DATA ANALYSIS OF CASE STUDIES

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Get in touch!

AGENDA

Game Co. - Market Research

Influenza Season

Rockbuster - Movie Rental

Nashville House Sales

Instacart - Online Groceries

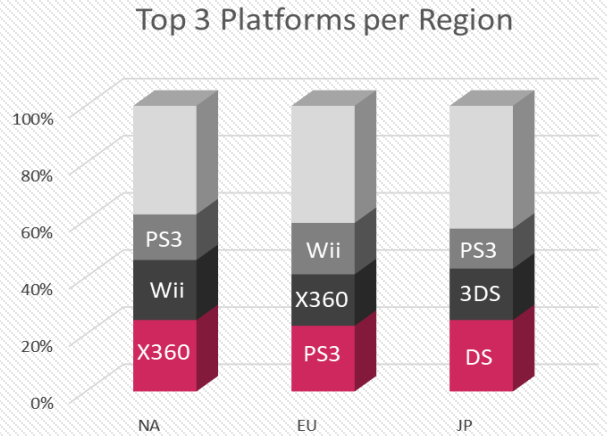
Olist – Online marketplace

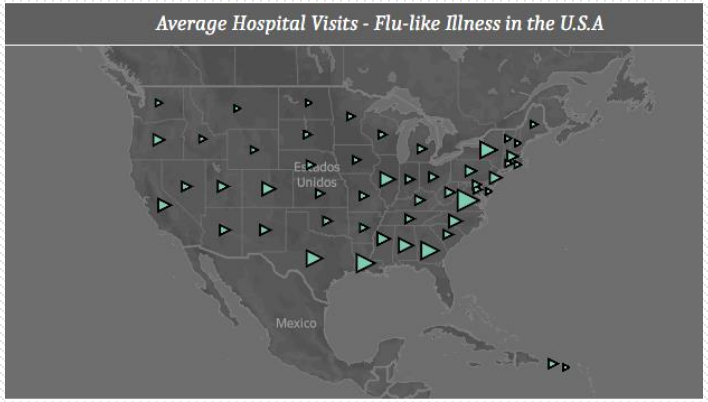
COVID – Worldwide Overview

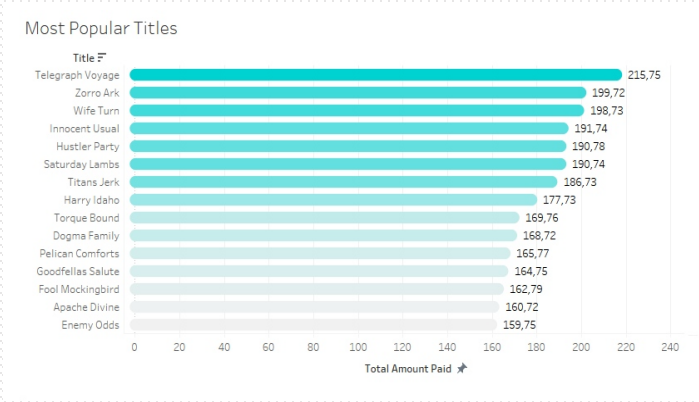
TOOLS

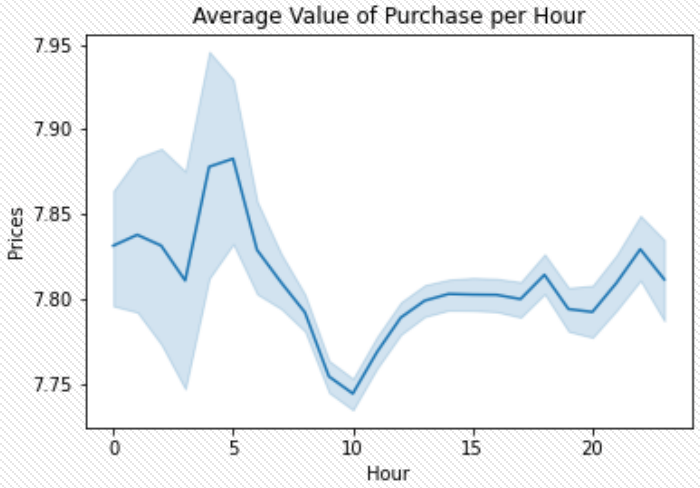
- These programs were used to analyse the data in the following case studies, accordingly to the data available.
- Python displays many advantages for being an open source and having a huge community ready to help. When I want to dig deeper in the coding world, I feel supported.
- SQL shows me that I need to have in mind in advance what I want to explore and insights are really valuable.
- Excel allows me to feel closer to the dataset, once I can check each cell if needed and I am more used to it.
- Tableau and Power Point allows me to better build informative, powerful and easy on the eyes visualizations. I have great pleasure to work with these tools.

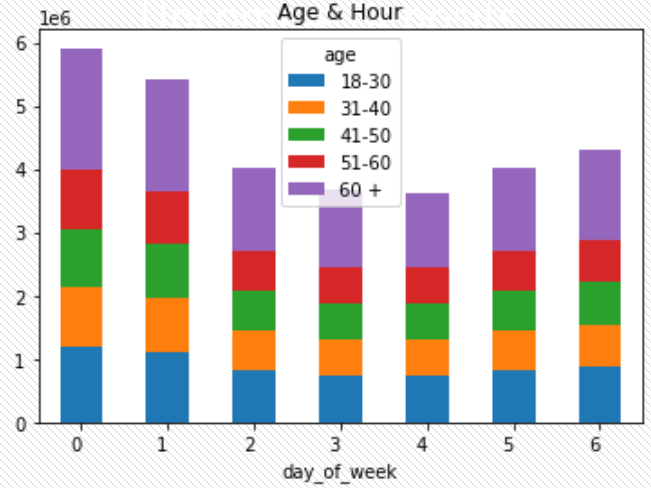
DATA VISUALIZATION

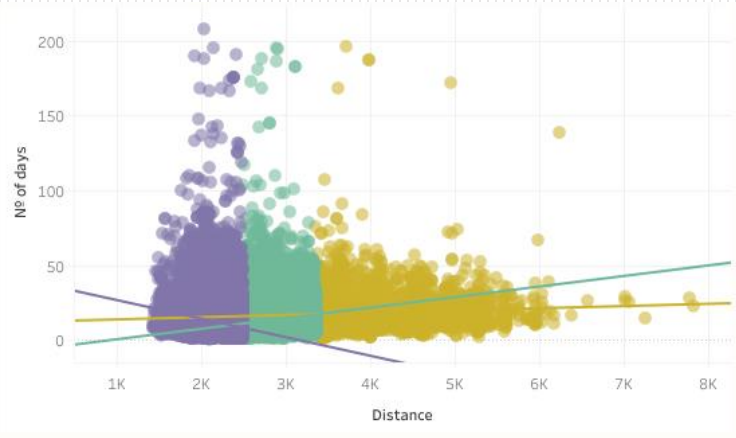












Clustering: to analyse the delivery of Olist

GAME CO.

Market Analysis

- Sales history and Market Share since 1980;
- Regional Analysis;
- Target: Regional top genres and platforms.

Data

- 16.5K titles;
- File: Excel - CSV;
- Regions: North America, Europe, Japan and others;
- Informations: title, platforms, year, genre, publisher;
- Pivot Tables and Charts;
- Data Source: GVZCharts.

Challenges

- Data Cleaning, missing values, formatting and standardizing the dataset;
- Lack of access to current data;
- Decrease of sales do not reflect the real numbers because online channels are not included in the dataset.

