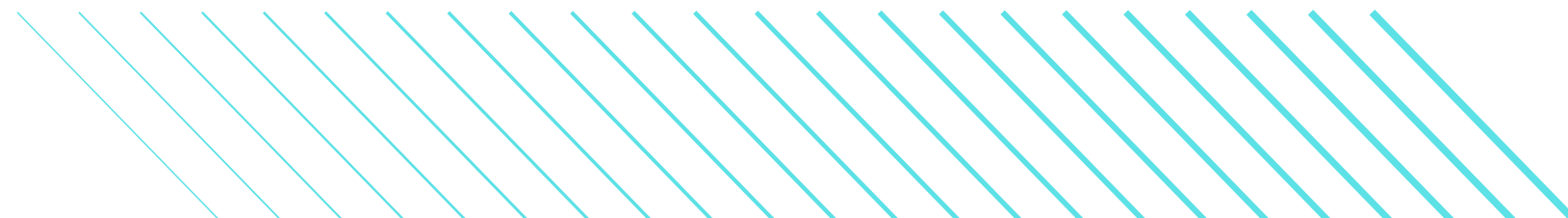
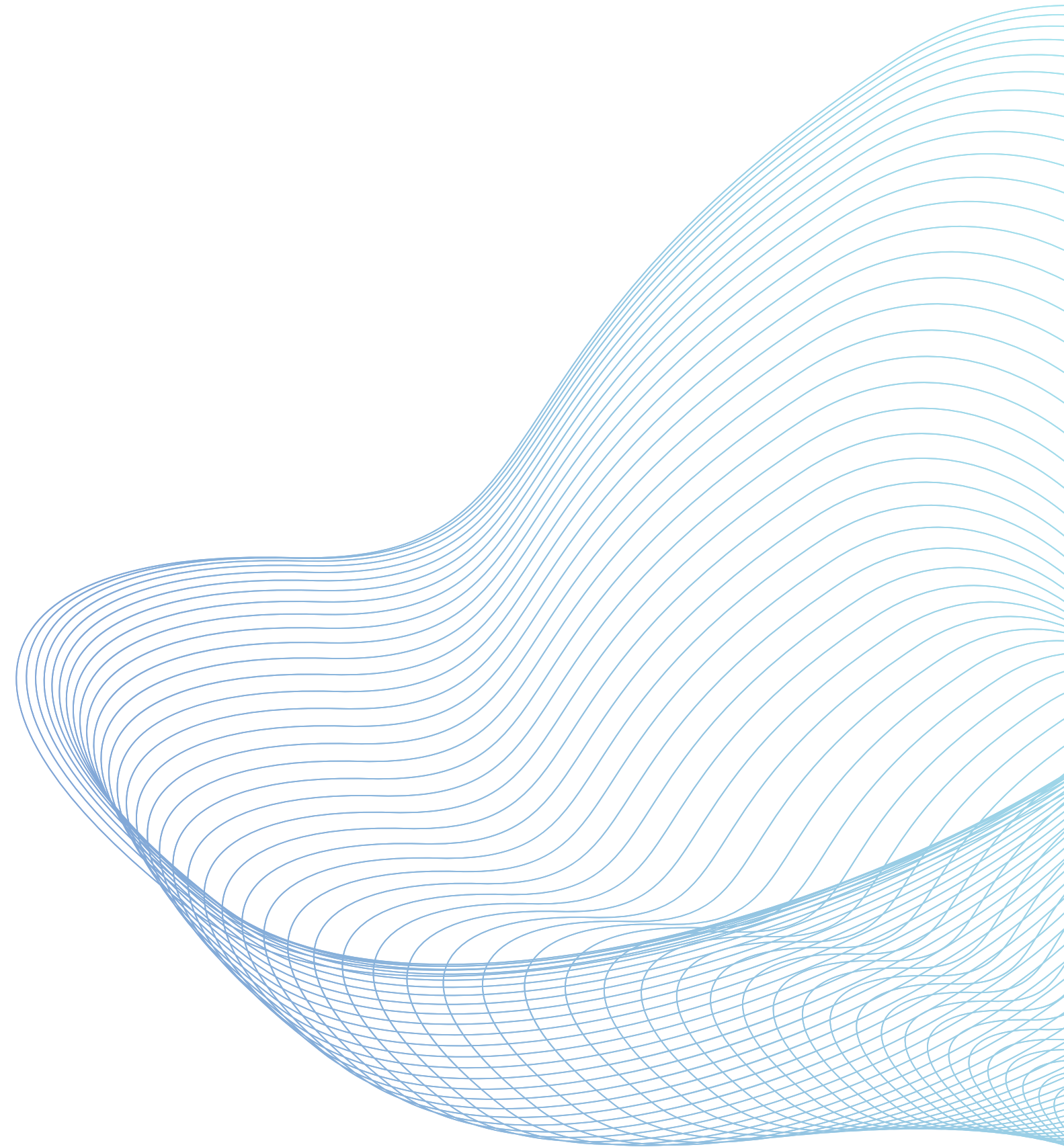


# SKYHACK HACKATHON

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# Introduction

The Skyhack hackathon focuses on leveraging data analytics and uncovering the keys to improving United's Food & Beverage (F&B) service.

Through rigorous analysis, we aim to identify opportunities, address challenges, and provide recommendations that will transform the F&B service into a delightful and satisfying journey for every traveler.

