



# FOOD TECH

## Machine Learning Improvement



Purwadhika Jakarta

| Rizqi Eka Maulana

REFINED BY AYURVEDIC PRINCIPLES  
CULMINATED BY INDONESIAN FLAVORS  
EVERYTHING IS SOURCED FRESHLY  
FROM LOCAL FARMS AND COOKED  
PREPARED AND COOKED ONCE USING  
QUALITY INGREDIENTS

### SPECIALS & APPETIZERS

#### BRIETABAK

A MODERN TWIST ON AN INDONESIAN STREET FAVORITE - MEATLESS PAPER-THIN MARTABAK LOOZING BRIE CHEESE, ONIONS, MUSHROOMS, ORGANIC DILL PICKLES

#### PURPLE RAIN

MADE PURPLE BEET HUMMUS DIP WITH ORGANIC BALINESE PURPLE 'UBE' SWEET POTATO CHIPS. PRINCE WLD HV APPROVED

#### SMOKED SALMON WHEAT ROTI

WHEAT PANCAKES WITH CREAM CHEESE + ORGANIC PICKLES

#### CHINESE SESAME SALAD

ORGANIC EGG LOUNGING ON A BED OF BEANS WITH TEMPEH, NORI, AVOCADO

#### RED TUNA CHOPPED QUINOA SALAD

RED TUNA W SPICY MAYO ON A BED OF SLICED CHOPPED SALAD, TOPPED WITH QUINOA, FRUIT + QUINOA. HAIYAH!

#### AVO GADO GADO

A MANDATORY INDONESIAN SALAD STAPLE - DONE THE MUDRA WAY - BIGGER PORTIONED AND WITH BETTER INGREDIENTS LIKE RED RICE, TEMPEH, BEANSPROUTS, CABBAGE, PEANUT SAUCE AND LUSCIOUS AVOCADOS

DUE TO INCESSANT INQUIRY, WE ALSO SERVE OUR EGGS ROSTI & DRAGON BOWLS AT NIGHT

# HELLO, WORLD

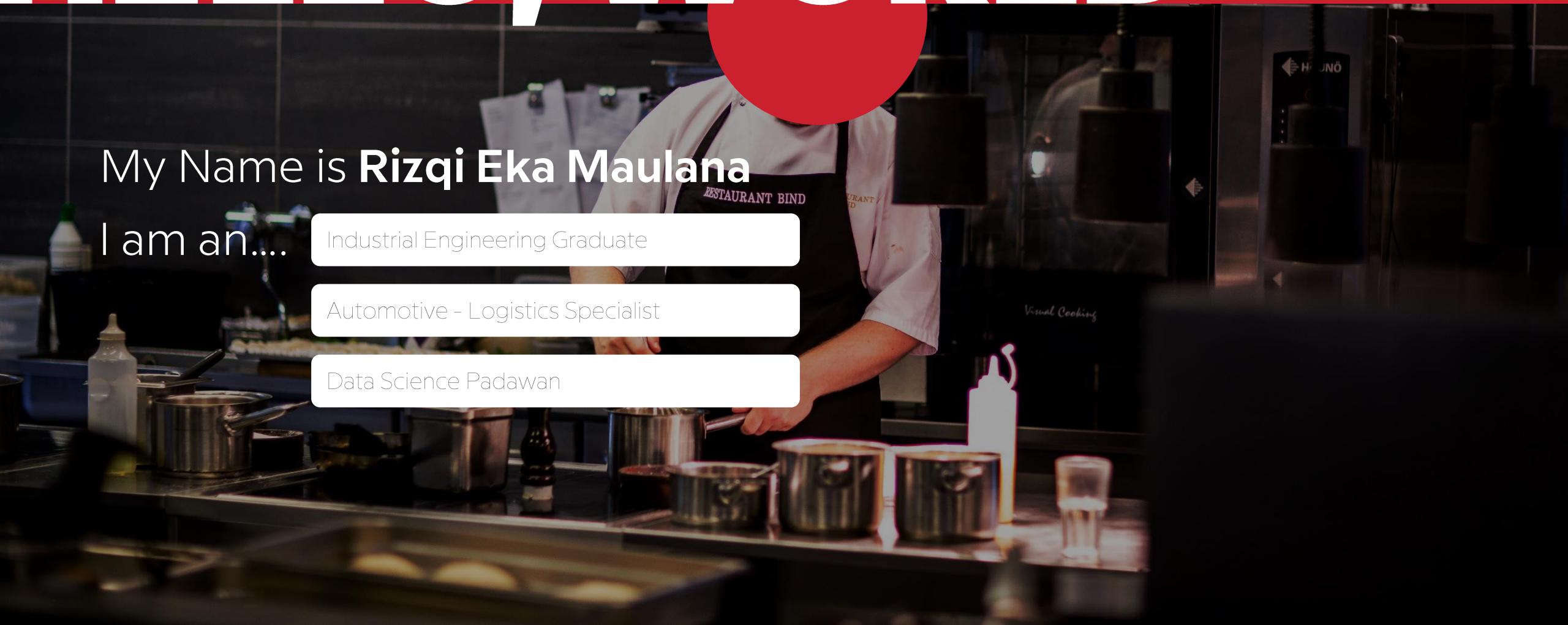
My Name is **Rizqi Eka Maulana**

I am an....

Industrial Engineering Graduate

Automotive - Logistics Specialist

Data Science Padawan



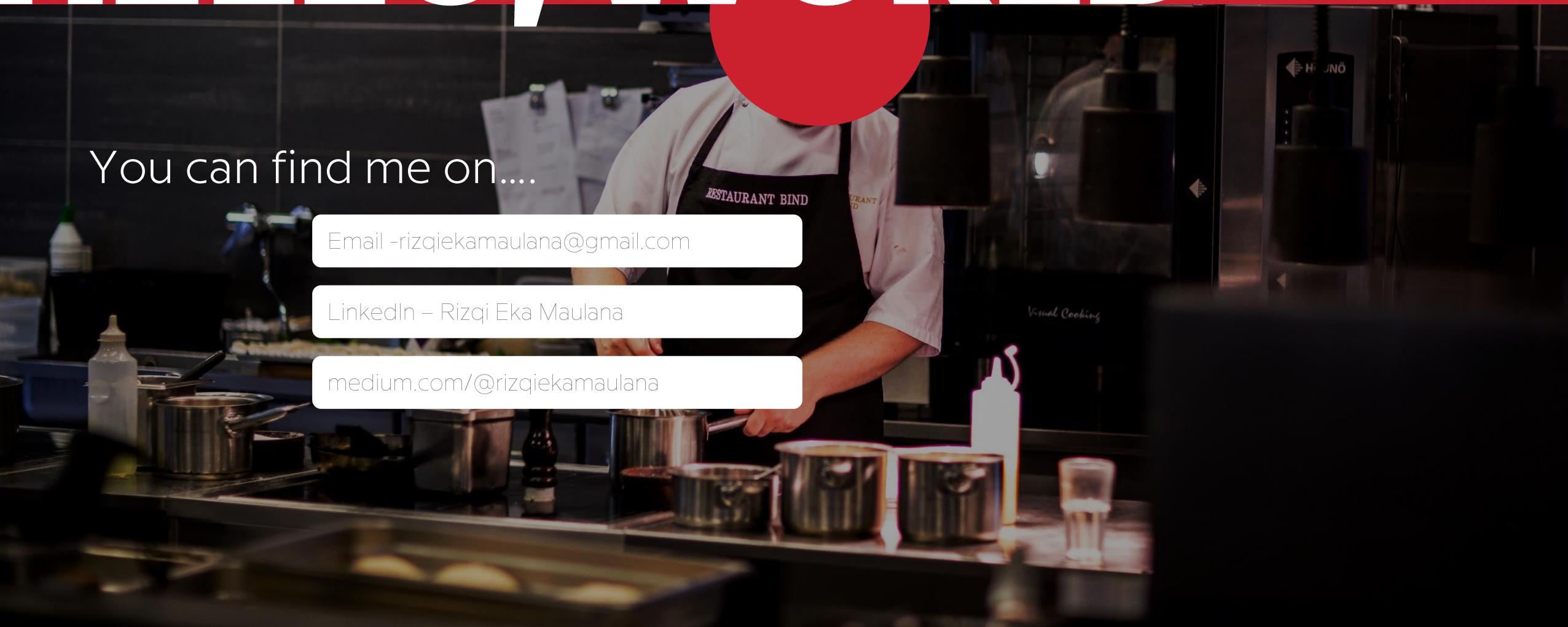
# HELLO, WORLD

You can find me on....

Email -rizqiekamaulana@gmail.com

LinkedIn – Rizqi Eka Maulana

medium.com/@rizqiekamaulana



A woman with long brown hair is shown from the side, looking down at her food. She is wearing a dark, patterned top. In the foreground, a yellow Starbucks coffee cup is visible on a saucer. To the left, there's a potted plant with large green leaves and some small red berries on the table. The background is dark with warm, glowing lights.

# BACKGROUND & BUSINESS UNDERSTANDING

# BACKGROUND

## General Outlook

Indonesia foodservice market is forecasted to grow at a **CAGR of 7.06%** during the forecast period (2019 - 2024)<sup>[1]</sup>

The Indonesian foodservice market is **extremely diverse**, consisting of high-end hotels and restaurants that serve local and international cuisine, fast food outlets, cafés and bars, bakeries, and low-end small restaurants, street-side restaurants known as warungs, and vendors that sell food to customers on the street.<sup>[1]</sup>

<sup>[1]</sup>[researchandmarkets.com](http://researchandmarkets.com)

# BACKGROUND

## The Rise of Food Tech

Consumption report by Nielsen (2018) : **11%** of Indonesians citizens **eat out at least once a day**, which is higher than the global average of **9%**. Additionally, Indonesian people are becoming more conscience of food quality and ease of purchase factors, resulting in a demand for safely prepared food as well as fast delivery options. <sup>[2]</sup>

Additionally, online ordering via apps such as Go-Jek's 'Go-Food' app, has provided a more seamless delivery service. As of **August 2018**, approximately **100,000** food operators were listed on the app, from small local nasi goreng stalls to pricey sushi restaurants. <sup>[2]</sup>

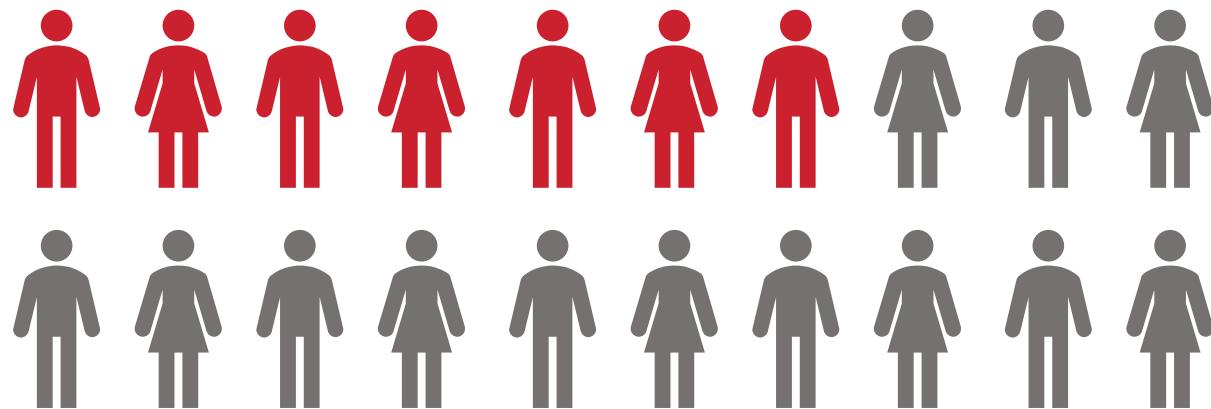
## COVID-19 Impact

THOUGH, since the pandemic started and PSBB (large-scale social restriction) imposed in Indonesia, most F&B services are closed temporarily or only able to serve takeaways. Now, people has **2 options: cook or order food online**

<sup>[2]</sup>[indonesia-investments.com](http://indonesia-investments.com)

## BACKGROUND

**63.5 million of Millenial**



**179.1 million total population**

<sup>[3]</sup>As of 2020 – Indonesian Central Bureau of Statistics

# BACKGROUND

**Amidst growing food services industry in Indonesia, especially in big cities,  
There may be thousands, ten-thousands, or even more food services selection,  
We as customers...**

- Sometimes confused which one to choose / from which one to order
- Sometimes wonder at what price point we should be okay with the food/restaurant's price

**These above are also questions that *food tech* can solve, and even, in turn, make  
these customer's confusion as a basis for "*product*" to the food services industry**

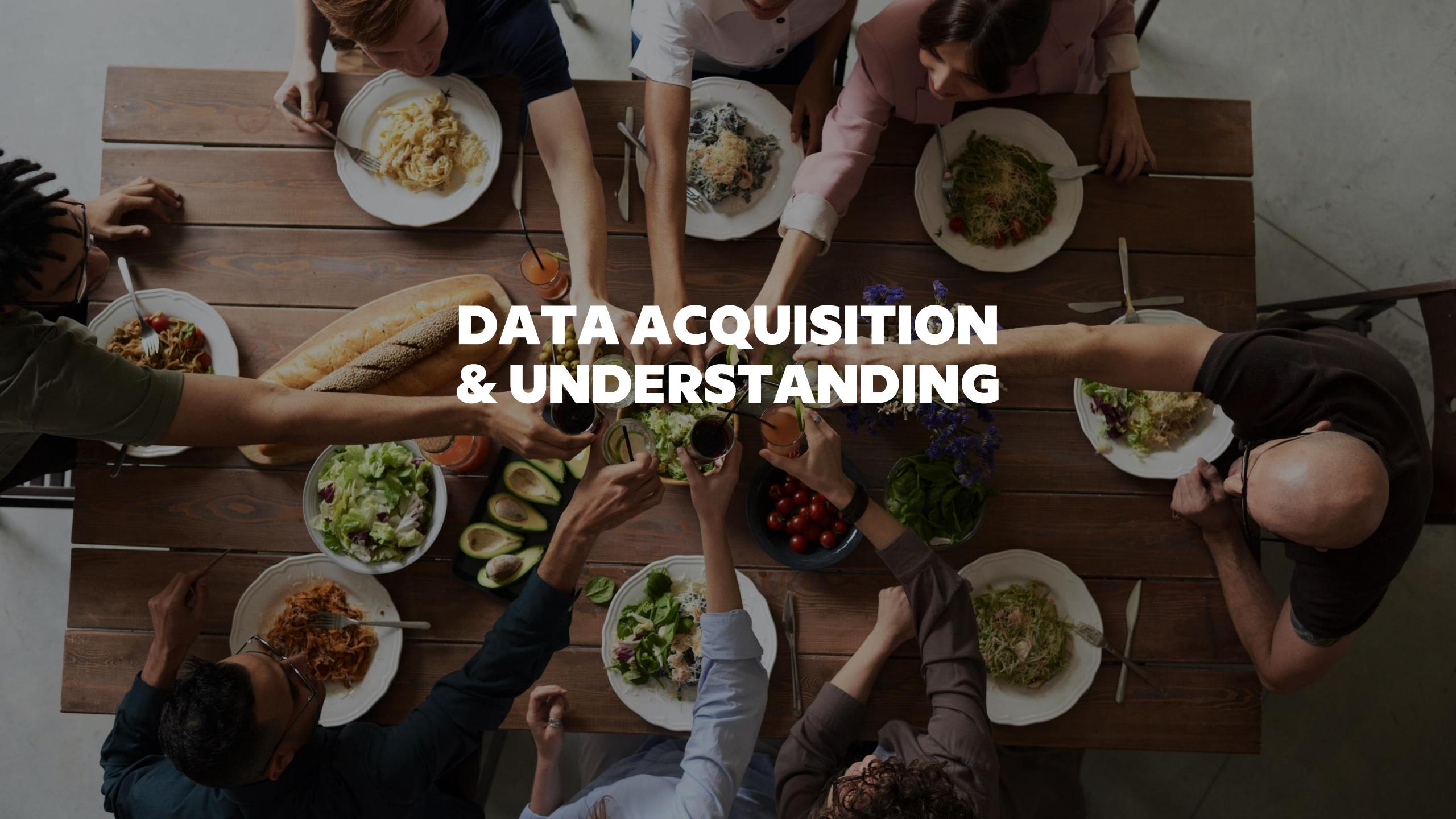
# RE-FORMULATING THE QUESTIONS



Food Services Alternatives:  
Recommender System



Price Benchmark:  
Price Prediction

A top-down photograph of a group of nine people dining at a long wooden table. They are eating various dishes like pasta, salads, and bread. The table is set with plates, glasses, and cutlery. The lighting is warm, creating a social and intimate atmosphere.

