2019 QBS Group 5
YouBike Forecast

陳元昊、黃琮仁、古裕彥、張碩宏

1

Get a Glimpse of the Data
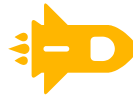
Data Preprocessing & Exploratory Data Analysis

Data Preprocess

Rent Record

sta_id	rent_time	return_time
5	2016/1/10 13:51	2016/1/10 15:00
10	2016/1/21 16:46	2016/1/21 17:10
5	2016/1/14 15:38	2016/1/14 16:24
5	2016/1/16 16:45	2016/1/16 17:21
7	2016/1/1 08:11	2016/1/1 09:05
63	2016/1/6 17:41	2016/1/6 18:11

Station Summary

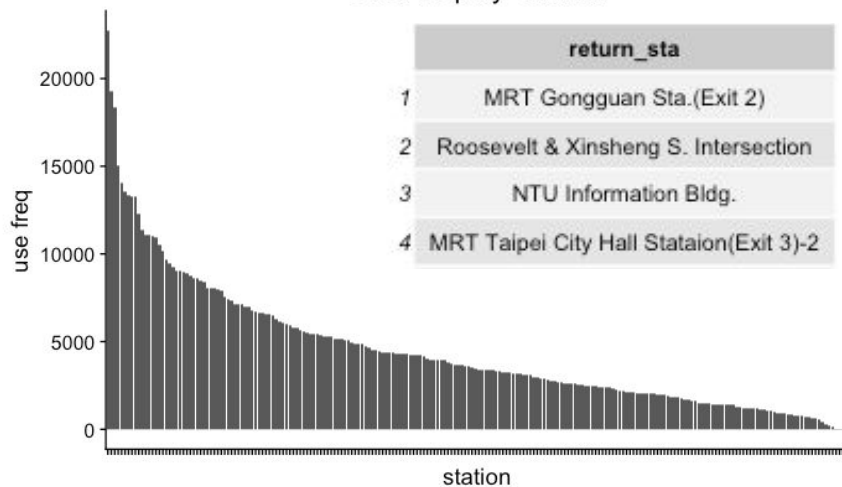| sta_id	period	demand
1	2016/1/1 00:00	0
	...	...
	2016/1/31 23:00	0
2	2016/1/1 00:00	0
	...	...
...	...	...

EDA

Return Freq. by Station

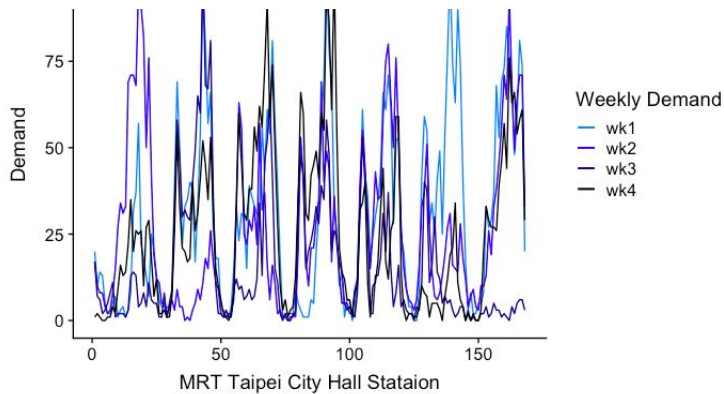|	rent_sta
1	MRT Gongguan Sta.(Exit 2)
2	Roosevelt & Xinsheng S. Intersection
3	MRT Taipei City Hall Stataion(Exit 3)-2
4	NTU Information Bldg.

Use Freq. by Station

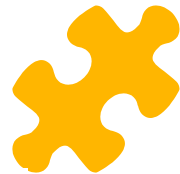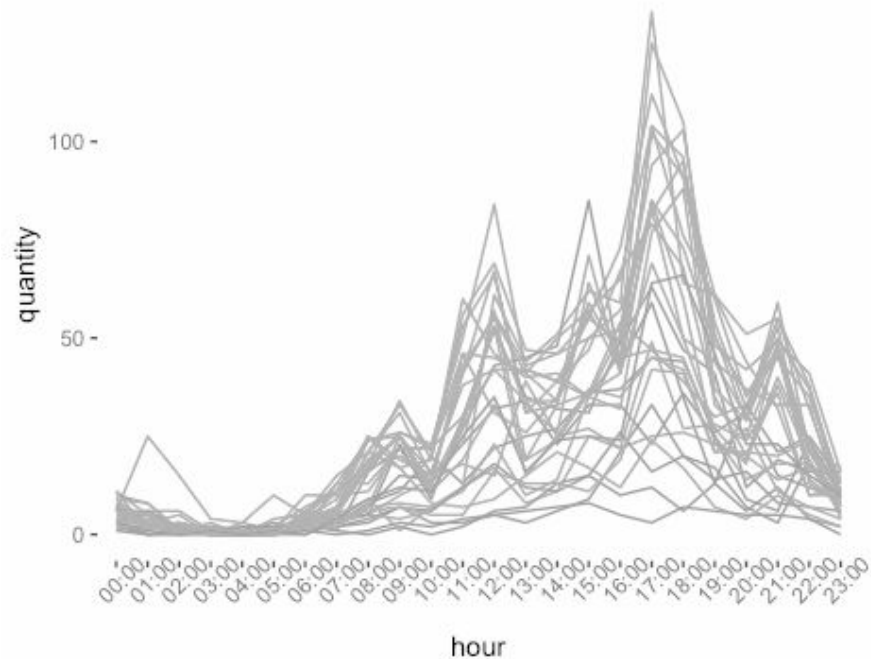|	return_sta
1	MRT Gongguan Sta.(Exit 2)
2	Roosevelt & Xinsheng S. Intersection
3	NTU Information Bldg.
4	MRT Taipei City Hall Stataion(Exit 3)-2
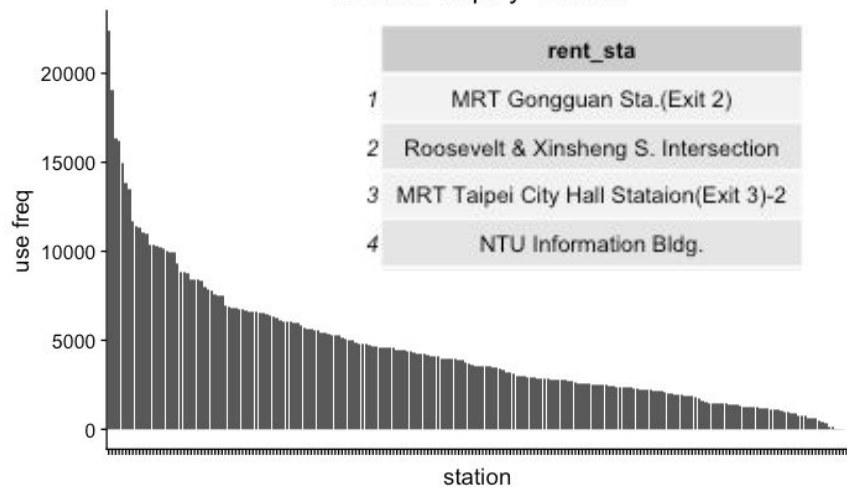
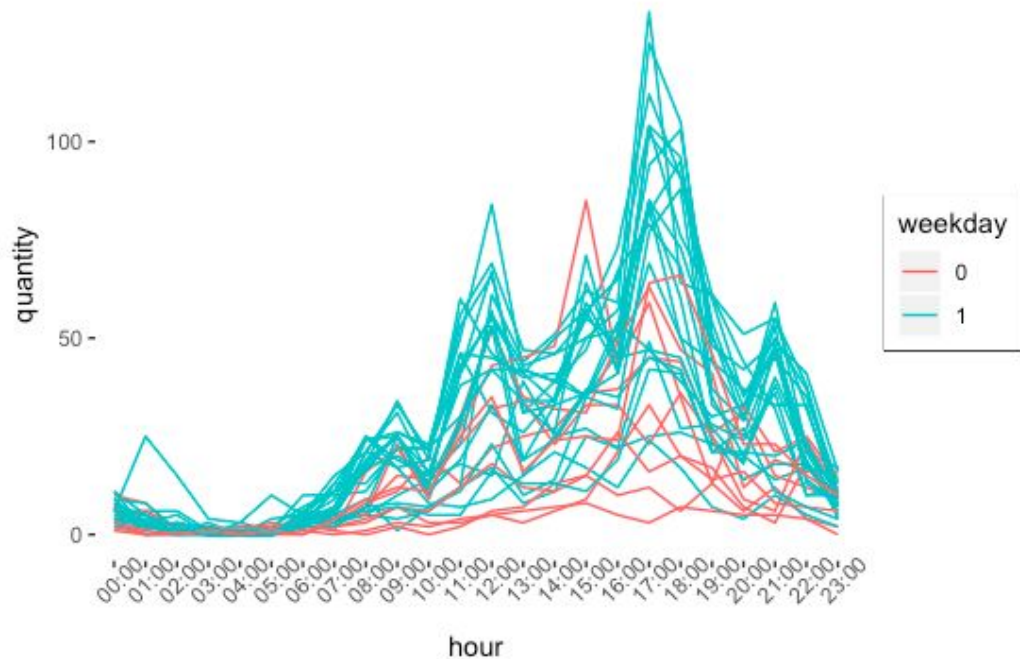# EDA

