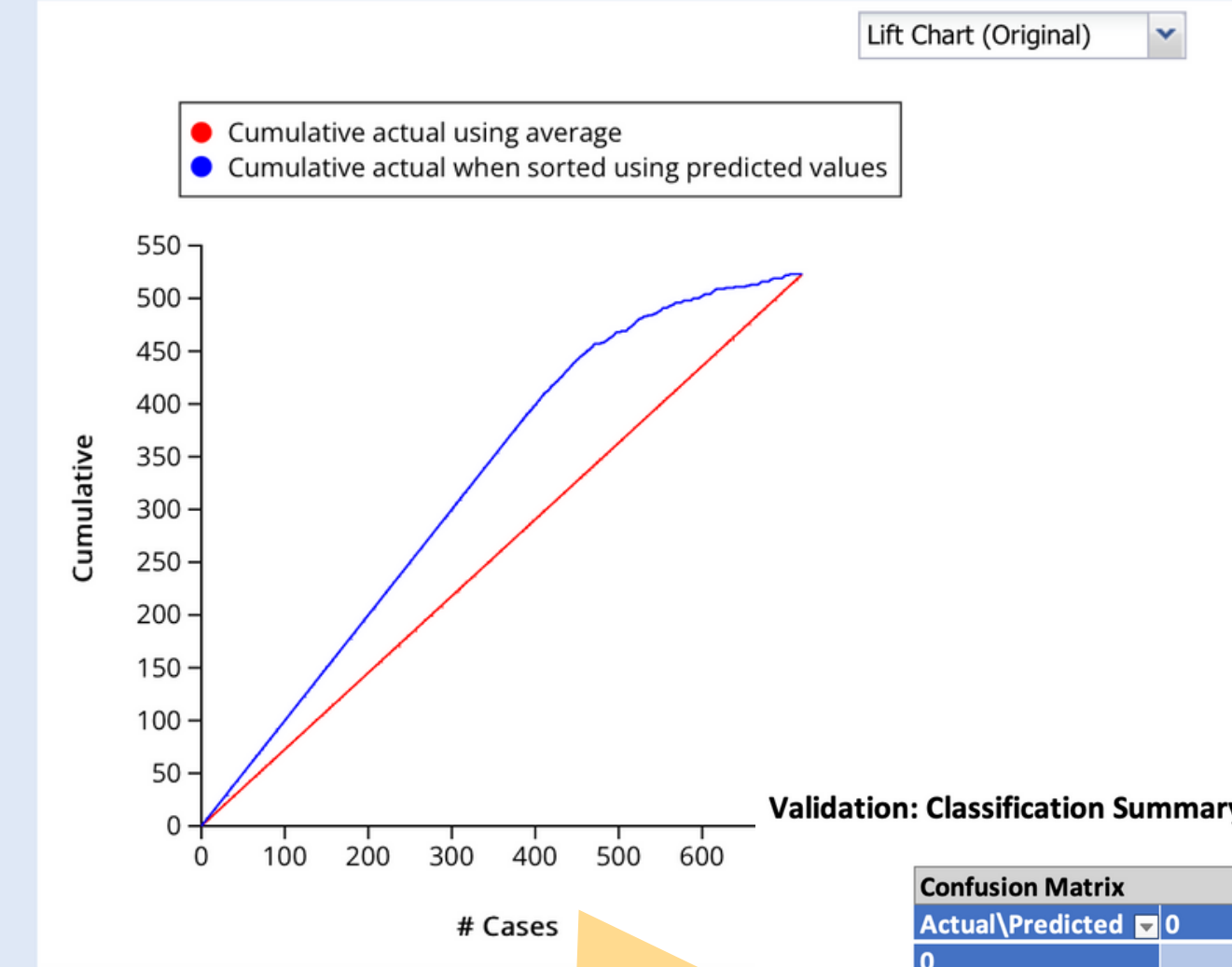- ● Cumulative actual when sorted using predicted values