# DATA ACQUISITION & UNDERSTANDING

**DATA  
MINING**

# zomato

Temukan makanan & minuman terbaik di Jakarta

Jakarta

Cari restoran, jenis masakan atau makanan



Di rumah saja?

**Makanan Anda  
bisa datang  
kepada Anda!**

Lihat restoran dengan layanan pengantaran makanan



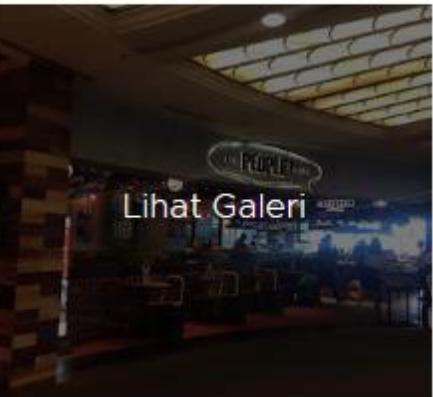
Tidak pakai antri

**Nikmati  
makanan lezat di  
rumah!**

Lihat restoran dengan layanan bawa pulang



Beranda / Indonesia / Jakarta / Central Jakarta / Thamrin / Grand Indonesia Mall, Thamrin / The People's Cafe



# The People's Cafe 1

Restoran Kasual - Fusion, Itali, Indonesia, Kopi

Thamrin 2

3

★ ★ ★ ★ 4.0 5

653 Ulasan

6



Add Photos



## Masakan

Fusion   Itali   Indonesia   Kopi

## Harga rata-rata

Rp200.000 untuk 2 orang (perkiraan) Tanpa alkohol

7

Rp50.000 harga 1 botol bir (rata - rata)

Bagaimana menghitung cost for two?

Tunai dan Kartu diterima

## Info Lebih Lanjut

Pesan Antar

Bawa Pulang Tersedia

Hanya Bir

Di dalam ruangan

Wifi Tersedia

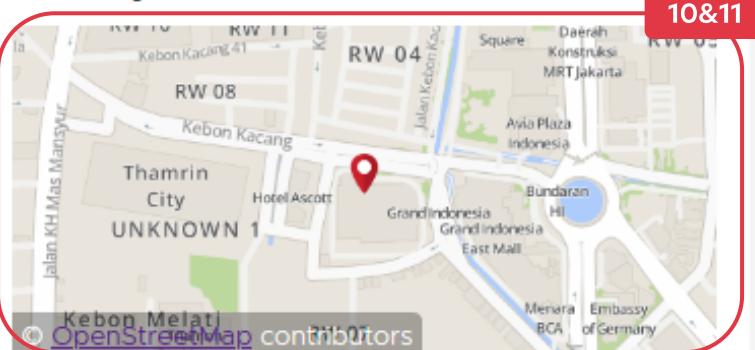
Reservasi meja direkomendasikan

8

## Telepon

+622123581157

## Petunjuk



Grand Indonesia Mall, West Mall, Lantai 5,  
Jl. M. H. Thamrin No. 1, Thamrin, Jakarta



Salin



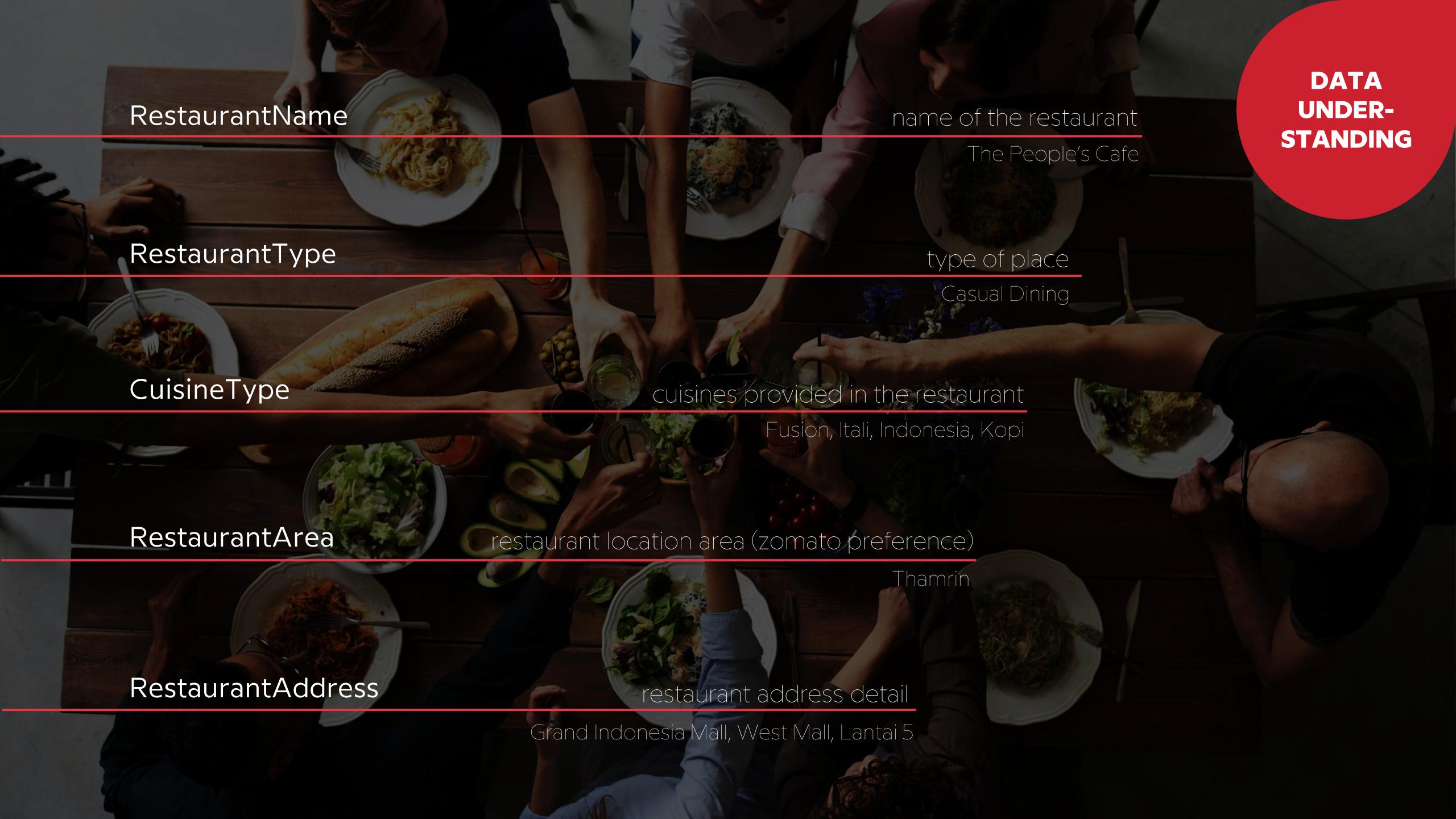
Petunjuk

Lihat seluruh outlet 20 The People's Cafe di J...



Lihat seluruh outlet 167 di Grand Indonesia Mal...





## DATA UNDER- STANDING

RestaurantName

name of the restaurant

The People's Cafe

RestaurantType

type of place

Casual Dining

CuisineType

cuisines provided in the restaurant

Fusion, Itali, Indonesia, Kopi

RestaurantArea

restaurant location area (zomato preference)

Thamrin

RestaurantAddress

restaurant address detail

Grand Indonesia Mall, West Mall, Lantai 5

# DATA UNDER- STANDING

rating of the restaurant

4.0

RestaurantRating

amount of reviews for the restaurant

653 ulasan

ReviewCounts

average price for 2 people (zomato calculation method)

Rp 200.000 untuk 2 orang (perkiraan) tanpa alkohol

Price for 2

facilities and additional info for the restaurant

hanya bir, wifi tersedia, bawa pulang tersedia, etc.

Additional Info

latitude & longitude coordinate

-6.21600000, 106.790000

Latitude&Longitude

# ZOMATO SCRAPING RESULT

	Restaurant Name	Restaurant Type	Cuisine Type	Restaurant Area	Restaurant Address	Restaurant Rating	Review Counts	Price for 2	Additional Info	Latitude	Longitude
0	Acta Brasserie	Casual Dining	['Barat', 'Asia', 'Grill House']	Senayan	The MAJ Senayan, Senayan National Golf Club, J...	3.7	80 Ulasan	Rp350.000 untuk 2 orang (perkiraan)Tanpa alkohol	['Bawa Pulang Tersedia', 'Alkohol Tersedia', '...']	-6.2167980000	106.797294000
1	Furusato Izakaya	Casual Dining	['Jepang']	Sudirman	Jl. Jend Sudirman No. 36, Sudirman, Jakarta 10210	3.9	55 Ulasan	Rp500.000 untuk 2 orang (perkiraan)Tanpa alkohol	['Pesanan Antar', 'Hanya Wine dan Bir', 'Area Me...']	-6.2146764771	106.816816322
2	Medja Restaurant	Casual Dining	['Indonesia']	Bogor Timur	Jl. Pajajaran Indah V No. 6, Bogor Timur, Bogor	4.0	259 Ulasan	Rp200.000 untuk 2 orang (perkiraan)Tanpa alkohol	['Bawa Pulang Tersedia', 'Hanya Bir', 'Tempat ...']	-6.6096150000	106.812364000
3	Animale Restaurant	Casual Dining	['Amerika', 'Mediterania']	Setiabudi	MD Place Bulding, Lantai 11, Jl. Setiabudi Sel...	4.3	113 Ulasan	Rp500.000 untuk 2 orang (perkiraan)Tanpa alkohol	['Bawa Pulang Tersedia', 'Hanya Bir', 'Reserva...']	-6.2086409900	106.828408353
4	Lawless Burgerbar	Casual Dining	['Burger']	Kemang	Jl. Kemang Selatan VIII No. 67H-67I, Kemang, J...	4.7	1,868 Ulasan	Rp150.000 untuk 2 orang (perkiraan)Tanpa alkohol	['Bawa Pulang Tersedia', 'Hanya Bir', 'Reserva...']	-6.2679110938	106.814406551

 Dapatkan Aplikasinya

Beranda &gt; Indonesia &gt; Restoran Jakarta

## Restoran Pesan Antar di Jakarta

## Filter

- Reservasi Meja
- Mitra zomato pro

## Urutkan

**Popularitas - tinggi ke rendah**

- Peringkat - tinggi ke rendah
- Biaya - tinggi ke rendah
- Biaya - rendah ke tinggi
- Baru terdaftar

## Kategori

Makan di luar	20476
<b>Restoran Pesan Antar</b> hapus	
Bar dan Nightlife	239
Kafe dan Deli	3308



RESTORAN KASUAL

**3 Wise Monkeys** 4.2 (2,075 Ulasan)**Senopati**

Jl. Senopati No. 46, Senopati, Jakarta

MASAKAN:

Jepang, Sushi

HARGA UNTUK 2:

Rp450.000

JAM:

11h - 1h (Sen-Min)

DITAMPILKAN DI:

Rolling in the Sushi, All You Can Eat!, Makan di Rumah

 Telepon menu View Reservasi Meja

Pemesanan Instant



RESTORAN KASUAL

**Greyhound Cafe** 4.0 (126 Ulasan)**Senopati**

Jl. Gunawarman No. 36 A, Senopati, Jakarta

MASAKAN:

Fusion, Thai, Eropa, Kue &amp; Roti, Minuman

HARGA UNTUK 2:

Rp300.000

JAM:

11h - 23h (Sen, Sel, Rab, Kam, Min), 11h - 24h...

 Telepon menu View**Greyhound Cafe**

Thamrin

Delivery Service

does the restaurant provide delivery service or not

# DATA ACQUISITION & UNDERSTANDING /

## Data Mining

```
▶ ▶ M
rdf['Restaurant Area'].unique()

array(['Senopati', 'Cikini', 'Bekasi Selatan', 'Setiabudi', 'Serpong',
       'Thamrin', 'Cinere', 'Gunung Sahari', 'Karet', 'Larangan',
       'Kuningan', 'Mangga Dua', 'Meruya', 'Pondok Aren', 'Kelapa Gading',
       'Kampung Melayu', 'Beji', 'Medan Satria', 'Tanjung Duren',
       'Sunter', 'Mangga Besar', 'Cimanggis', 'Daan Mogot', 'Grogol',
       'Pinang Ranti', 'Bogor Tengah', 'Pluit', 'Bogor Utara',
       'Bekasi Utara', 'Fatmawati', 'Cempaka Putih', 'Cibubur',
       'Pondok Indah', 'Bogor Timur', 'Pasar Minggu', 'Serpong Utara',
       'Ciputat Timur', 'Rawalumbu', 'Roxy', 'Gambir', 'Kemayoran',
       'Jatiuwung', 'Lebak Bulus', 'Ancol', 'Matraman', 'Jagakarsa',
       'Bintaro', 'Tanah Sareal', 'Bendungan Hilir', 'Kec. Tangerang',
       'Cipayung', 'Cibodas', 'Pondok Bambu', 'Tanah Abang', 'Cawang',
       'Cipondoh', 'Cakung', 'Senen', 'Jatisampurna', 'Senayan', 'Tebet',
       'Sawangan', 'Cengkareng', 'Taman Mini', 'Dharmawangsa', 'Kemang',
       'Sukmajaya', 'SCBD', 'Jatinegara', 'Sudirman', 'Pondok Melati'],
```

Zomato Restaurant Area Information doesn't show **same level of detail** -> ex: SCBD, Roxy, Gatot Subroto, etc.

Based on **Latitude & Longitude Coordinate**

Let's do **REVERSE GEOCODING** using **HEREMAPS API** !

# HEREMAPS REVERSE GEOCODING RESULT

	Province	City	District/Kecamatan
0	DKI Jakarta	Jakarta Selatan	Kebayoran Baru
1	DKI Jakarta	Jakarta Pusat	Menteng
2	DKI Jakarta	Jakarta Pusat	Menteng
3	DKI Jakarta	Jakarta Pusat	Menteng
4	Jawa Barat	Bekasi Kota	Bekasi Selatan

# SHAPES of DATASET

11

Zomato Basic Data: Restaurant Name - Longitude

3

HereMaps: Reverse Geocoding of Lat-Long

1

Zomato Data: Delivery Service

15

Columns

11267

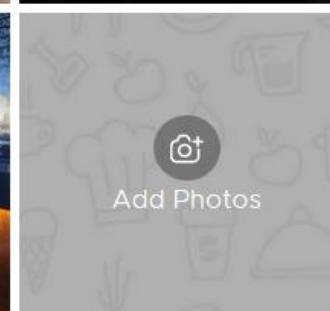
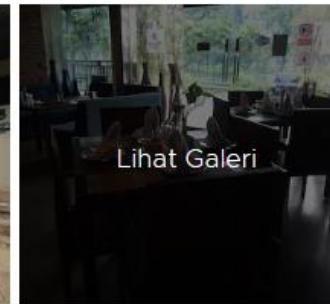
Rows

## DATA ACQUISITION & UNDERSTANDING /

### Data Preprocessing / Restaurant Type & Cuisine Type

## RestaurantType & CuisineType

Turned out, there was a mistake when we scrape data from Zomato



### Hungry Hatt Restaurant & Lounge

Restoran Kasual, Bar - Barat  
Serpong

RestaurantType is not limited to **Single Type** !

★ ★ ★ ★ 3.5

11 Ulasan

Let's combine **RestaurantType & CuisineType** then check closer.

# DATA ACQUISITION & UNDERSTANDING /

## Data Preprocessing / Restaurant Type & Cuisine Type

RestaurantType

### Tipe Restoran

Quick Bites

Casual Dining

Kafe

Toko Minuman

Food Court

Toko Kue & Roti

Dessert Parlor

Kios

Kaki Lima

Bar

### Pilih masakan

Masukkan kata kunci untuk mencari...