EDA rent by week

2
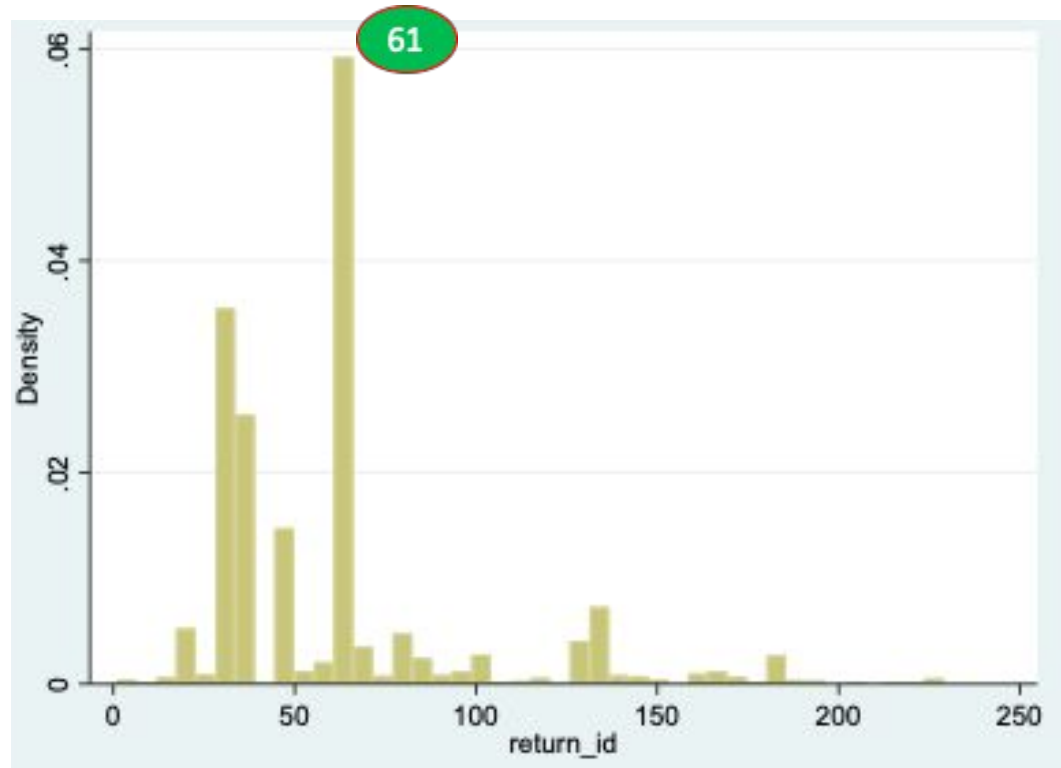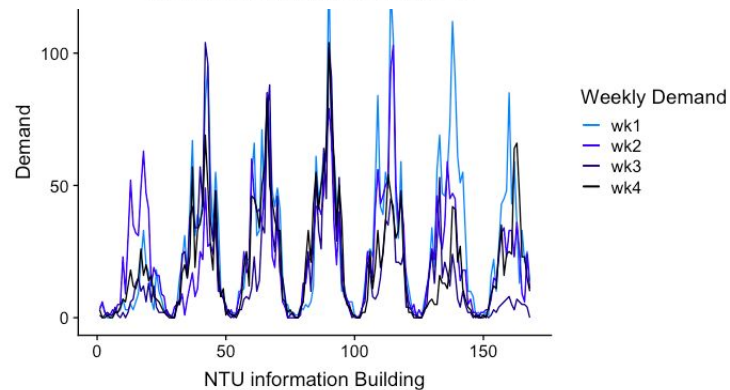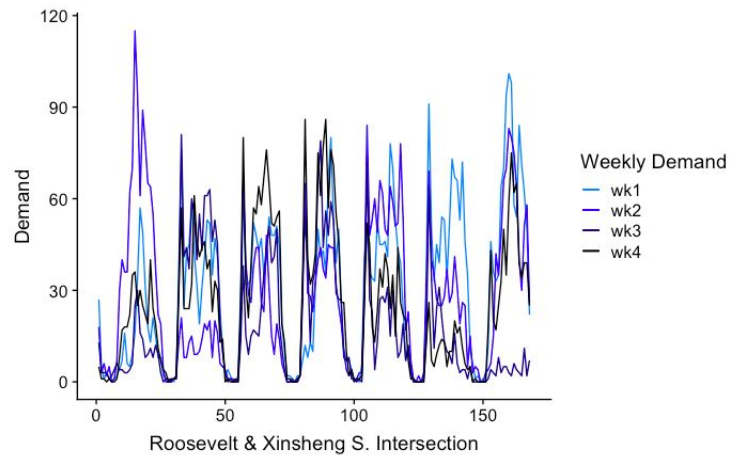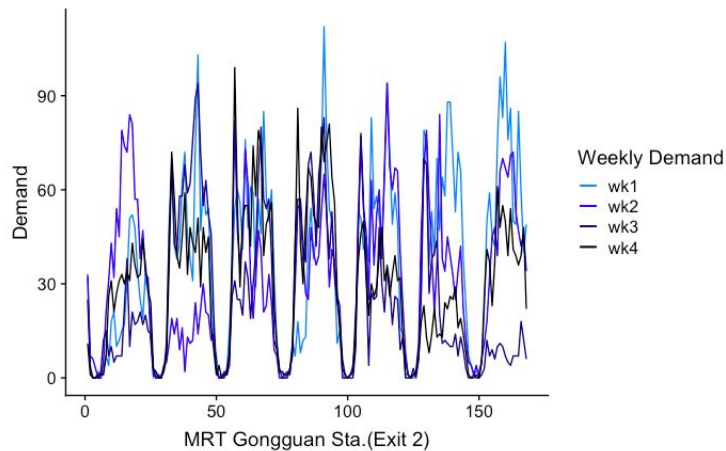
Build up our Models
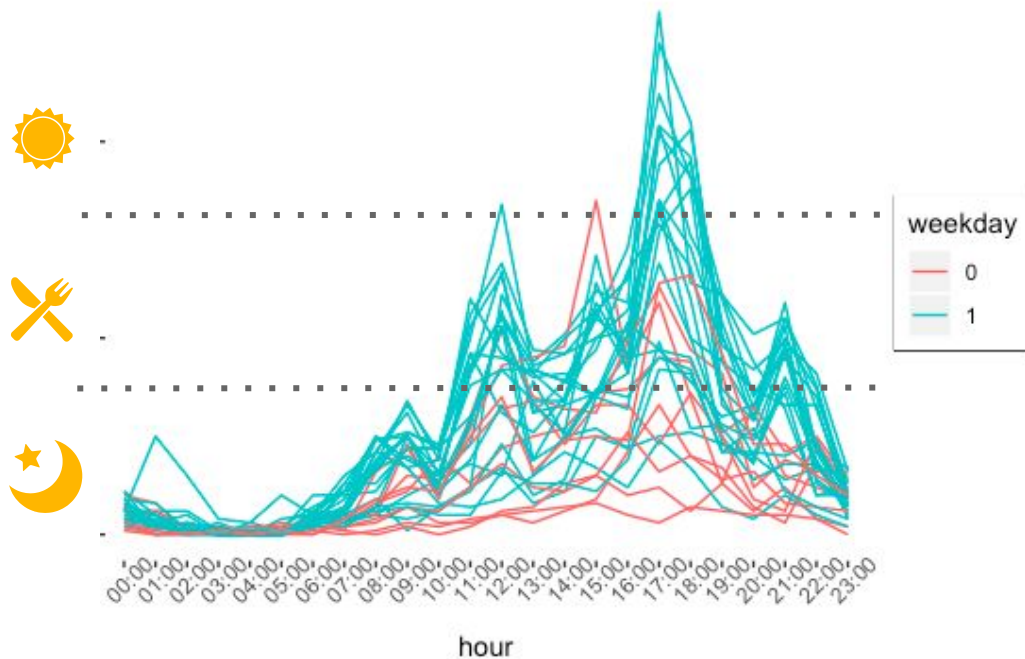
Autoregression Model & Hidden Markov Model
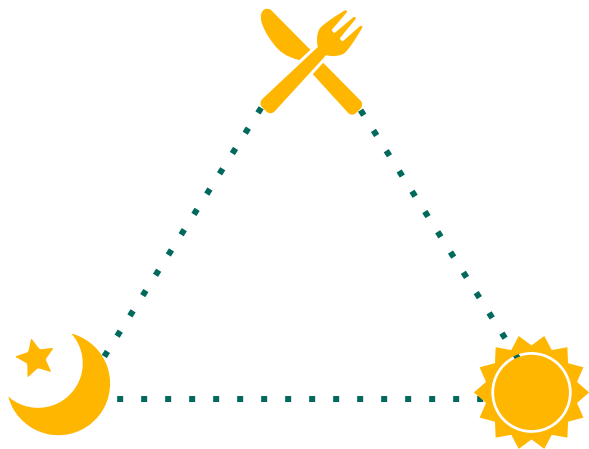
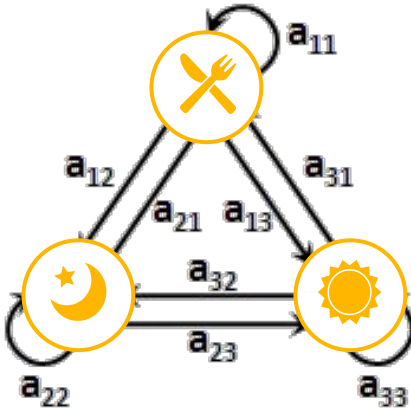# **Intuitive** Model (1)
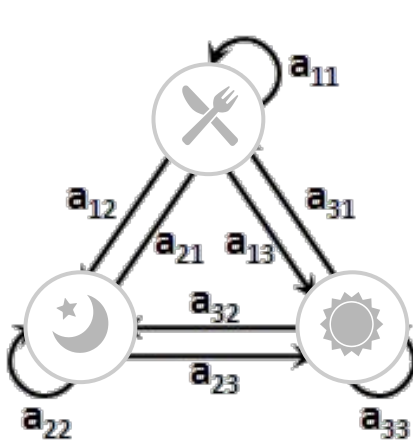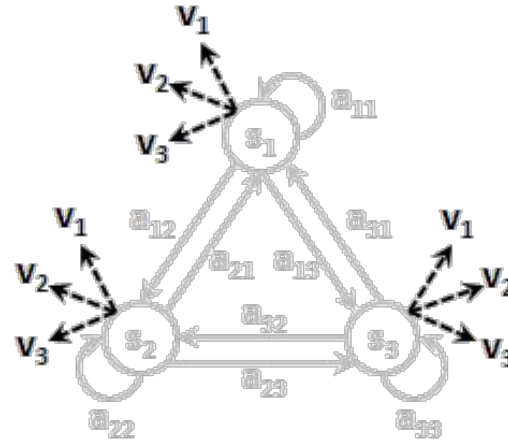
Intuitive Model (1)