REGIONAL ANALYSIS DASHBOARD: NORTH AMERICA

93%

1980 Market

Sales Units: 10,6M

32%

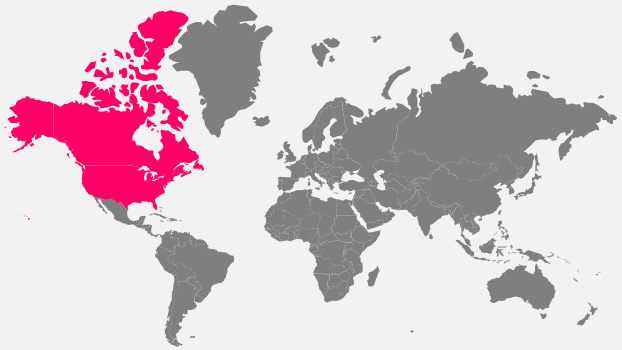
2016 Market

Sales Units: 22,6M

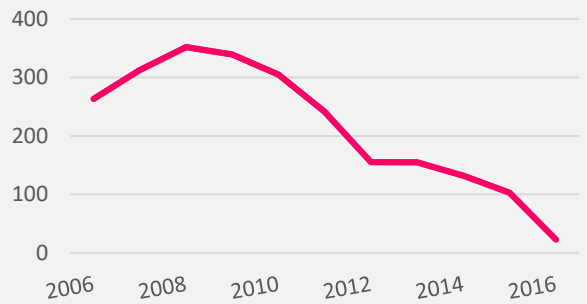
Shooter (52%*)	363M
Misc (51%)	288M
Sports (50%)	396M
Fighting (50%)	95M
Simulation (49%)	109M

* % from Global Sales

Market Location



Sales



*Data from the last 10 years

NA lost market share

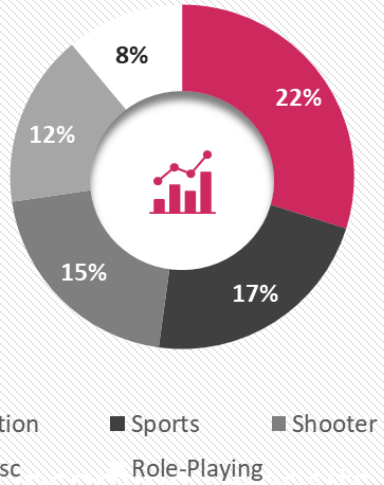
Increase and decrease of sales

STABLISHING TARGETS: GENRES AND PLATFORMS

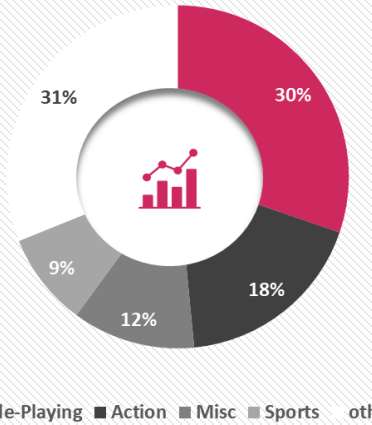
Year	(Multiple Items)
2006-2016	
Row Labels	**Sum of NA_Sales**
Action	529,05
Sports	395,53
Shooter	363,49
Misc	287,94
Role-Playing	196,06
Platform	135,65
Racing	132,9
Simulation	108,78
Fighting	94,54
Adventure	61,98
Puzzle	43,34
Strategy	28,65
N/A	0,03
Grand Total	**2377,94**

The diferences between regions were well observed through Pivot Tables and Charts

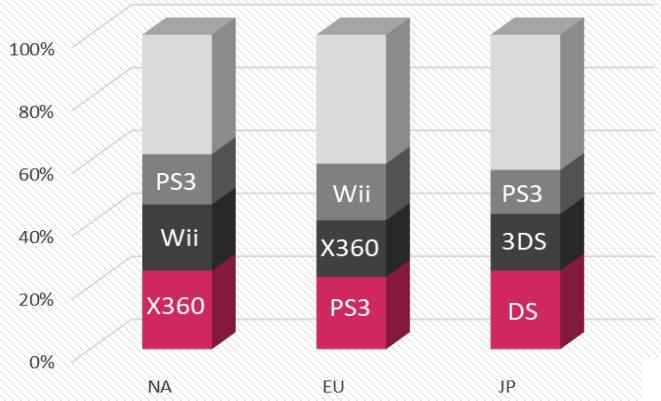
NA and Eu % are similar:



Japan has as different top seller:
Role-playing



Top 3 Platforms per Region



Year	(Multiple Items)
2006-2016	
Row Labels	**Sum of NA_Sales**
X360	587,44
Wii	497,28
PS3	388,9
DS	331,4
PS2	114,89

*Data from the last 10 years

INFLUENZA SEASON

Goals

- Work with a staff agency to relocate professionals during Influenza Season;
- Formulate and test hypothesis to background the relocation;

Data

- File: Excel - CSV;
- Informations: Hospital Visits 2010 - 2019, Mortality 2009 - 2017, Vaccination in children until 35 months in 2017, laboratory tests 2010 - 2015, Census of the population 2010 – 2019;
- Tableau: Data Visualization;
- Data Source: CDC Years 2009-2017 and US Census Bureau.

Challenges

- Data Cleaning, inconsistency, different levels of granularity;
- Detect the high risk groups, create the correlation of the variables, elaborate the hypothesis to support it and test it, was a nice challenge;
- Learn how to use Tableau and write a Report Interim;
- Lack of access to current data, including the pandemy Covid-19 and its impacts on the flu season numbers.

DESCRIPTIVE ANALYSIS

- If the population from high-risk groups is higher in some states, then there are more hospitalizations flu illness related.
- High risk groups: < 5 years and 65 + years.

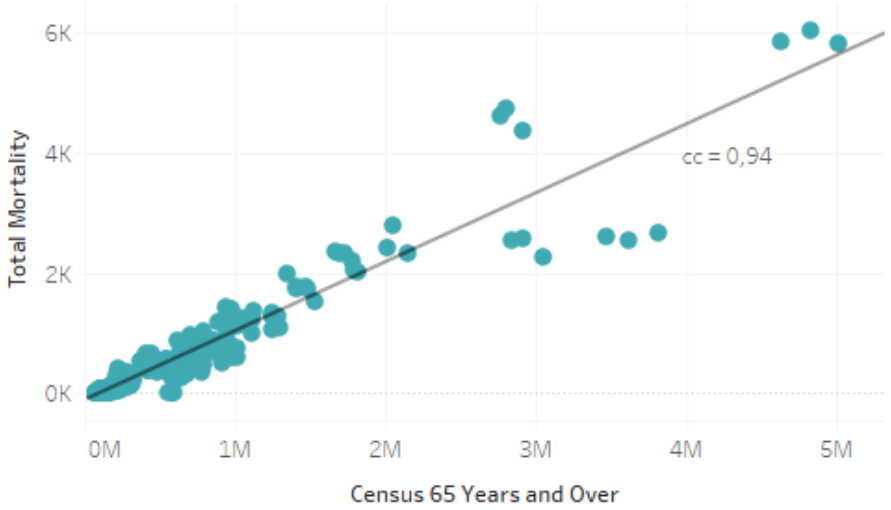
** But... how strongly are they correlated?*

The correlation coefficient is measured between two variables to understand how strongly are they correlated or connected.
The values to measure the relationship are:

cc = 0: no relationship - 0.1–0.3: weak relationship - 0.3–0.5: moderate relationship - 0.5–1.0: strong relationship

*There is a **strong** relationship among the three variables!*

Total Mortality by Influenza x Census of the high risk group



Flu like-illness Hospital Visits and Census of the high risk group

Source: CDC. Years 2009-2017

HYPOTHESIS TESTING

- *Independent Variable: Number of vulnerable people (sum of population < 5 years and 65+)*
- *Dependent Variables: Mortality and Hospitalization by flu-like illness.*

Test 1

Null Hypothesis

$H_0: \mu_{high} = \mu_{low}$

1. If States have higher number of people from high risk groups, then they have the same mortality rates from flu like illness.

