

# Implementação de um ANPR Para Fiscalização de Faixa Azul

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Leon Martins



# INTRODUÇÃO

# Problema



1st  
Sistema depende da fiscalização



2nd  
Verificação Manual é trabalhosa e sujeita a falhas



3rd  
Limita a Mobilidade Urbana

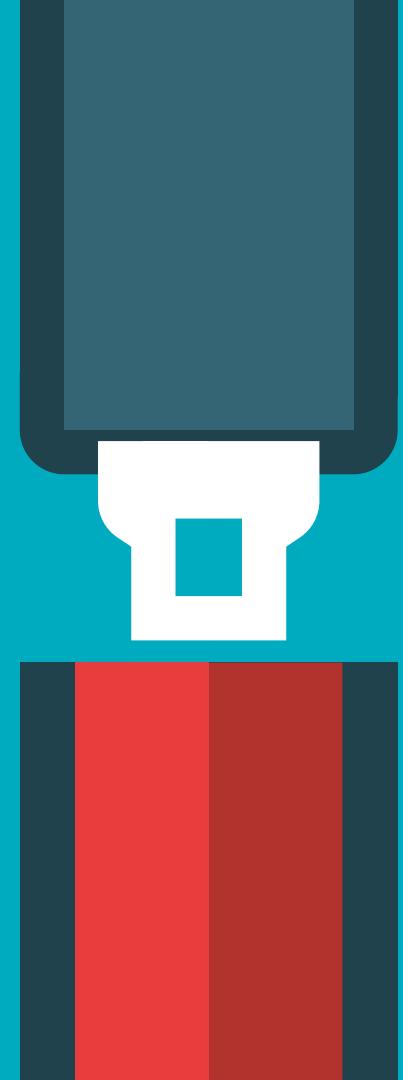
# Objetivo

O1 Automatizar a detecção de infrações

O2 Aumentar a eficiência da fiscalização

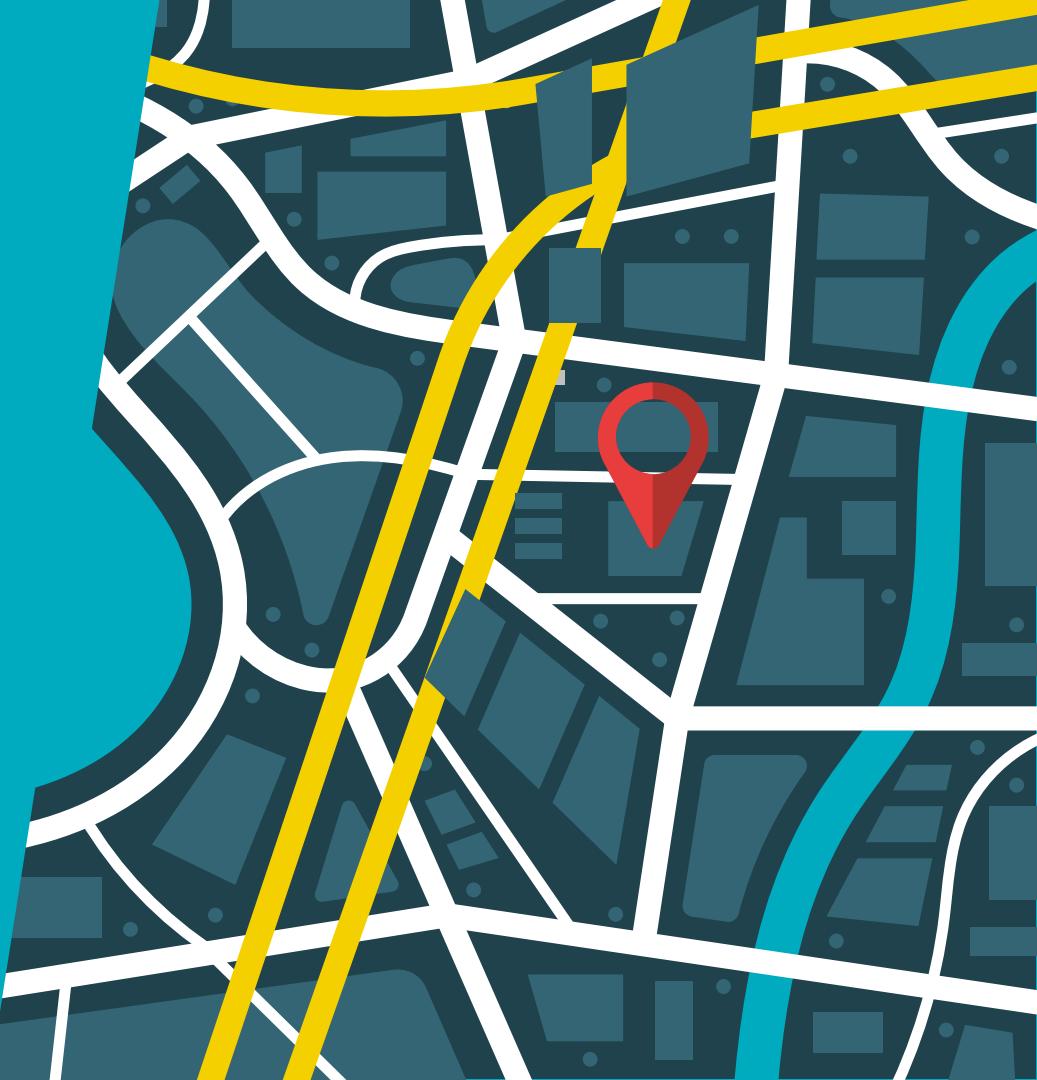
O3 Melhorar a precisão e a confiabilidade

O4 Reduzir o tempo de resposta



# Justificativa

A modernização da fiscalização de faixas azuis é necessário para superar as limitações do sistema vigente



# REVISÃO DE LITERATURA

# Estudos Relacionados

- PATEL, Chirag; SHAH, Dipti; PATEL, Atul. Automatic number plate recognition system (anpr): A survey. *International Journal of Computer Applications*, v. 69, n. 9, 2013.
- TANG, Junqing et al. Automatic number plate recognition (ANPR) in smart cities: A systematic review on technological advancements and application cases. *Cities*, v. 129, p. 103833, 2022.
- CIMIRRO, Jean Lucas da Silva. Reconhecimento de imagens: Uso do método Yolo no reconhecimento de placas de trânsito. 2022.
- PURANIC, Aniruddh; DEEPAK, K. T.; UMADEVI, V. Vehicle number plate recognition system: a literature review and implementation using template matching. *International Journal of Computer Applications*, v. 134, n. 1, p. 12-16, 2016.