Intuitive Model (1)

HMM Model

3 Different States

HMM Model

3 Different States

Demand(i) ~ Poisson(λ(i))

λ = α + β × weekday

α ~lognormal(3, 1)

β ~ lognormal(1, 1)

HMM Model
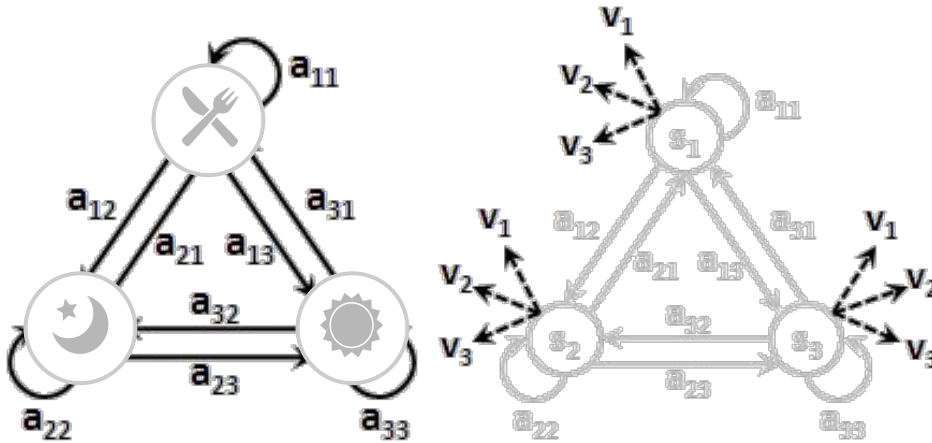
3 Different States

Demand(i) ~ Poisson(λ(i))

$\lambda = \alpha + \beta \times$ weekday

α ~lognormal(3, 1)

β ~ lognormal(1, 1)

Period	State	λ	Pred
2016/1/1 00:00	🌙	1	0
...	...	...	...
2016/1/3 10:00	☀️	30	32
...	...	...	...

Expected Outcome

Backtest
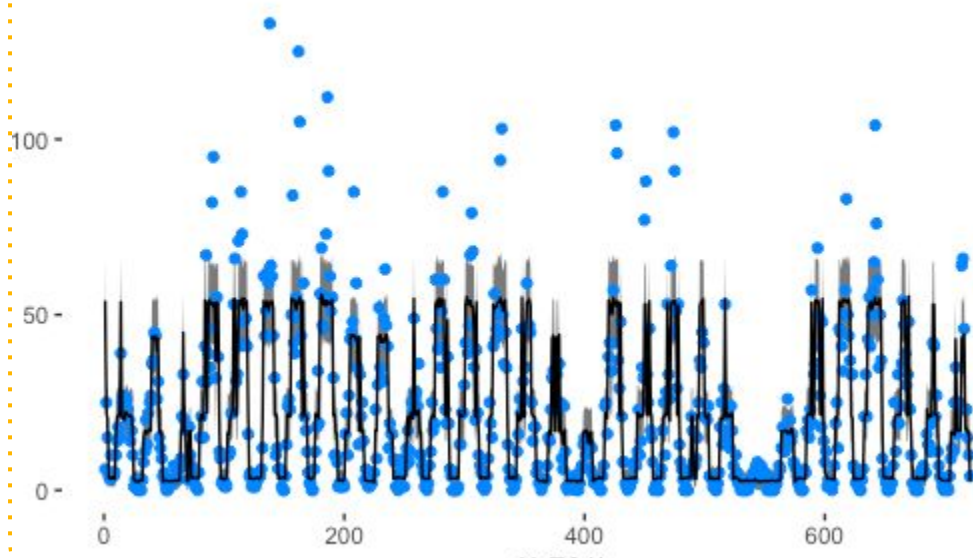
Parameters

$a[1]$	12.26
$a[2]$	1.90
$a[3]$	34.17
$bp[1]$	4.44
$bp[2]$	0.75
$bp[3]$	9.63

Train/Test Split(1)

		week1	week2	week3
	00:00	🌙⭐	🍴	🌙⭐
Mon.	...	...	...	...
	08::00	☀️	🌙⭐	☀️
	...	...	...	...
Tue.	00:00	🌙⭐	🍴	🍴

MODE →

week4
🌙⭐
☀️
🍴

→ Poisson($\lambda1$)
$\lambda1 = \alpha1 + \beta1 \times weekday$

→ Poisson($\lambda2$)
$\lambda2 = \alpha2 + \beta2 \times weekday$

→ Poisson($\lambda3$)
$\lambda3 = \alpha3 + \beta3 \times weekday$

Train/Test Split(1)

		week1	week2	week3		week4	
	00:00	🌙	🍴	🌙		🌙	→ Poisson($\lambda 1$) $\lambda 1 = \alpha 1 + \beta 1 \times$ weekday
Mon.	...	...	...	...	MODE →		
	08::00	☀	🌙	☀		☀	→ Poisson($\lambda 2$) $\lambda 2 = \alpha 2 + \beta 2 \times$ weekday
	...	...	...	...			
Tue.	00:00	🌙	🍴	🍴		🍴	→ Poisson($\lambda 3$) $\lambda 3 = \alpha 3 + \beta 3 \times$ weekday

Train/Test Split(2)

		week1	week2	week3
Mon.	00:00	🌙⭐	🍴	🌙⭐
	...	...	...	...
	08::00	☀️	🌙⭐	☀️
	...	...	...	...
Tue.	00:00	🌙⭐	🍴	🍴

week4
🌙⭐ 🍴
☀️ 🌙
🍴 🌙⭐

Average

⅔ * Poisson($\lambda 1$)
⅓ * Poisson($\lambda 2$)

⅔ * Poisson($\lambda 3$)
⅓ * Poisson($\lambda 1$)