FINAL MODEL
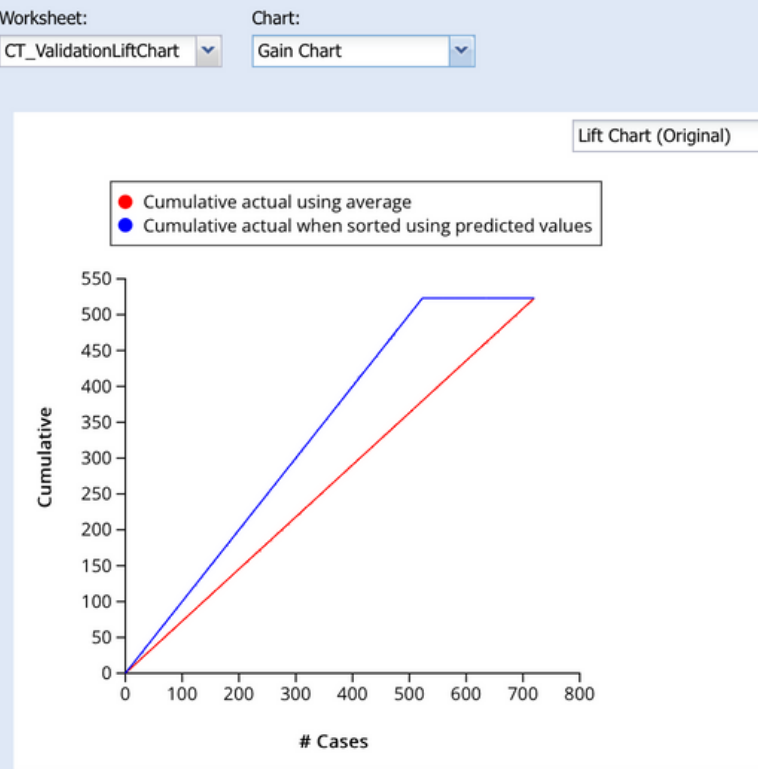
Worksheet: LogReg_ValidationLiftCh
Chart: Decile Chart

Validation: Classification Summary

Confusion Matrix

Actual\Predicted	0	1
0	477	46
1	43	154

Error Report

Class	# Cases	# Errors	% Error
0	523	46	8.7954111
1	197	43	21.827411
Overall	720	89	12.361111

Metrics

Metric	Value
Accuracy (#correct)	631
Accuracy (%correct)	87.638889
Specificity	0.7817259
Sensitivity (Recall)	0.9120459
Precision	0.9173077
F1 score	0.9146692
Success Class	0
Success Probability	0.5
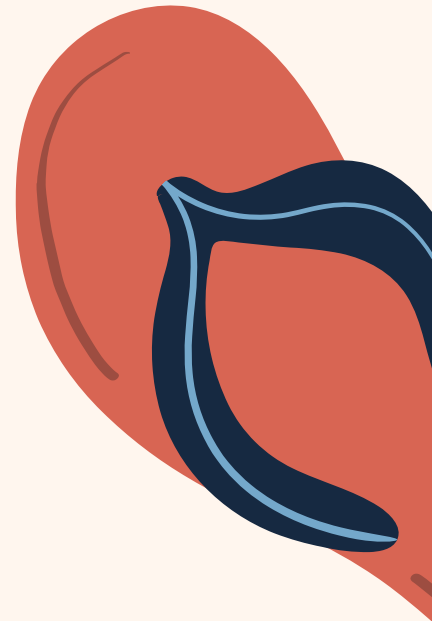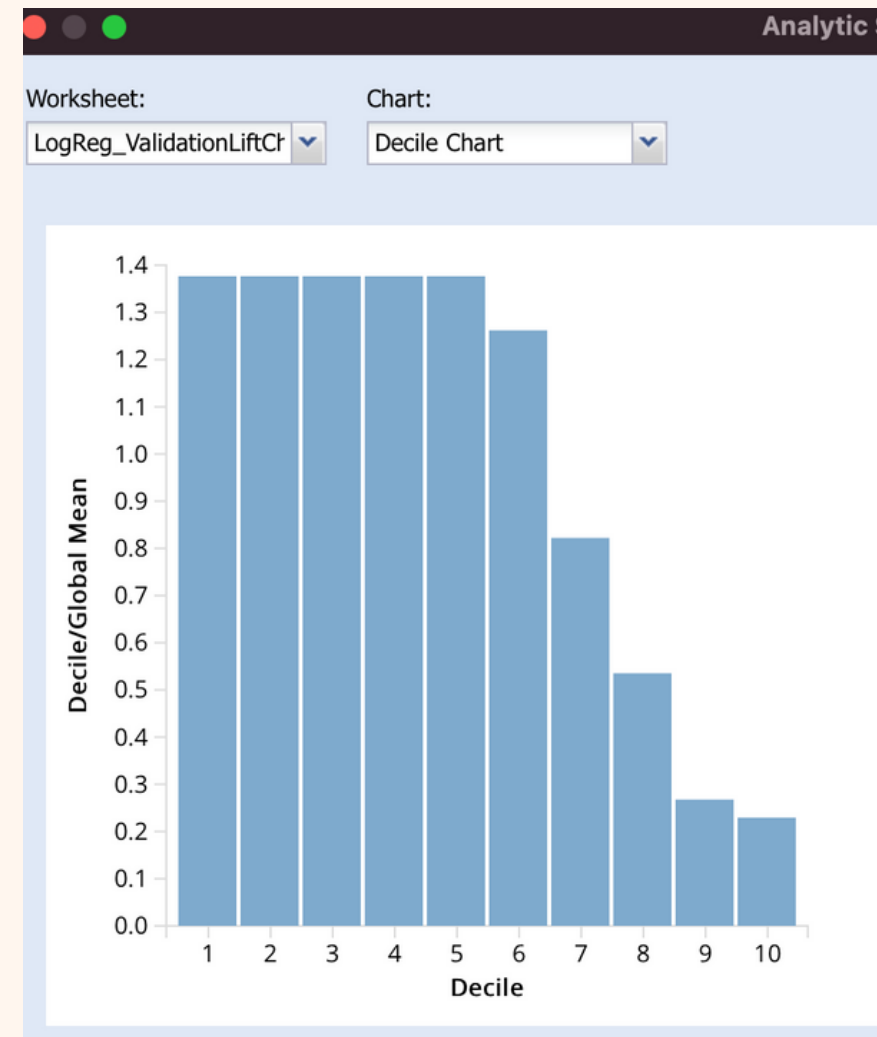
Coefficients