Alternative Hypothesis

$H_A: \mu_{high} \neq \mu_{low}$

1. If States have higher number of people from high risk group, then they do not have the same mortality rates from flu like illness.

T test

two - tailed because it can be higher or lower

	*States with **higher** Average of mortality per 100.000 habitants*	*States with **lower** Average of mortality per 100.000 habitants*
Mean	0,129	0,017
Variance	0,010	0,000
Observations	26,000	26,000
Pooled Variance	0,005	
Hypothesized Mean Difference	0,000	
df	50,000	
t Stat	5,570	
P(T<=t) one-tail	0,000	
t Critical one-tail	1,676	
P(T<=t) two-tail	0,000	
t Critical two-tail	2,009	

Test 2

Null Hypothesis

$H_0: \mu_{high} = \mu_{low}$

2. If States have a higher number of people from high risk groups, then they have the same rates of hospitalized people with flu-like illness.

Alternative Hypothesis

$H_A: \mu_{high} \neq \mu_{low}$

2. If States have a higher number of people from high risk groups, then they don't have the same rates of hospitalized people with flu-like illness.

T test

two - tailed because it can be higher or lower

	States with higher Average of flu-like illness like hospitalizations per 100.000 habitants	*States with lower Average of flu-like illness hospitalizations per 100.000 habitants*
Mean	1,763	0,196
Variance	3,367	0,014
Observations	26,000	26,000
Pooled Variance	1,690	
Hypothesized Mean Difference	0,000	
df	50,000	
t Stat	4,347	
P(T<=t) one-tail	0,000	
t Critical one-tail	1,676	
P(T<=t) two-tail	0,000	
t Critical two-tail	2,009	

For both analyses, the P was lower than 0,05 and indicates that both null hypotheses can be rejected.

Meaning that **States with higher number of high-risk people don't have the same rates of mortality and hospitalizations than other states.**

- ***Final Considerations:***

- *Each State has different needs;*
- *States with higher number of vulnerable people, hospitalizations and deaths: should be treated as **priority**.*
- *The best treatment is always prevention: Vaccinations, Information and Hygiene.*

My Tableau vizualizations for this project

Check out the Interim Report

ROCKBUSTER STEALTH

Goals

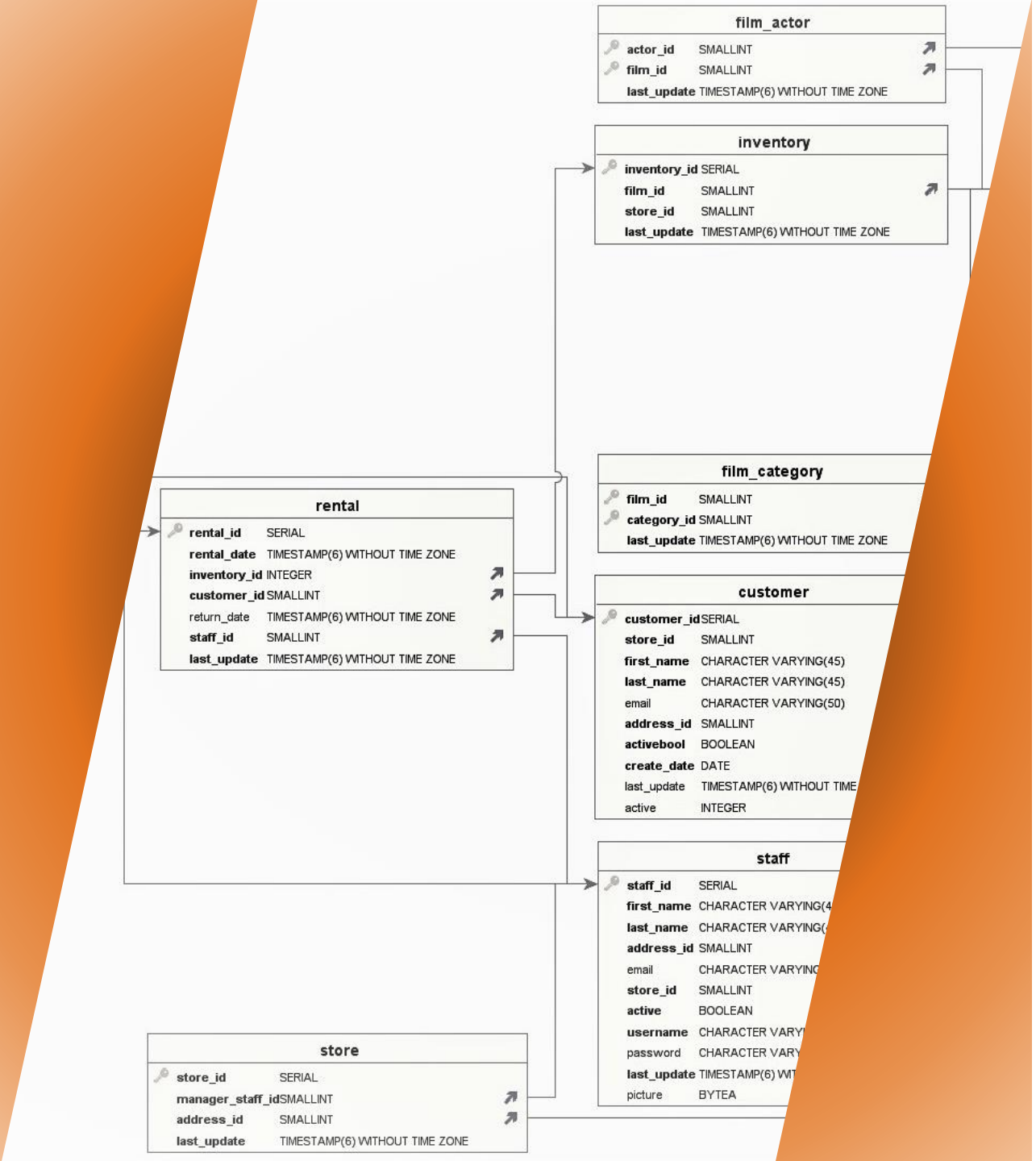
- Help the company understand its operations and revenue.
- Keep the company competitive in the market.

Data

- Database: SQL;
- Program: PostgreSQL, DB Visualizer, Tableau;
- Data Souce: Rockbuster data.

Challenges

- Understand the complexity of the DB;
- Program in SQL to extract the information of the DB;
- Write a Data Dictionary;
- Visualization with Tableau;
- Presentation in Power Point.



DATA DICTIONARY

All the data connections were described here:

Payment

	Columns	Data type	Description
	payment_id	SERIAL	Primary key of payment fact table, is the payment id number
	customer_id	SMALLINT	Foreign key, is a customer id number and has a dimension table
	staff_id	SMALLINT	Foreign key, is a staff id number and has a dimension table
	rental_id	INTEGER	Foreign key, is a rental id number and has a dimension table
	amount	NUMERIC(5,2)	Numeric data, is the amount of payment
	payment_date	TIMESTAMP(6) WITHOUT TIME ZONE	Date and time registered at the moment of the last update

Links to

	Table	Join	Description
	rental	payment.inventory_id = inventory.inventory_id	Foreign Key constraint referencing inventory.inventory_id
	customer	payment_customer_id = customer.customer_id	Foreign Key constraint referencing customer.customer_id
	staff	payment.staff_id = staff.staff_id	Foreign Key constraint referencing staff.staff_id

SQL CODING & OUTPUT

Coding in SQL was interesting and rewarding, once I could understand, I could expand the search for more information:

```
SELECT SUM(payment.amount) AS total_amount_paid,
       COUNT(payment.payment_id) AS total_payments,
       country.country
FROM payment
INNER JOIN rental ON payment.rental_id = rental.rental_id
INNER JOIN inventory ON rental.inventory_id = inventory.inventory_id
INNER JOIN film ON inventory.film_id = film.film_id
INNER JOIN film_category ON film_category.film_id = film.film_id
INNER JOIN category ON film_category.category_id = category.category_id
INNER JOIN customer ON payment.customer_id = customer.customer_id
INNER JOIN address ON customer.address_id = address.address_id
INNER JOIN city ON address.city_id = city.city_id
INNER JOIN country ON city.country_id = country.country_id
GROUP BY country
ORDER BY total_amount_paid DESC
```

total_amount_paid	total_payments	Country
6034,78	1422	India
5251,03	1297	China
3685,31	869	United States
3122,51	749	Japan
2984,82	718	Mexico
2919,19	681	Brazil
2765,62	638	Russian Federation
2219,7	530	Philippines
1498,49	351	Turkey
1352,69	331	Indonesia

PRESENTATION

Where are customers with a high lifetime value based?