⅔ * Poisson($\lambda 2$)
⅓ * Poisson($\lambda 1$)
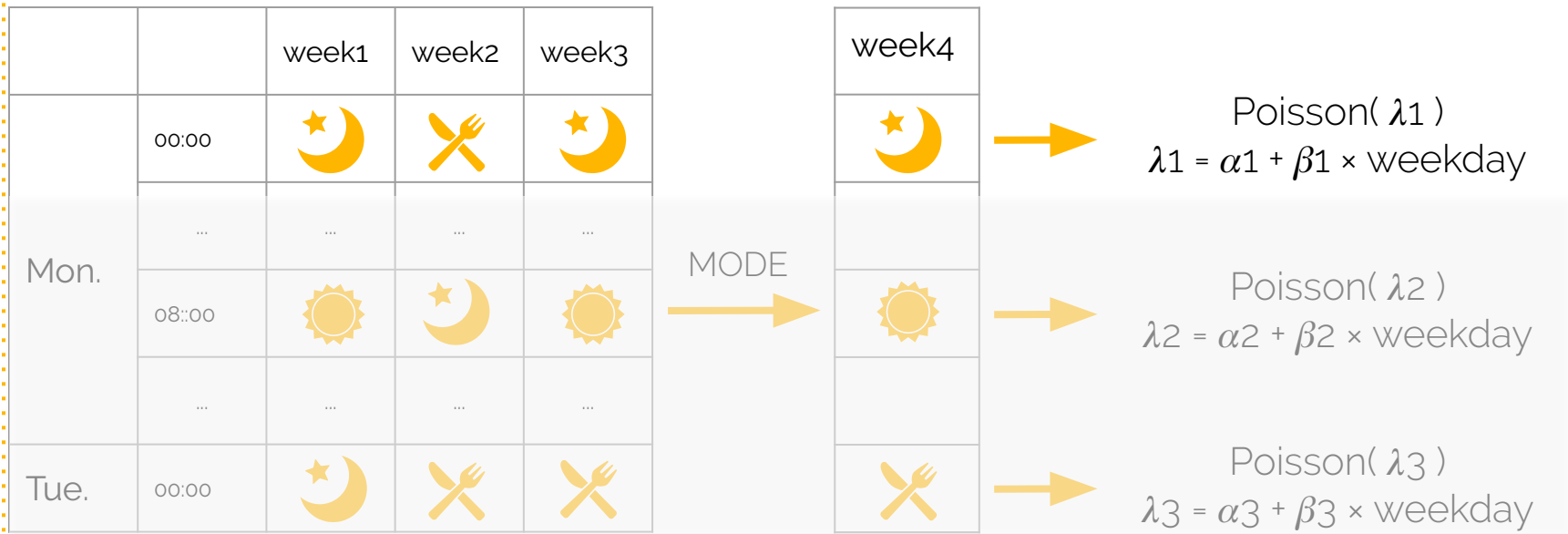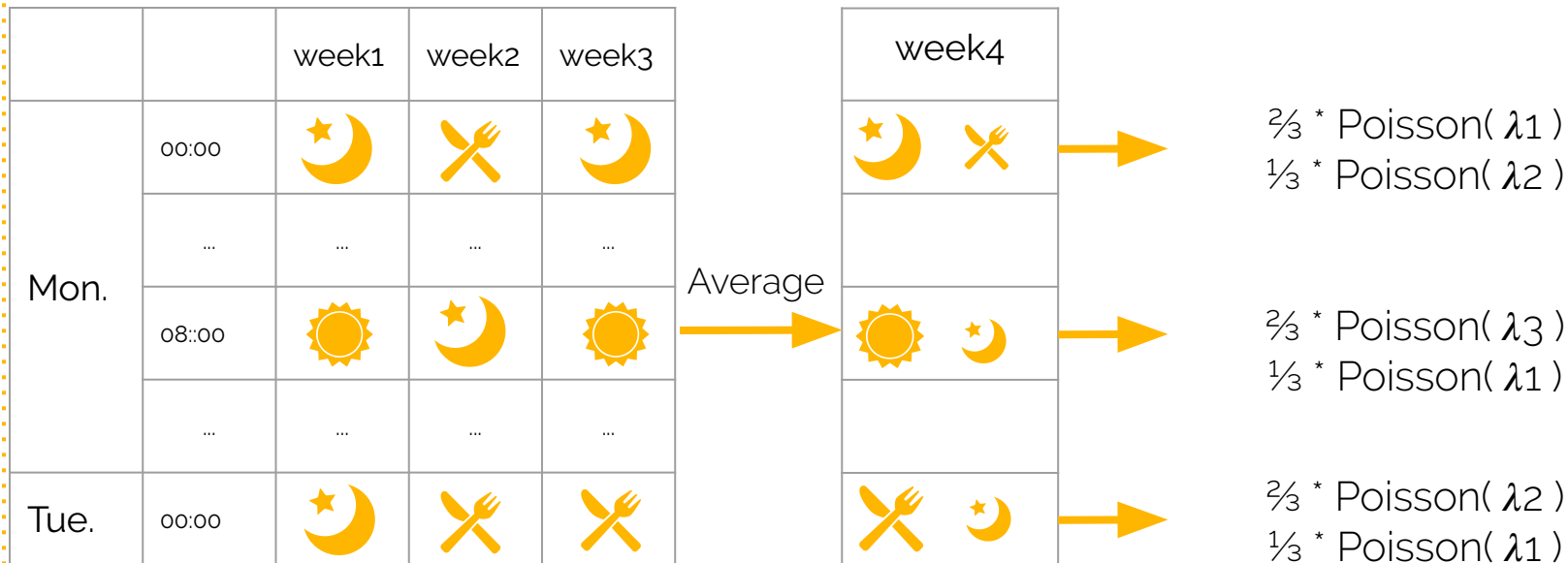
Comparison
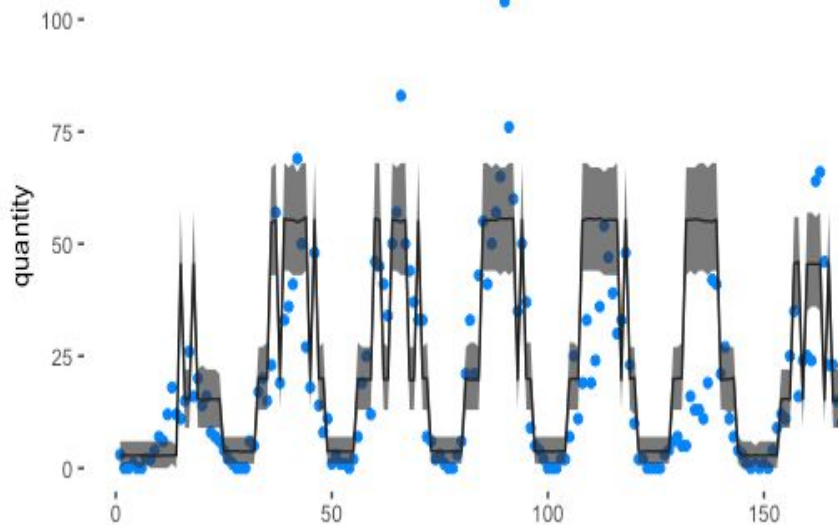
Mode Prediction
RMSE = 14.96
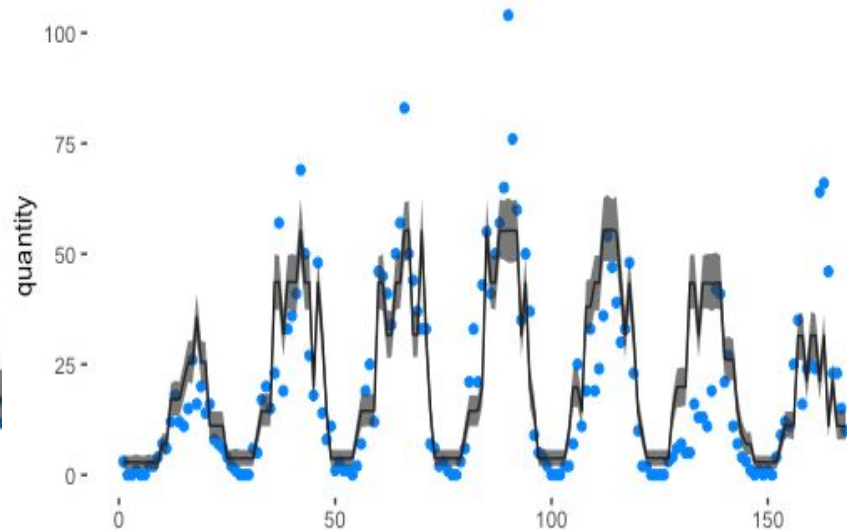
Average Prediction
RMSE = 11.81

Intuitive Model (2)