# METODOLOGIA

# Ferramentas

**Spring - Java**

API e Server Stream  
Events

**Next/React**

Aplicação web

**Kafka Clusters**

Servidor de comunicação  
entre serviços

**YOLO - Python**

Reconhecimento de  
placas em carros

**Easy Ocr - Python**

Reconhecimento de  
texto em placas

# Etapas de Processamento de Imagens

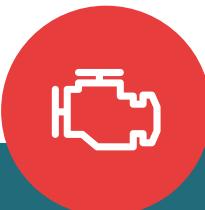
## 1 - Detecção

vasculhar a imagem de um carro para identificar sua placa e recortá-la



## 2 - Reconhecer

preparar imagem cortada para aplicar o OCR

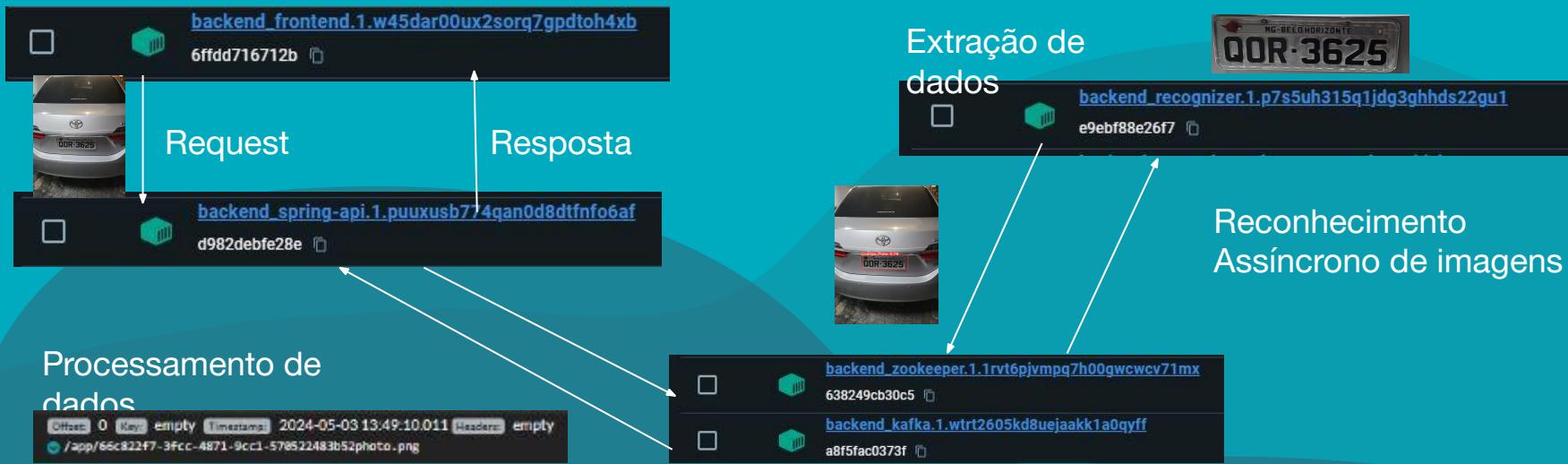


## 3 - Confirmar

A partir de uma API, validar ocorrência de infração

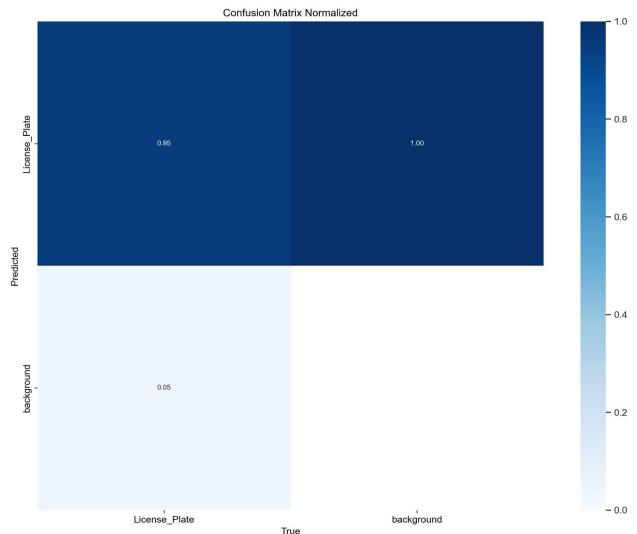
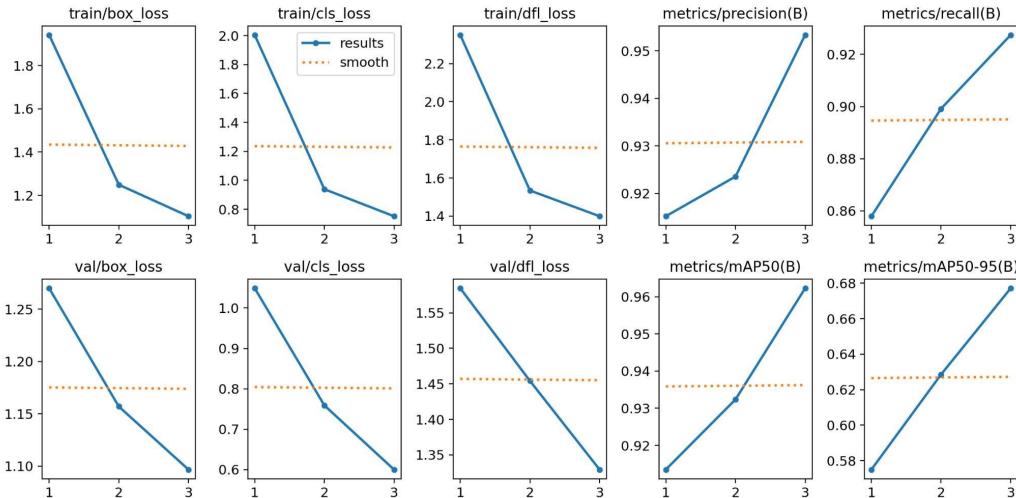


# Fluxo Global de Processamento

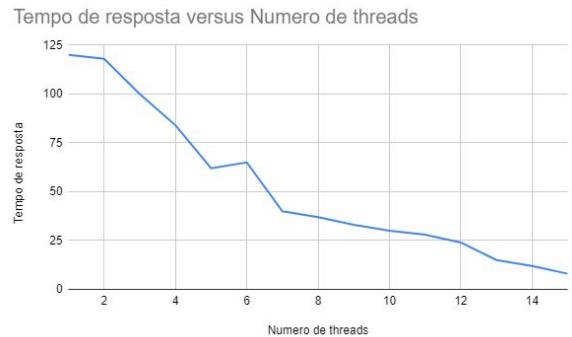


# CONCLUSÃO

# Performance do Yolo<sub>v8</sub>

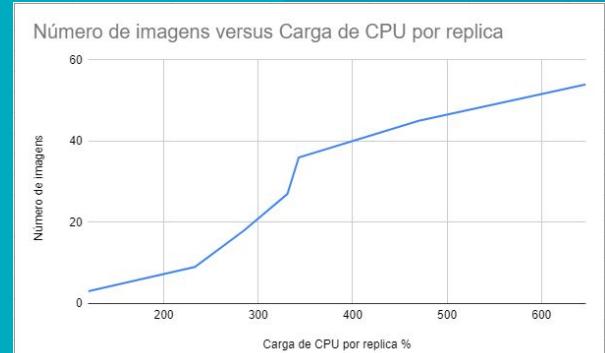
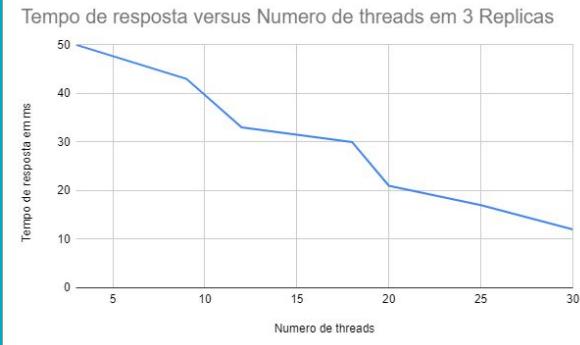


# Métricas de Paralelismo



Conjunto de 50 Fotos

Conjunto de 50 fotos  
com 3 reconhecedores  
ativos

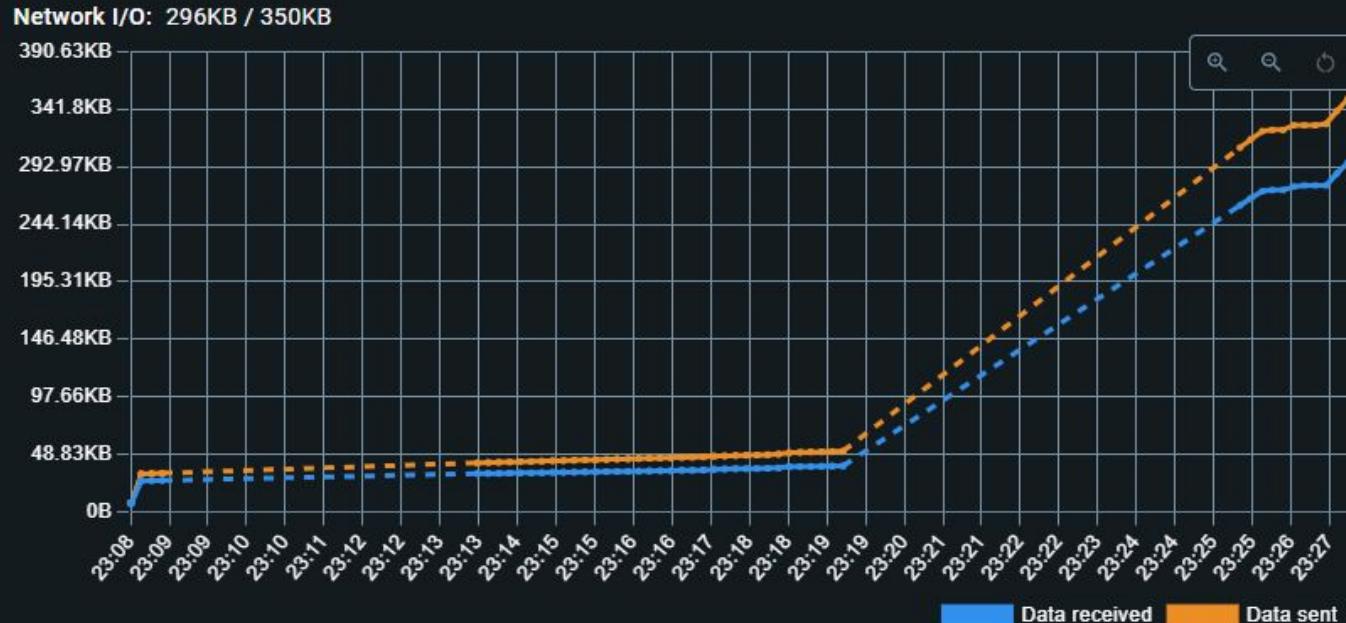


Para 60 fotos  
analizando carga da  
CPU em 3 réplicas

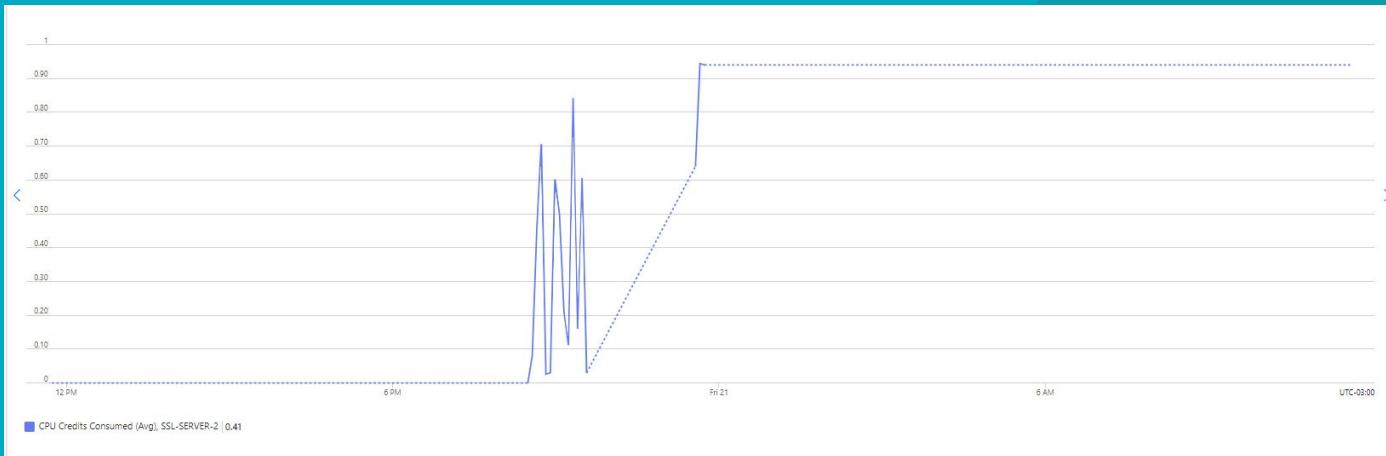
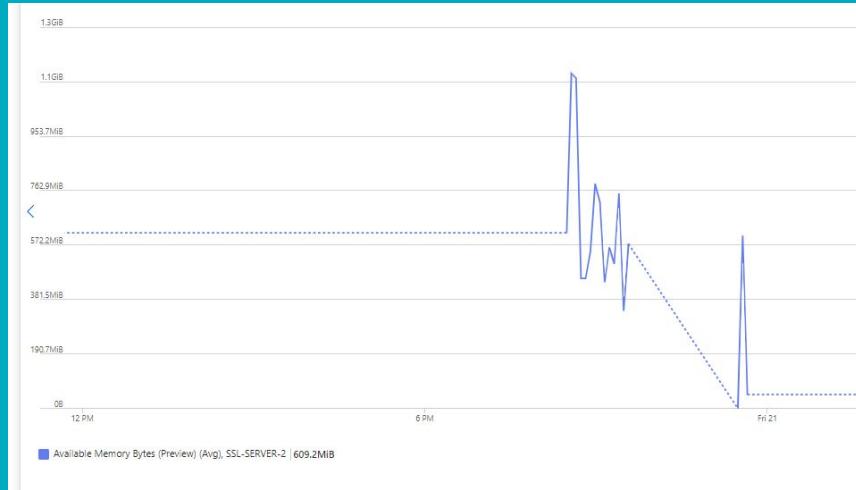
# 60 imagens visualização da memória usada/cpu/dados enviados e disk writes