# Data Overview

- Survey data – Inflight Satisfaction Score
- Survey data – Customer comments/feedback
- Inflight Service – Pre-order data
- Inflight Service – Inventory data (only for Business/First Class)

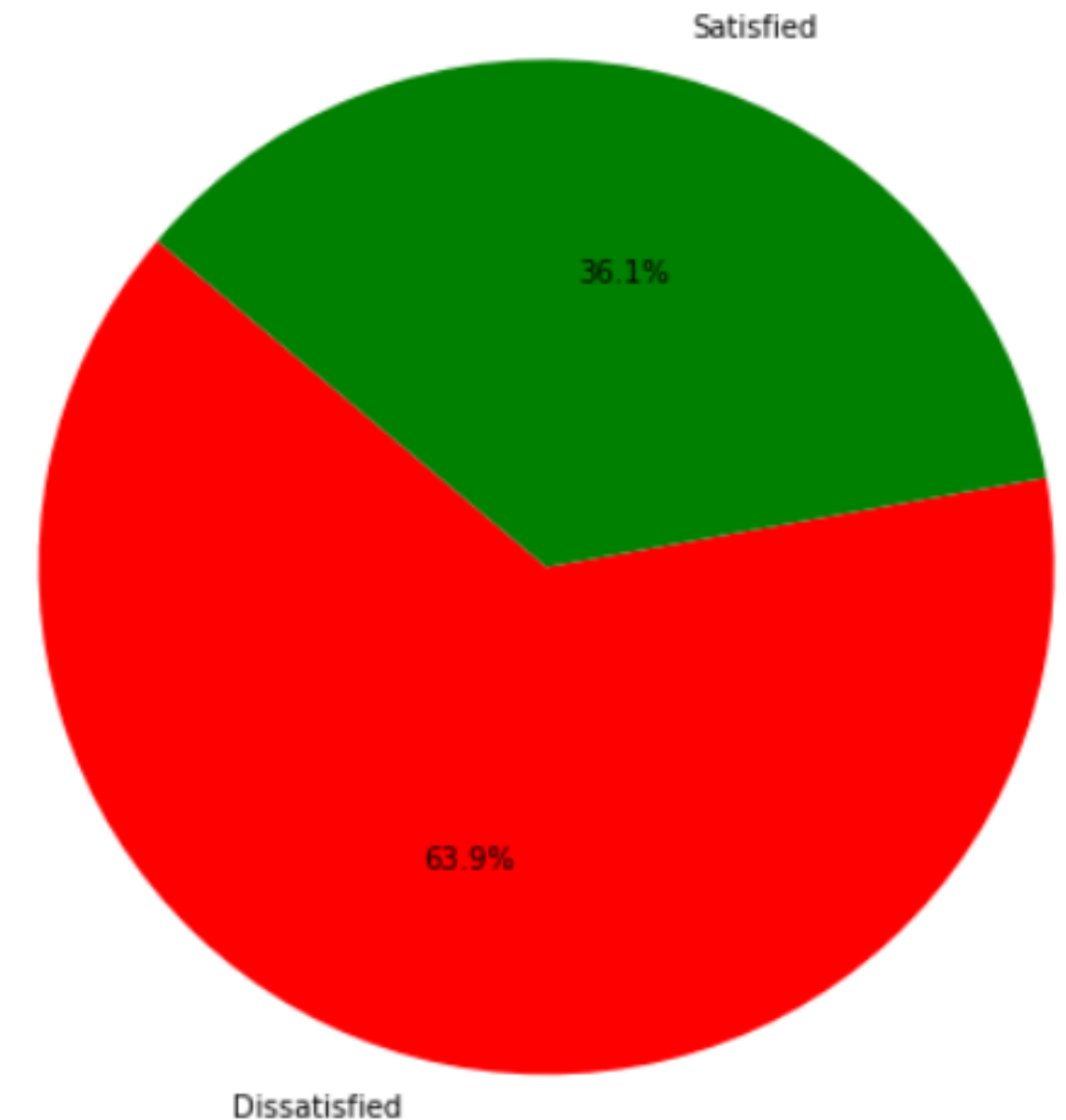
# Findings

After analyzing the data, I came across a couple of findings:

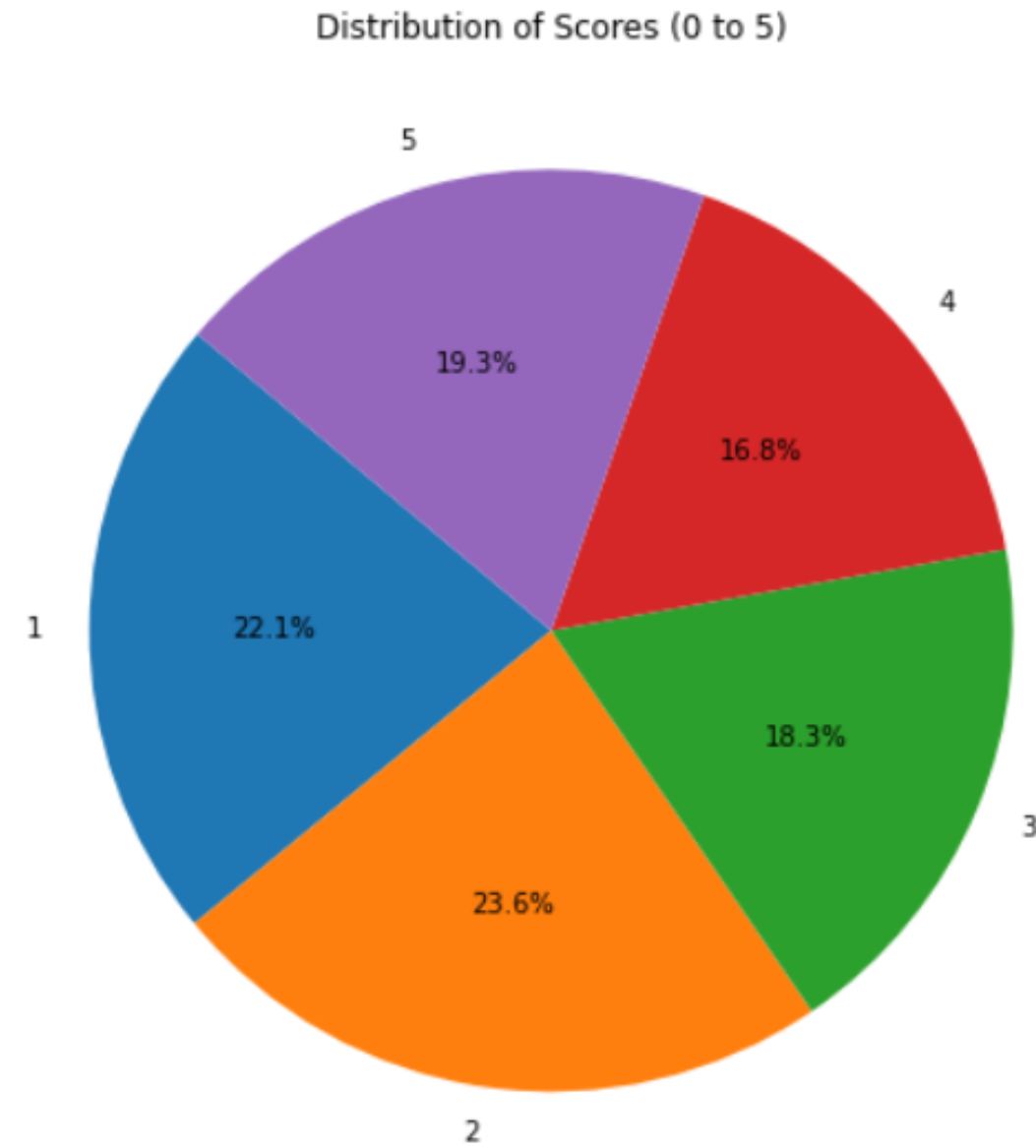
## Regarding Customer Satisfaction

The distribution of satisfaction looks like this:

**Around 64% of the customers  
are dissatisfied with  
F&B of United Airlines.**



# The Satisfaction-Score Distributions looks like this



19.3% gave 5 score

16.8% gave 4 score

18.3% gave 3 score

23.6% gave 2 score

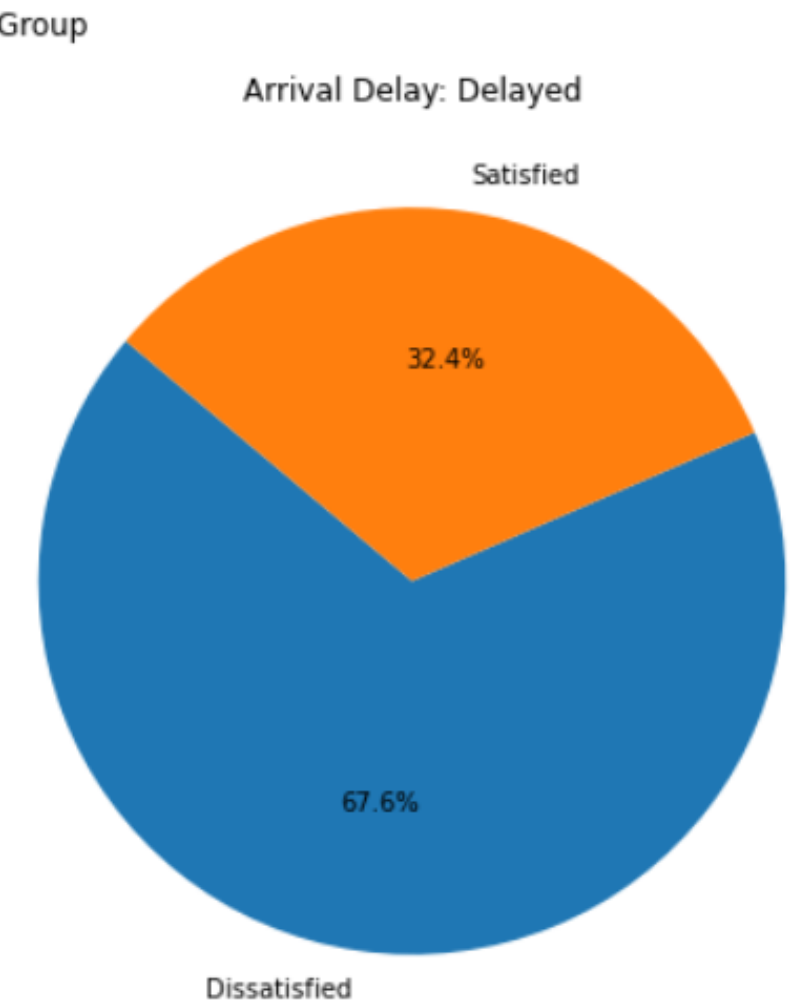
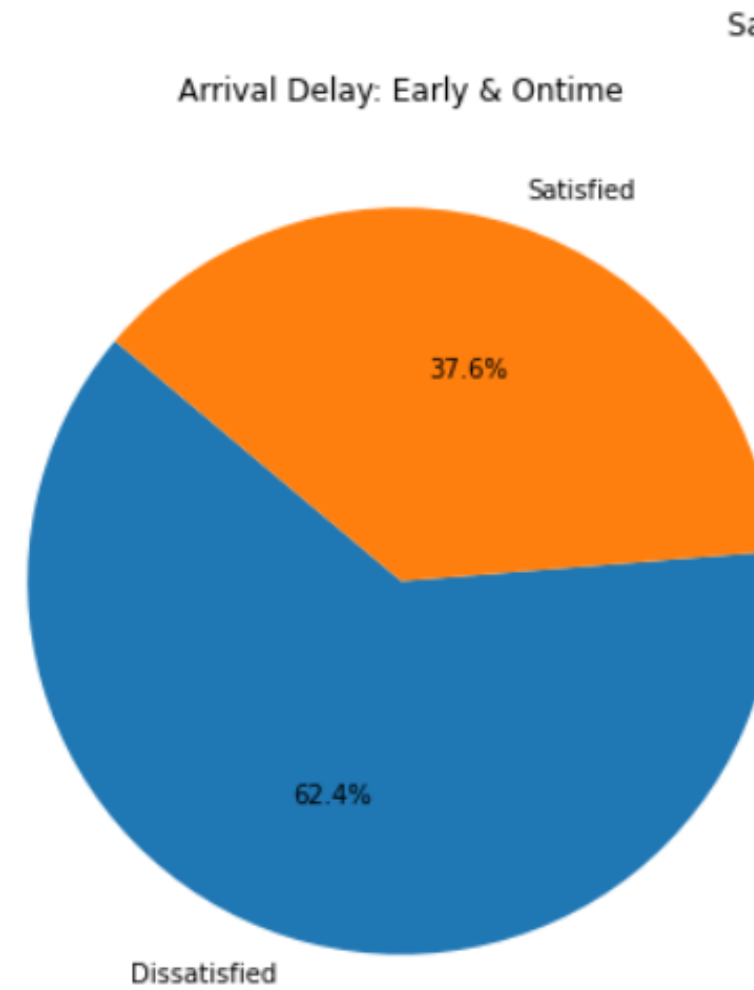
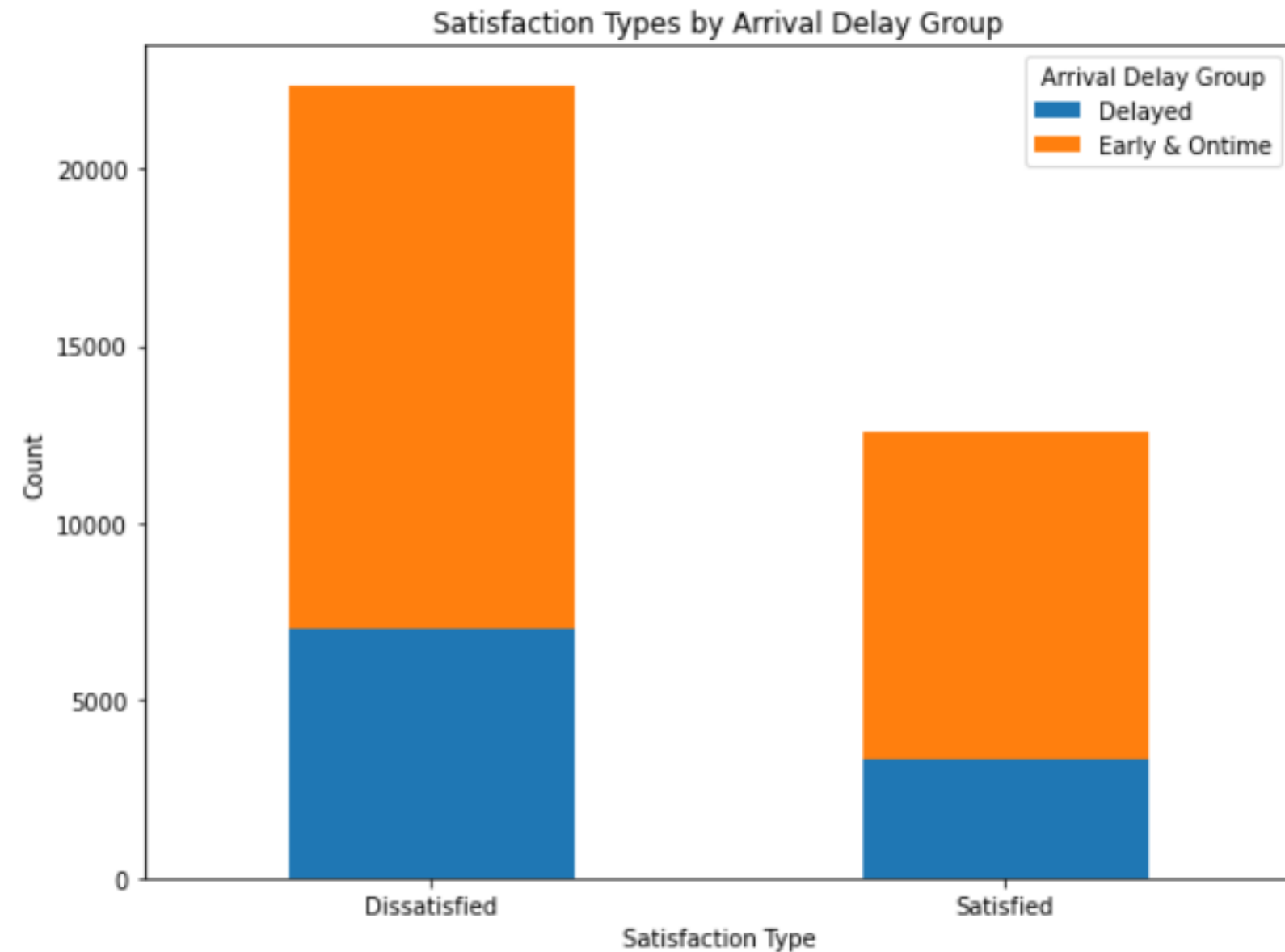
22.1% gave 1 score