AR Model

		Day(n-1)		Day(n): N-1 hour	Day(n)
AR Model	00:00				
	...		....		
	24:00				
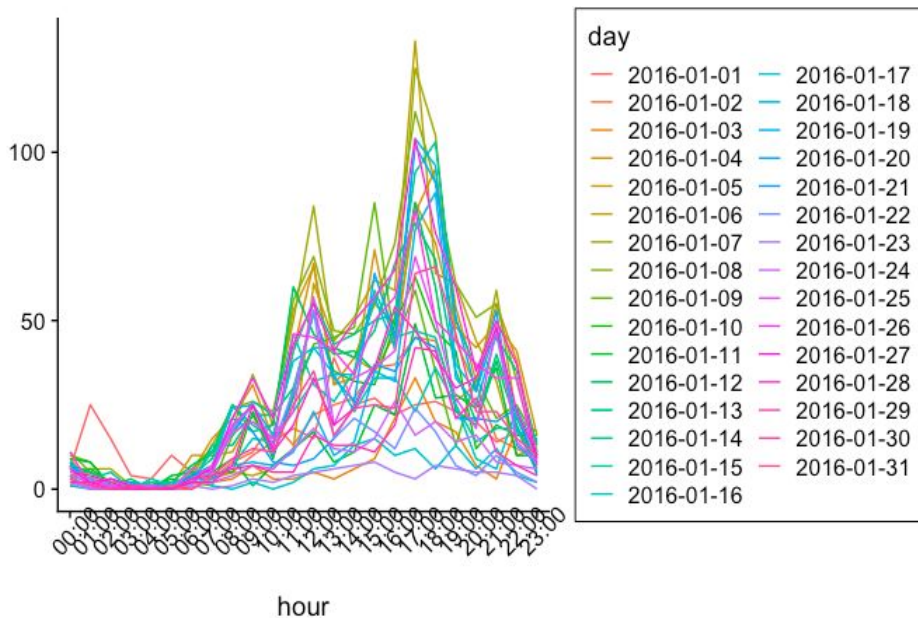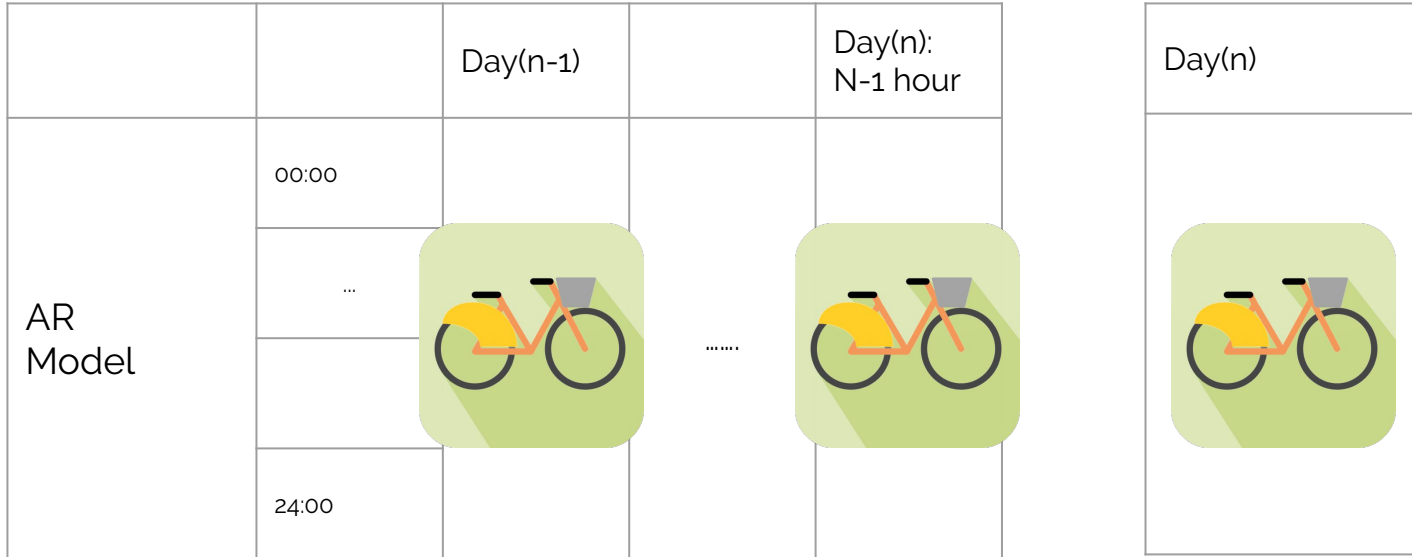
Backtest
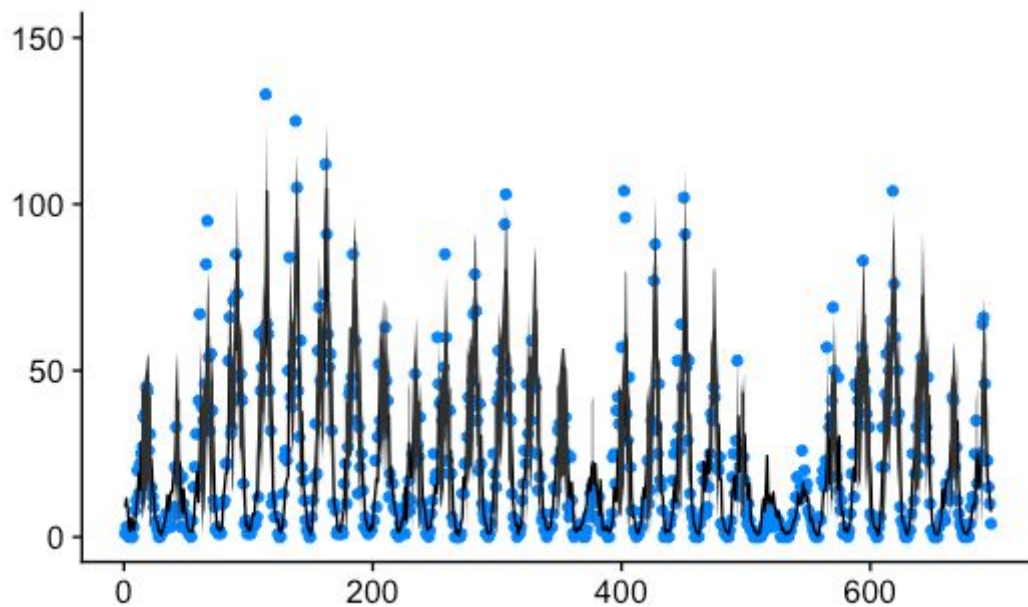
Parameters