# Chamadas do kafka entre backend e reconhecedor



# Azure



# OBRIGADO

CREDITS: This presentation template was created by **Slidesgo**, including icons by **Flaticon**, infographics & images by **Freepik** and illustrations by **Stories**





# Contexto

- 20.000 vagas físicas;
- Deveria oferecer 100.000 oportunidades de estacionamento;
- Falta de fiscalização;
- 80% dos motoristas estacionam de forma irregular;
- Soluções tecnológicas estão em estudo para melhorar a fiscalização;



ÚLTIMAS CIDADES ESPORTE POLÍTICA ECONOMIA BBB 24 ENTRETENIMENTO BRASÍLIA CANAL O TEMPO PODCASTS CLASSIFICADOS PROMOÇÕES

Portal O Tempo > Cidades > Artigo

## MONITORAMENTO

# Rotativo em Belo Horizonte terá fiscalização digital

Veículo com sistema eletrônico parecido com o de um radar terá câmera para ler as placas

Por Raquel Penaforte Publicado em 27 de junho de 2019 | 03h00 - Atualizado em 27 de junho de 2019 | 10h16



TIMES

itatiaia®

• Últimas Notícias • Itatiaia Esporte • Cidades • Brasil • Política • Entretenimento

## Sistema de estacionamento rotativo de Belo Horizonte está em colapso, garantem especialistas

Série especial da Itatiaia aponta problemas e alternativas para o sistema da capital mineira

29/11/2022 às 08:58 • Ailton do Vale

# Contents of This Template

Here's what you'll find in this **Slidesgo** template:

1. A slide structure based on a company profile presentation, which you can easily adapt to your needs. For more info on how to edit the template, please visit **Slidesgo School** or read our **FAQs**.
2. An assortment of graphic resources that are suitable for use in the presentation can be found in the **alternative resources** slides.
3. A **thanks** slide, which you must keep so that proper credits for our design are given.
4. Several **resources** slides, where you'll find links to all the elements used in the template.
5. **Instructions for use**.
6. Final slides with:
  - The **fonts and colors** used in the template.
  - A selection of **illustrations**. You can also customize and animate them as you wish with the online editor. Visit **Storyset** to find more.
  - More **infographic resources**, whose size and color can be edited.
  - Sets of **customizable icons** of the following themes: general, business, avatar, creative process, education, help & support, medical, nature, performing arts, SEO & marketing, and teamwork.

You can delete this slide when you're done editing the presentation.

# Table of Contents

O1

About Our  
Company

Here you can describe the  
topic of the section

O2

Services/  
Products

Here you can describe the  
topic of the section

O3

Our  
Clients

Here you can describe the  
topic of the section

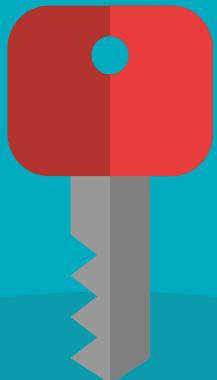
O4

Expected  
Projection

Here you can describe the  
topic of the section

O1

# About Our Company

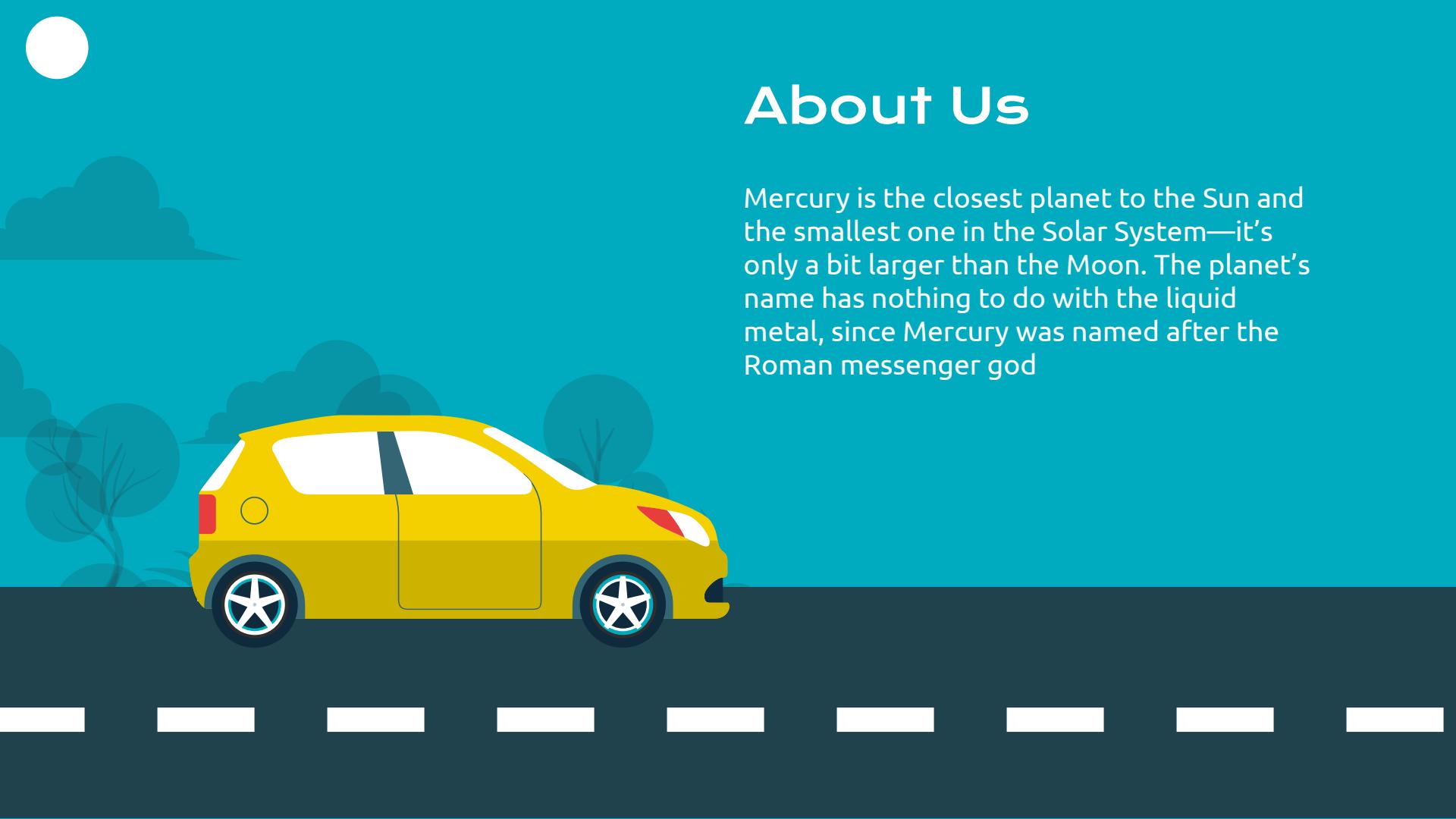


[HOME](#)

# About Us

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. The planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god





# About Us

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. The planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god

# Our Story

2005

Jupiter is the biggest planet of them all

2008

Venus has a beautiful name, but it's hot

2010

Despite being red, Mars is actually a cold place



# Our Story

Jupiter is the biggest planet of them all

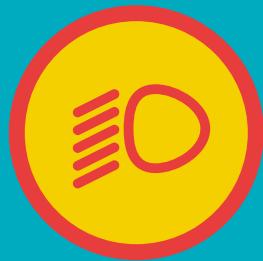
2005

Despite being red, Mars is actually a cold place

2010

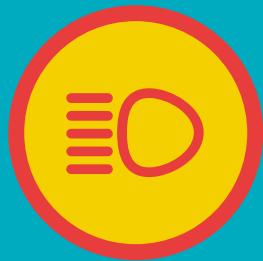
Venus has a beautiful name, but it's hot

# Our Philosophy



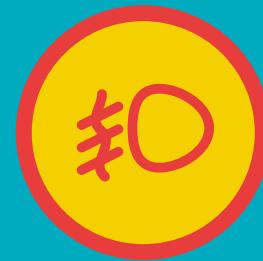
## Mision

Despite being red, Mars is a cold place. It's full of iron oxide dust



## Vision

Mercury is the closest planet to the Sun and the smallest one



## Values

Jupiter is a gas giant and the biggest planet in the Solar System

# Our Philosophy

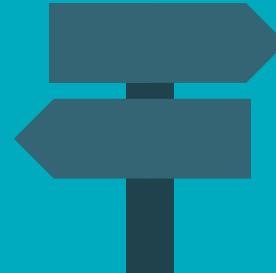
## Mision

Despite being red, Mars is a cold place. It's full of iron oxide dust



## Vision

Mercury is the closest planet to the Sun and the smallest one



## Values

Jupiter is a gas giant and the biggest planet in the Solar System





“This is a quote, words full of wisdom that someone important said and can make the reader get inspired.”