TOP 10

No. of Customers		No. of Rentals
60	India	1422
53	China	1297
31	Japan	749
20	Philippines	580
14	Indonesia	331
36	United States	869
30	Mexico	718
28	Brazil	681
28	Russia Federation	638
15	Turkey	351

Top 10 Sales Numbers

$6.035	India
$5.251	China
$3.685	U.S.A
$3.123	Japan
$2.985	Mexico
$2.919	Brazil
$2.766	Russia
$2.220	Philippines
$1.498	Turkey
$1.353	Indonesia

Check the whole Presentation in Tableau!

NASHVILLE HOUSE SALES

Goals

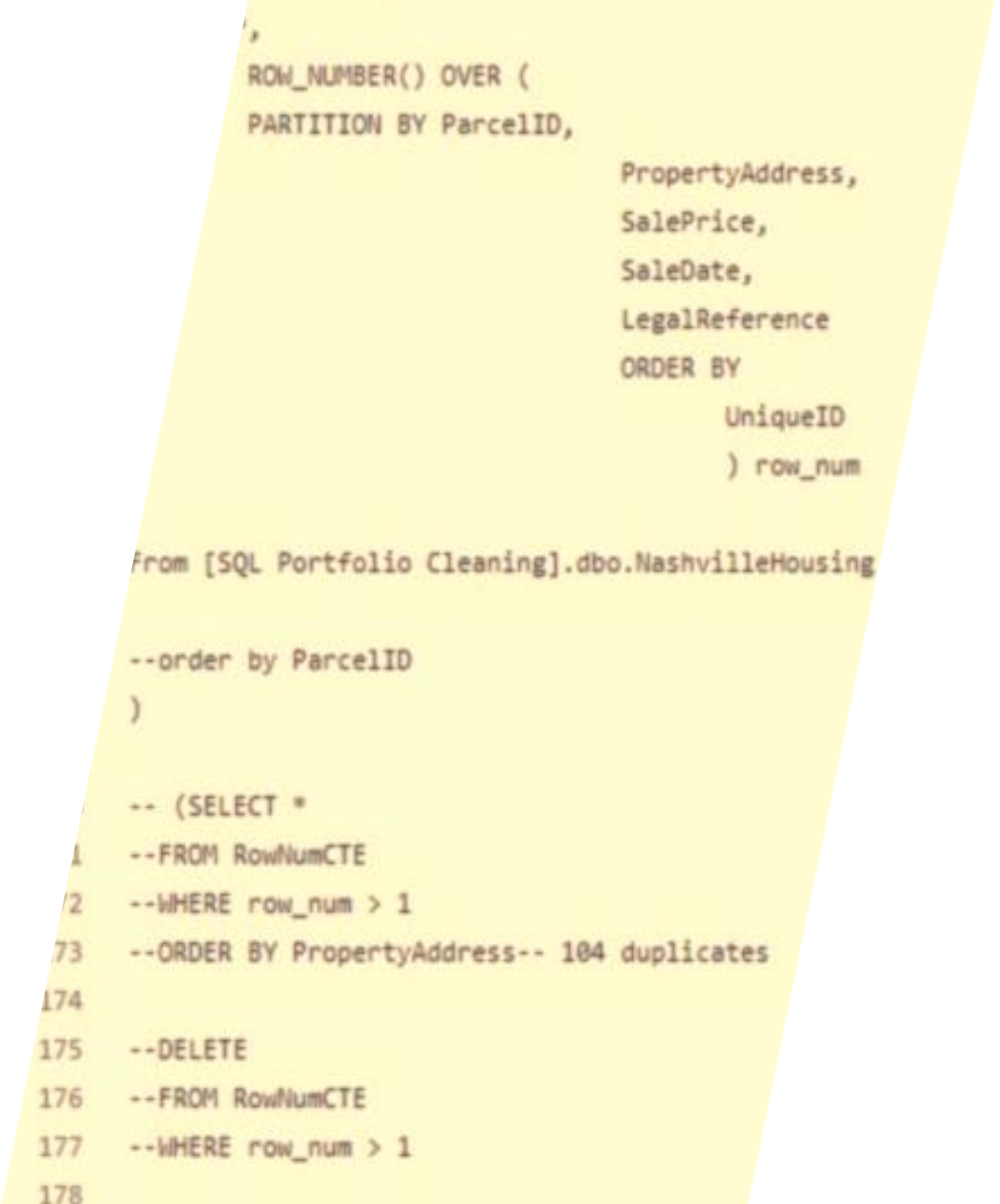
- Perform cleaning in the dataset using SQL queries.
- Create a visualization of the House Sales scenario in Nashville

Data

- Database: SQL;
- Program: Microsoft SQL Server Management Studio, Microsoft Excel and Tableau;
- Data Souce: Nashville House Sales.

Challenges

- Understand the complexity of the DB;
- Program in SQL to extract the information of the DB;
- Visualization with Tableau;



```
,
ROW_NUMBER() OVER (
PARTITION BY ParcelID,
                            PropertyAddress,
                            SalePrice,
                            SaleDate,
                            LegalReference
                            ORDER BY
                                    UniqueID
                                    ) row_num

From [SQL Portfolio Cleaning].dbo.NashvilleHousing

--order by ParcelID
)

-- (SELECT *
--FROM RowNumCTE
--WHERE row_num > 1
--ORDER BY PropertyAddress-- 104 duplicates

--DELETE
--FROM RowNumCTE
--WHERE row_num > 1
```

QUERYING FOR CLEANING

Step by Step

Cleaning data is the **beginning of every good analysis**. In this project, I performed the data cleaning from an .csv excel file while using Microsoft SQL Server Management Studio. Procedures:

- Converting Date types;
- Checking null values;
- Fulfilling null values in addresses with the corresponding IDs;
- Splitting Columns;
- Create new Column with Case statement;
- Removing duplicates with CTE and row_num > 1;
- Dropping columns with DROP COLUMN.

RESULTS

29 NULL VALUES

Fulfilled with corresponding ID values through JOIN

2 COLUMNS TO 6

Split using STRING, CHARINDEX, UPDATE, SET, PARSENAME, REPLACE.

1 NEW COLUMN

Created with CASE – WHEN to input status of Sold as Vacant

1 CASTING AS DATE

cleaning the TimeStamp using UPDATE, SET and CAST.

3 COLUMNS DROPPED

Using ALTER TABLE, DROP COLUMN

Check the visualization of the cleaned data in Tableau!