# But people's dissatisfaction can influenced due to **different reasons**

- Due to flight delays
- Due to their cabin(Business/Economy)
- Due to generational difference

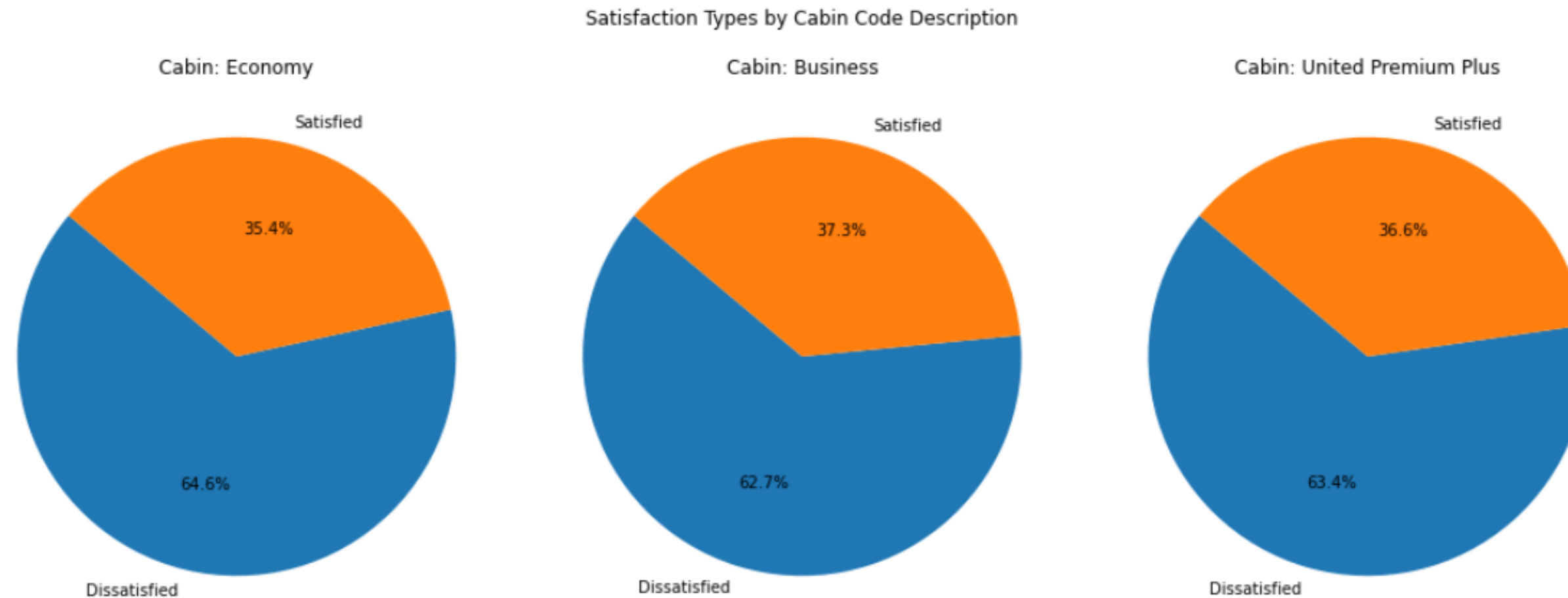
I tried to find the correlation between these reasons and their satisfaction scores.

# Due To Flight Delays



As we can see there is only a **minor difference**, i.e., **5%** of people are more dissatisfied if the flight is delayed