— SOMEONE FAMOUS



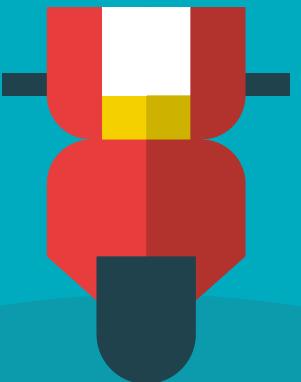
“This is a quote, words full of wisdom that someone important said and can make the reader get inspired.”

—SOMEONE FAMOUS



02

# Services/ Products



# Locations



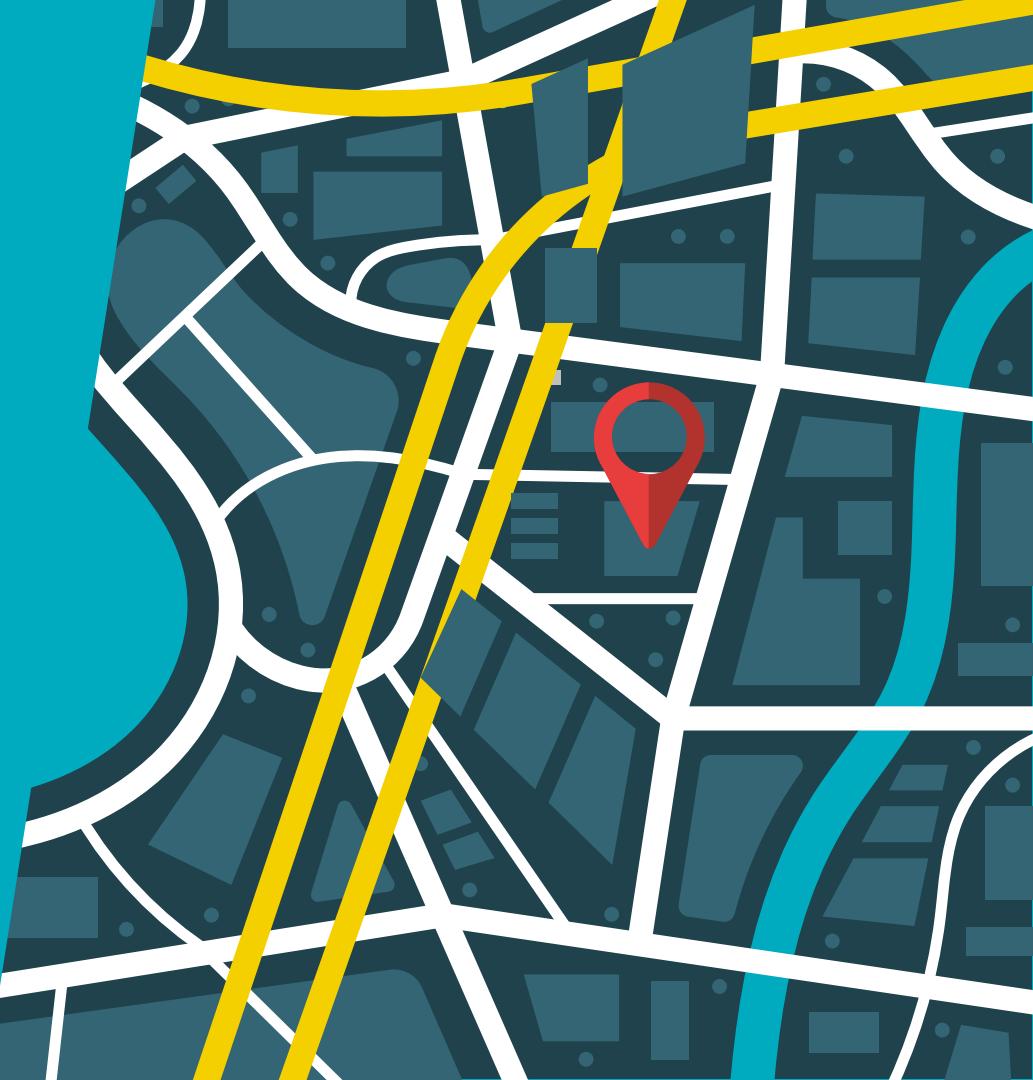
## LICENSES

Find out where all our offices around the world are located in this map

# Locations

## OUR DRIVING CENTER

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon



# Our Services

## MERCURY

Mercury is the closest planet to the Sun



## VENUS

Venus has a beautiful name, but it's terribly hot



## MARS

Despite being red, Mars is a cold place



## JUPITER

It's the biggest planet in the Solar System



## NEPTUNE

Neptune is the farthest planet from the Sun



## SATURN

Saturn is the ringed one and a gas giant



# Our Services

## MERCURY

Mercury is the closest planet to the Sun

## VENUS

Venus has a beautiful name, but it's terribly hot

## MARS

Despite being red, Mars is a cold place

O1

O4

O2

O5

O3

O6

## JUPITER

It's the biggest planet in the Solar System

## NEPTUNE

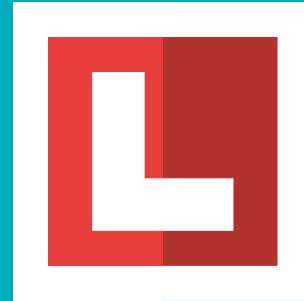
Neptune is the farthest planet from the Sun

## SATURN

Saturn is the ringed one and a gas giant



**AWESOME  
WORDS**



**AWESOME WORDS**



# Best Sellers

**1st** 

Despite being red,  
Mars is actually a  
cold place

**2nd** 

Venus has a quite  
beautiful name, but  
it's terribly hot

**3rd** 

Saturn is the gas  
giant with the rings  
all around it

# Best Sellers

## CAR LICENCE

Despite being red,  
Mars is actually a  
cold place



## BUS LICENCE

Venus has a quite  
beautiful name, but  
it's terribly hot



# Our Strengths

## LOYALTY

Neptune is the farthest planet from the Sun



## RELIABILITY

Mercury is the closest planet to the Sun



## EFFICIENCY

Despite being red, Mars is actually a cold place



## COMMITMENT

Jupiter is the biggest planet in the Solar System



# Our Strengths

## EXCELLENCE

Mercury is the closest planet to the Sun



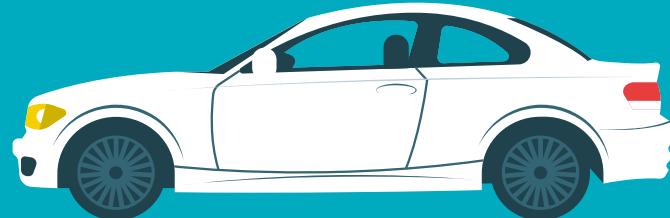
## SECURITY

Jupiter is the biggest planet in the Solar System



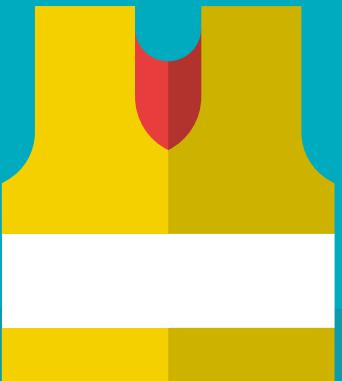
## VITALITY

Neptune is the farthest planet from the Sun



03

## Our Clients



[HOME](#)

# Customer Profile

## GENDER



## AGE



To modify this graph, click on it, follow the link, change the data and paste the new graph here