INSTACART

Goals

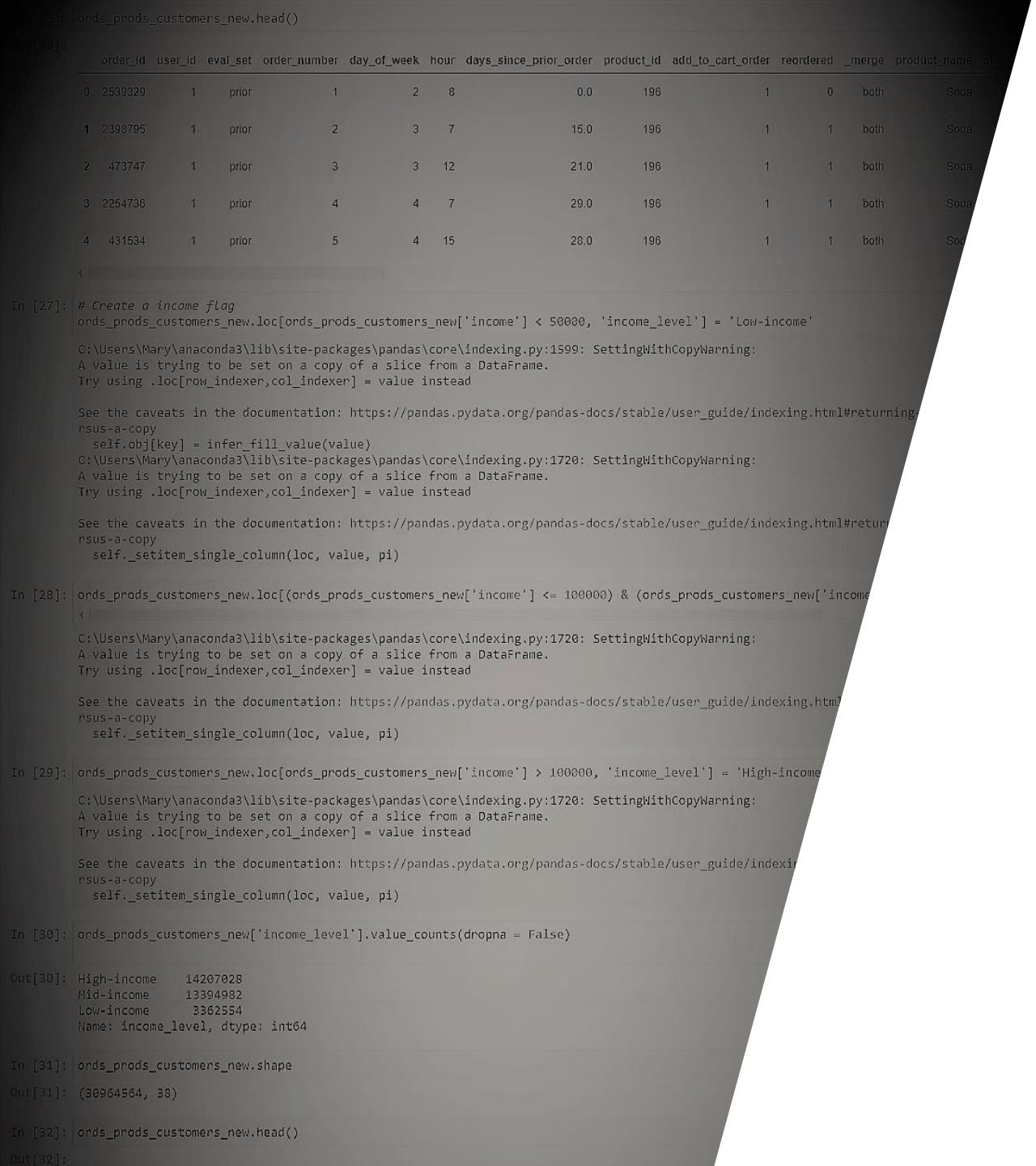
- Profile the customers and their behaviour;
- Target marketing actions accordingly.

Data

- Database: Open-source data and customer data set (ficticious);
- Program: Anaconda/Jupiter, Python, Matplot/Seaborn;
- Data Souce: Instacart, Dictionary, Customer dataset

Challenges

- Understand the complexity of the data;
- Program in Python to extract the information;
- Learn programming language and expand through Stackflow;
- Cleaning, Wrangling, Labeling, Creating new columns, Merging data sets;
- Visualization with Matplot/Seaborn;
- Create a Final Report with findings and observations.



```
In [25]: ords_prods_customers_new.head()

Out[25]:
   order_id  user_id eval_set  order_number  day_of_week  hour  days_since_prior_order  product_id  add_to_cart_order  reordered     _merge product_name
0   2539329        1    prior             1            2     8                     0.0         196                  1          0       both         Soda
1   2398795        1    prior             2            3     7                    15.0         196                  1          1       both         Soda
2    473747        1    prior             3            3    12                    21.0         196                  1          1       both         Soda
3   2254736        1    prior             4            4     7                    29.0         196                  1          1       both         Soda
4    431534        1    prior             5            4    15                    28.0         196                  1          1       both         Soda

In [27]: # Create a income flag
         ords_prods_customers_new.loc[ords_prods_customers_new['income'] < 50000, 'income_level'] = 'Low-income'

         C:\Users\Mary\anaconda3\lib\site-packages\pandas\core\indexing.py:1599: SettingWithCopyWarning:
         A value is trying to be set on a copy of a slice from a DataFrame.
         Try using .loc[row_indexer,col_indexer] = value instead

         See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning
         rsus-a-copy
           self.obj[key] = infer_fill_value(value)
         C:\Users\Mary\anaconda3\lib\site-packages\pandas\core\indexing.py:1720: SettingWithCopyWarning:
         A value is trying to be set on a copy of a slice from a DataFrame.
         Try using .loc[row_indexer,col_indexer] = value instead

         See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#retur
         rsus-a-copy
           self._setitem_single_column(loc, value, pi)

In [28]: ords_prods_customers_new.loc[(ords_prods_customers_new['income'] <= 100000) & (ords_prods_customers_new['income

         C:\Users\Mary\anaconda3\lib\site-packages\pandas\core\indexing.py:1720: SettingWithCopyWarning:
         A value is trying to be set on a copy of a slice from a DataFrame.
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         rsus-a-copy
           self._setitem_single_column(loc, value, pi)

In [29]: ords_prods_customers_new.loc[ords_prods_customers_new['income'] > 100000, 'income_level'] = 'High-income

         C:\Users\Mary\anaconda3\lib\site-packages\pandas\core\indexing.py:1720: SettingWithCopyWarning:
         A value is trying to be set on a copy of a slice from a DataFrame.
         Try using .loc[row_indexer,col_indexer] = value instead

         See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexi
         rsus-a-copy
           self._setitem_single_column(loc, value, pi)

In [30]: ords_prods_customers_new['income_level'].value_counts(dropna = False)

Out[30]: High-income    14207028
         Mid-income     13394982
         Low-income      3362554
         Name: income_level, dtype: int64

In [31]: ords_prods_customers_new.shape

Out[31]: (30964564, 38)

In [32]: ords_prods_customers_new.head()

Out[32]:
```

HANDS ON DATA!