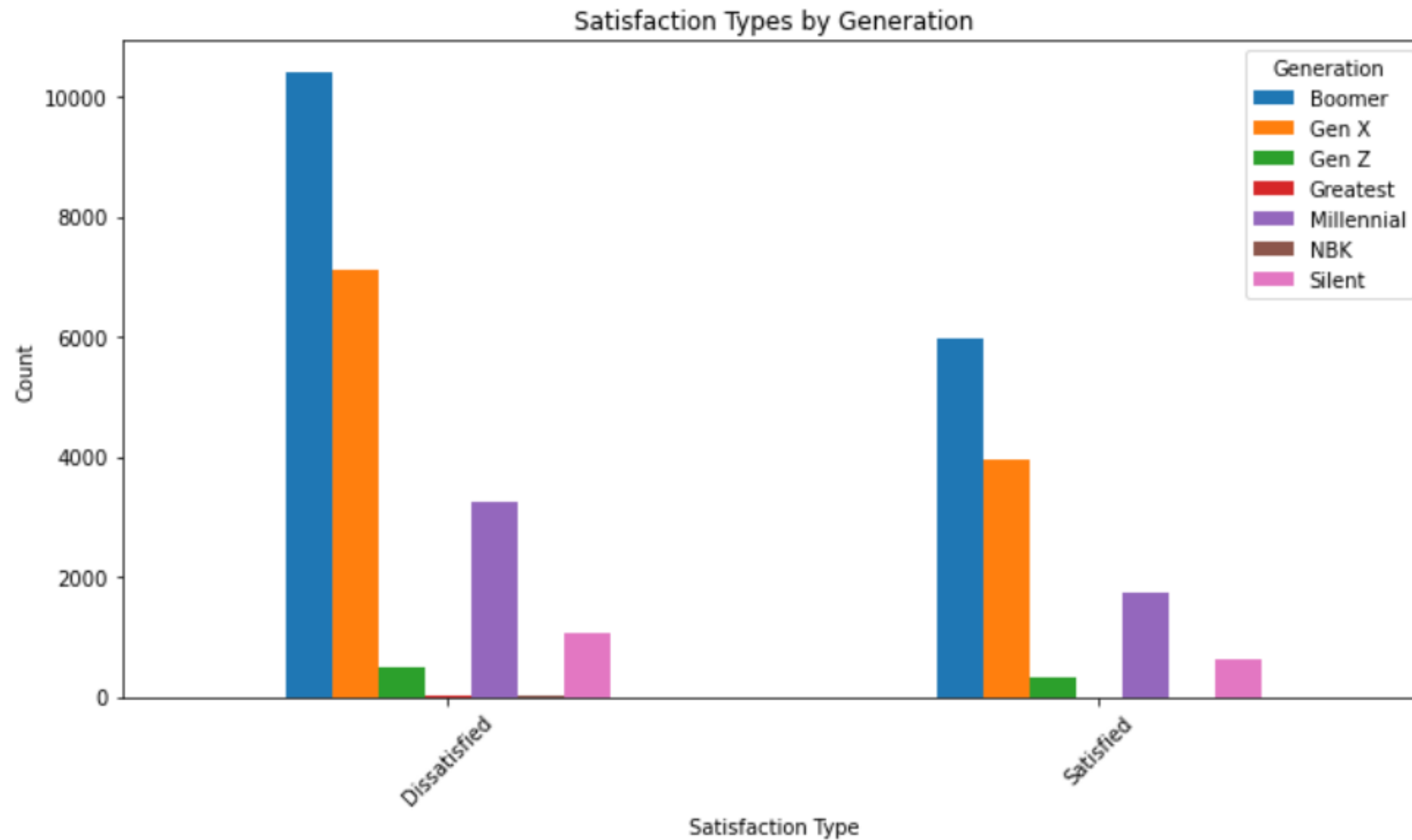
# Due to cabin class



Also, in this case, there is a very minor difference (**1.9%**) of the people in lower cabin class are more dissatisfied



# Due to difference in generation



Similarly in this, the difference is negligible, but we found that Gen-Z are 4% more satisfied

# Most Popular and Least Popular Items

10 Most Preordered Meals:

	meal_short_description	pre_order_qty
102	Za'atar chicken	36135
12	Brioche cheeseburger	33687
75	Scrambled eggs	26099
45	Impossible™ Meatball Bowl	20757
8	Belgium waffle	18568
89	Takeoff	13437
90	Tapas	13008
93	Tomato and kale baked egg	11235
101	Za'atar chicken with spinach, roasted peppers,...	8694
96	Vegetarian chili and polenta cake	8063

10 Least Preordered Meals:

	meal_short_description	pre_order_qty
43	I will decide onboard	0
44	I would like to go directly to sleep	0
95	Vegetarian (Non-Dairy) Meal	0
42	I do not want to eat	0
2	Asian Vegetarian Meal	0
50	Kosher Meal	0
32	Gluten-free Meal	0
41	I am a United Club member and will eat there b...	0
9	Bhuta palak	1
60	Penne pasta	1

# Food Wastage: A Concern

In the inventory, a lot of times the entrees aren't consumed as much as planned. Hence leads to food wastage. United can save a lot of cost and save a lot of food if plans the entrees more judiciously.

Total Food Wastage: 257293

Top 10 Wasted Food Entree Descriptions:

	entree_description	planned_entree_count \
100	Zatar chicken	137864
56	Impossible Meatball Bowl	87523
6	Belgium waffle	55022
79	Scrambled eggs	60331
9	Brioche cheeseburger	18693
95	Tomato and kale baked egg	9426
26	Classic selection cheese tray	8937
16	Chicken breast entree	7821
98	Vegetarian chili and polenta cake	4516
64	Mediterranean Falafel Bowl	4054

	consumed_entree_count	food_wastage
100	63307	74557
56	35155	52368
6	23037	31985
79	31439	28892
9	4311	14382
95	2494	6932
26	3811	5126
16	4152	3669
98	848	3668
64	735	3319

# Feedbacks/Comments

In the dataset (Survey data – Customer comments/feedback), we are given customer feedback about F&B.

Through these comments, we can get various insights and major complaints and can know where can we improve.

I performed **Topic Modelling** on people's comments to find the general sentiment of public.

# Topic Modelling

Topic modeling is a type of statistical modeling that uses unsupervised Machine Learning to identify clusters or groups of similar words within a body of text. This text mining method uses semantic structures in text to understand unstructured data without predefined tags or training data.

## Steps:

- Preprocessing Data
- Tokenize the data
- Remove Stop words
- Lemmatize the data
- Vectorize the data (I used count vectorizer )
- Trained the vectorized data on LDA model

# Sentiments found using LDA

I used bigram, trigram, 4-gram and 5-gram to find the best context of the feedback.