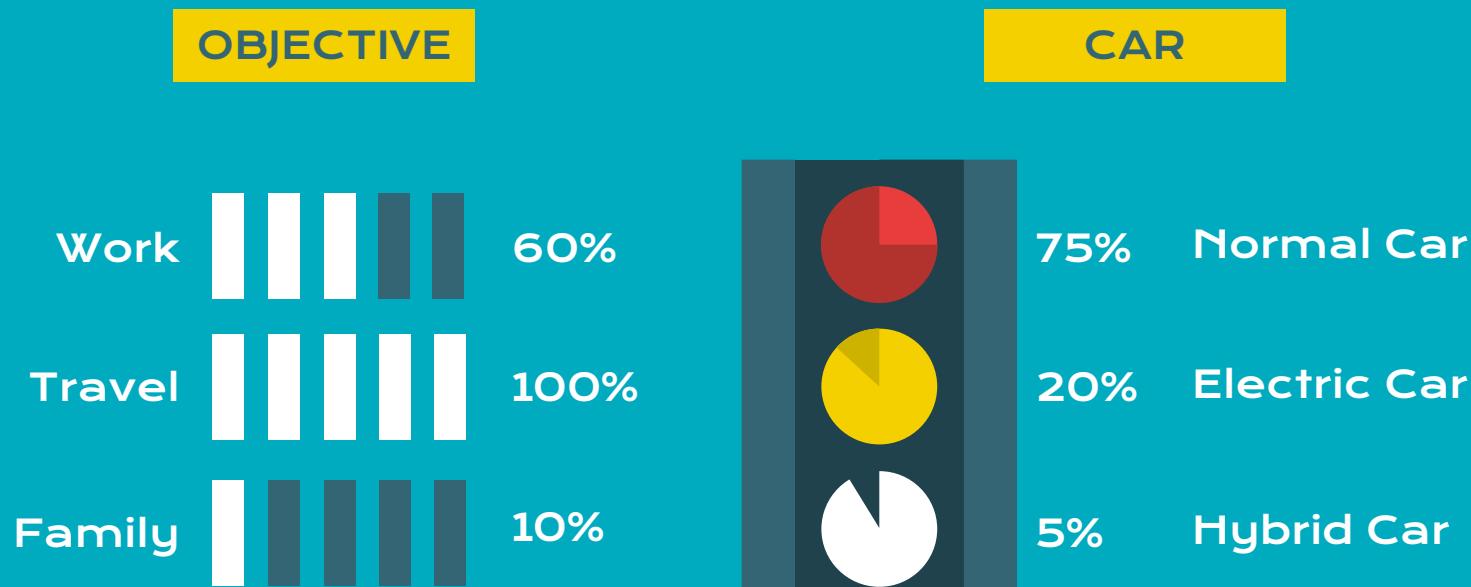
## CLASS -A-



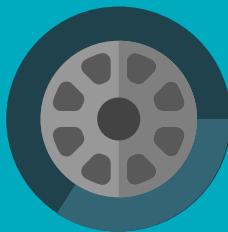
## CLASS -B-



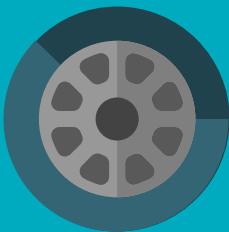
# Customer Profile



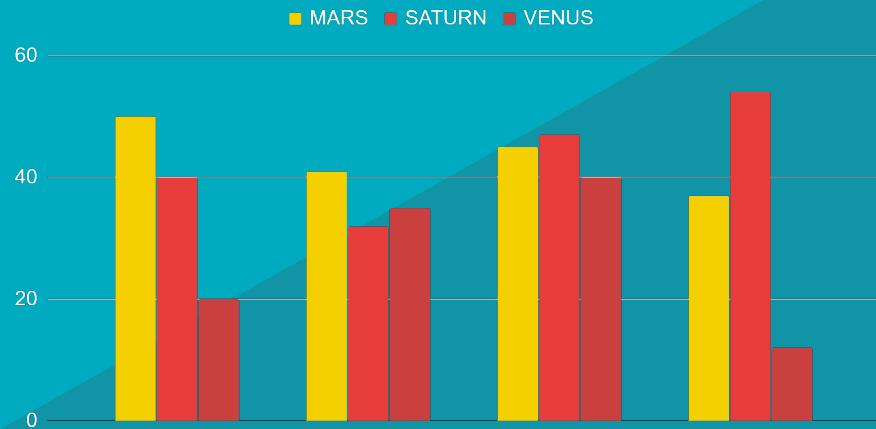
# Our Numbers



**65%**  
Success



**35%**  
Failure



To modify this graph, click on it, follow the link, change the data and paste the resulting graph here

**\$28.87**  
avg. price per unit

**30 DAYS**  
avg. days on market

**45 SHOPS**  
amount of retailers

# Our Numbers



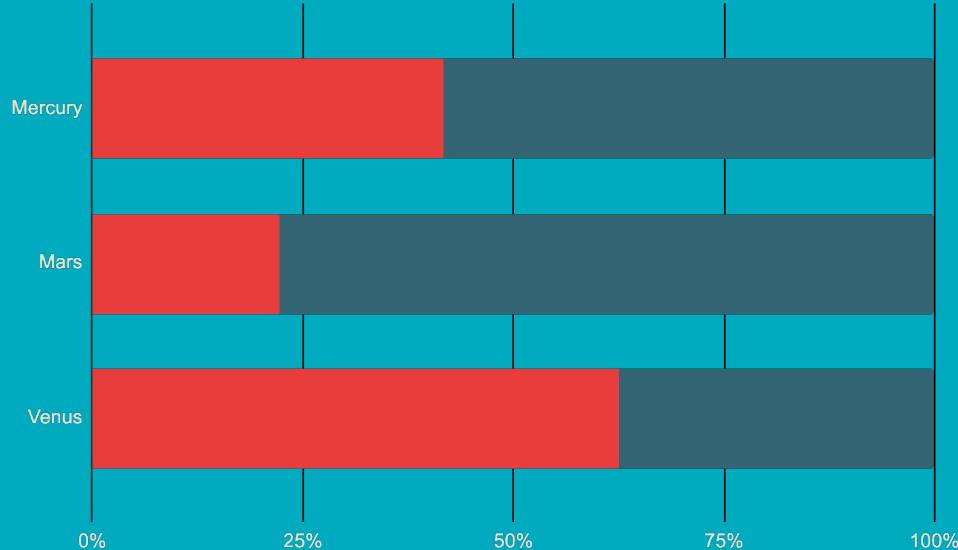
## LICENCES

Mercury is the closest planet to the Sun



## CLASSES

Jupiter is the biggest planet in the Solar System



To modify this graph, click on it, follow the link, change the data and paste the resulting graph here



85,320

NEW DRIVERS EVERY YEAR

7,531

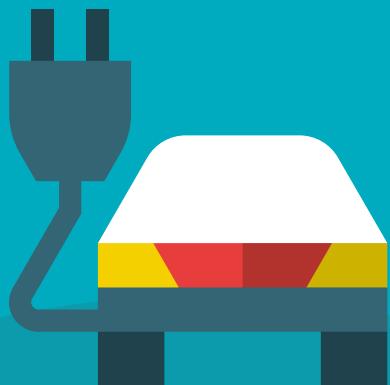
NEW DRIVERS

986

LICENCES THIS YEAR

O4

# Expected Projection



# Our Growth



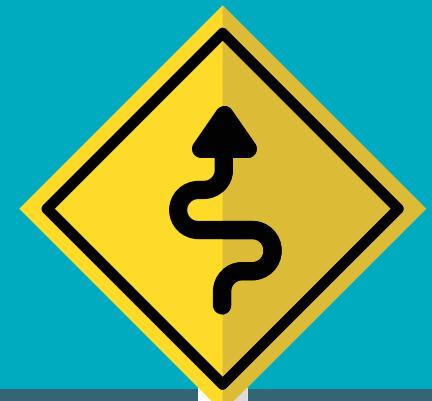
To modify this graph, click on it, follow the link, change the data and paste the resulting graph here

**20,000**

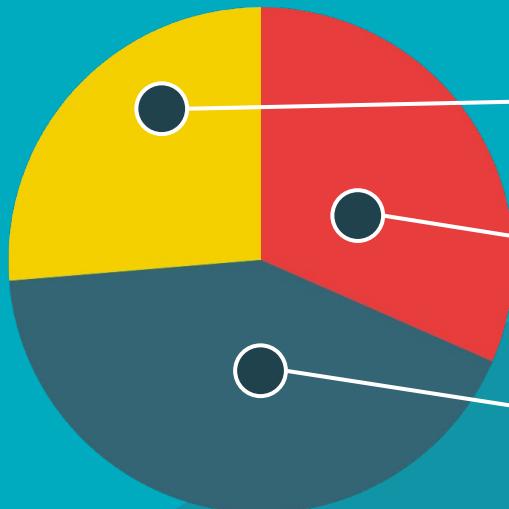
Expected income  
for 2021

**100**

New employees  
next year



# Our Growth



VENUS **26,3%**

It has a beautiful name, but it's hot

MERCURY **31,6%**

Mercury is the closest planet to the Sun

MARS **42,1%**

Despite being red, Mars is a cold place

To modify this graph, click on it, follow the link, change the data and paste the resulting graph here

A photograph of a young man with dark hair and a beard, wearing a denim vest over a white shirt, fastening his seatbelt in the driver's seat of a car. The background shows the interior of the car and some blurred buildings through the window.