Aceh

Asia

Kue & Roti

Bali

Belanda

Inggris

Kafe

Kopi

Desserts

Eropa

Fusion

Grill House

India

Jepang

Kalimantan

Libanon

Malaysia

Medan

Timur Tengah

India Utara

Palembang

Pizza

Satay

Snacks

India Selatan

Makanan Jalanan

Sunda

Tea

Turki

Yogyakarta

Amerika

Australian

Bakmi

Bangka

Betawi

Bubble Tea

Karibia

Kontinental

Dimsum

Cemilan

Jerman

Makanan Sehat

Indonesia

Jawa

Kebab

Lombok

Manado

Mediterania

Mongolia

Padang

Peranakan

Portugal

Seafood

Soto

Spanyol

Sulawesi

Sushi

Tex-Mex

Vietnam

Arab

Barbekyu

Bakso

Batak

Minuman

Burger

Chinese

Deli

Hanya Minuman

Perancis

Yunani

Ice Cream

Itali

Jus

Korea

Makassar

Martabak

Meksiko

Maroko

Pakistan

Peruvian

Ramen

Singapura

Amerika Latin

Steak

Sumatera

Taiwanese

Thai

Barat

CuisineType

## DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Restaurant Type & Cuisine Type

RestaurantType

Tipe Restoran

Quick Bites

Casual Dining

Kafe

Toko Minuman

Food Court

Toko Kue & Roti

Dessert Parlor

Kios

Kaki Lima

Bar

Unlisted RestaurantType

Rest Type	Count	Perc%
Bar Cocktail	1	0.01
Beer Garden	1	0.01
Pub	2	0.02
Bar Wine	3	0.03
Juice Bar	4	0.04
Klub	9	0.08
Fine Dining	55	0.49
Lounge	101	0.90

Recategorize Restaurant Type

BAR

TOKO MINUMAN

FINE DINING

LOUNGE

# DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Restaurant Type & Cuisine Type

## Pilih masakan

x

CuisineType

Masukkan kata kunci untuk mencari...

Aceh	Amerika	Arab
Asia	Australian	Barbekyu
Kue & Roti	Bakmi	Bakso
Bali	Bangka	Batak
Belanda	Betawi	Minuman
Inggris	Bubble Tea	Burger
Kafe	Karibia	Chinese
Kopi	Kontinental	Deli
Desserts	Dimsum	Hanya Minuman
Eropa	Cemilan	Perancis
Fusion	Jerman	Yunani
Grill House	Makanan Sehat	Ice Cream
India	Indonesia	Itali
Jepang	Jawa	Jus
Kalimantan	Kebab	Korea
Libanon	Lombok	Makassar
Malaysia	Manado	Martabak
Medan	Mederterania	Meksiko
Timur Tengah	Mongolia	Maroko
India Utara	Padang	Pakistan
Palembang	Peranakan	Peruvian
Pizza	Portugal	Ramen
Satay	Seafood	Singapura
Snacks	Soto	Amerika Latin
India Selatan	Spanyol	Steak
Makanan Jalanan	Sulawesi	Sumatera
Sunda	Sushi	Taiwanese
Tea	Tex-Mex	Thai
Turki	Vietnam	Barat
Yogyakarta		

## Unlisted RestaurantType

	Cuisine Type	Count	Perc%
0	Makanan Cepat Saji	119	1.06

Make New Category

# DATA ACQUISITION & UNDERSTANDING /

## Data Preprocessing / Restaurant Type & Cuisine Type

CuisineType

Pilih masakan

x

Masukkan kata kunci untuk mencari...

Aceh	Amerika	Arab
Asia	Australian	Barbekyu
Kue & Roti	Bakmi	Bakso
Bali	Bangka	Batak
Belanda	Betawi	Minuman
Inggris	Bubble Tea	Burger
Kafe	Karibia	Chinese
Kopi	Kontinental	Deli
Desserts	Dimsum	Hanya Minuman
Eropa	Cemilan	Perancis
Fusion	Jerman	Yunani
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Jepang	Jawa	Jus
Kalimantan	Kebab	Korea
Libanon	Lombok	Makassar
Malaysia	Manado	Martabak
Medan	Mederterania	Meksiko
Timur Tengah	Mongolia	Maroko
India Utara	Padang	Pakistan
Palembang	Peranakan	Peruvian
Pizza	Portugal	Ramen
Satay	Seafood	Singapura
Snacks	Soto	Amerika Latin
India Selatan	Spanyol	Steak
Makanan Jalanan	Sulawesi	Sumatera
Sunda	Sushi	Taiwanese
Tea	Tex-Mex	Thai
Turki	Vietnam	Barat
Yogyakarta		

Combine Category

## DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Restaurant Type & Cuisine Type

# The Great Separation

Pilih masakan

x

CuisineType

Masukkan kata kunci untuk mencari...

Aceh	Amerika	Arab
Asia	Australian	Barbekyu
Kue & Roti	Bakmi	Bakso
Bali	Bangka	Batak
Belanda	Betawi	Minuman
Inggris	Bubble Tea	Burger
Kafe	Karibia	Chinese
Kopi	Kontinental	Deli
Desserts	Dimsum	Hanya Minuman
Eropa	Cemilan	Perancis
Fusion	Jerman	Yunani
Grill House	Makanan Sehat	Ice Cream
India	Indonesia	Itali
Jepang	Jawa	Jus
Kalimantan	Kebab	Korea
Libanon	Lombok	Makassar
Malaysia	Manado	Martabak
Medan	Mediterania	Meksiko
Timur Tengah	Mongolia	Maroko
India Utara	Padang	Pakistan
Palembang	Peranakan	Peruvian
Pizza	Portugal	Ramen
Satay	Seafood	Singapura
Snacks	Soto	Amerika Latin
India Selatan	Spanyol	Steak
Makanan Jalanan	Sulawesi	Sumatera
Sunda	Sushi	Taiwanese
Tea	Tex-Mex	Thai
Turki	Vietnam	Barat
Yogyakarta		

CuisineType



Cuisine Regionality Type

# DATA ACQUISITION & UNDERSTANDING /

## Data Preprocessing / Restaurant, Cuisine, & Regionality Type

▶ 🔍 ML

```
cuisine_type = ['Bakmi', 'Bakso', 'Barbekyu', 'Bubble Tea', 'Burger', 'Desserts', 'Dimsum', 'Hanya Minuman', 'Ice Cream', 'Jus', 'Kebab', 'Kopi', 'Kue & Roti', 'Martabak', 'Minuman', 'Pizza', 'Ramen', 'Satay', 'Seafood', 'Snacks', 'Soto', 'Steak', 'Sushi', 'Tea', 'Makanan Jalanan', 'Makanan Sehat', 'Grill House', 'Deli', 'Makanan Cepat Saji']  
  
cuisineRegional_type = ['Aceh', 'Amerika', 'Amerika Latin', 'Arab', 'Asia', 'Australian', 'Bali', 'Bangka', 'Barat', 'Batak', 'Belanda', 'Betawi', 'Chinese', 'Eropa', 'Fusion', 'India', 'India Selatan', 'India Utara', 'Indonesia', 'Inggris', 'Itali', 'Jawa', 'Jepang', 'Jerman', 'Kalimantan', 'Kontinental', 'Korea', 'Libanon', 'Lombok', 'Makassar', 'Malaysia', 'Manado', 'Maroko', 'Mediterania', 'Meksiko', 'Mongolia', 'Padang', 'Pakistan', 'Palembang', 'Peranakan', 'Perancis', 'Peruvian', 'Singapura', 'Spanyol', 'Sulawesi', 'Sumatera', 'Sunda', 'Taiwanese', 'Thai', 'Timur Tengah', 'Turki', 'Vietnam', 'Yogyakarta', 'Yunani']
```

# SEPARATION RESULT

▶ 🔍 ML

rdf.head()

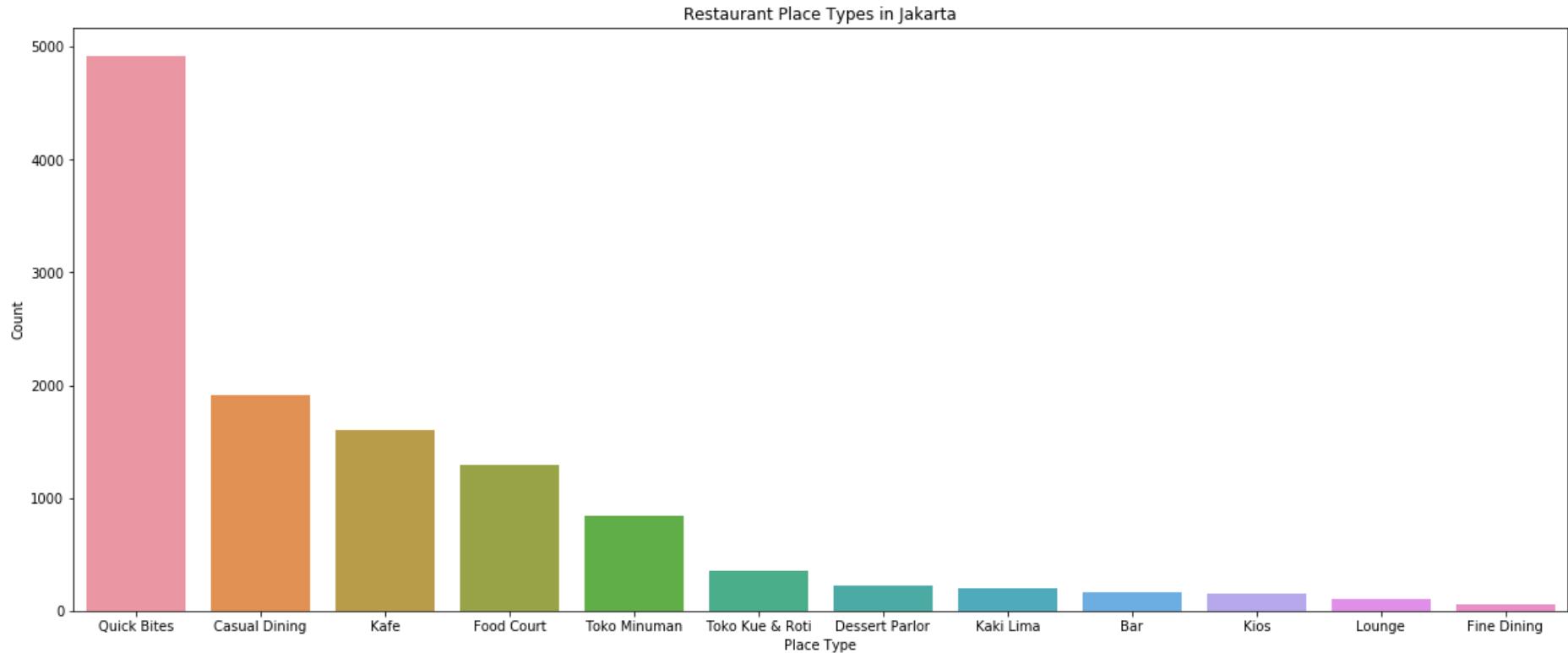
	Restaurant Name	Restaurant Area	Restaurant Rating	Review Counts	Latitude	Longitude	Website	Restaurant Address	Price for 2	Additional Info	Province	City	District/Kecamatan	Types	Place Type	Cuisines	Cuisine Regionality
0	Holy Smokes	Senopati	4.4	1437	-6.239143	106.807954	https://www.zomato.com/id/jakarta/holy-smokes...	Jl. Wolter Monginsidi No. 27, Senopati, Jakarta	500000	[Di dalam ruangan, Hanya Wine dan Bir, Parkir ...]	DKI Jakarta	Jakarta Selatan	Kebayoran Baru	[Grill House, Steak, Casual Dining]	[Casual Dining]	[Grill House, Steak]	[Unspecified Region]
1	Pempek Megaria	Cikini	4.3	461	-6.199900	106.843739	https://www.zomato.com/id/jakarta/pempek-megar...	Metropole 21, Jl. Pegangsaan Timur No. 21, Cik...	70000	[Bawa Pulang Tersedia, Di dalam ruangan]	DKI Jakarta	Jakarta Pusat	Menteng	[Palembang, Quick Bites]	[Quick Bites]	[Unspecified Cuisine]	[Palembang]
2	Tjikini Lima	Cikini	4.0	391	-6.189802	106.837150	https://www.zomato.com/id/jakarta/tjikini-lima...	Jl. Cikini I No. 5, Cikini, Jakarta 10330	300000	[Ruang Pribadi Tersedia, Tempat duduk di luar,...]	DKI Jakarta	Jakarta Pusat	Menteng	[Casual Dining, Indonesia, Barat]	[Casual Dining]	[Unspecified Cuisine]	[Barat, Indonesia]
3	Gado-Gado Bon-Bon	Cikini	4.0	177	-6.192959	106.838377	https://www.zomato.com/id/jakarta/gado-gado-bo...	Jl. Cikini 4 No. 5, Cikini, Jakarta	90000	[Bawa Pulang Tersedia, Di dalam ruangan]	DKI Jakarta	Jakarta Pusat	Menteng	[Jawa, Quick Bites]	[Quick Bites]	[Unspecified Cuisine]	[Jawa]
4	Koffie Fictie	Bekasi Selatan	1.5	1	-6.272059	106.970932	https://www.zomato.com/id/jakarta/koffie-ficti...	Grand Galaxy Park, Ruko RSOD No. 026, Jl. Lotu...	100000	[Bawa Pulang Tersedia, Di dalam ruangan]	Jawa Barat	Bekasi Kota	Bekasi Selatan	[Kopi, Kafe]	[Kafe]	[Kopi]	[Unspecified Region]

## DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Restaurant, Cuisine, & Regionality Type

# PLACE TYPES

	Place Type	Count
0	Quick Bites	4923
1	Casual Dining	1912
2	Kafe	1604
3	Food Court	1295
4	Toko Minuman	843
5	Toko Kue & Roti	352
6	Dessert Parlor	224
7	Kaki Lima	199
8	Bar	165
9	Kios	149
10	Lounge	101
11	Fine Dining	55



## DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Restaurant, Cuisine, & Regionality Type

### CUISINE TYPES

	Cuisine Type	Count
0	Unspecified Cuisine	4831
1	Kopi	2108
2	Minuman	740
3	Desserts	675
4	Bakmi	660

### REGIONALITY TYPES

	Cuisine Regionality	Count
0	Unspecified Region	3938
1	Indonesia	3014
2	Barat	931
3	Chinese	927
4	Jawa	889

The Amount of **Unspecified Cuisine/Region** is quite alarming (~4000-5000 of ~11000 Rows)

Let's **impute** that by utilizing the **Restaurant Name** !

# DATA ACQUISITION & UNDERSTANDING /

## Data Preprocessing / Restaurant, Cuisine, & Regionality Type

### Example of Cuisine Corpora:

```
ayamlist = ['ayam', 'chick', 'geprek', 'chicken', 'penyet', 'bensu', 'yam']
mielist = ['mie', 'bakmi', 'bakmie', 'noodle', 'tiaw', 'kwetiaw', 'emie', 'yamien', 'lomie', 'sotomie', 'miesop', 'indomie', 'ifumie']
baksoelist = ['baks', 'bakso', 'baso']
bbqlist = ['bbq', 'barbeque']
bebeklist = ['bebek']
bubbletealist = ['boba']
buburlist = ['bubur']
delilist = ['deli']
dessertslist = ['dessert']
dimsumlist = ['dimsum']
```

### Example of Regionality Corpora:

```
chineselist = ['kwetiau', 'shabu', 'dimsum', 'chinese', 'tiaw', 'kwetiaw', 'orient', 'oriental', 'wonton', 'mandarin']
eropalist = ['patisserie', 'swiss', 'waffle', 'churros']
indialist = ['india', 'indian']
indonesialist = ['nasi', 'soto', 'warung', 'baks', 'bakso', 'sate', 'martabak', 'geprek', 'gado', 'uduk', 'penyet', 'indo', 'baso', 'bogor', 'bandung', 'pecel', 'indonesia', 'siomay', 'kampung', 'nusantara', 'sambal', 'warunk', 'bakwan', 'sederhana', 'timbel', 'madura', 'kalasan', 'tegal', 'warkop', 'taliwang', 'rawon', 'ambengan', 'ketoprak', 'lele', 'maranggi', 'seblak', 'oemah', 'tongseng', 'cobek', 'indonesia', 'cabe', 'warteg', 'lontong', 'cendol', 'batagor', 'ronde', 'ketupat', 'rujak', 'gulai', 'surabi', 'ketan', 'cincau', 'bensu', 'pondok', 'mie', 'bakmi', 'duren', 'goreng', 'bakmie', 'emie', 'gurame', 'yamien', 'sotomie', 'miesop', 'ropangyuk', 'indomie']
italilist = ['pasta', 'italia', 'italian']
jawalist = ['solo', 'malang', 'kudus', 'jawa', 'pawon', 'surabaya', 'jowo', 'semarang', 'angkringan', 'lamongan', 'suraboyo']
jepanglist = ['sushi', 'ramen', 'jepang', 'tako', 'takoyaki', 'teppan', 'yakiniku', 'bento', 'hokkaido', 'teppanyaki', 'izakaya', 'katsu', 'mochi', 'sake', 'ichiban', 'momochi']
kalimantanlist = ['pontianak', 'kalimantan']
```

## DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Restaurant, Cuisine, & Regionality Type

## IMPUTATION RESULT

Unspecified Cuisine

3365

Unspecified Regionality

1140

Amount of Improvement & Percentage in Cuisines Type :

1466

30.35 %

Amount of Improvement & Percentage in Cuisine Regionality Type :

2798

71.05 %

We're gonna leave this for now, and revisit later

## RestaurantReview & RestaurantRating

### 3 Type of Values in **RestaurantReview**:

1. Not Reviewed Yet : no one has reviewed this restaurant - Replace with 0
2. Tidak cukup Ulasan : not enough review to be mentioned in Zomato Website - Replace with 1
3. "xxxx" Ulasan : number represents the amount of reviews for this restaurant - Delete "Ulasan" string

### 2 Type of Values in **RestaurantRating**:

1. Not Rated Yet : no rating OR not enough rating (connected to Type 1 & 2 Review) - Replace with 0 & 1.5
2. "x.x": The aggregated rating of all ratings of this particular restaurant - Change Type to Float

## DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Price for 2

# Price for 2

### For Irregular Entry in Price for 2

NO PRICE DATA FOUND

1. For the time being, we'll convert No Price Data Found to 0

PRICE TOO SMALL

2. Rp200 untuk 2 orang (perkiraan) Tanpa alkohol
3. Rp150 untuk 2 orang (perkiraan)
4. Rp100 untuk 2 orang (perkiraan)
5. Rp70 untuk 2 orang (perkiraan)
6. Rp50 untuk 2 orang (perkiraan)
7. Rp40 untuk 2 orang (perkiraan)



## DATA ACQUISITION & UNDERSTANDING /

### Data Preprocessing / Restaurant Review, Rating, & Price

## Dropping Incomplete Rows

Restaurants don't fulfill Review / Rating Criteria :  
4473 39.7 %  
Restaurants's Price is not listed :  
56 0.5 %  
Restaurants don't fufill Review/Rating & Price Criteria  
4483 39.79 %

Remaining Rows = **6784 (60.21%)**

# DATA ACQUISITION & UNDERSTANDING /

## Data Preprocessing / Restaurant, Cuisine, & Regionality Type II

Let's **impute** the remaining **Unspecified Cuisines** with MODE by City/Province !