alpha	0.87
beta	0.55
beta2	0.40
sigma	12.09

Mode Prediction
RMSE = 12.07

Train/Test Split

		week1	week2	week3		week4
	00:00					
	...					
	24:00					
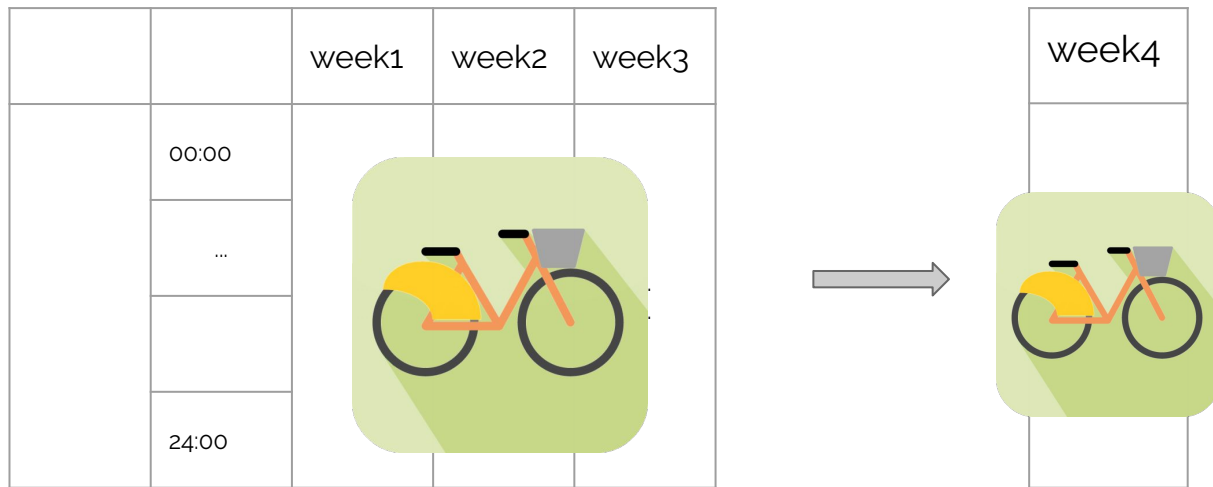
Pred. Result
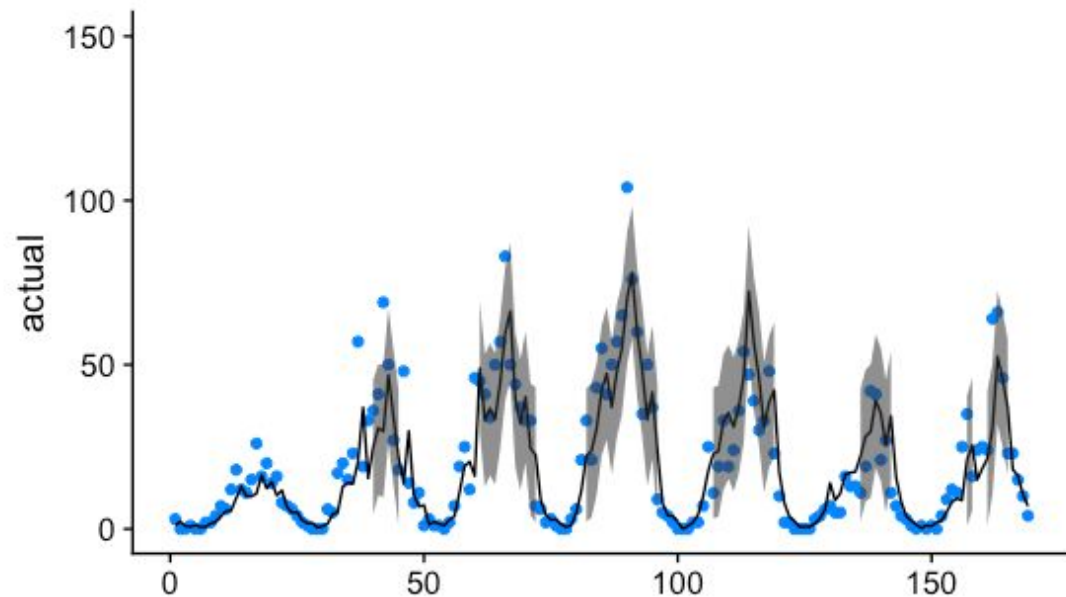
Prediction
RMSE = 10.24

Future Improvement

Weekly Demand
— wk1
— wk2
— wk3
— wk4

NTU information Building
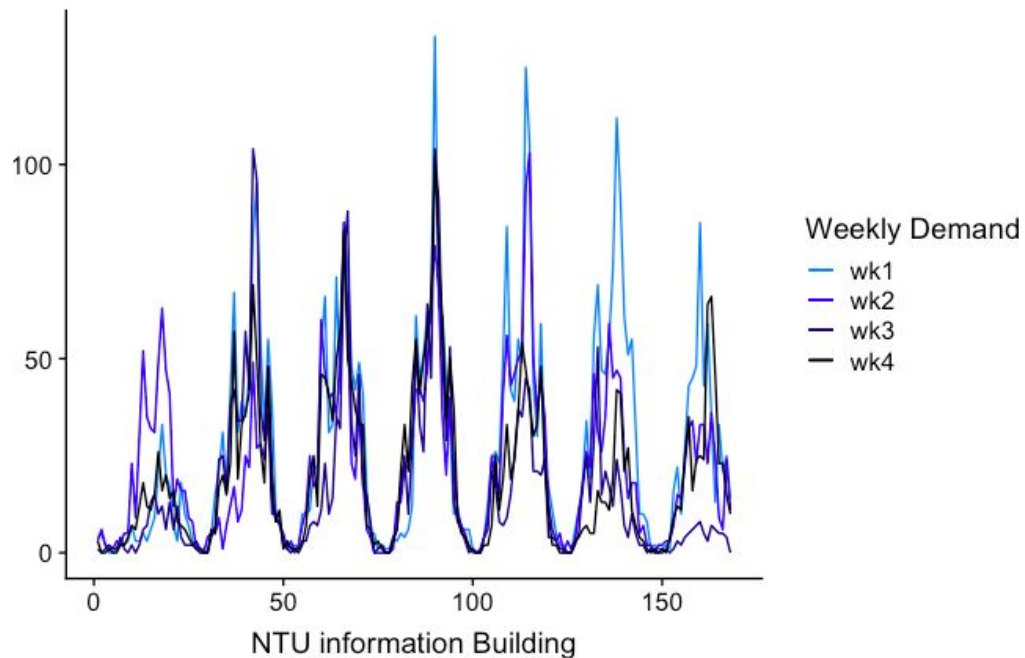
Application in Reality

Out of "bike" Alert System

Model Comp.
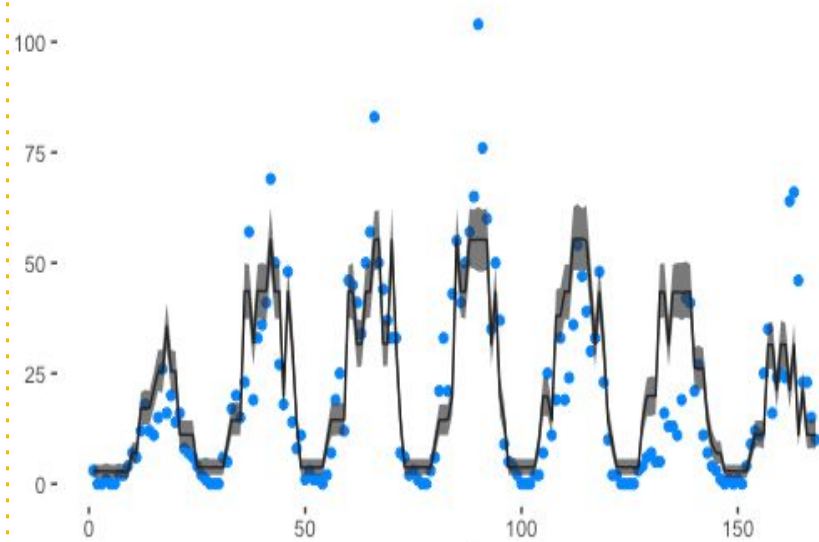
HMM with Aveg Prediction
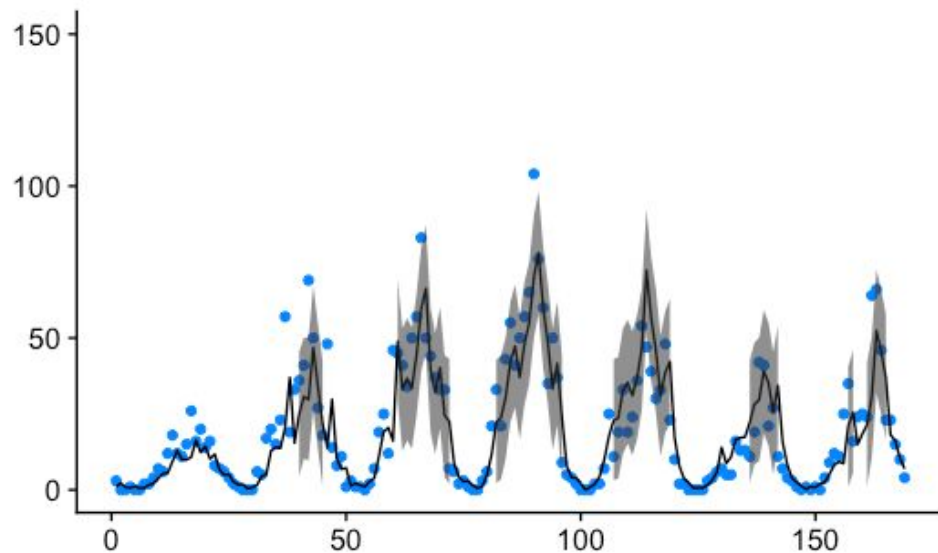
Autoregressive

Location
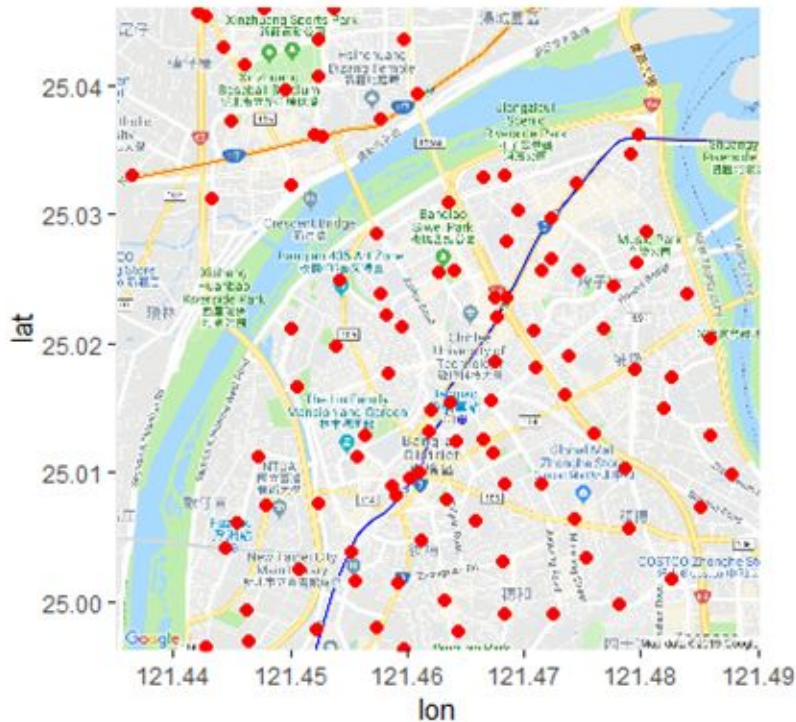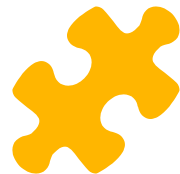
Quotations are commonly printed as a means of inspiration and to invoke philosophical thoughts from the reader.