A Picture Is  
**Worth** a  
Thousand  
Words



A Picture Is  
Worth a  
Thousand  
Words

# Future Projects

1

MERCURY

Mercury is the closest planet to the Sun

2

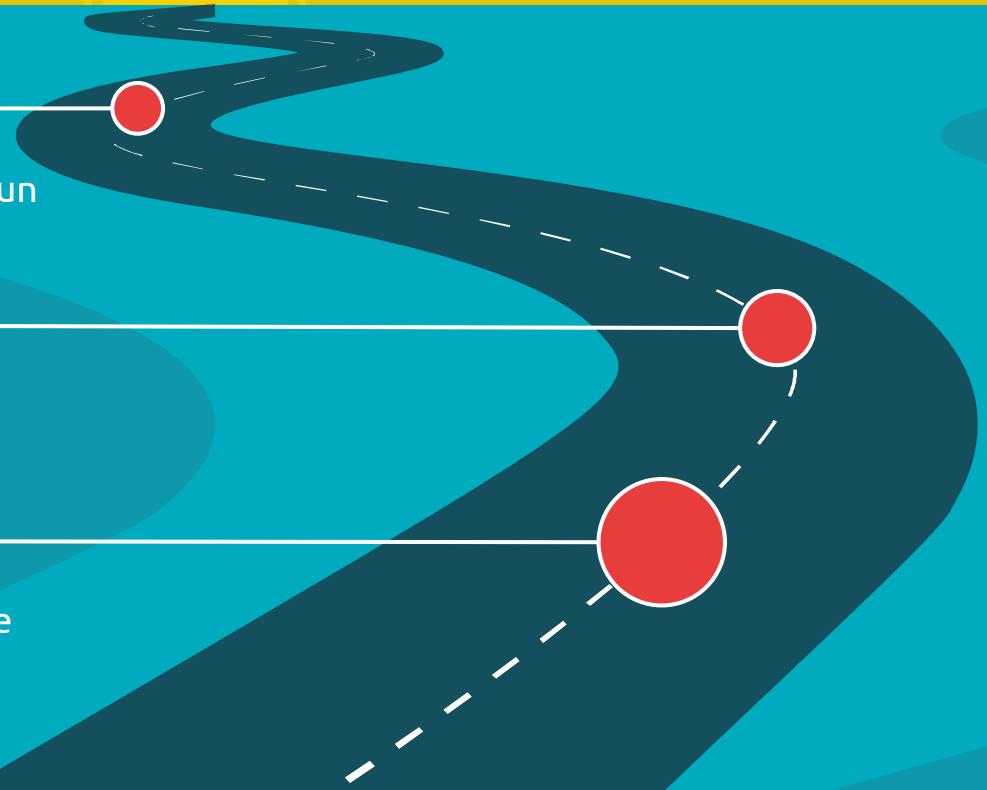
VENUS

It has a beautiful name, but it's hot

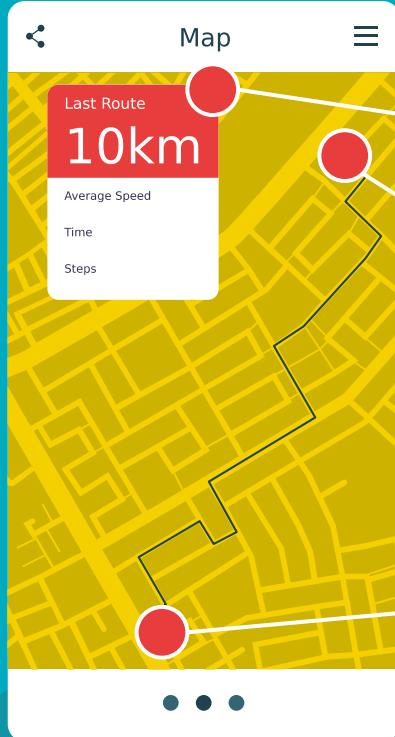
3

MARS

Despite being red, Mars is a cold place



# Future Projects



1

MERCURY

2

VENUS

3

MARS

Mercury is the closest planet to the Sun

It has a beautiful name, but it's hot

Despite being red, Mars is a cold place

# Future Projects

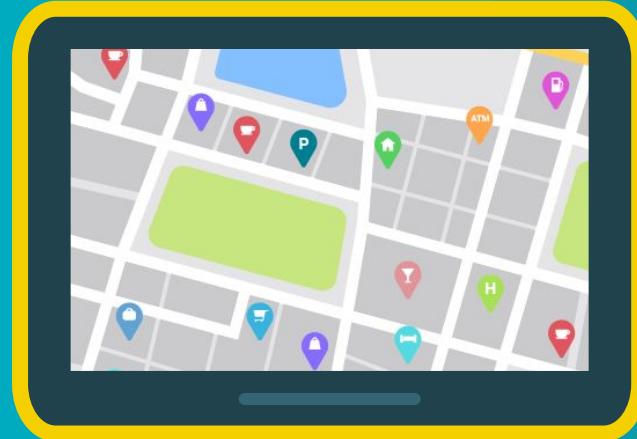
## AI DRIVER TEST

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. The planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god



# Future Projects

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. The planet's name has nothing to do with the liquid metal



# Customer Testimonials



**JOHN PATTERSON**  
**XX.XXXX.XXX**

"Despite being red, Mars is a cold place. The planet is full of iron oxide dust."

XX DRIVER LICENSE XX



**HELENA JAMES**  
**XX.XXXX.XXX**

"Mercury is the closest planet to the Sun and the smallest one in the Solar System."

XX DRIVER LICENSE XX

# Customer Testimonials

xx.xxxx.xxx

**HELENA JAMES**

“Despite being red, Mars is a cold place. The planet is full of iron oxide dust.”

xx.xxxx.xxx

**JOHN PATTERSON**

“Mercury is the closest planet to the Sun and the smallest one in the Solar System.”

xx.xxxx.xxx

**KRISTEN DOE**

“Saturn is the gas giant with the rings all around it.”

# Awards



MERCURY

Mercury is the closest planet to the Sun and the smallest one in the Solar System



VENUS

Venus has a beautiful name and is the second planet from the Sun. It's terribly hot



JUPITER

Despite being red, Mars is actually a cold place. It's full of iron oxide dust

# Awards



## MERCURY

Mercury is the closest planet to the Sun



## VENUS

Venus has a beautiful name, but it's terribly hot



## MARS

Despite being red, Mars is a cold place



## JUPITER

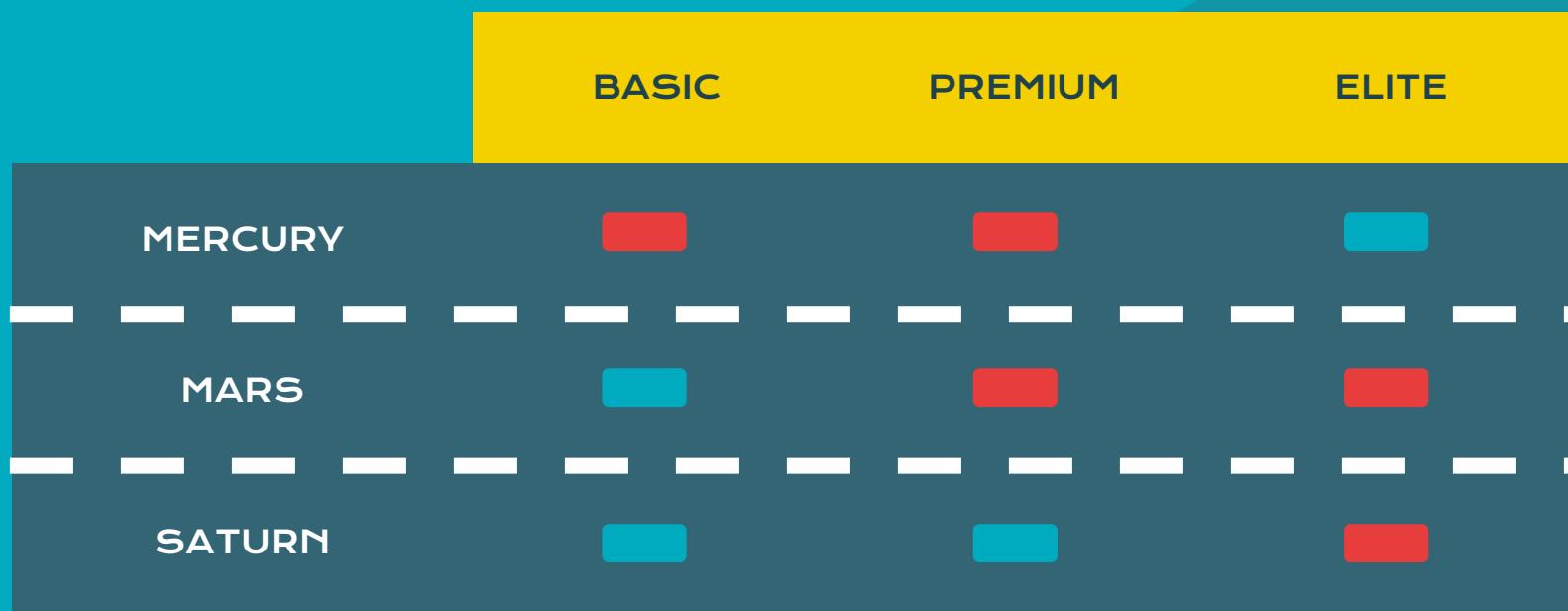
It's the biggest planet in the Solar System



## SATURN

Saturn is the ringed one and a gas giant

# Our Fleet



# Our Fleet

	BASIC	PREMIUM
MERCURY	✓	✗
MARS	✗	✓
SATURN	✗	✗

# Our Team

JENNA DOE

Despite being red, Mars  
is a cold place full of  
iron oxide dust

JOHN JAMES

Jupiter is a gas giant  
and the biggest planet  
in the Solar System

JANE PATTERSON

Mercury is the closest  
planet to the Sun and  
the smallest one



# Our Team

CEO

Mercury is the  
closest planet to the  
Sun

TEACHERS

Jupiter is the  
biggest planet in  
the Solar System



# Our Values



Despite being red, Mars is a cold place full of iron oxide dust



Jupiter is a gas giant and the biggest planet in the Solar System

# Learning to Drive

Mercury is the closest planet to the Sun



Venus has a beautiful name, but it's hot



Neptune is the farthest planet from the Sun



Despite being red, Mars is a cold place



Saturn is the ringed one and a gas giant



# Learning to Drive

## O1 MERCURY

Mercury is the closest planet

## O2 VENUS

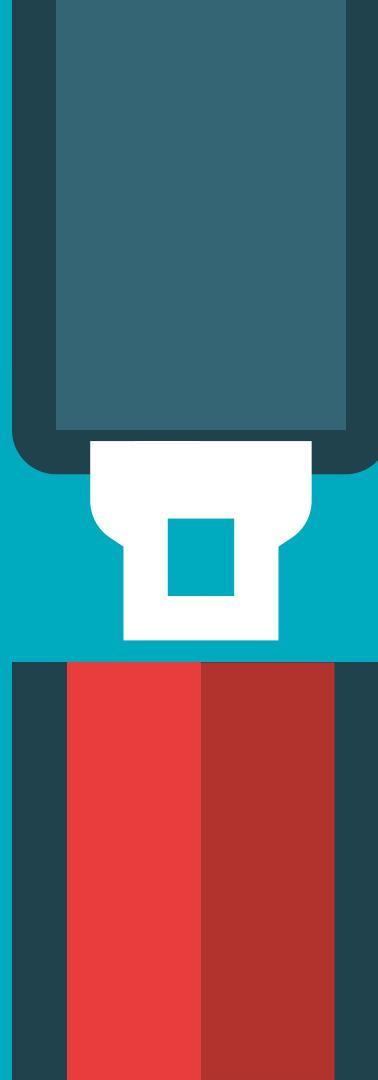
Venus has a beautiful name

## O3 SATURN

Saturn is the ringed one

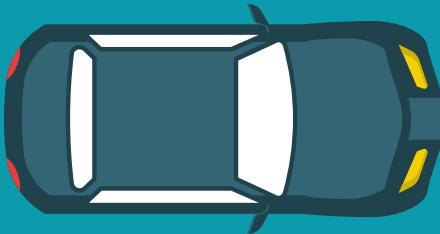
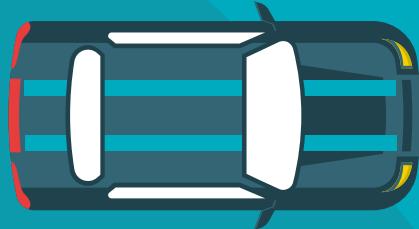
## O4 NEPTUNE