City Level

Cuisine	Cuisines Count
City/Province	
Bekasi Kabupaten	Kopi
Bekasi Kota	Kopi
Bogor Kabupaten	Kopi
Bogor Kota	Kopi
Cianjur	Dimsum
Depok	Kopi
Jakarta Barat	Kopi
Jakarta Pusat	Kopi
Jakarta Selatan	Kopi
Jakarta Timur	Kopi
Jakarta Utara	Kopi
Tangerang	Dimsum
Tangerang Kabupaten	Kopi
Tangerang Kota	Kopi
Tangerang Selatan	Kopi

Province Level

Cuisine	Cuisines Count
City/Province	
Banten	Kopi
Jawa Barat	Kopi

# DATA ACQUISITION & UNDERSTANDING /

## Data Preprocessing / Restaurant, Cuisine, & Regionality Type II

Let's **impute** the remaining **Unspecified Regionality** with MODE by City/Province !

### City Level

Cuisine Regionality Regionality Count

#### City/Province

City/Province	Cuisine	Regionality	Regionality Count
Bekasi Kabupaten	No Region	9	
Bekasi Kota	Indonesia	160	
Bogor Kabupaten	Indonesia	97	
Bogor Kota	Indonesia	289	
Cianjur	Indonesia	9	
Depok	Indonesia	123	
Jakarta Barat	Indonesia	506	
Jakarta Pusat	Indonesia	330	
Jakarta Selatan	Indonesia	707	
Jakarta Timur	Indonesia	202	
Jakarta Utara	Indonesia	330	
Tangerang	Chinese	1	
Tangerang Kabupaten	Indonesia	105	
Tangerang Kota	Indonesia	93	
Tangerang Selatan	Indonesia	247	

### Province Level

Cuisine Regionality Regionality Count

#### City/Province

City/Province	Cuisine	Regionality	Regionality Count
Banten	Indonesia	445	
Jawa Barat	Indonesia	681	

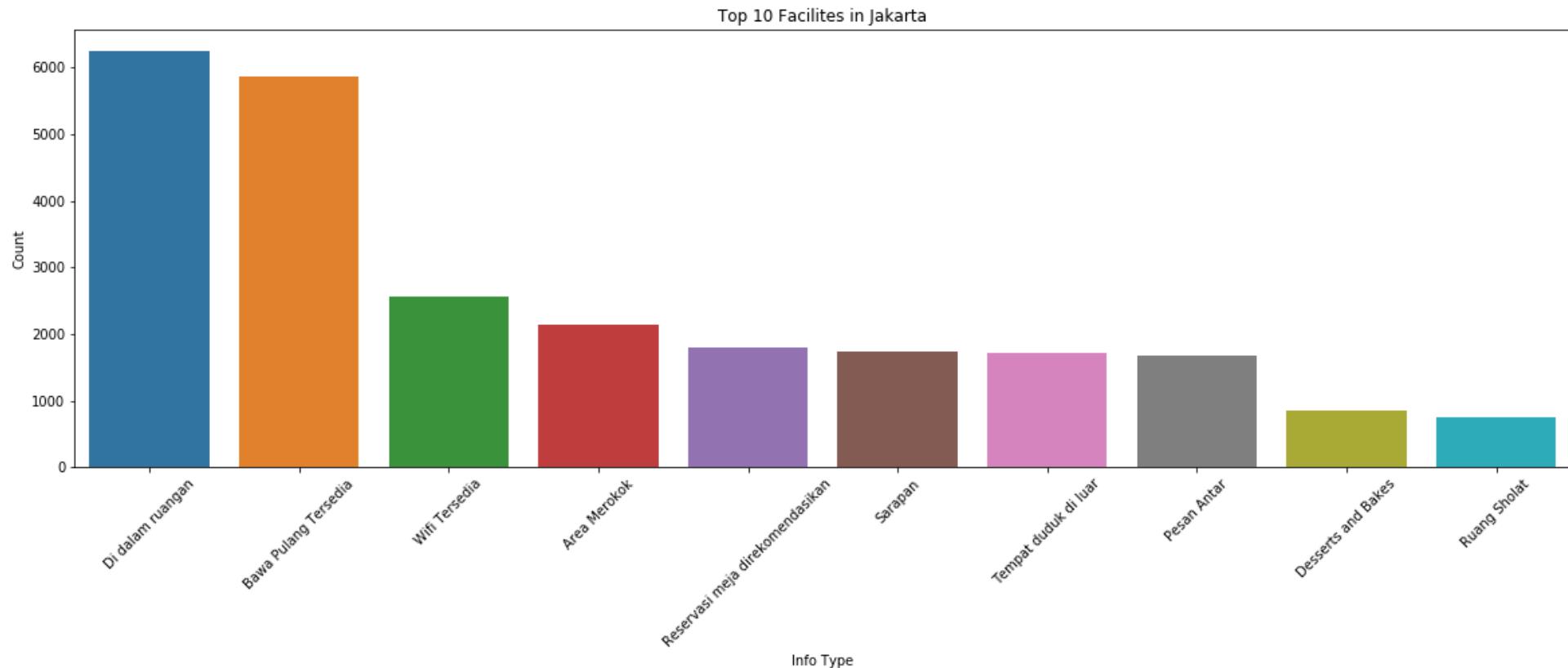
# DATA ACQUISITION & UNDERSTANDING /

Data Preprocessing / Additional Info

## Additional Info

The Amount of **Additional Info Category : 52 Types**

	Info Type	Count
0	Di dalam ruangan	6255
1	Bawa Pulang Tersedia	5855
2	Wifi Tersedia	2568
3	Area Merokok	2138
4	Reservasi meja direkomendasikan	1806
5	Sarapan	1735
6	Tempat duduk di luar	1720
7	Pesan Antar	1677
8	Desserts and Bakes	845
9	Ruang Sholat	755



## DATA ACQUISITION & UNDERSTANDING /

### Data Preprocessing / Additional Info

## Additional Info

There are a few very interesting info that could be a deciding factor in how expensive a restaurant is:

13	Live Entertainment	319
14	Parkir Valet Tersedia	282
15	Ramah untuk Anak	193
16	Live Music	181
17	Menyediakan cocktail	166
18	Hanya Bawa Pulang	161
19	No Additional Info	158
20	Parkir Gratis	158
21	Hanya Wine dan Bir	151
22	Kehidupan Malam	148
23	Buffet	139
24	Hanya untuk reservasi meja	108

# DATA ACQUISITION & UNDERSTANDING /

# Data Preprocessing / Additional Info

## Additional Info

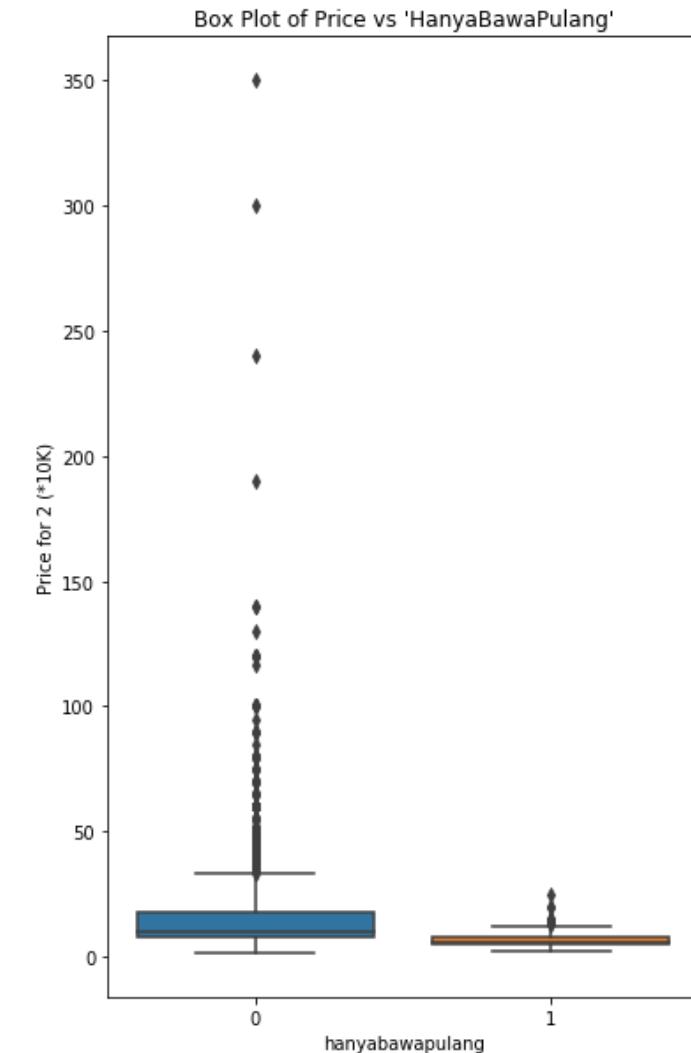
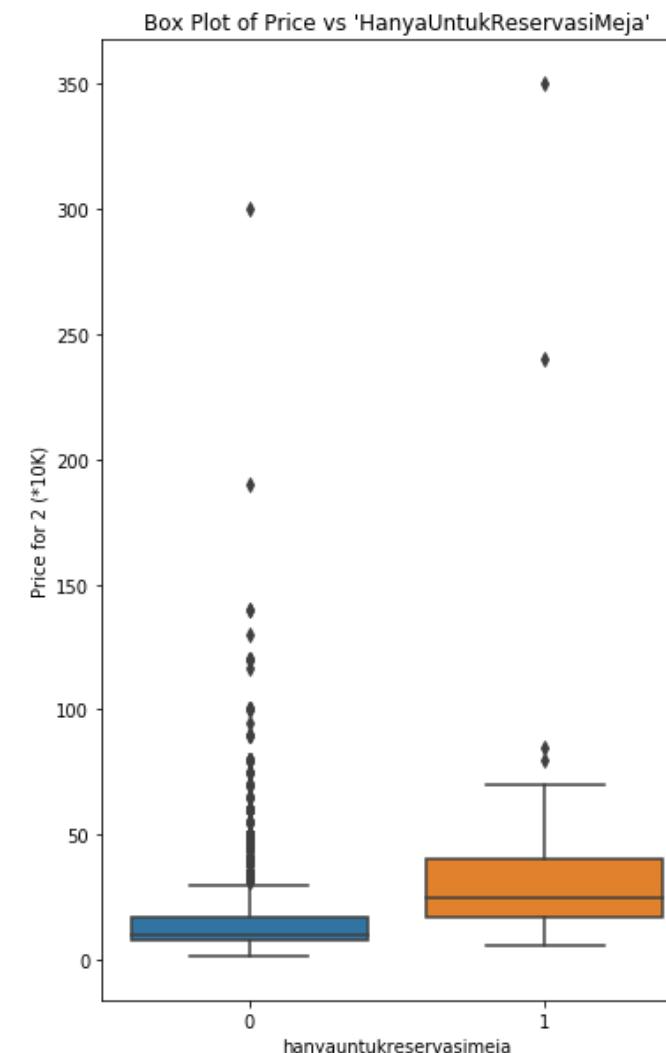
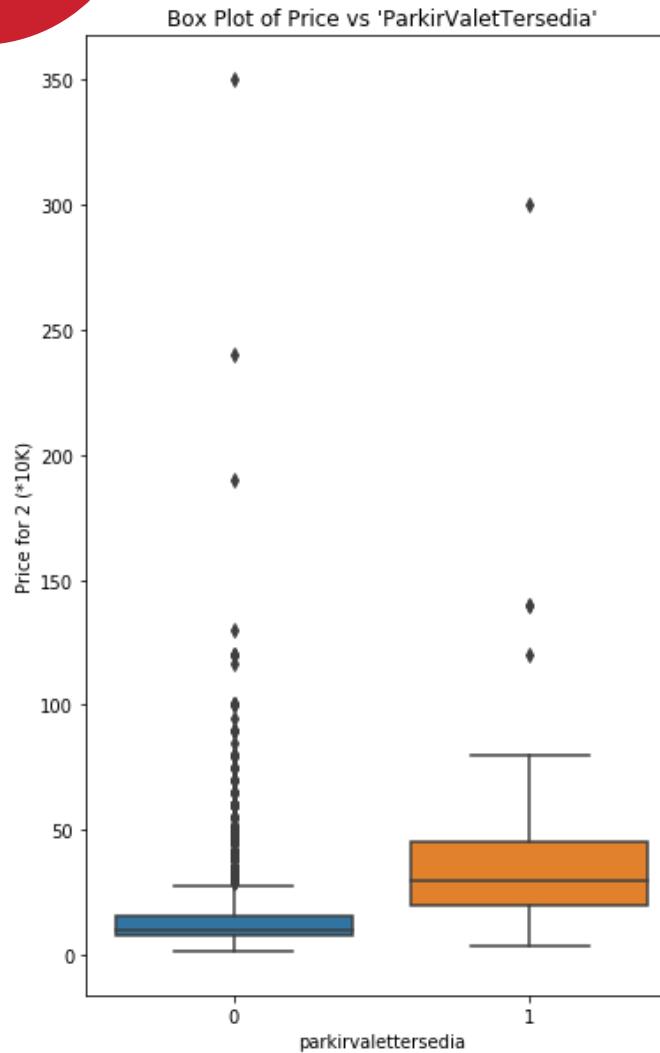
Out of **52** additional info, we'll take **top 30** (>40 rest.) additional info (based on count) to do **One-Hot Encoding**,  
As we will use these features to predict restaurant's price

alkoholtersedia areamerokok bawapulangtersedia brunch buffet dessertsandbakes didalamruangan hanyabawapulang hanyabir hanyautukreservasimeja hanvwinedanbir kehidupanmalam liveentertainment livemusic makandengangrup makanmewah menvediakcocktail