You can also split your content

White

Is the color of milk and fresh snow, the color produced by the combination of all the colors of the visible spectrum.

Black

Is the color of coal, ebony, and of outer space. It is the darkest color, the result of the absence of or complete absorption of light.

Want big impact?
Use big image.

Use **diagrams** to explain your ideas

Lorem ipsum tempus

Lorem ipsum tempus

Lorem ipsum congue tempus

Lorem ipsum congue tempus
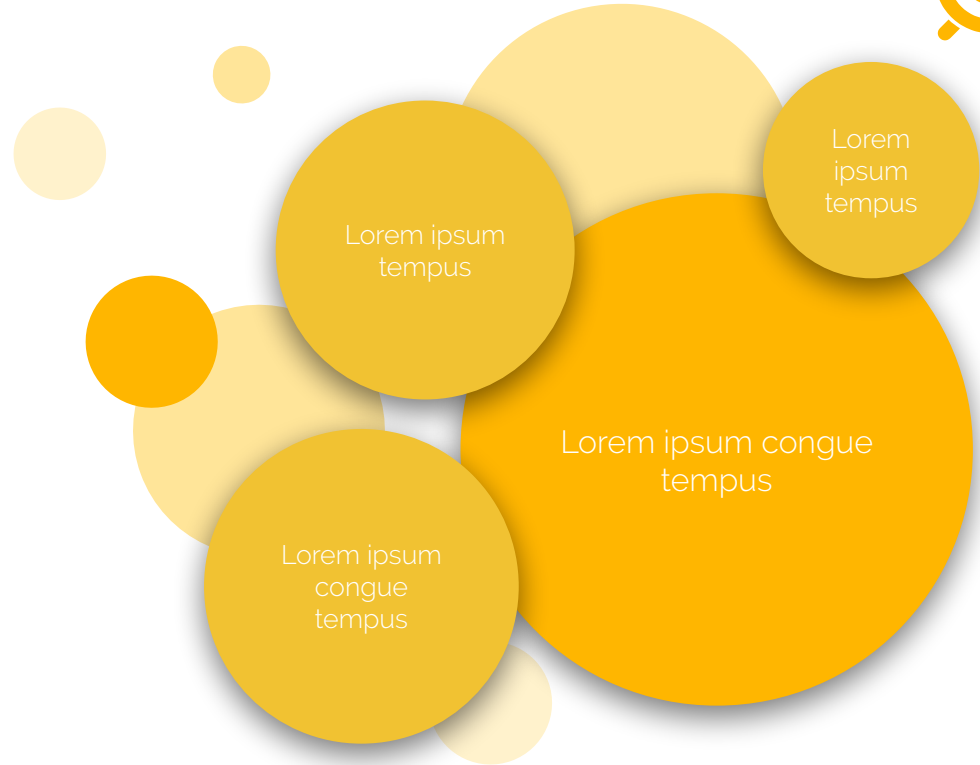
And tables to **compare** data

	A	B	C
Yellow	10	20	7
Blue	30	15	10
Orange	5	24	16

Maps

our office

89,526,124

Whoa! That's a big number, aren't you proud?

89,526,124$
That's a lot of money

185,244 users
And a lot of users

100%
Total success!
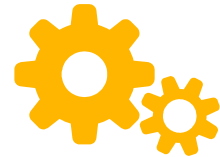
Our process is
easy

first — second — third — last

Lorem Ipsum

Lorem ipsum dolor sit amet, consectetur adipiscing.

Sit Amet

Lorem ipsum dolor sit amet, consectetur adipiscing.

Donec Ultrices

Lorem ipsum dolor sit amet, consectetur adipiscing.

Litora

Lorem ipsum dolor sit amet, consectetur adipiscing.

Let's review some concepts

Yellow

Is the color of gold, butter and ripe lemons. In the spectrum of visible light, yellow is found between green and orange.

Blue

Is the colour of the clear sky and the deep sea. It is located between violet and green on the optical spectrum.

Red

Is the color of blood, and because of this it has historically been associated with sacrifice, danger and courage.
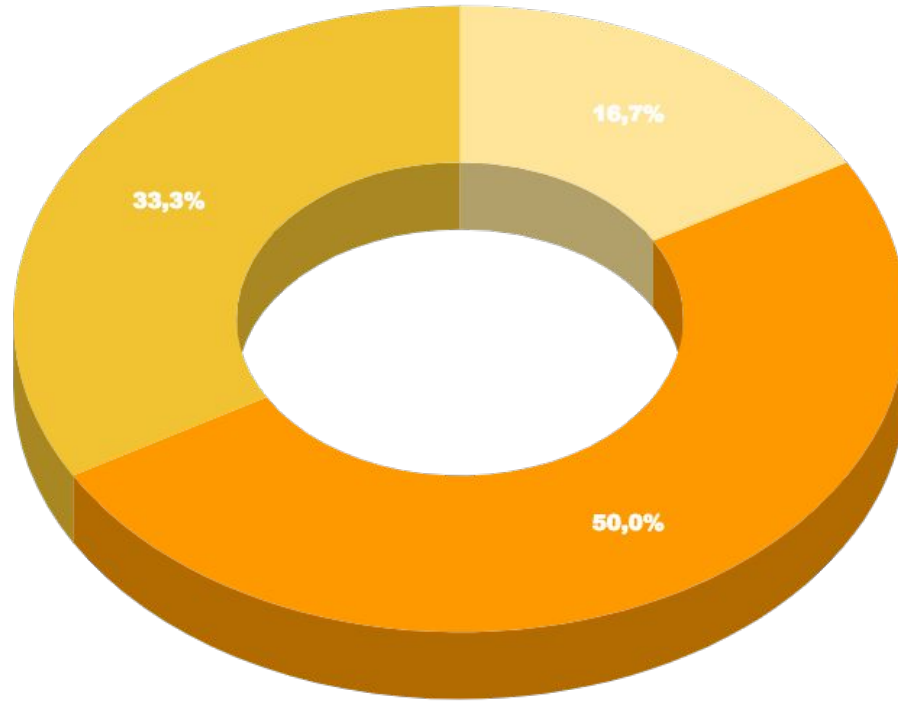
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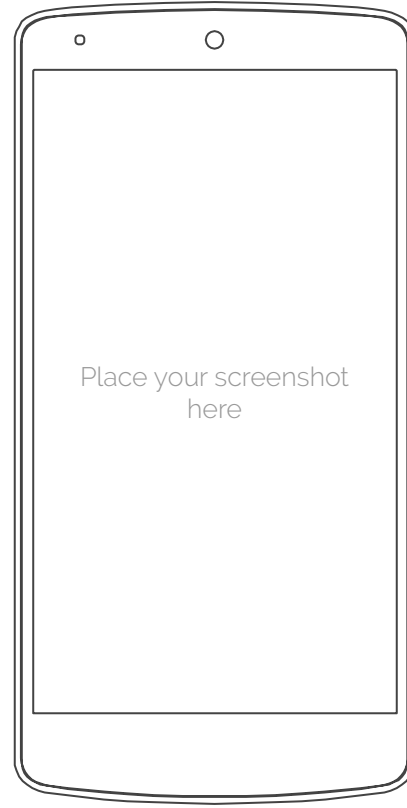
Red

Is the color of blood, and because of this it has historically been associated with sacrifice, danger and courage.