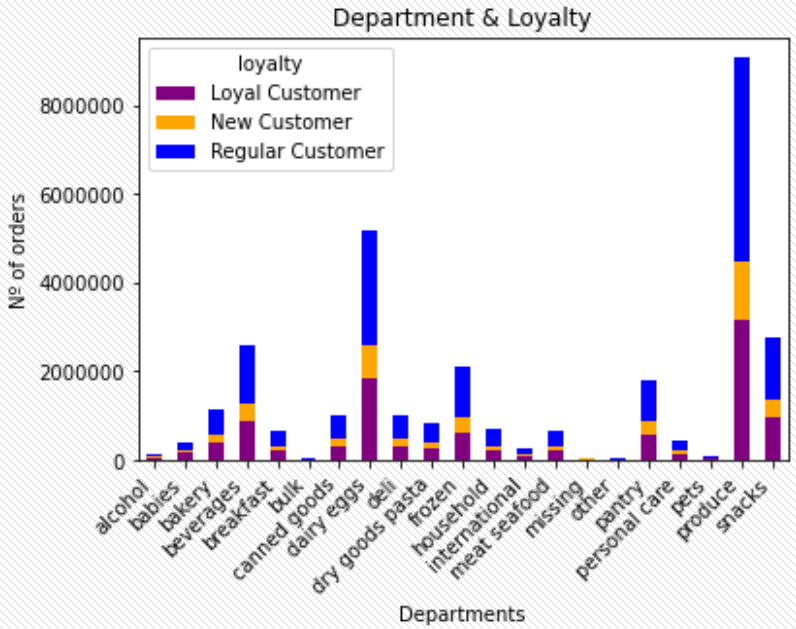
PYTHON = CHALLENGE

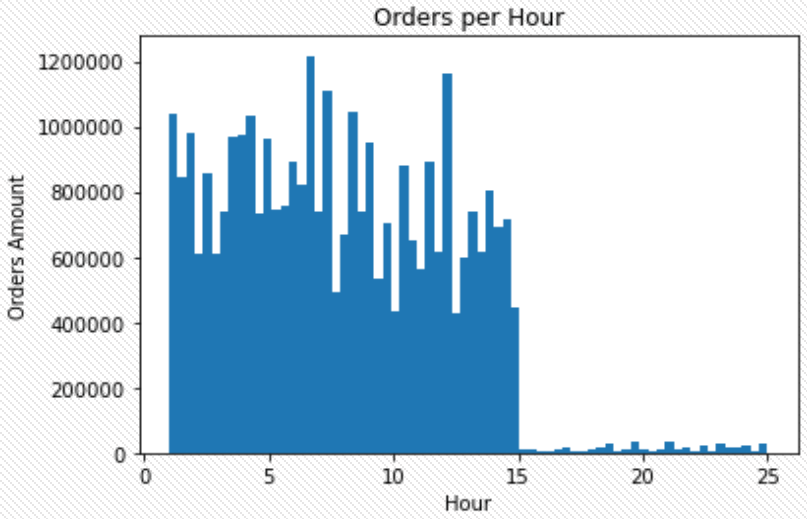
- Data Wrangling, Data Consistency, Merging, New Variables, Labeling, Grouping, Aggregating.

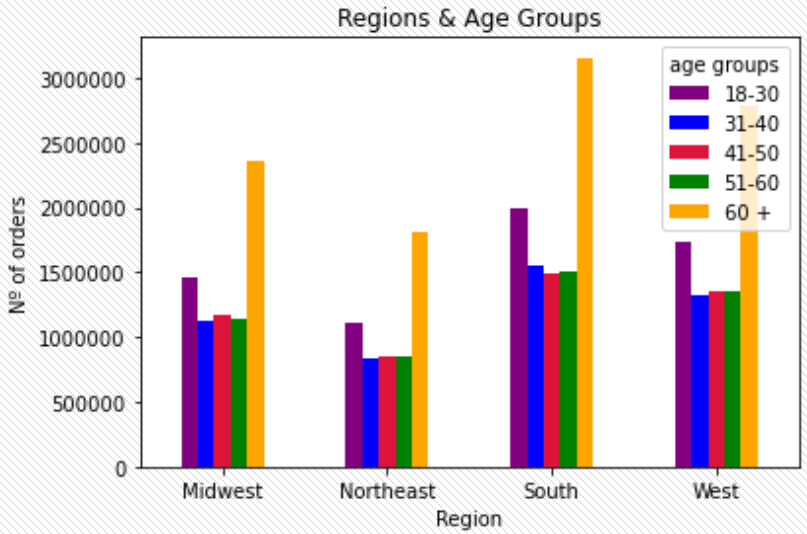
This was all new!

- A lot was taught and learned while dealing with this huge data set;
- I searched for codes in Stackflow as I wanted to improve in every step.

VISUALIZATIONS & RECOMMENDATIONS







BUSINESS PRIORITIES

- Loyal customers are responsible for 41% of the orders of Babies and Bulker Departments, special offers could be directed to this group;
- Email marketing could be sent in the afternoon to target morning and lunch-time purchases, also weekends, increasing avg ticket;
- South and West regions present more orders (31% and 28%) , also 60+ years old is the public that most buy in Instacart.

OLIST

Goals

- Perform Exploratory Analysis;
- Obtain insights about: customers, company's growth, reviews.

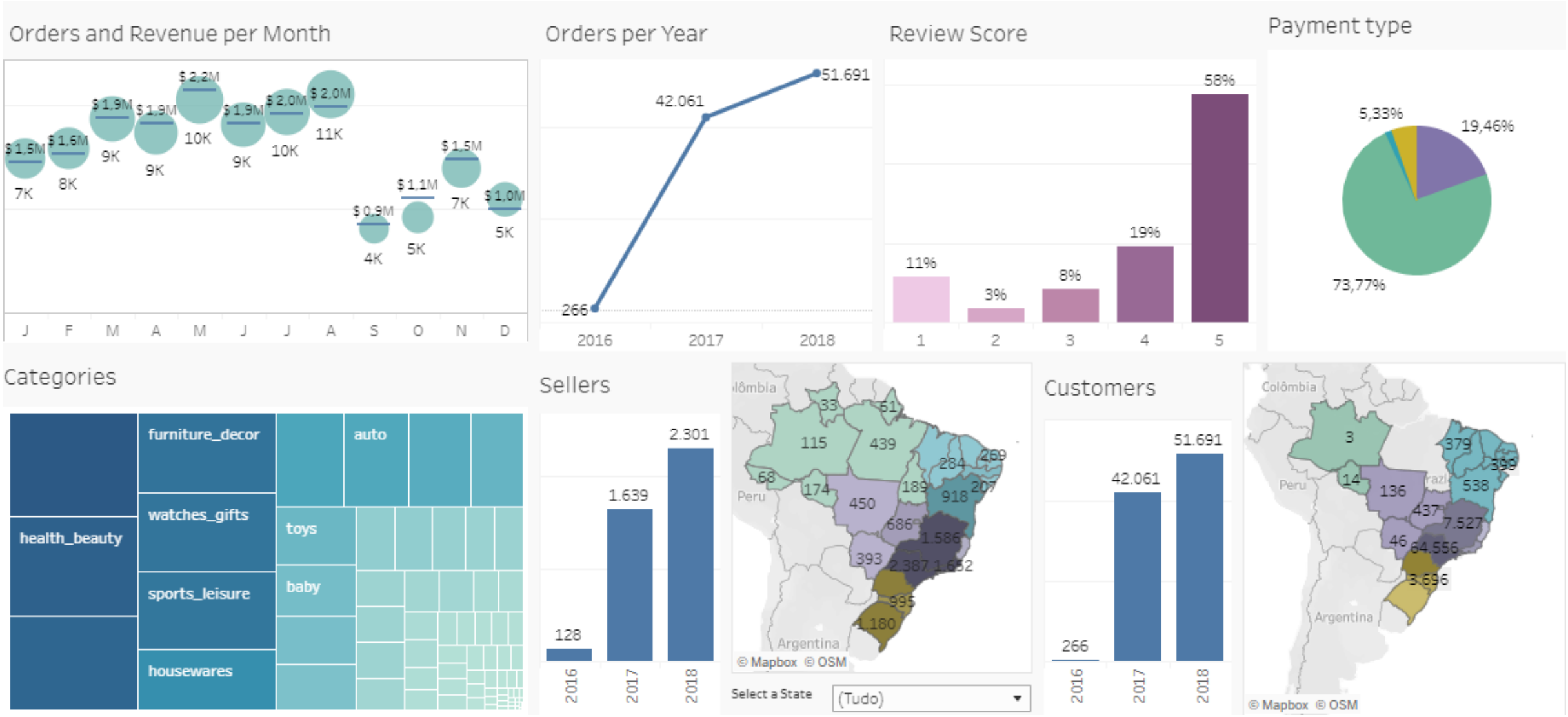
Data

- Database: Open-source data;
- Program: Anaconda/Jupiter, Python, Pandas, Matplot/Seaborn, Statsmodel, Tableau;
- Data Souce: Kaggle