The best context is found using 4-gram and 5-gram

# The 4-gram LDA result for positive comments look like this:

```
['would like see option' 'gluten free option snack'  
'small snack would nice' 'diet dr pepper would' 'hour flight would nice'  
'would nice small snack' 'ahead flight flight attendant'  
'day ahead flight flight' 'like see option available'  
'could little bigger especially' 'snack box would nice'  
'would great could offer' 'potato chip would nice'  
'dr pepper would great' 'would nice get snack' 'need gluten free option'  
'food beverage served flight' 'snack like biscoff pretzel'  
'larger portion would nice' 'snack like nut pretzel'  
'see wanted anything else' 'pre order meal return'  
'order meal return flight' 'asked would like drink'  
'best meal ever airplane']  
['would nice gluten free' 'need gluten free option'  
'gluten free snack option' 'would nice offered whole'  
'would nice different option' 'chicken orzo impossible meatball'  
'also different water dasani' 'service would nice get'  
'wine offered even though' 'would nice flight attendant'  
'nice provide small snack' 'would nice provide small'  
'better snack selection first' 'snack selection first class'  
'would great better quality' 'nice gluten free snack'  
'never asked would like' 'free snack would appreciated'  
'thai green curry chicken' 'card file automatically charged'  
'small snack would nice' 'everyone eat cooky pretzel'  
'would great long flight' 'best airline food ever'  
'food actually pretty good']  
['snack like pretzel cooky' 'would nice small snack' 'would like see meal'  
'cooked vegan breakfast option' 'beverage service first class'  
'came around multiple time' 'able purchase food beverage'  
'wish united would offer' 'turkey cheese sandwich good'  
'able use credit card' 'would nice complimentary snack'  
'would nice long flight' 'high fructose corn syrup'  
'would definitely fly united' 'able pre order meal'  
'great gluten free option' 'would nice offered snack'  
'gluten free snack option' 'complimentary snack offered flight'  
'good enough first class' 'wish airline would offer'  
'one best flight meal' 'first class ticket would'
```

# The 5-gram LDA result for positive comments look like this:

```
['would like see option available' 'love starting offering dr pepper'  
'would love starting offering dr' 'better snack selection first class'  
'dehydrating many people wish avoid'  
'water unfluoridated neurotoxin filtered reverse'  
'would possible pure water coffee' 'nice spring water possible look'  
'read label discloses ingredient form' 'read thoroughly may help clarify'  
'water salted beverage one read' 'water salted beverage ideally water'  
'thoroughly may help clarify water'  
'health reason may something worthwhile'  
'water possible look quality water' 'realize dasani labelled water given'  
'water option aquafina kirkland crystal'  
'unnecessary salt high fructose corn' 'high fructose corn syrup health'  
'cola dasani claim water label' 'part inflight service would possible'  
'water offered flight idealize many' 'beverage one read label discloses'  
'reason may something worthwhile look'  
'spring water possible look quality']  
['gluten free option would nice' 'would nice gluten free snack'  
'pre order meal return flight' 'hour flight long time go'  
'day ahead flight flight attendant' 'qui est servi aujourd'hui sur'  
'repas beaucoup plus convenable que' 'comparer ce qui est servi'  
'produits servis sont de plus' 'que ce petits plat peu'  
'salade dans un modeste snack' 'minuscule portion sans goût que'  
'remplis qui prennent de la' 'maintenant est plus un passe'  
'prennent de la place sur' 'que avais faim un sandwich'  
'mais je pense que ce' 'faim un sandwich turkey salade'  
'sans goût que servi sur' 'servait pendant me premier vols'  
'que ai pris avec ce' 'acheté en arrivant sfo parce'  
'accompagné un verre de vin' 'ensemble de minuscule portion sans'  
'un yahourt ou un petit']  
['would like see iced tea' 'thought paying extra business polaris'  
'expensive yet something always looked'  
'people want return normalcy bringing'  
'right away saved continental taking' 'right away saved continental hbr'  
'expense account seat wife two'  
'covid disappeared missing houston london'  
'class since sometimes opting singapore'  
'review article turnaround continental gave'  
'frankfurt munich houston sundae expensive' 'day always skip nut cherry'  
'nut cherry wondering premade sundae'  
'hypothesis deleting ice cream cart' 'seat wife beijing london year'  
'cream sundae service thinking reference' 'hbr org http hbr org'  
'bringing back ice cream sundae' 'covid people want return normalcy'  
'away saved continental hbr org' 'post covid people want return'  
'cream sundae cart would great' 'cream sundae cart miss brand'  
'away saved continental taking continental'  
'giving feedback think way post']
```