Neptune is the farthest planet

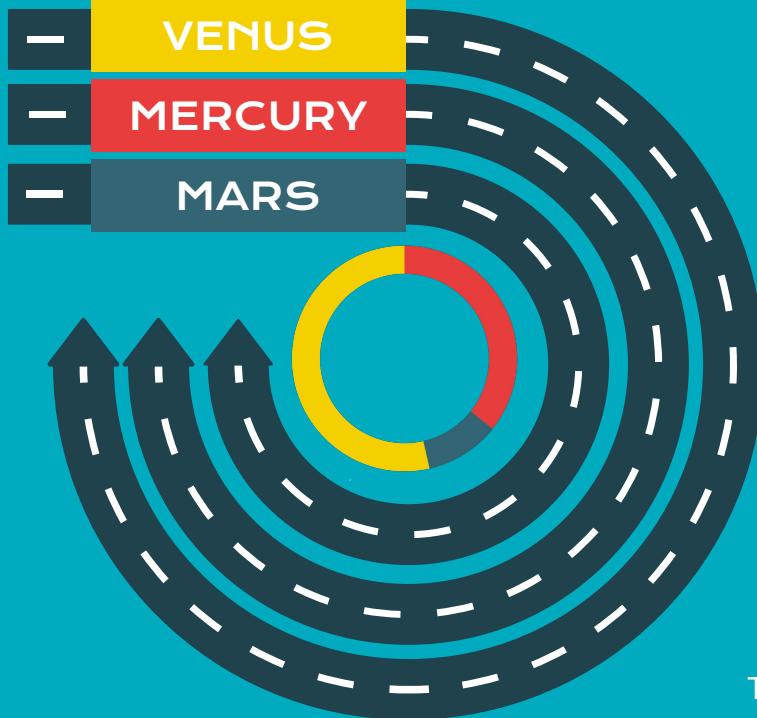


# Experience

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon



# Routes



**VENUS** 53,6%

It has a beautiful name, but it's hot

**MERCURY** 35,7%

Mercury is the closest planet to the Sun

**MARS** 10,7%

Despite being red, Mars is a cold place

To modify this graph, click on it, follow the link, change the data and paste the resulting graph here

# Our Lessons



Insert your multimedia content here



# Pack Prices

## 5 DRIVING LESSONS

Despite being red, Mars is actually a very cold place

\$50

## 10 DRIVING LESSONS

Jupiter is a gas giant and the biggest planet of them all

\$90

## 20 DRIVING LESSONS

Mercury is the closest planet to the Sun and the smallest

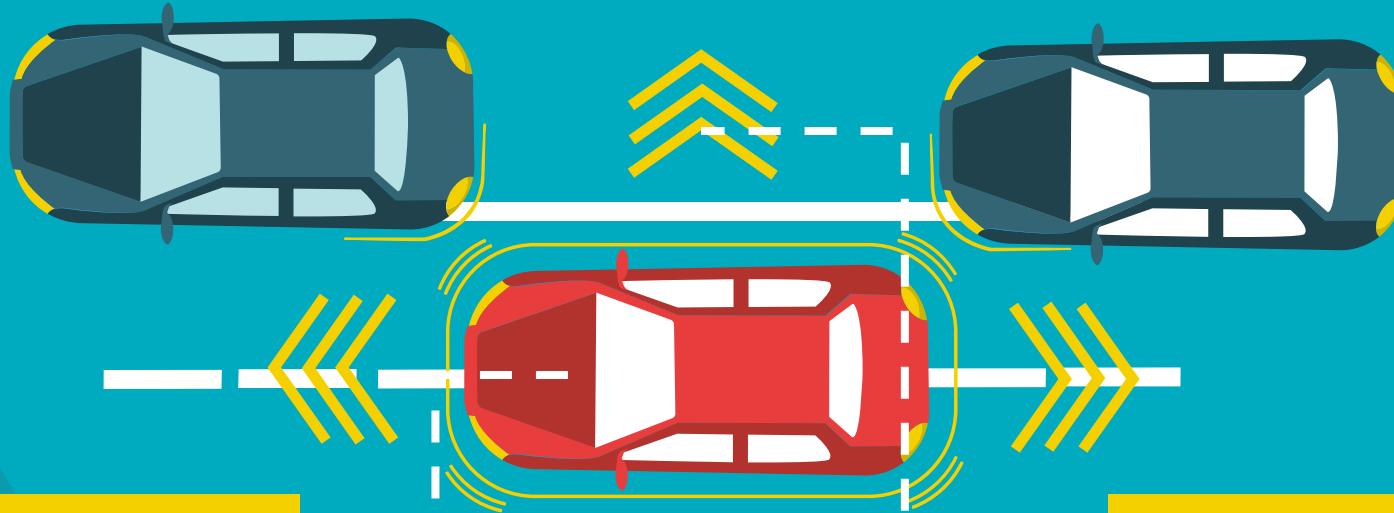
\$180

# TIMETABLE

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. The planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god

	MON	9AM TO 3PM
	TUE	8AM TO 4PM
	WED	8AM TO 4PM
	THU	8AM TO 4PM
	FRI	10AM TO 1PM

# How to Park Properly



Mercury is the  
closest planet to  
the Sun

Jupiter is the  
biggest planet in  
the Solar System

# Our Future

## ELECTRIC CARS

Mercury is the closest planet to the Sun and the smallest one in the Solar System



# Safety First

**2KM AWAY**

It's the closest planet to the Sun

**10KM AWAY**

It's a gas giant and  
the biggest planet

**5KM AWAY**

Mercury is the  
smallest planet



# Our Cars

ELECTRIC CAR



- Here you can describe a reason to use it
- Here you can describe a reason to use it

NORMAL CAR



- Here you can describe a reason to use it
- Here you can describe a reason to use it

# THANKS

**Do you have any questions?**

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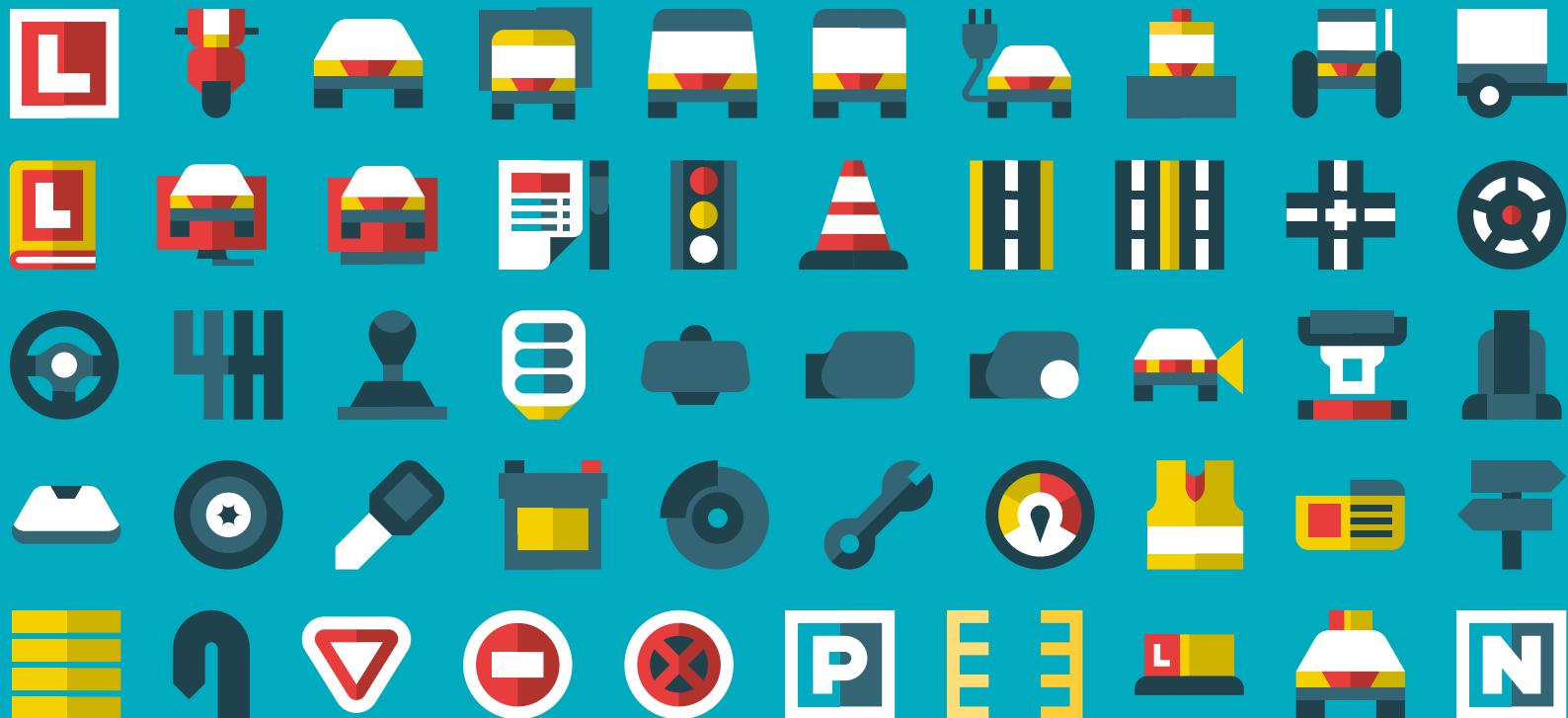


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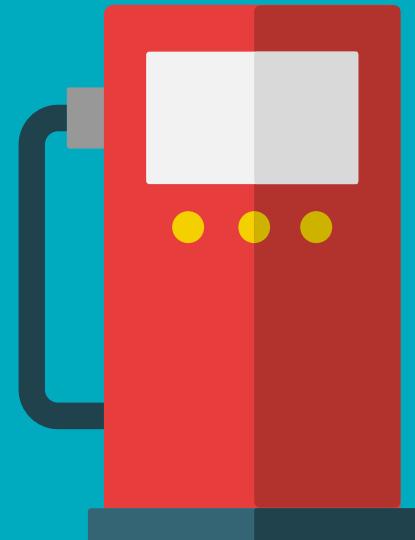
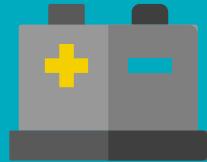
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# Driving School Icons