You can insert graphs from Google Sheets

Android
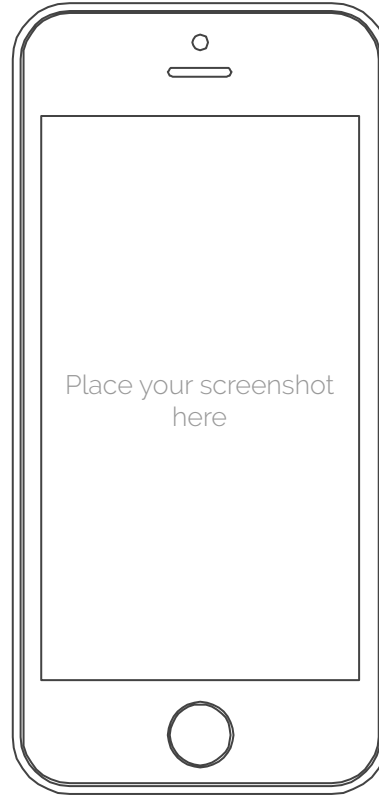# project

Show and explain your web, app or software projects using these gadget templates.

Place your screenshot here

iPhone project

Show and explain your web, app or software projects using these gadget templates.

Place your screenshot here

Tablet
project

Show and explain your web, app or software projects using these gadget templates.

Place your screenshot here
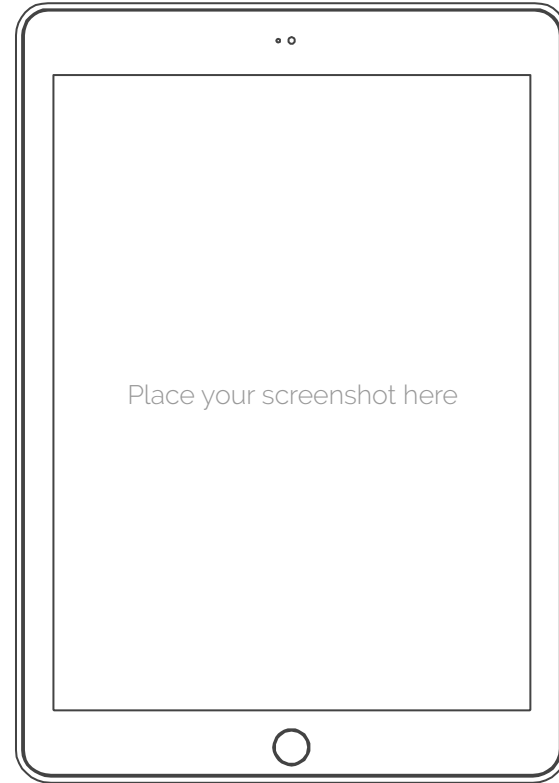
Desktop project

Show and explain your web, app or software projects using these gadget templates.

Place your screenshot here
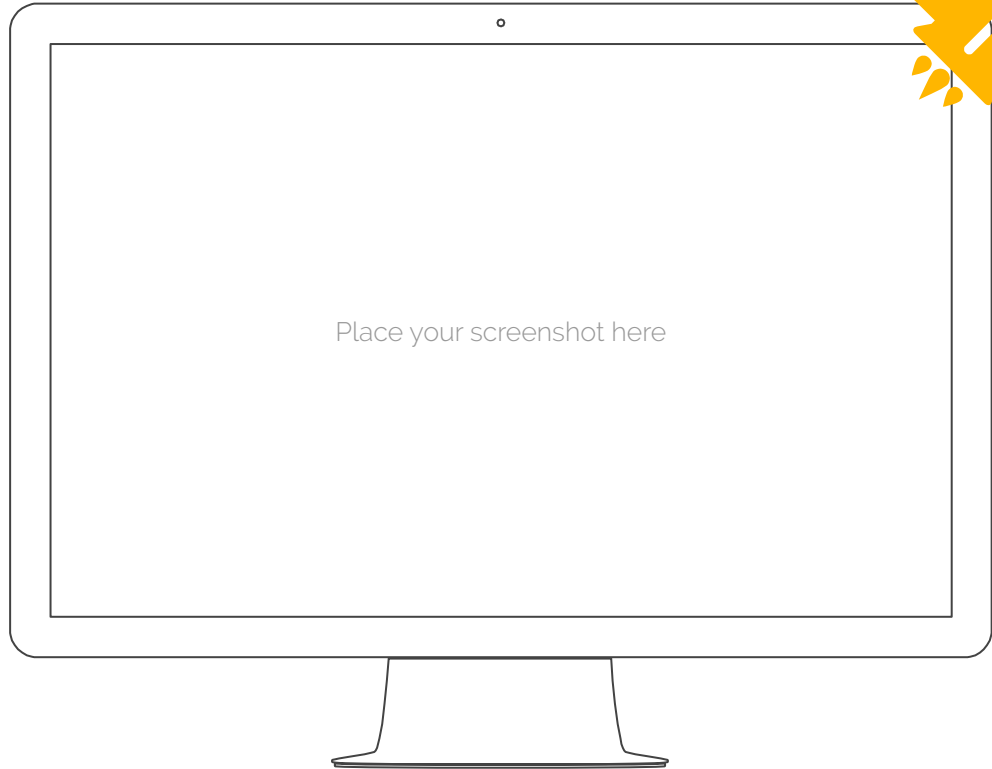
Thanks!

Any questions?

You can find me at @username & user@mail.me

Credits

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by SlidesCarnival
- Photographs by Unsplash

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This presentation uses the following typographies:

- Titles: Raleway ExtraBold
- Body copy: Raleway Light

You can download the fonts at

https://www.fontsquirrel.com/fonts/raleway

You don't need to keep this slide in your presentation. It's only here to serve you as a design guide if you need to create new slides or download the fonts to edit the presentation in PowerPoint®
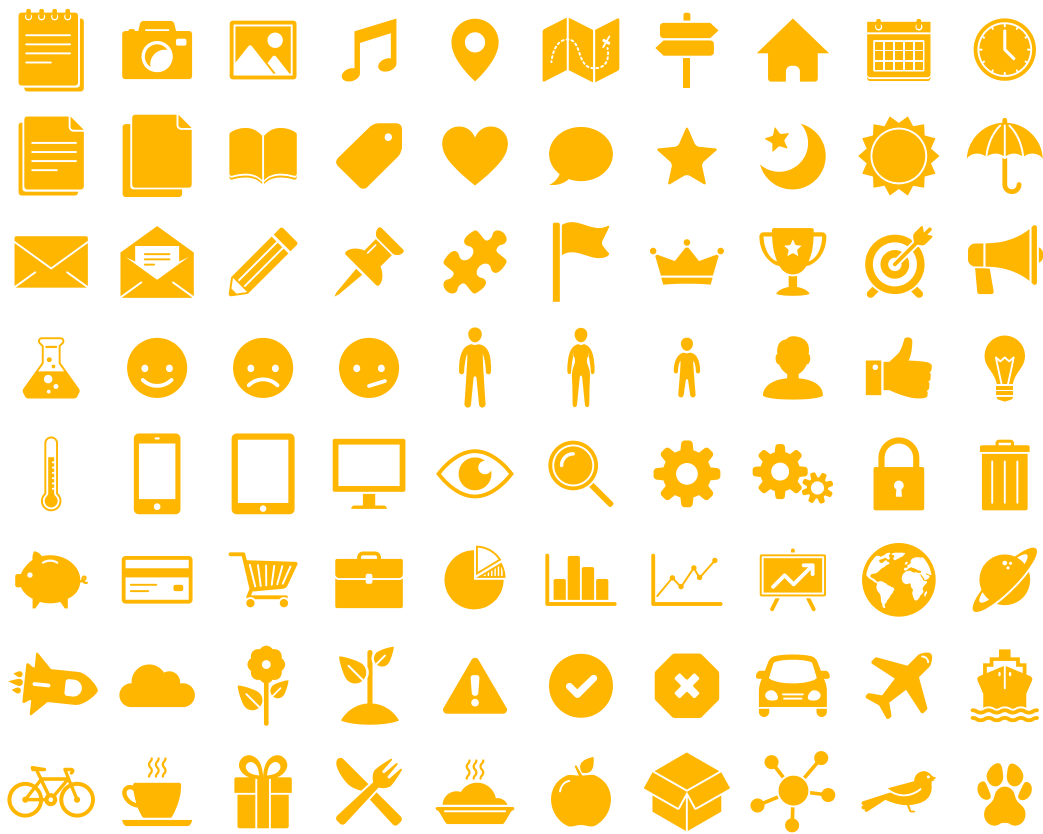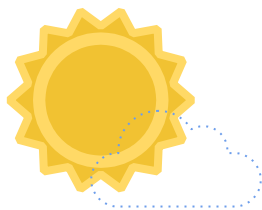
SlidesCarnival icons are editable shapes.

This means that you can:
- Resize them without losing quality.
- Change fill color and opacity.
- Change line color, width and style.

Isn't that nice? :)

Examples:

Now you can use any emoji as an icon!
And of course it resizes without losing quality and you can change the color.

How? Follow Google instructions
https://twitter.com/googledocs/status/730087240156643328

and many more...