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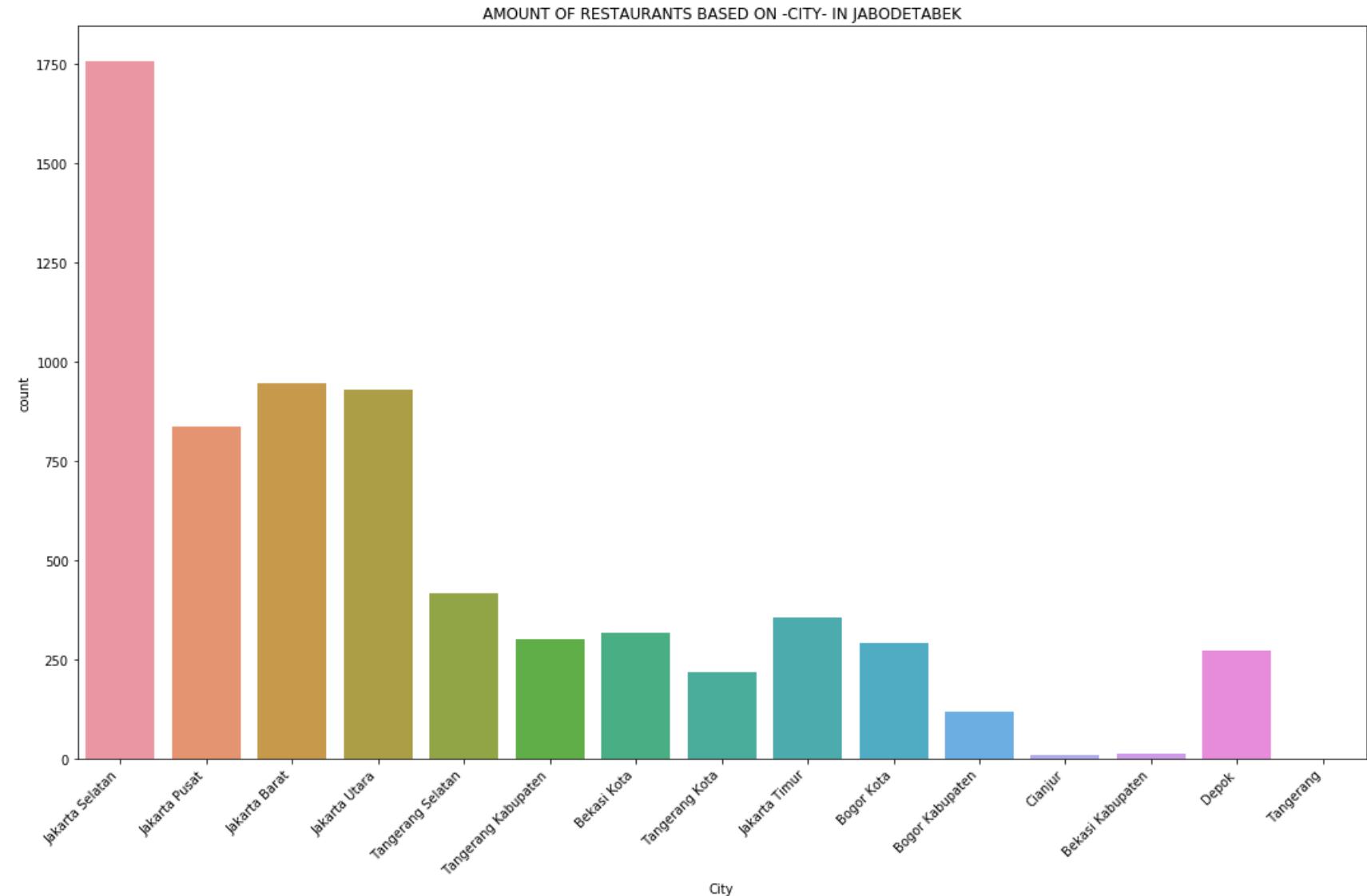
0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0

It's important for us to one-hot encode the **Additional Info..**  
As those features have varying degree of **predicting power** to restaurant's price



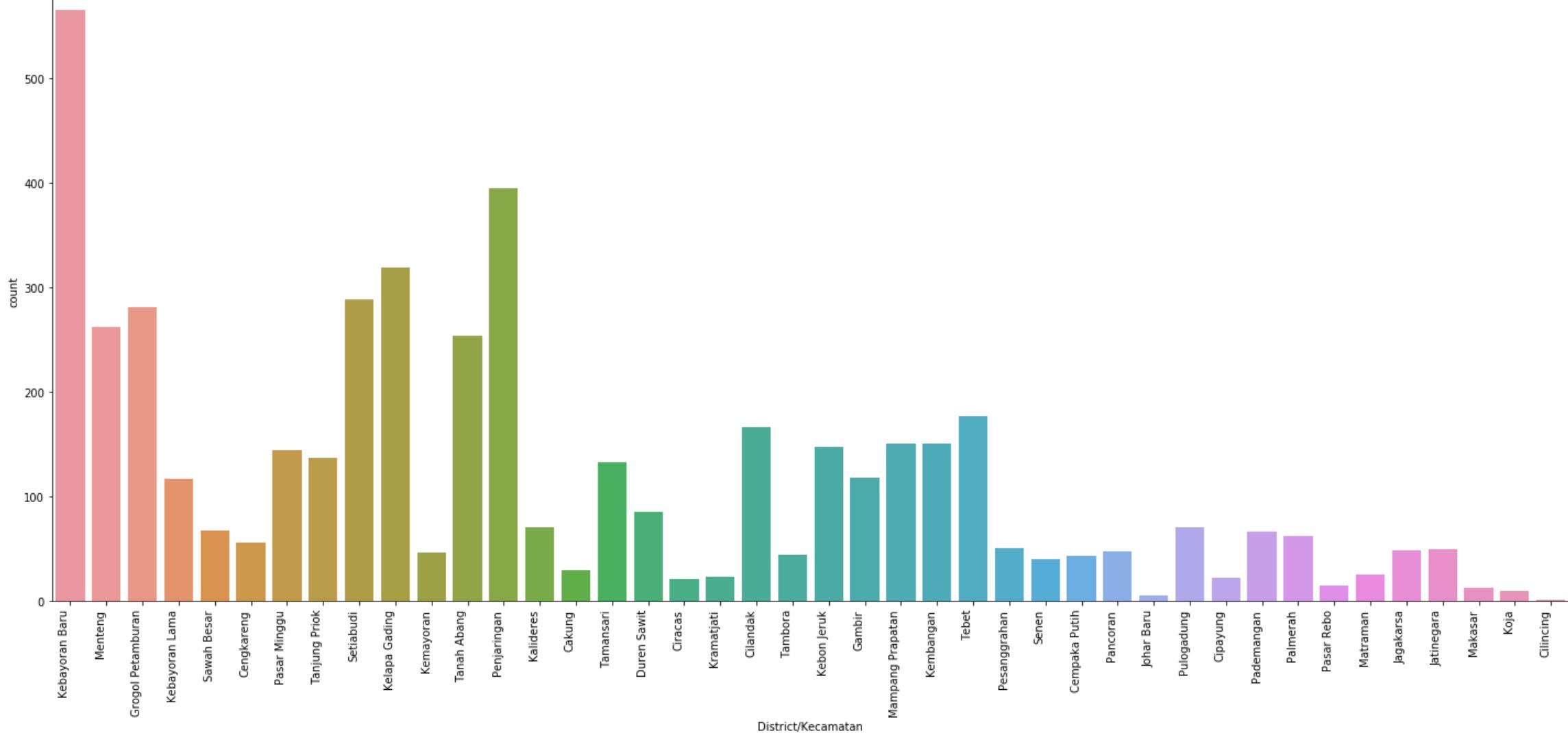
Now, this is where **Reverse Geocoding Result** come in handy...

PS. Do remember that no price data / no review / not enough review restaurant have been eliminated