# The 4-gram LDA result for negative comments look like this:

```
['flight sat first class' 'beverage served short flight'  
'food beverage served short' 'food beverage service short'  
'beverage service short flight' 'snack food offered flight'  
'first class food good' 'elect topping many quantity' 'one ua used serve'  
'learning understanding choosing gone' 'also ice cream smoother'  
'region etc unfortunately quality' 'red white ask grape'  
'white ask grape idea' 'selected wine indicating producer'  
'topping many quantity poured' 'quality nice feeling learning'  
'chose sundae sundae nothing' 'ice cream smoother one'  
'feeling learning understanding choosing' 'sundae nothing one ua'  
'sundae sundae nothing one' 'list pre selected wine'  
'nothing one ua used' 'pre selected wine indicating']  
['allergic peanut tree nut' 'yo consumo derivados de'  
'veganos etc como yo' 'tal vez un sandwich'  
'dulce deberia considerar alguna' 'por veganos etc como'  
'alguna alternativa para el' 'sirvieron en el tramo'  
'snack de desayuno fue' 'pan dulce deberia considerar'  
'etc como yo consumo' 'alternativa para el lacteo'  
'lacteo por veganos etc' 'como lo que sirvieron'  
'como yo consumo derivados' 'derivados de leche tal'  
'desayuno fue un yogurt' 'con una rebanada de'  
'tramo amsterdam houston excelente' 'rebanada de pan dulce'  
'un sandwich como lo' 'fue un yogurt con' 'si el snack de'  
'lo que sirvieron en' 'vez un sandwich como']  
['first class one vegan' 'like like many need'  
'receipt within minute clicking' 'receive email like attached'  
'information finally email receipt' 'make customer go much'  
'need receipt business expense' 'within minute clicking purchase'  
'received response better part' 'email flight reservation receipt'  
'bunch information finally email' 'information told could find'  
'manner one issue call' 'many need receipt business'  
'need delivered customer timely' 'like attached instructing click'  
'email like attached instructing' 'used make customer go'  
'necessary receipt inflight purchase' 'see screenshot call customer'  
'email receipt get united' 'email receipt receive email'  
'service issue like like' 'trouble tax customer service'  
'report important need delivered']  
['miss honey roasted peanut' 'quick flight food beverage'  
'food beverage served flight' 'old ice cream sundae'  
'meal airline flown united' 'beyond something edible quality'  
'one replaced something name' 'name far inferior breakfast'  
'handy gin tonic though' 'flown united enough expect'  
'enough expect anything beyond' 'plane high expectation food'  
'airline flown united enough' 'option longer exist random'  
'egg whatever handy gin' 'high expectation food however'  
'sundae long one replaced' 'though degraded year old'  
'though bad although difficult' 'edible quality though degraded']
```

# The 5-gram LDA result for negative comments look like this:

```
['atop waffle usually soggy' 'even salt pepper added'  
'option time flight nothing' 'limited selection snack sugary'  
'see screenshot call customer' 'consumer opposed simply stating'  
'disappointing alternative yogurt hard'  
'disappointing also plenty beverage' 'either bring pay high'  
'link return flight never' 'box need better pita'  
'glass turbulence impossible cut' 'phone airplane mode would'  
'glass wine first class' 'breakfast egg chicken sausage'  
'say curry chicken meal' 'provided breakfast still green'  
'gluten free food online' 'provided flight provide water'  
'breakfast snack yoghurt biscotti' 'breakfast still green banana'  
'snack food purchase seem' 'gluten free option complimentary'  
'food except pretzel cracker' 'food economy even know']  
['first took flight attendant' 'good good main meal'  
'available last alternative something' 'louisville flight sat first'  
'snack biscuit pretzel etc' 'stating pre order mistake'  
'filled small amount crushed' 'first board bad procedure'  
'better domestic flight make' 'offered one snack drink'  
'snack flight ewr atl' 'food good european flight'  
'piece cake cooky something' 'please stop offering awful'  
'included list wine offered' 'choose meal advance several'  
'snack basket please rotate' 'could use app pay'  
'ewr inferior champagne upon' 'snack bar tail airplane'  
'familiar beverage option outlined' 'long trip returning long'  
'long haul bfast also' 'side dish tasted terrible'  
'huge slice cheesecake red']  
['since pick tray extra' 'atl offered snack drink'  
'meal dessert meal airline' 'spicy said know still'  
'spicy seems short sighted' 'food snack trying cut'  
'spirit option wine pretty' 'squash ravioli disappointing cheese'  
'st class particularly tasty' 'meal really filling adult'  
'got given one small' 'pre order like selection'  
'food particularly appealing business' 'neither good diabetic anyone'  
'earth shattering long flight' 'pitiful every way roll'  
'considering air cabin dry' 'somewhat little spicy sure'  
'apparently go record board' 'like flight attendant gave'  
'heard another passenger asked' 'heard lot negative comment'  
'snack much plane ticket' 'got early really care' 'going go first class']  
['qatar emirate turkish etihad' 'another passenger asked coffee'  
'proper sundae whipped cream' 'eat bit disappointed mistake'  
'selection beverage limited choice' 'ask food provide food'  
'helpful flt attendant walk' 'cold cut disappointing could'  
'ask given stress inconvenience' 'away option would better'  
'ice heard another passenger' 'due horrendously long line'  
'ago bit fast food' 'stomach ache stomach gas'  
'cheeseburger second meal usual' 'sense choice quality far']
```

# Recommendations

The crux of the complaints can be found in the LDA results

The major such complaints are as follows:

- From the results like these-

['atop waffle usually soggy' 'even salt pepper added'  
'option time flight nothing' 'limited selection snack sugary'  
'see screenshot call customer' 'consumer opposed simply stating'  
'glass turbulence impossible cut' 'phone airplane mode would']

- we can say that the food quality needs to improved and several changes need to be made, such can be found in the LDA results of the sentiment of the comments.

# Major customer complaints

Besides specific complaints, the major complaints from the customers are:

- People want to see more options.
- A lot of people want gluten-free options
- People want to have more snack options.

Then there are a lot of specific complaints regarding the quality of food served, which suggests a better quality of catering can resolve many specific complaintss

# Future Steps

With more data, we can perform even better and more accurate sentiment analysis and

can pinpoint the most crucial issues.

With more rich and quality data, we can categorize different complaints coming from

different generations, from different cabin classes, or even different nationalities.

The feedback on the preorder data can help in improving the preorders done by customers, as the current numbers are low.

More algorithms and transformers can be applied to the feedback and on the inventory data, to decide a better inventory that will get a good satisfaction score.

**Thank You**