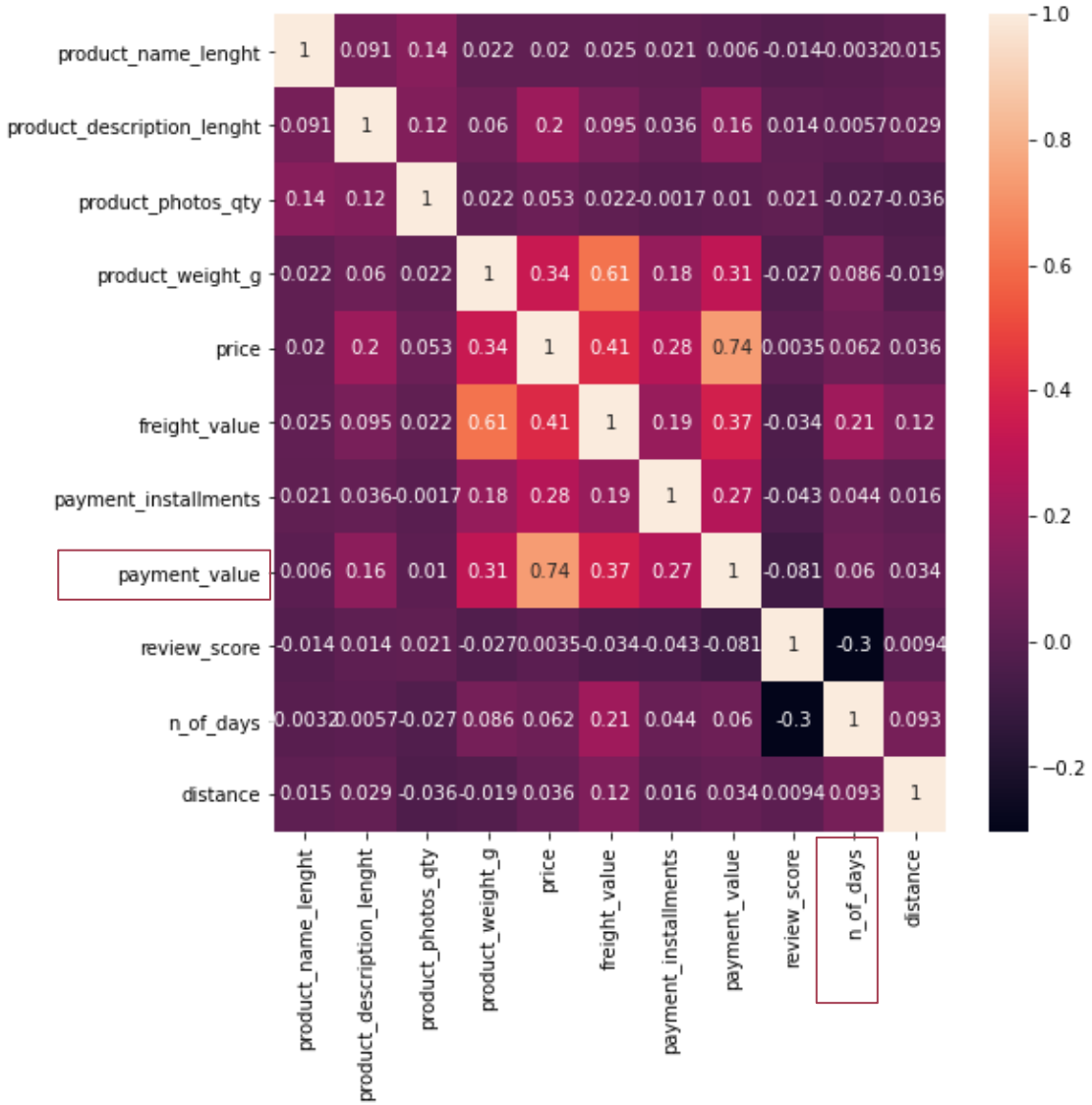
Challenges

- Understand the complexity of the data;
- Program in Python to extract the information;
- Expand knowledge through Stackflow and other blogs;
- Cleaning, Wrangling, Merging, Clustering, Statistics finding;
- Visualization with Matplot/Seaborn;
- Create an interective dashboard to obtain a business overview;
- Create a final presentation with findings and observations.

MY INTERACTIVE BUSINESS DASHBOARD IN TABLEAU

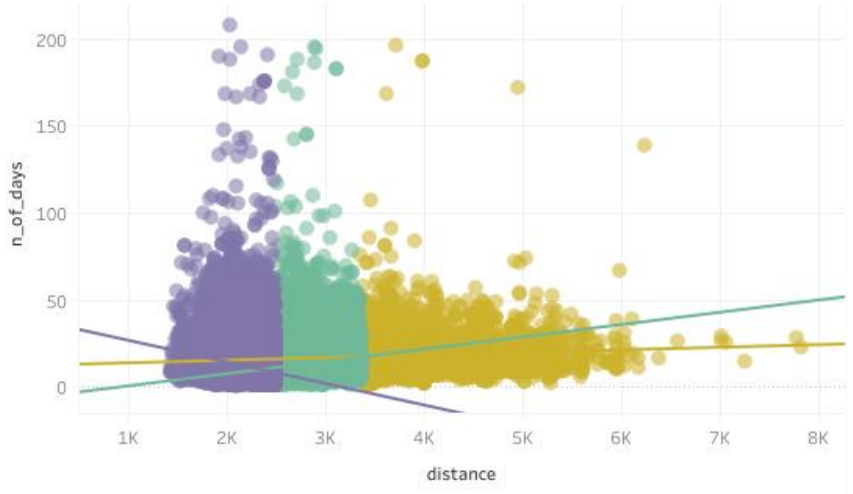


CORRELATION MATRIX AND CHANGE OF PLANS



- I did a **correlation matrix** with the data available, performed a **linear regression** with categorical and numerical data and proceeded to **clustering** to try and find patterns.
- My linear regression with review_score and n_of_days to process the order didn't had good results due to the high mean squared error.
- Therefore, I had to change my focus on payment value and distance between seller and customer.
- Using these variables, I proceeded to clustering.

RESULTS & RECOMMENDATIONS



Cluster 1: the longer the distance, more expensive is the order.
Cluster 3: the shorter the distance, the cheaper is the order.
Cluster 2: the longer the distance, the cheaper is the order.

So, is it a matter of regional logistic costs or lower product's prices?

Cluster	1	2	3
avg_distance	3652	2788	2282
avg_payment	354	170	166
avg_n_of_days	18	12	9

Next steps:

- Check the reasons why the avg price is cheaper for cluster 2;
- Keep track of reasons for low review score;
- Check the products, categories and regions where the logistic costs are lower;
- Adopt another method for analyzing the relationship between review_score and n_of_days to process the order;
- Gather more data to trace seasonality;
- Check how many of the sellers and customers are active and not only registered.

Check my Tableau presentation!

COVID

Goals

- ✓ Create visualizations from COVID Pandemie;
- ✓ Generating a worldwide overview.