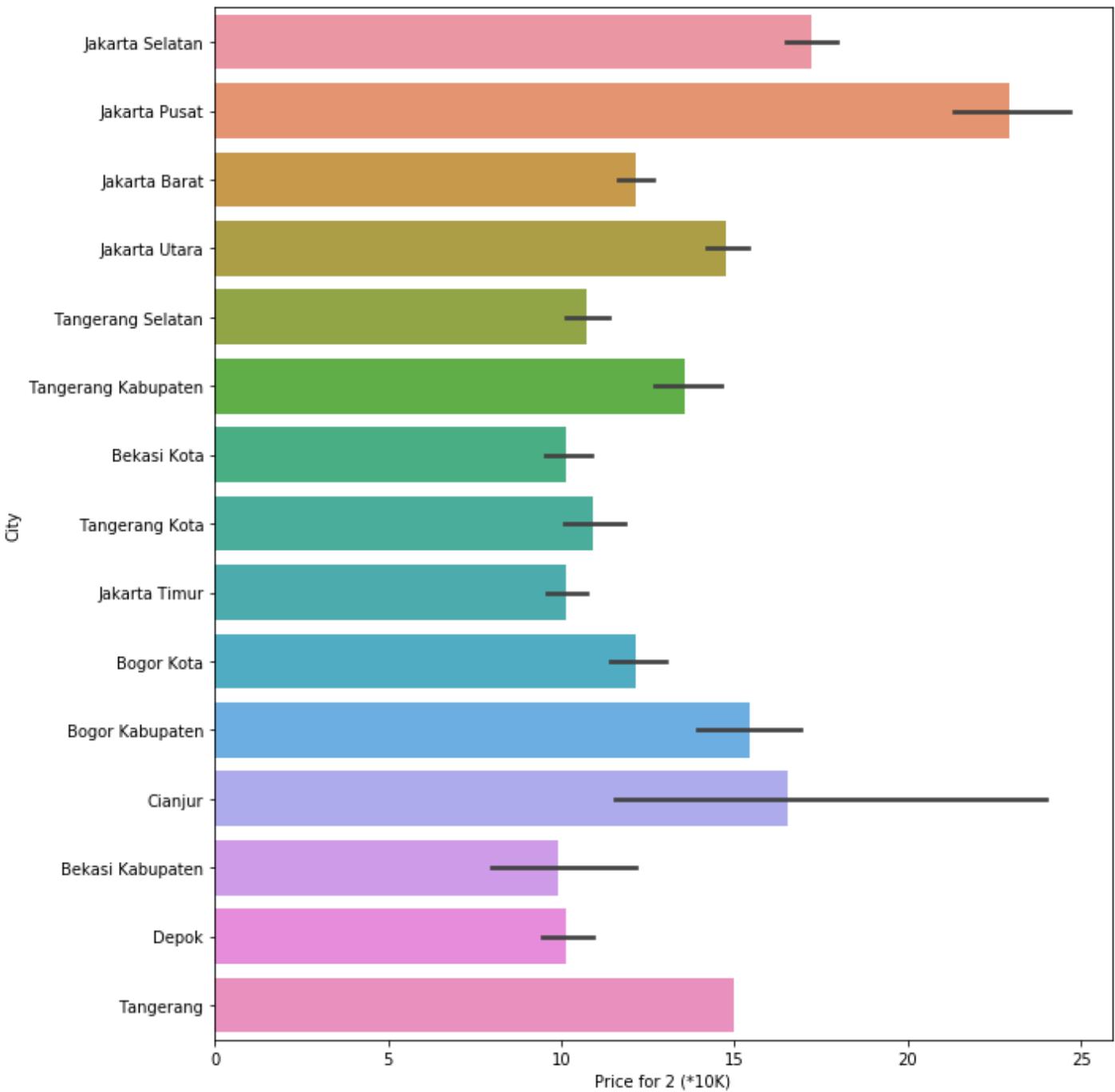
# DATA EXPLO- RATION

AMOUNT OF RESTAURANTS BASED ON -KECAMATAN- IN DKI JAKARTA

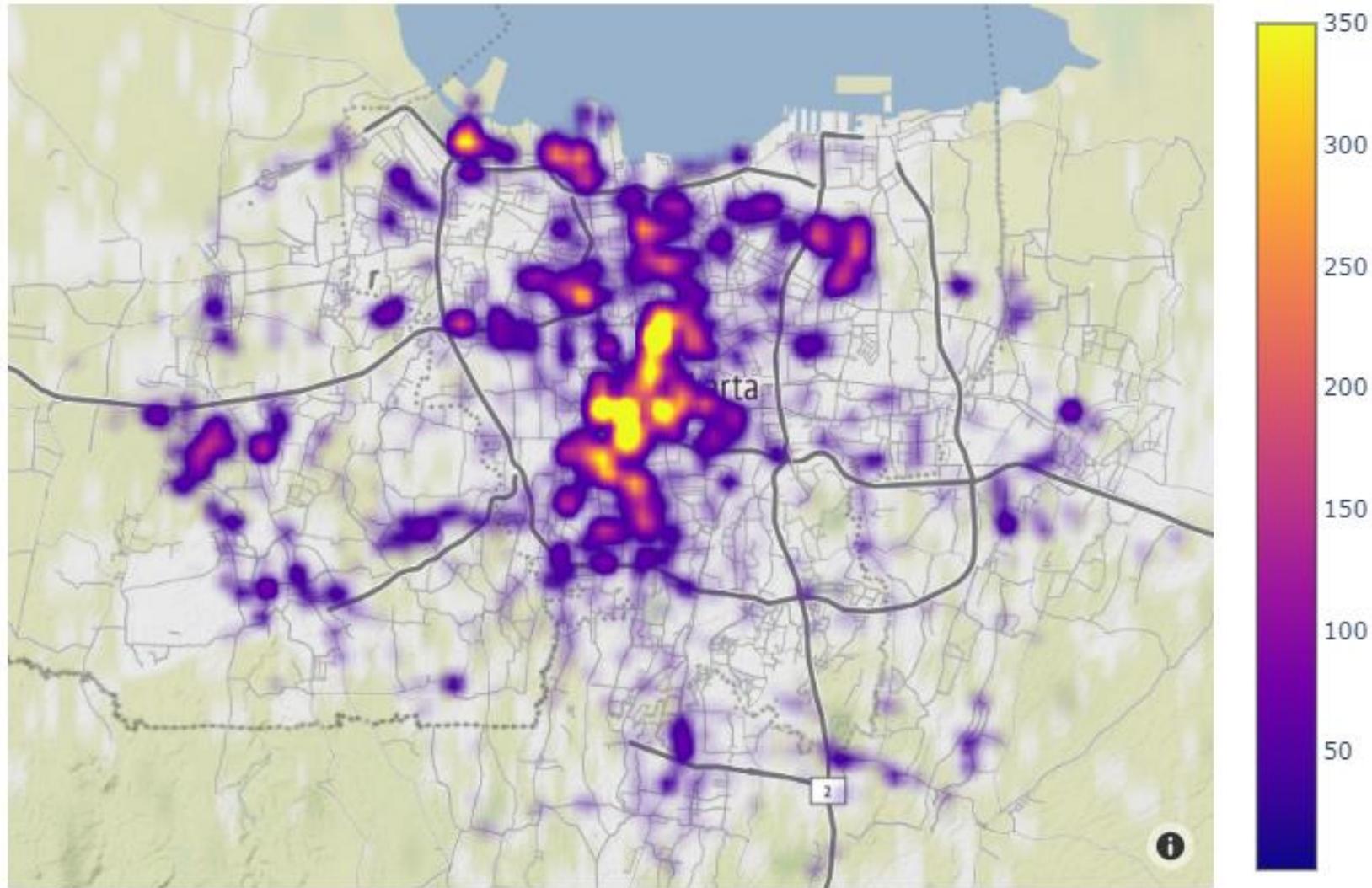


# DATA EXPLO- RATION

AVERAGE PRICE FOR 2 BASED ON -CITY-



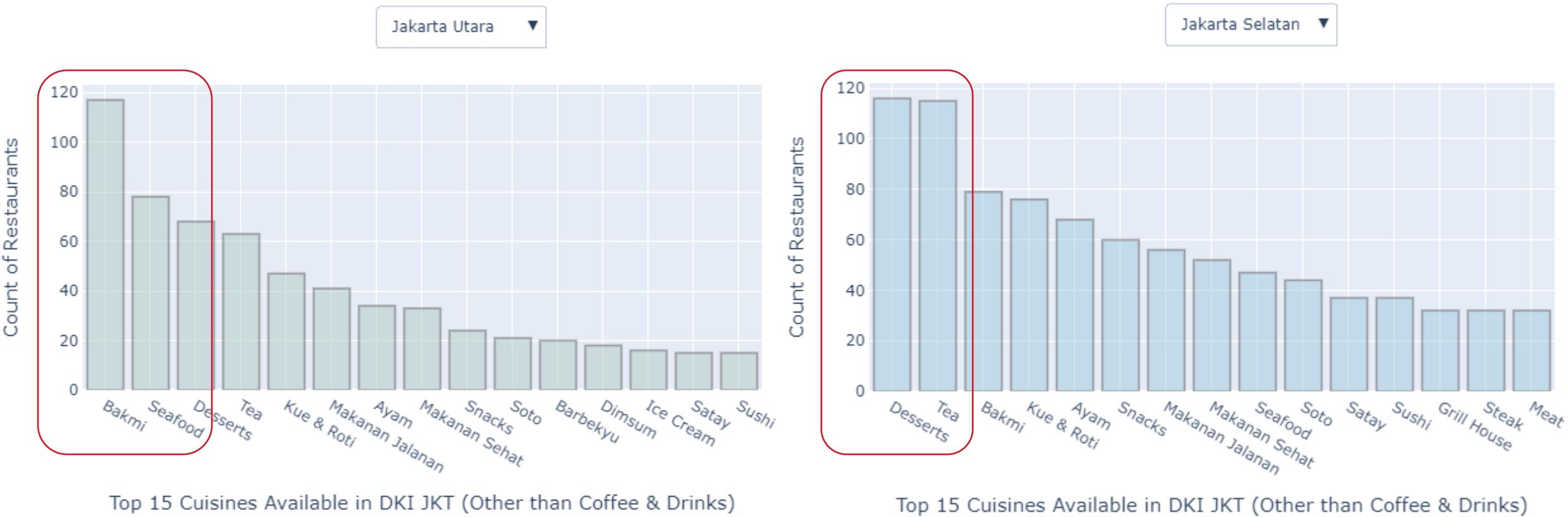
DATA  
EXPLO-  
RATION



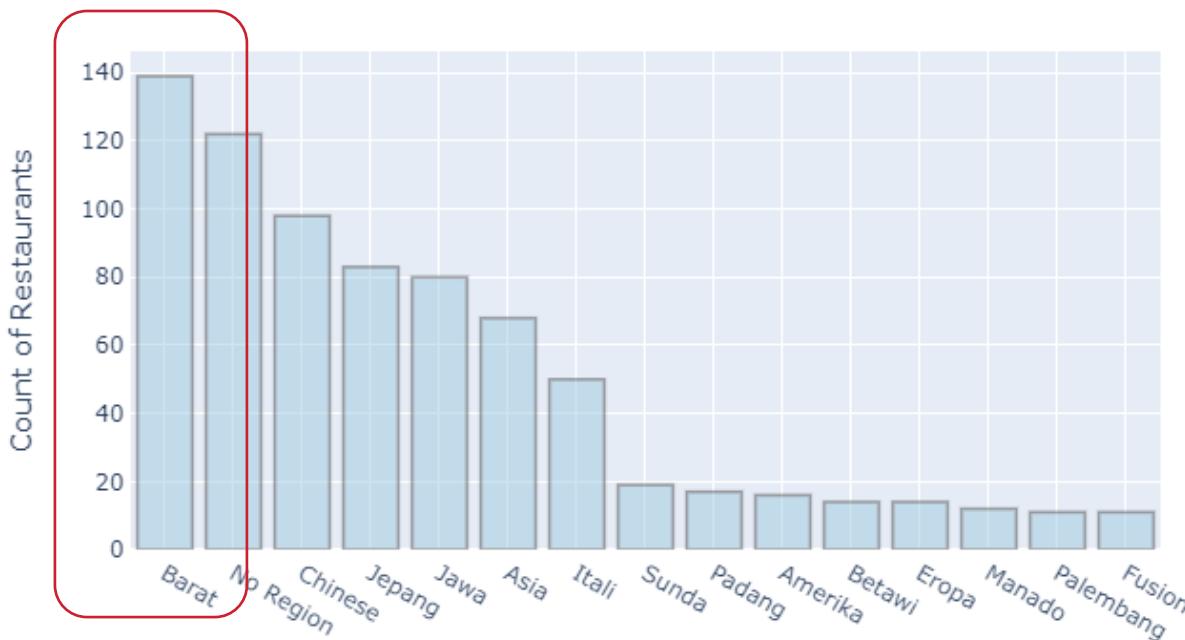
# PLACE TYPE DISTRIBUTION ACROSS DKI JAKARTA



## CUISINES DISTRIBUTION ACROSS DKI JAKARTA (OTHERS THAN COFFEE & DRINK)



## REGIONALITY DISTRIBUTION ACROSS DKI JAKARTA (OTHERS THAN INDONESIA)



Top 15 Regionality Available in DKI JKT (Other than Indonesia)



Top 15 Regionality Available in DKI JKT (Other than Indonesia)

A night photograph of a Parisian cafe terrace. The building has large arched windows with signs that read "CAFE BAR" and "LE NEMOURS". Several round tables are covered with striped umbrellas, and many people are seated at them, eating and talking. A waiter in a white shirt and black vest is visible on the left. The scene is lit by street lamps and the warm light from the cafe's interior.

# MODELING A-RECOMMENDER SYSTEM

# CONTENT-BASED RECOMMENDER SYSTEM

Similarity based on **What?**

- 1 Place Type
- 2 Cuisines
- 3 Regionality
- 4 Location (City)
- 5 Price for 2

Count Vectorizer  
Cosine Similarity

Price Gap Matrix

Can be turned off  
and on

SCONES	4 9 0	DRAFT PINT	13 0 0
POPCORN	6 5 0	CRAFT BEER	12 0 0
NACHO	7 5 0	COFFEE	3 5 0
TORTILLA	8 9 0	WINE	7 0 0
HOTDOGS	7 3 0	SODA	3 5 0
PIZZA	15 9 0	WATER	4 5 0
SALTED EGG FRIES	8 9 0	POSH TEA	6 0 0

# MODELING B-PRICE PREDICTION

金院 1  
GOLDEN

# MODELING STRATEGY



One-Hot Encoding  
For Place Type, Cuisines,  
Regionality, City, Province



Price for 2  
Outlier Check

Outlier Included



Model that's able to  
predict Super Expensive  
Restaurant

Outlier Excluded



Model that's more  
focused to predict  
Restaurant which price  
lies between Upper &  
Lower Limit

Correlation Check  
(Features Reduction)  
 $> 0.2 \mid < -0.2$

# MODELING STRATEGY



Outlier Included



Outlier Excluded

Correlation  
Check  
(Features  
Reduction)  
 $> 0.2 \mid < -0.2$

Robust Scaler

K-Fold to  
compare baseline  
model of 10 types of  
Regression Model

GridSearchCV to  
Search best parameters

# MODELING / A-RECOMMENDER SYSTEM



## MODEL with OUTLIERS

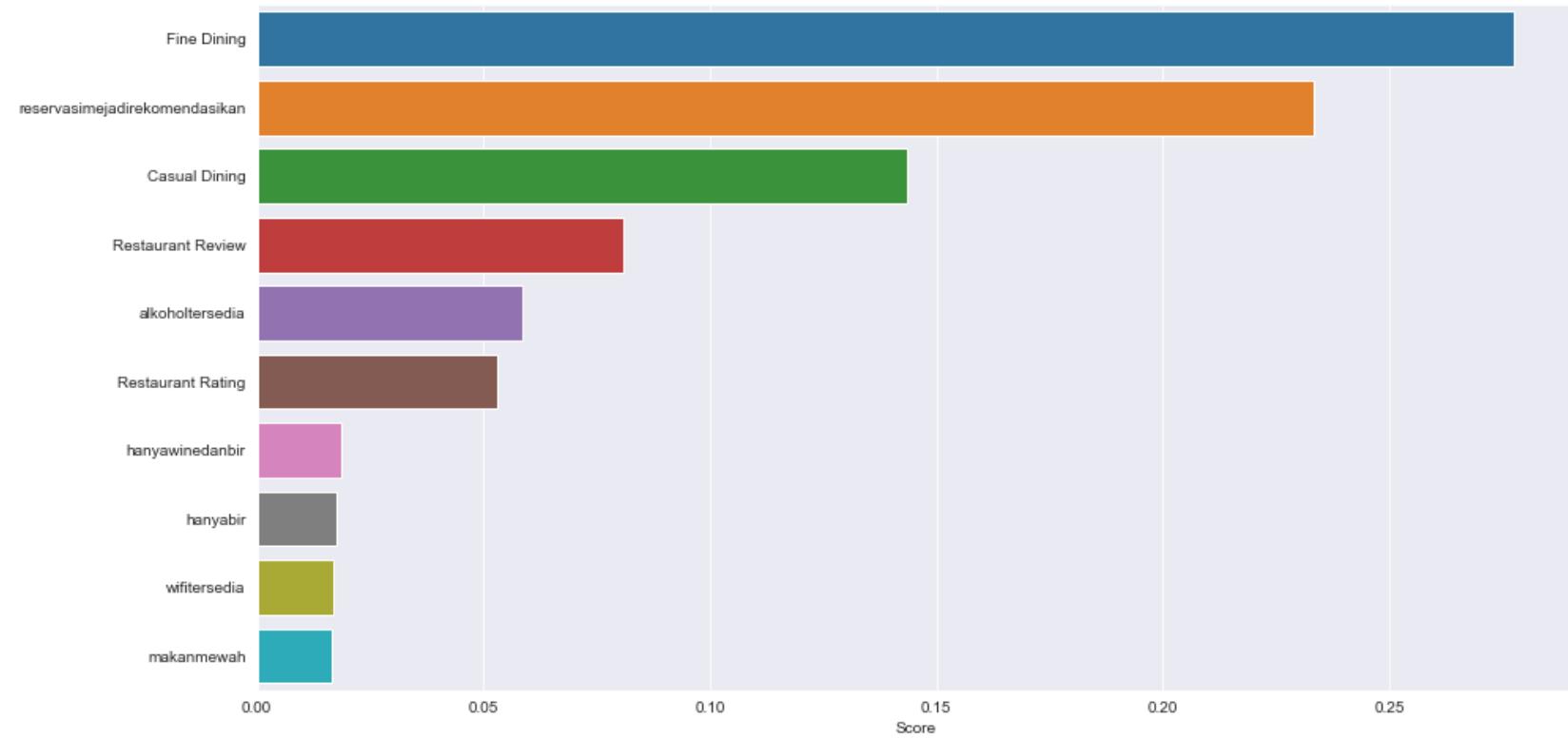
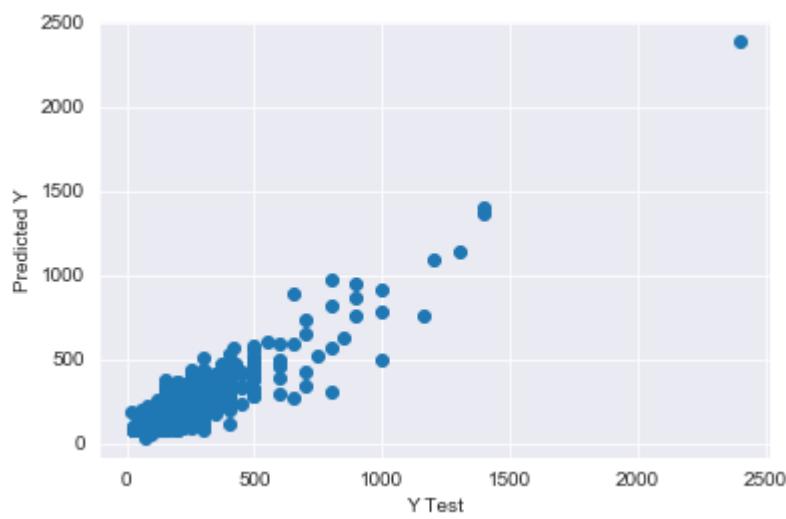
	MAE	RMSE	R2_Score	Adj. R2_Score
Linear Regression	50.651	94.077	0.622	0.620
Lasso	50.924	93.450	0.624	0.623
Ridge	50.540	92.806	0.623	0.623
DecisionTreeRegressor	65.974	127.134	0.262	0.259
RandomForestRegressor	53.534	99.437	0.560	0.558
GradientBoostingRegressor	50.132	96.894	0.594	0.591
AdaBoostRegressor	123.155	153.726	-0.129	-0.132
KNeighborRegressor	55.408	106.474	0.511	0.509
SVR	60.362	128.921	0.288	0.285
XGBRegressor	53.382	107.282	0.474	0.473

	MAE	RMSE	R2_score	Adj. R2_Score
Linear Regression	50.03	89.54	0.67	0.66
Lasso	50.78	91.19	0.65	0.65
Ridge	50.01	89.65	0.67	0.66
RandomForestRegressor	40.59	62.63	0.84	0.84
GradientBoostingRegressor	42.47	64.31	0.83	0.83

# MODELING / A-RECOMMENDER SYSTEM



## MODEL with OUTLIERS



# MODELING / A-RECOMMENDER SYSTEM



## MODEL without OUTLIERS

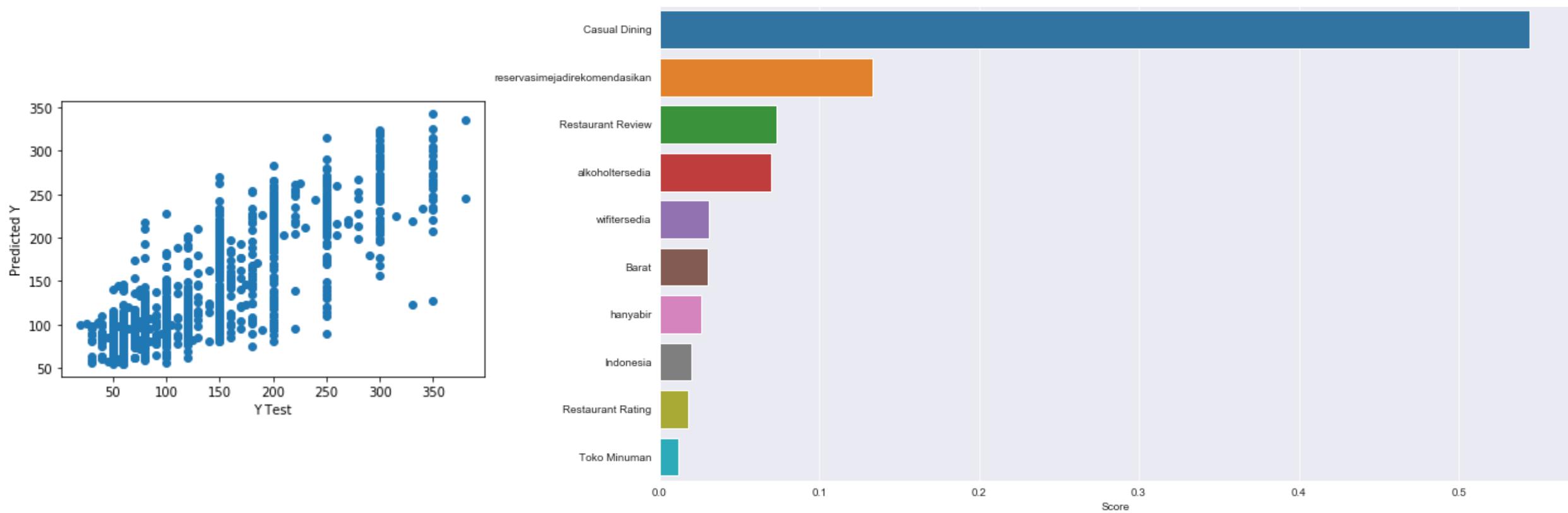
	MAE	RMSE	R2_Score	Adj. R2_Score
Linear Regression	34.862	46.705	0.619	0.617
Lasso	36.085	48.077	0.595	0.591
Ridge	34.878	46.737	0.617	0.614
DecisionTreeRegressor	46.978	65.058	0.258	0.255
RandomForestRegressor	37.545	50.384	0.553	0.553
GradientBoostingRegressor	34.467	46.459	0.620	0.620
AdaBoostRegressor	42.966	52.905	0.509	0.506
KNeighborRegressor	38.075	51.643	0.534	0.530
SVR	39.340	54.435	0.480	0.479
XGBRegressor	36.468	49.672	0.565	0.565

	MAE	RMSE	R2_score	Adj. R2_Score
Linear Regression	35.13	46.78	0.62	0.62
Ridge	35.14	46.78	0.62	0.62
GradientBoostingRegressor	31.83	42.06	0.70	0.70
XGBoostRegressor	32.71	43.36	0.68	0.68