Predictor	Estimate	Confidence Interval: Lower	Confidence Interval: Upper	Odds	Standard Error	Chi2-Statistic	P-Value
Intercept	2.67343624	2.21387021	3.133002267	14.4896737	0.234476772	129.9989987	4.0998E-30
Class	-0.0814367	-0.280069532	0.117196077	0.92179103	0.10134513	0.645706054	0.42165207
Age	-0.431625	-0.647842987	-0.215407108	0.64945284	0.110317302	15.30826644	9.1316E-05
Flight Distan	-0.7825772	-1.022582738	-0.542571678	0.45722612	0.122454051	40.8421011	1.6504E-10
Seat comfor	0.33144509	-0.16428274	0.827172919	1.39297965	0.25292701	1.717246971	0.19004781
Departure/A	3.03870335	2.589811035	3.487595666	20.878154	0.2290309	176.0307137	3.5656E-40
Food and dri	-0.7914312	-1.351936083	-0.230926287	0.45319572	0.285977142	7.658851966	0.00564944
Gate location	0.30175431	0.02459553	0.57891309	1.35222896	0.141410139	4.553505472	0.03285142
Inflight wifi s	0.05968554	-0.448580481	0.56795156	1.06150269	0.259324163	0.05297272	0.81796897
Inflight enter	0.86786673	0.392159093	1.343574359	2.38182435	0.242712436	12.78562664	0.00034929
Online suppo	-0.1018703	-0.472772316	0.269031666	0.90314666	0.189239187	0.289783222	0.59035948
Ease of Onlin	0.06753565	-0.491317469	0.626388771	1.0698684	0.285134382	0.056100535	0.81276888
On-board se	-0.1961153	-0.438383226	0.046152636	0.82191747	0.123608359	2.517255228	0.11260643
Leg room se	-0.1233575	-0.369365921	0.122650874	0.88394757	0.125516795	0.965889852	0.32570738
Baggage han	0.0900173	-0.21669252	0.396727112	1.09419321	0.156487476	0.330896945	0.56513141
Checkin serv	0.10653719	-0.122992847	0.336067232	1.1124193	0.117109315	0.827598348	0.36296791
Cleanliness	0.12042716	-0.21148141	0.452335731	1.12797858	0.169344219	0.505717684	0.47699854
Online boar	-0.2556141	-0.813915682	0.30268742	0.77444074	0.284852964	0.805245362	0.36952971
Departure D	-0.1742807	-0.382566088	0.034004638	0.84006104	0.106269995	2.689536216	0.10100921

SUMMARY

The logistic regression model provides coefficients for each predictor variable, which represent the influence of that variable on customer satisfaction.

The variables with positive coefficients: Departure/Arrival Time Convenience, Inflight Entertainment, and Gate Location have a positive influence on customer satisfaction.

The variables with negative coefficients: Age, Flight Distance, Food and Drink have a negative influence on customer satisfaction

RECOMENDATION

- Based on the logistic regression model results, prioritize initiatives that have the highest predicted impact on customer satisfaction.

- Consider a phased approach to implementation, starting with high-impact areas and expanding based on performance feedback.

- Consider ongoing training for staff to adapt to changing customer preferences and ensure effective customer interactions using logistic regression model insights.

- Regularly assess the logistic regression model's performance and consider refining the model by incorporating additional relevant variables.