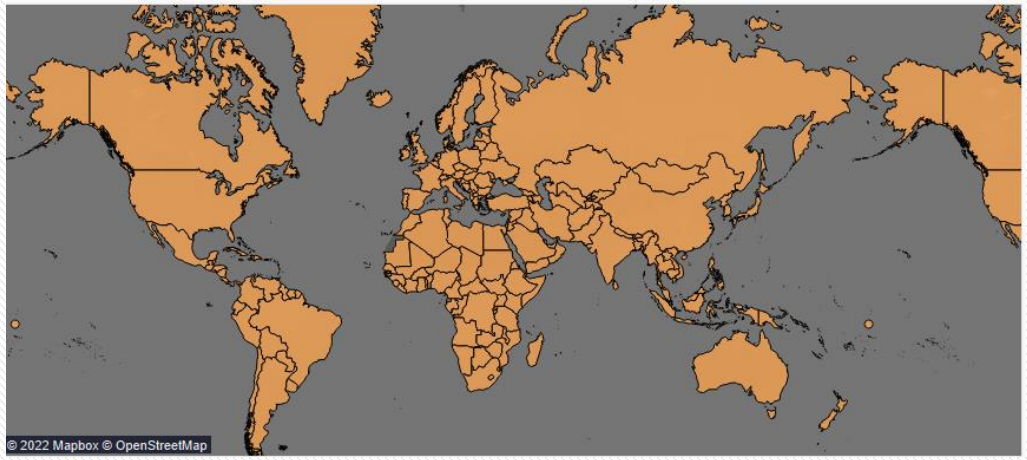
Data

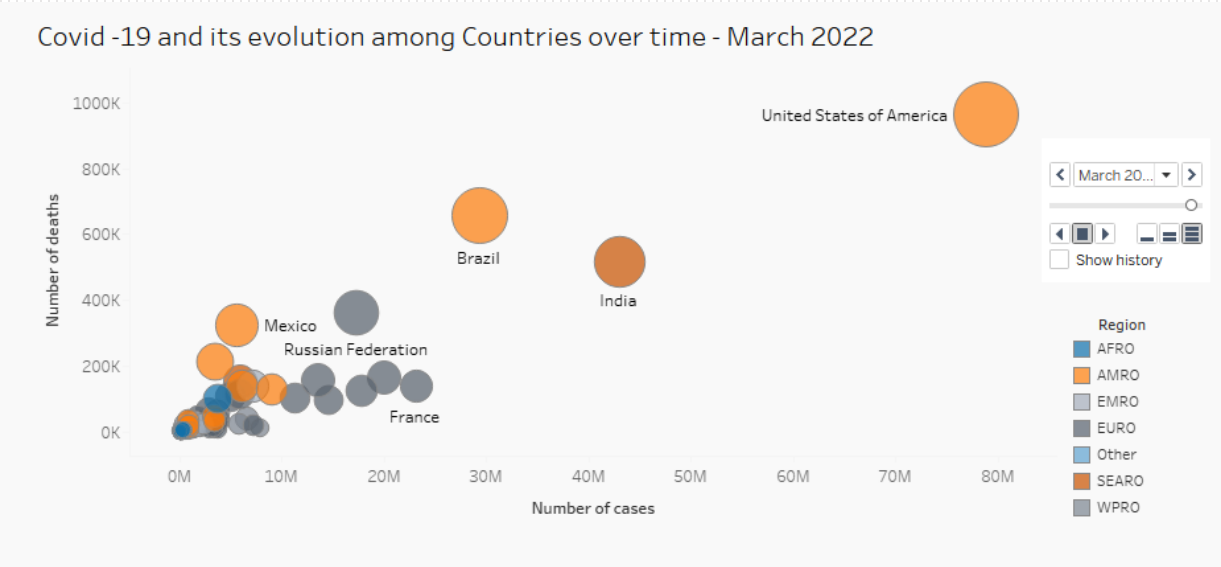
- ✓ Database: Open-source data in WHO website;
- ✓ Program: Excel, Tableau;
- ✓ Data Souce: WHO

Challenges

- ✓ Clean, split columns, rename countries;
- ✓ Create map filter, formatting, reference line with field calculation, map backgrounds, area chart, axis editing, animation;
- ✓ Create a final presentation with findings and observations.

VISUALIZATIONS

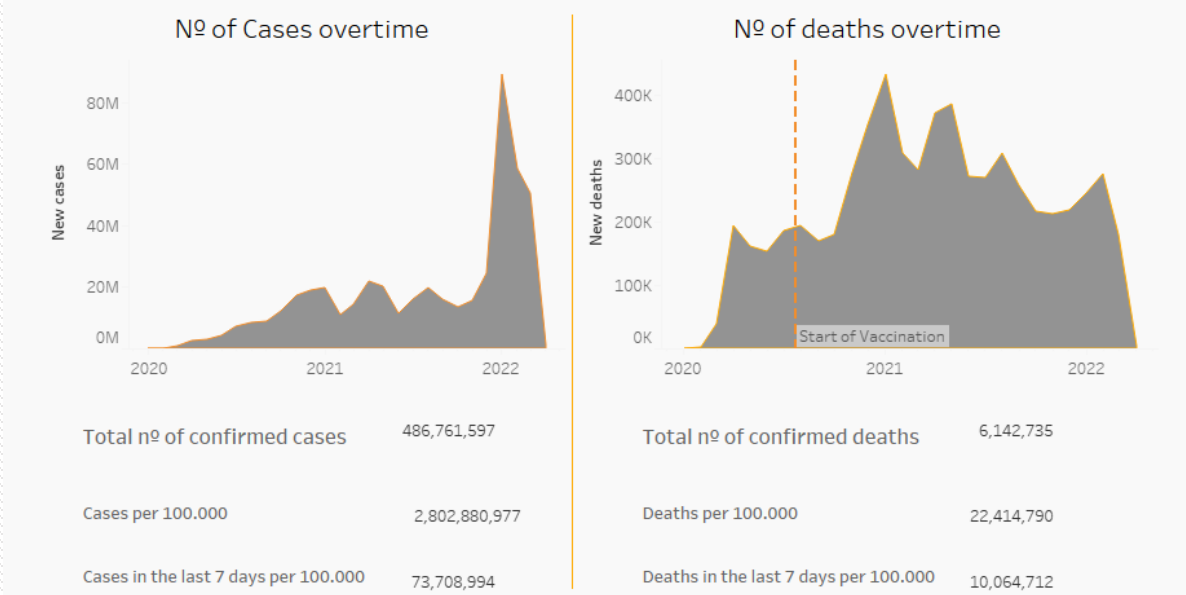




UNDERSTANDING THE WORLDWIDE SITUATION

- ✓ Each country displays of number of total confirmed cases, cases per 100.000 and actual cases on the date of the extracted data.
- ✓ I developed a map that works as a filter for all further information, so the user can have an overview of COVID Pandemic as well as its aspects in each country.
- ✓ Additionally, I created an interactive visualization for number of confirmed cases and deaths, by pushing the play one can see the evolution of the Pandemic.

FURTHER INFO



Total nº of confirmed cases	486,761,597
Cases per 100.000	2,802,880,977
Cases in the last 7 days per 100.000	73,708,994

Total nº of confirmed deaths	6,142,735
Deaths per 100.000	22,414,790
Deaths in the last 7 days per 100.000	10,064,712

Vaccination Information

Start of Vaccination	Nº of people fully vaccinated per 100.000	Nº of people that received the booster per 100.000	Nº of people that are fully vaccinated per 100.000
22 July, 2020	45,433	13,225	82,040

My initial wish was to create a correlation between the number of deaths and the increase of vaccinations, but there was **lack of vaccination data in a timeline and hospitalization numbers.**

Check my vizualization in Tableau!

THANK YOU





Get in touch!