# MODELING / A-RECOMMENDER SYSTEM

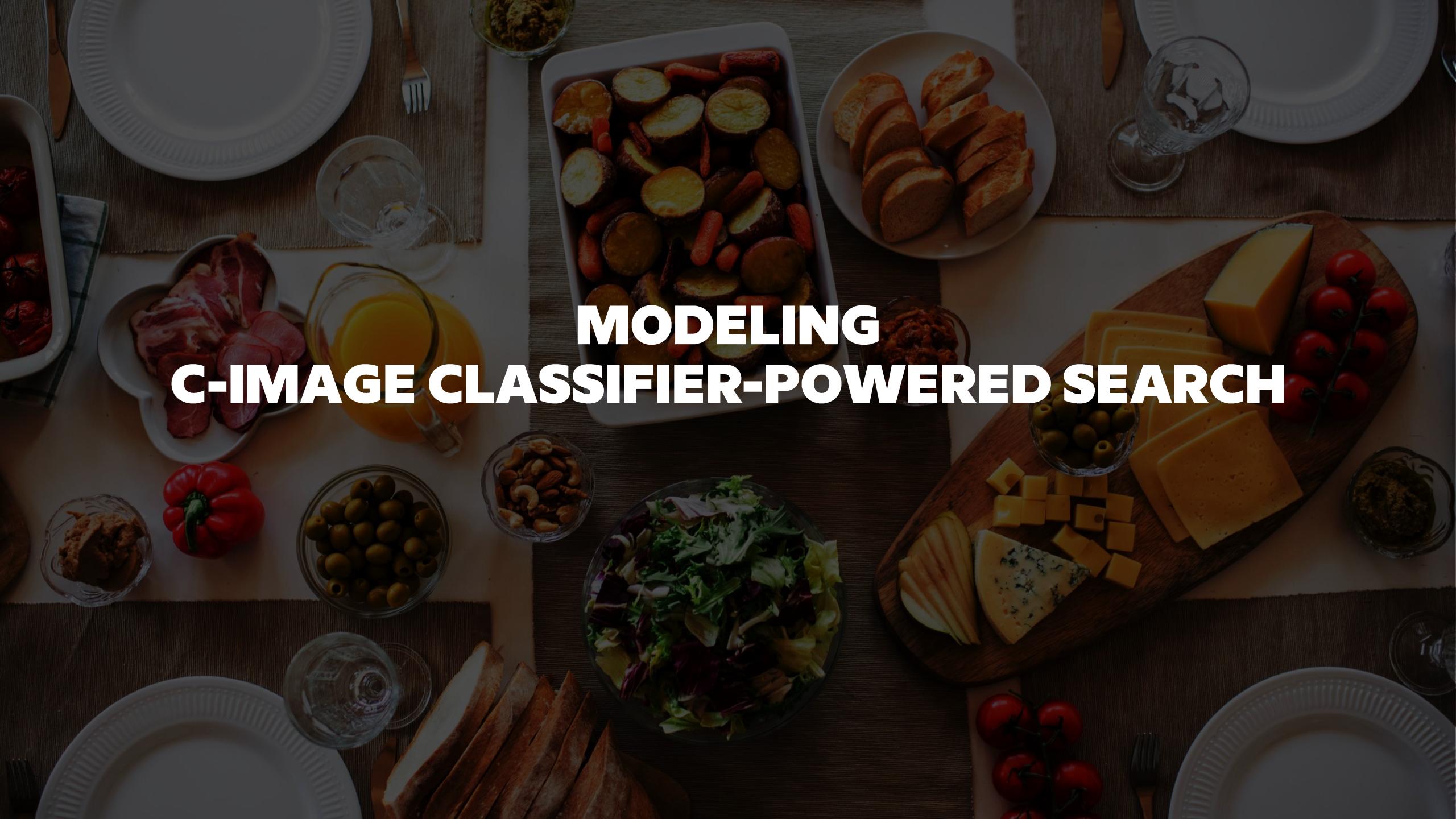


## MODEL without OUTLIERS



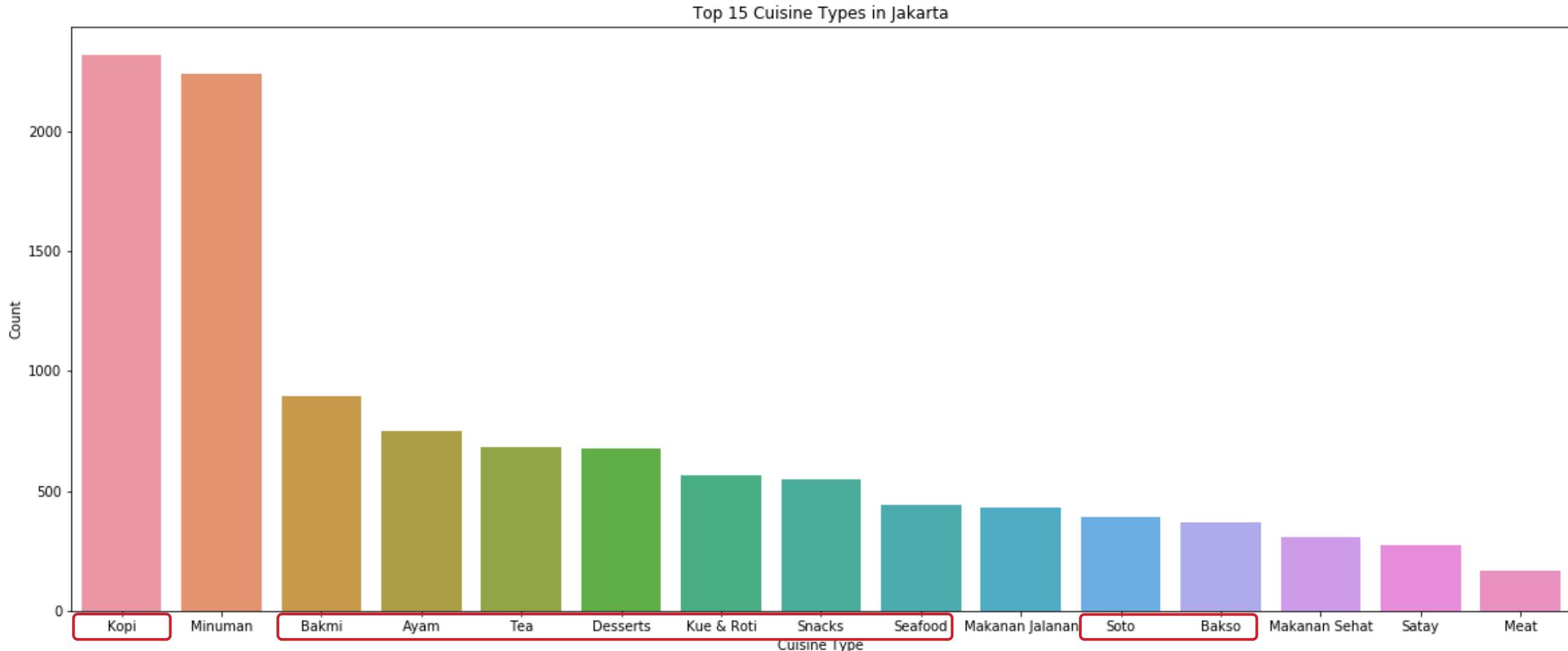


# HOW CAN WE ADD ANOTHER VALUE USING MACHINE LEARNING?



# MODELING C-IMAGE CLASSIFIER-POWERED SEARCH

Let's set a limitation to this model.  
We're gonna classify **Top 10 Cuisines in Jabodetabek** as our target



# Scrape Images from Google.

Google

Soto Kudus



Q Semua Maps Gambar Berita Video Selengkapnya Setelan Alat

resep

resep soto kerbau

warung soto ayam

memasak soto

soto daging sapi

kuah soto

bumbu soto

resep masakan

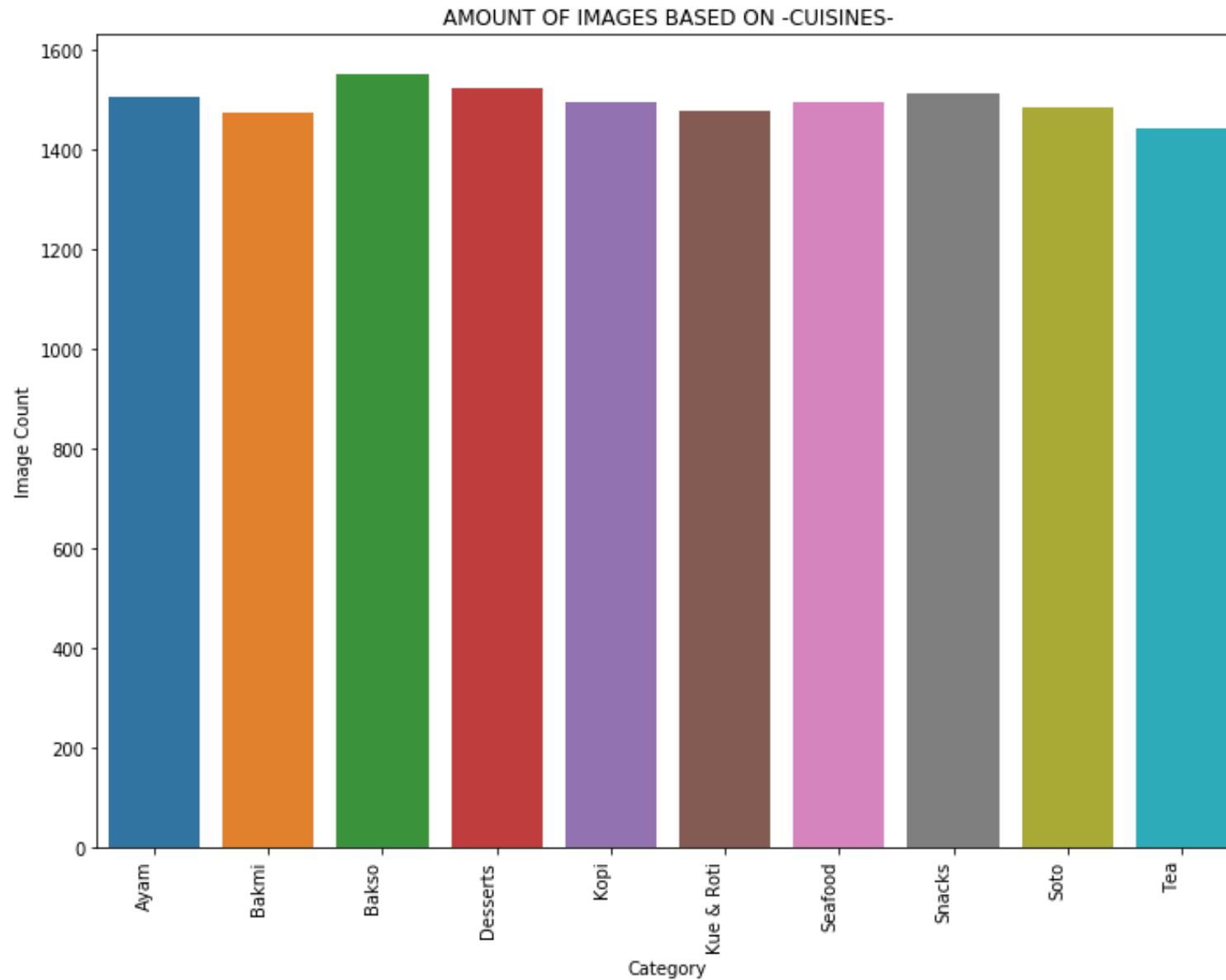
daging kerbau

membuat soto

soto lamongan

Resep Soto Kudus oleh Fitri...  
cookpad.comSoto Asli Khas Kudus P...  
resepkoki.idResep Soto Kudus Asli Daging Ayam | ...  
craftlog.comResep Soto Kudus Asli Enak | oleh res...  
craftlog.comCara Memasak Soto Kudus Bumbu Instan -...  
bumburesto.comResep Soto Kudus yang Menghangatkan - Masak...  
masakapahariini.comSoto Kudus Bahan: 1 kg ayam, ...  
pinterest.comResep Soto Kudus - Resepedia  
resepedia.idCara Mudah Memasak Soto Kudus - YouTube  
youtube.comResep Soto Kudus oleh Susi A...  
cookpad.comSoto Kudus Senayan - Mall Art...  
traveloka.com5 Soto Kudus Terenak di Jakarta...  
idntimes.comResep Soto Kudus Sederhana ...  
yummy.co.idSoto Kudus hingga Pacitan, Ini ...  
food.detik.comSoto Kudus Ayam Kampung Roxy - ...  
facebook.comSOTO KUDUS - Semua Halaman - Sajian Sedap  
sajiansedap.grid.idSoto Kudus, Semarang dan Kemiri, ...  
food.detik.comRESEP SOTO KUDUS ASLI....! .. Bahan-bahan Unt...  
id.pinterest.comResep Soto Kudus Ayam Asli Enak dan Ca...  
resepparamasak.infoSoto Kudus Mbah Di', Jelambar - Lengkap: ...  
pergikuliner.com7 Soto Kudus Paling Maknyus di Jaka...  
qraved.comResep Soto Asli Kudus Paling Enak Diantara ...  
tutorialpot.comResep Soto Kudus daging oleh Susi Agung -...  
cookpad.com

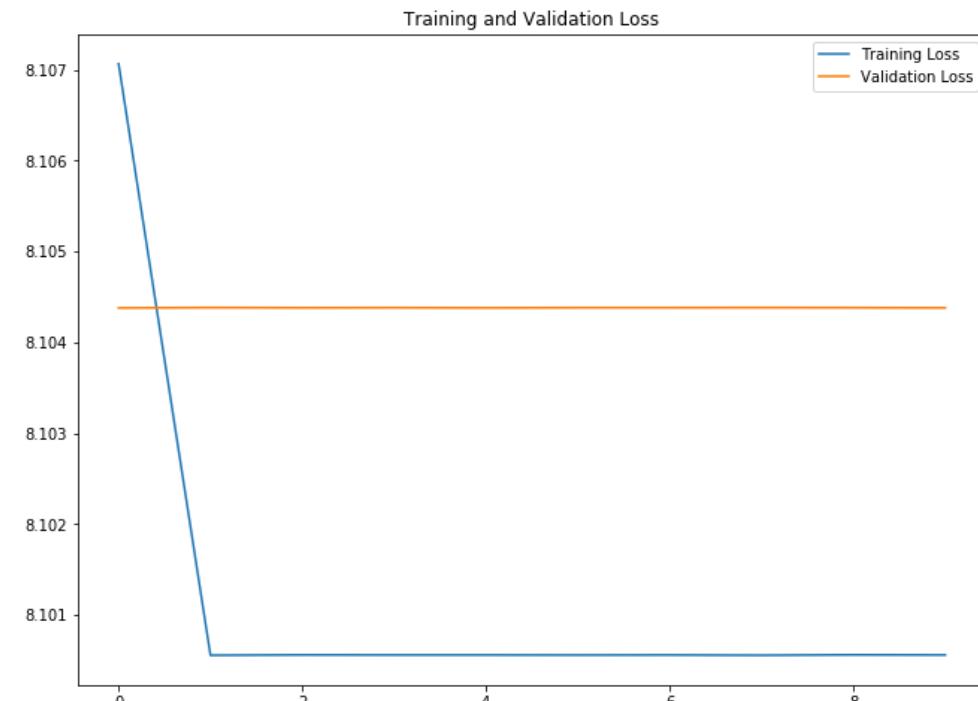
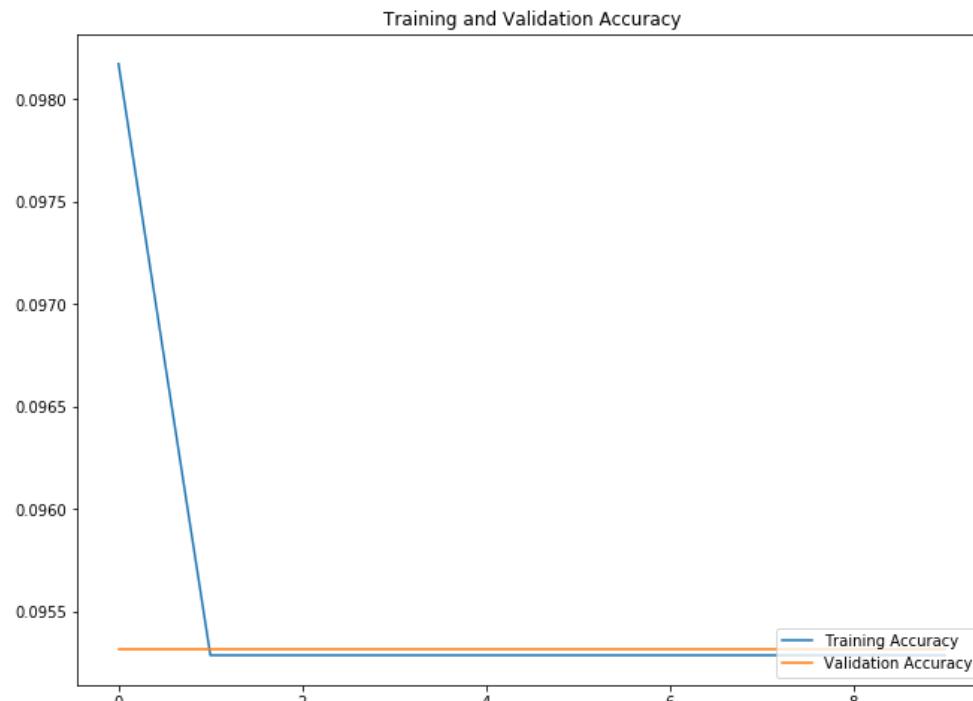
We're going to use **ACCURACY** as our measurement metrics,  
so let's make a **balanced dataset** from the beginning



# CONVOLUTIONAL NEURAL NETWORKS (CNN) MODEL ARCHITECTURE

1

11 Layers CNN



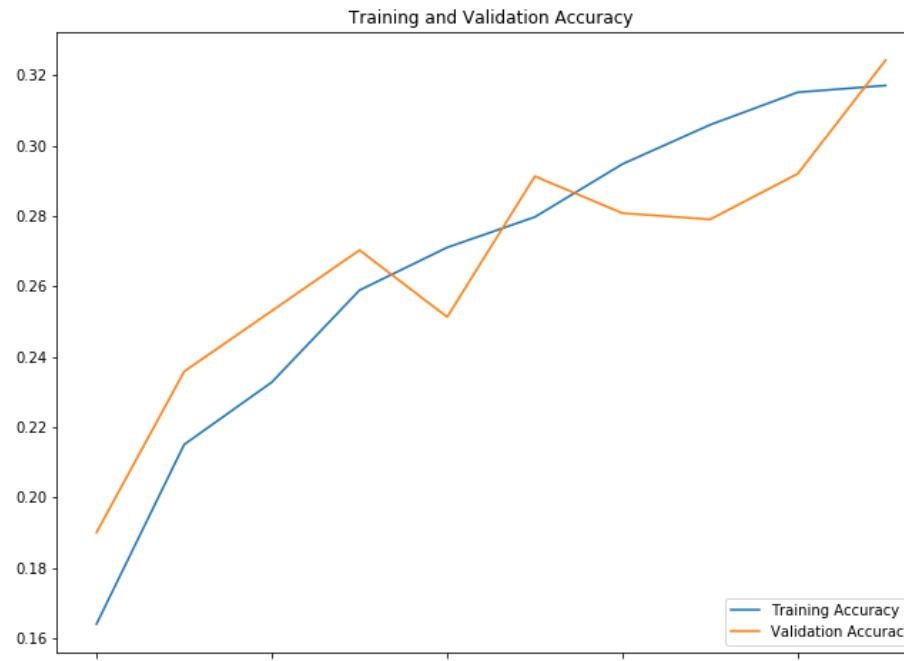
**10 Epochs – 2.8 Hours**

**9.5% Accuracy** (Less Than Random Guess Probability)

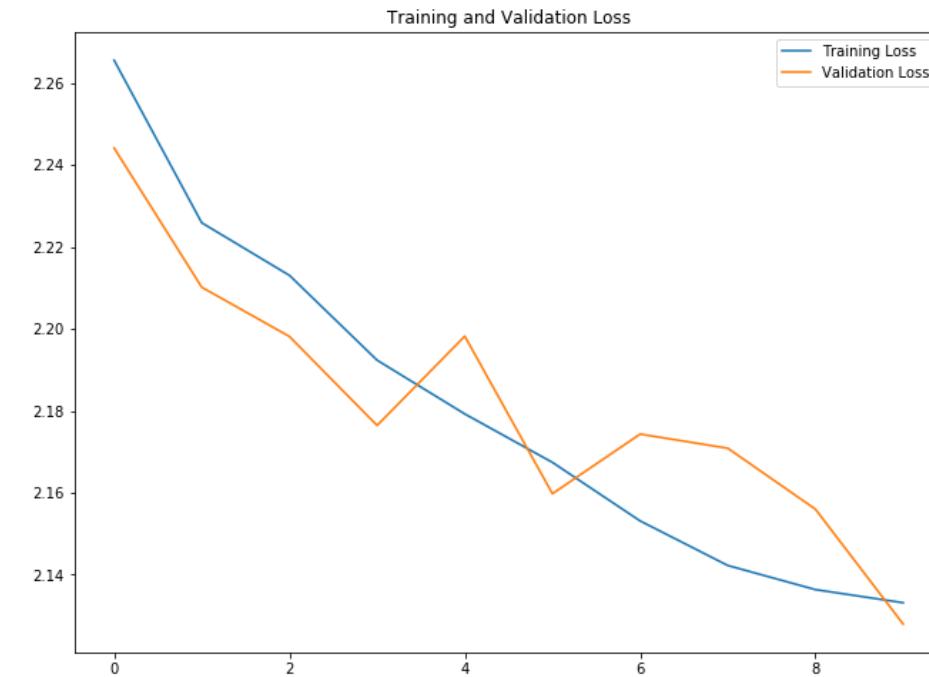
## CONVOLUTIONAL NEURAL NETWORKS (CNN) MODEL ARCHITECTURE

2

- 11 Layer CNN
- +1 DropOut Layer – Regularization (to prevent overfitting)
- Image Augmentation (to enrich training/validation data)



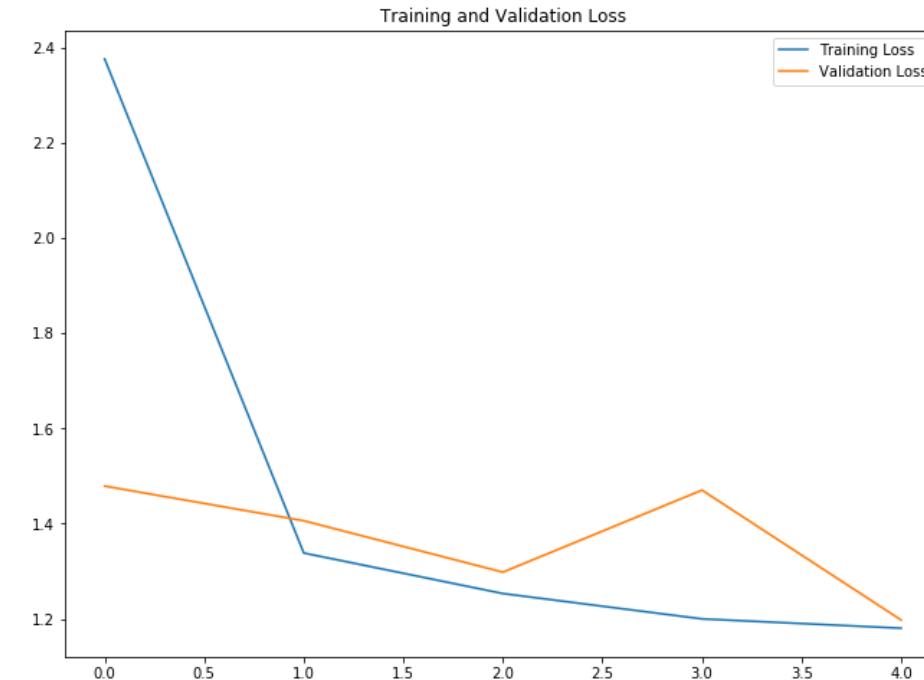
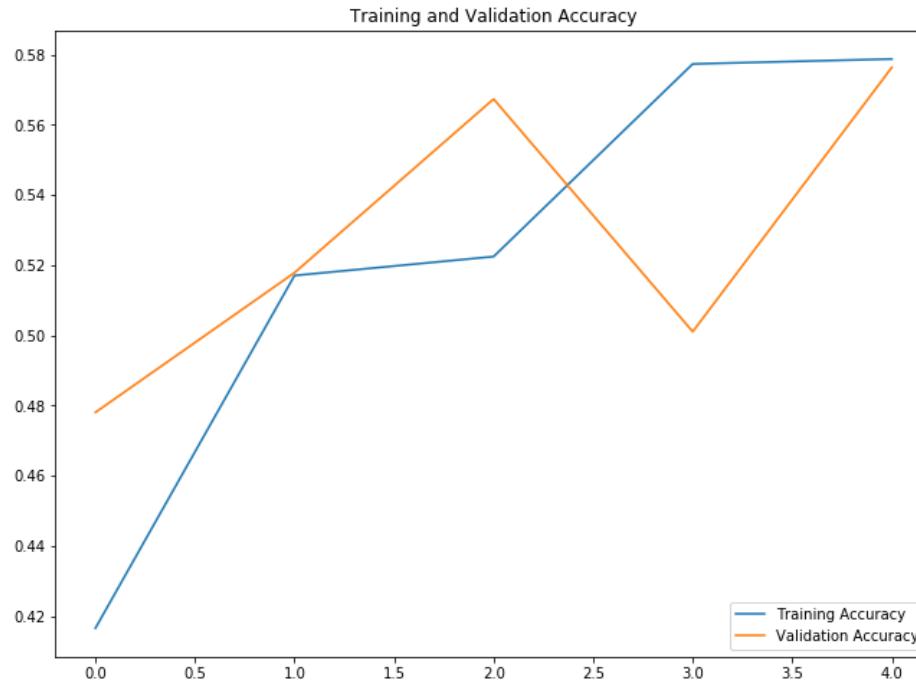
**10 Epochs – 2.8 Hours**  
**32% Accuracy**



## CONVOLUTIONAL NEURAL NETWORKS (CNN) MODEL ARCHITECTURE

3

249 Layers CNN – Transfer Learning – InceptionV3  
Data Augmentation (to enrich training/validation data)  
Fine Tuning Method



**5 Epochs – 1.4 Hours**

**58% Accuracy** (Significantly Higher)

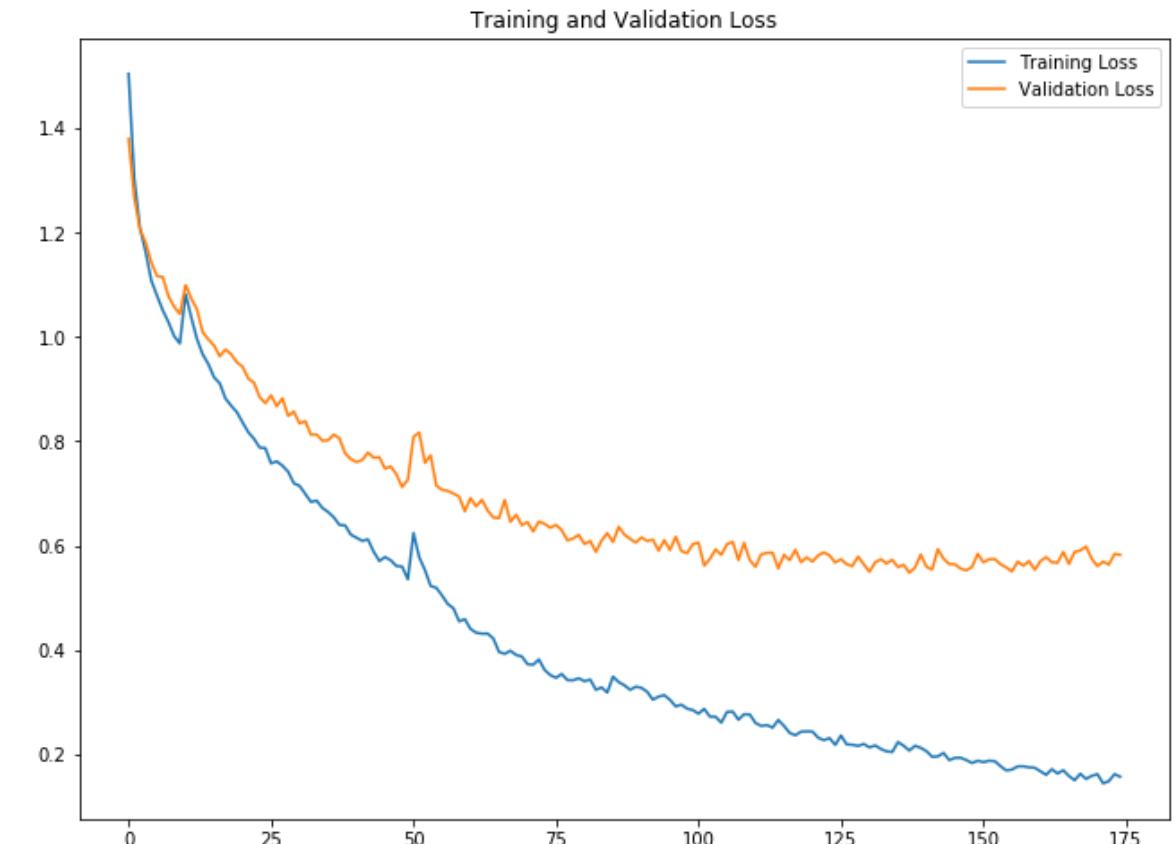
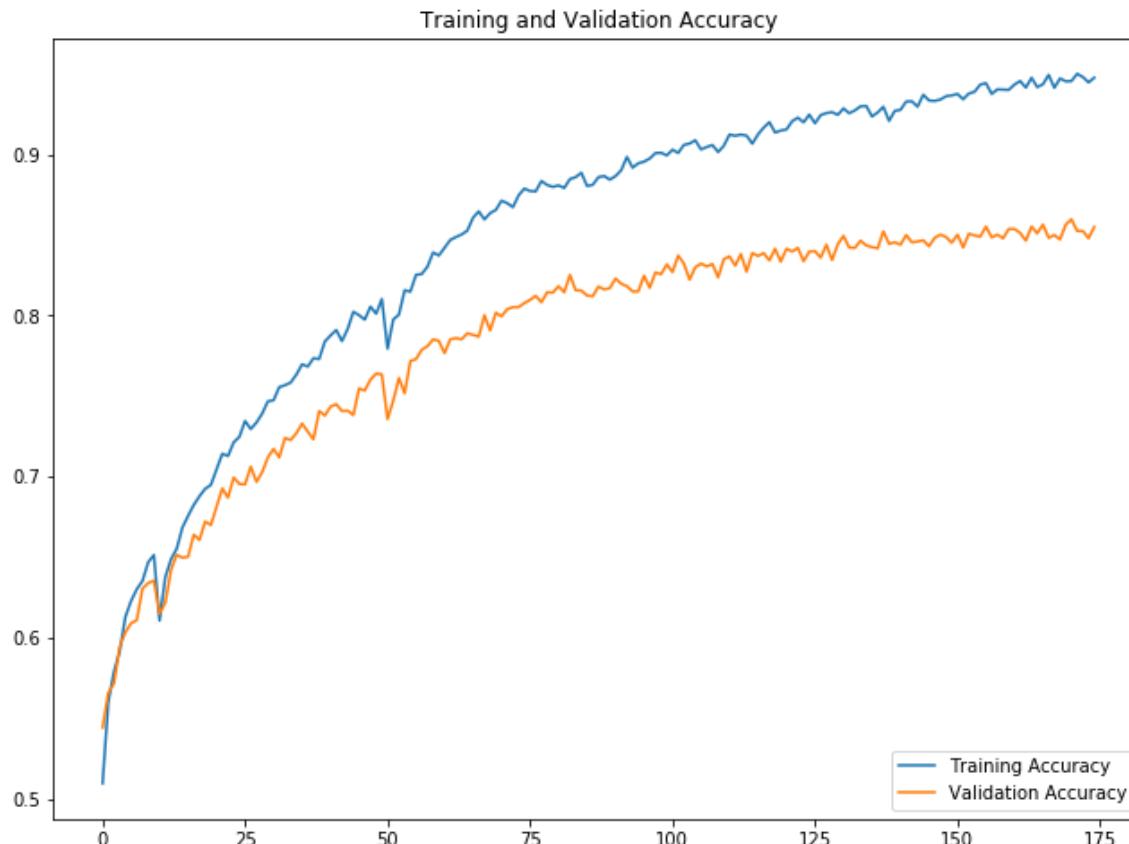
# MODELING / C-IMAGE CLASSIFIER

3

Continue Training Layers 90-310

**175 Epochs – 53.5 Hours**

**95% Train Accuracy  
86% Validation Accuracy**



A photograph of a rustic meal on a wooden table. In the foreground, there's a plate of meat (possibly ribs or chops) with a dark, charred crust. Next to it is a cluster of green olives. Behind the meat, there's a variety of cured meats like ham and salami, along with several types of cheese, including a large wedge of Swiss cheese with holes. To the right, there's a glass of white wine and a bottle of beer. The lighting is warm and focused on the food, creating a cozy atmosphere.

**FUTURE WORKS**

## General

- Collect More Data from Zomato Across Indonesia
- Try to Experiment with More Features (Weighted Rating, More Additional Info, etc)
- For Cuisines and Regionality, if we can impute it by looking at the menu, one-by-one (instead of mode), it will give more accurate result for all models

## Recommender System

- Try to use Collaborative Filtering – if we can get our hands to user data

## Price Prediction

- Experiment with Normalization, Grid Search CV to get higher Adjusted R2 Square

## Image Classifier

- Get at least 10K data per category to make sure our model will be really robust to
- Add up to 30/40 Cuisines Category to make it more useful

# THANK YOU!

Any Questions?

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