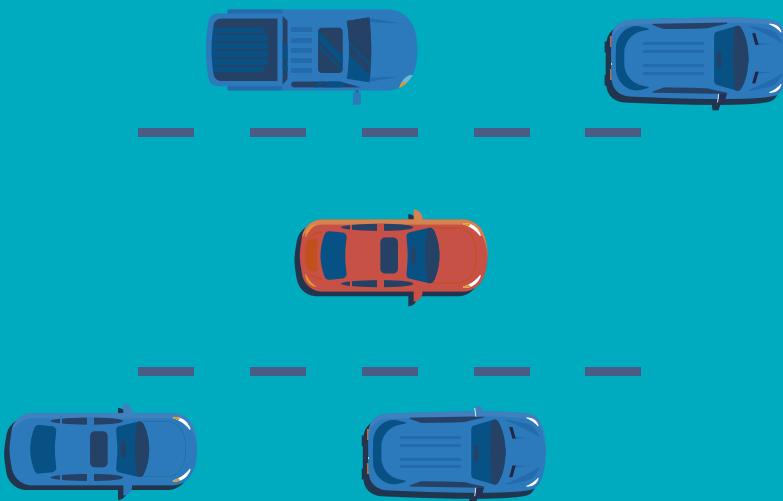
# Alternative Resources



# Alternative Resources



# Alternative Resources



# Infographic Resources

It's the closest planet to the Sun

76%

It's a gas giant and the biggest planet

27%

Mercury is the smallest planet

84%



# Resources

Did you like the resources on this template? Get them for free at our other websites:

## PHOTOS

- Green color traffic light
- Close up man driving car
- Young Man

## VECTORS

- Garage icons collection
- Blank vehicle license plate
- Futuristic interior design of car
- Colored city map
- Realistic billboard
- Car presentation template
- Top view of flat cars on parking lot
- Flat urban landscape
- Flat hand holding car key
- Car pictograms set
- Collection of signs
- Set of traffic signs

# Resources

Did you like the resources on this template? Get them for free at our other websites:

## PHOTOS

- Group of friends standing in front of car raising hands gesturing
- Close-up modern car outdoors
- Man driving car on road

- Close-up of man's hand shifting gear in car
- Young woman enjoying road trip
- Side view of smiley woman driving her personal car
- Driver smiles and leaning on the steering wheel

## ICONS

- Driving School

# Resources

Did you like the resources on this template? Get them for free at our other websites:

## VECTORS

- Flat running mobile app infographic
- Top view of futuristic autonomous car with flat design
- Street map desing with catering sector pins

- Different views of white german car
- Electric car
- Interior design of autonomous car
- Top view of modern autonomous car
- Vehicle pack in front position
- Street map with pin and routes
- Highways collection
- Selection of three colorful vehicles with different landscapes
- Roads infographic
- Electric car infographics

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#00abbf

#336574

#1f424c

# Storyset

Create your Story with our illustrated concepts. Choose the style you like the most, edit its colors, pick the background and layers you want to show and bring them to life with the animator panel! It will boost your presentation. Check out [How it Works](#).



Pana



Amico



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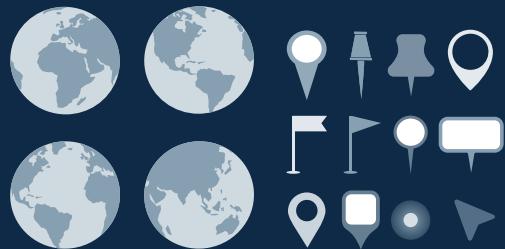
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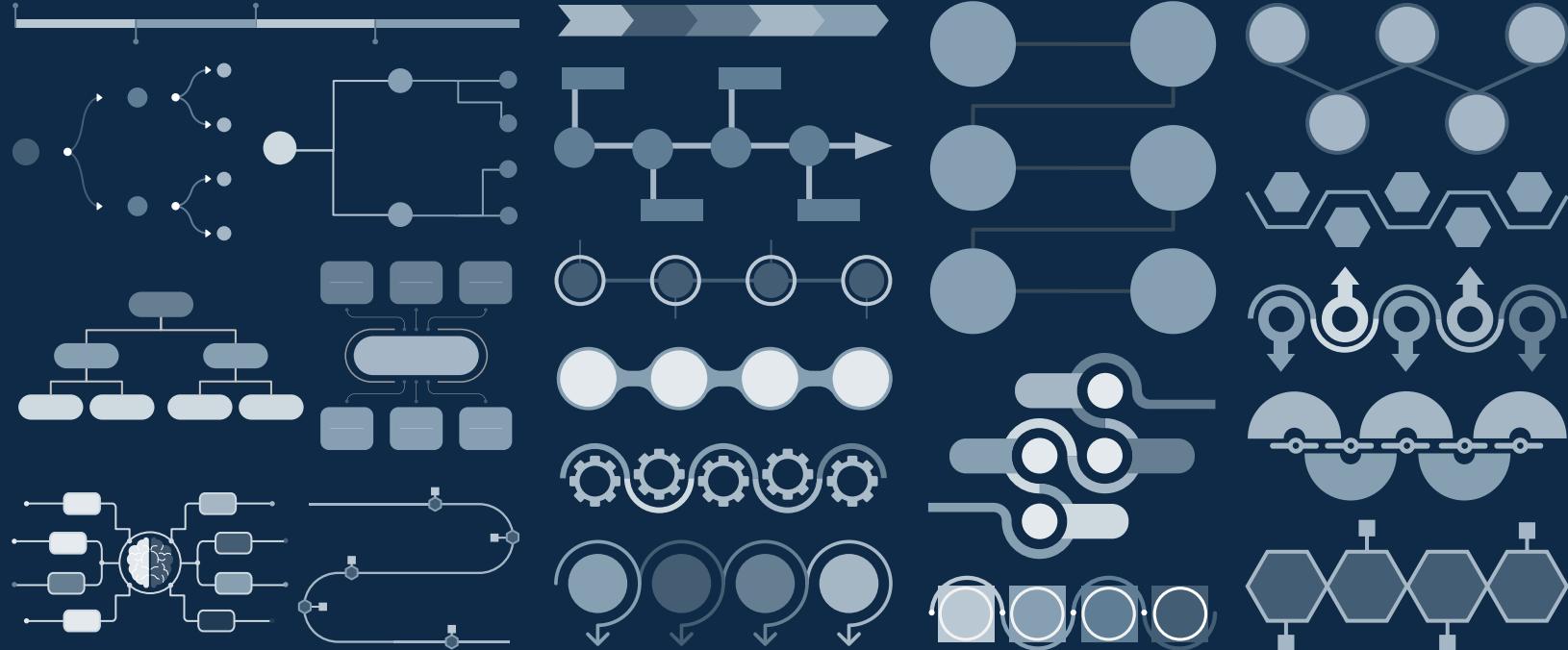
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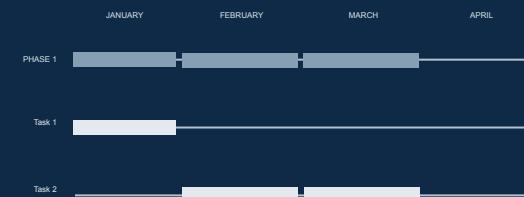
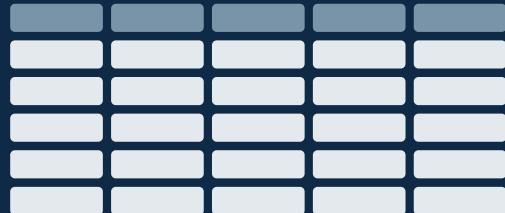
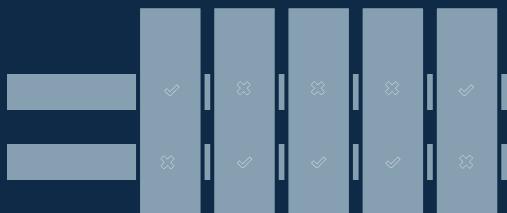
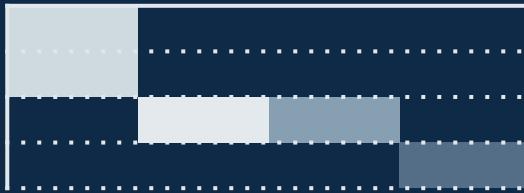
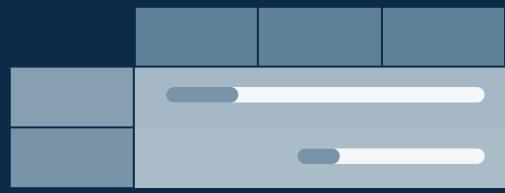
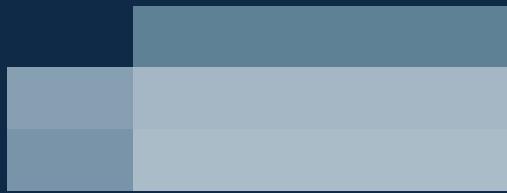
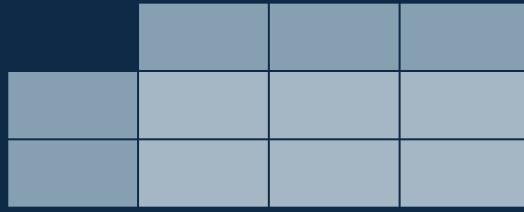
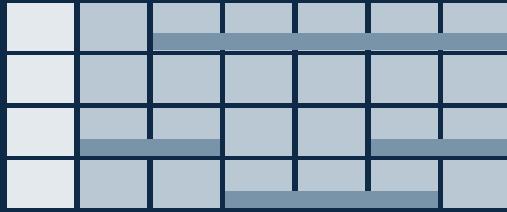
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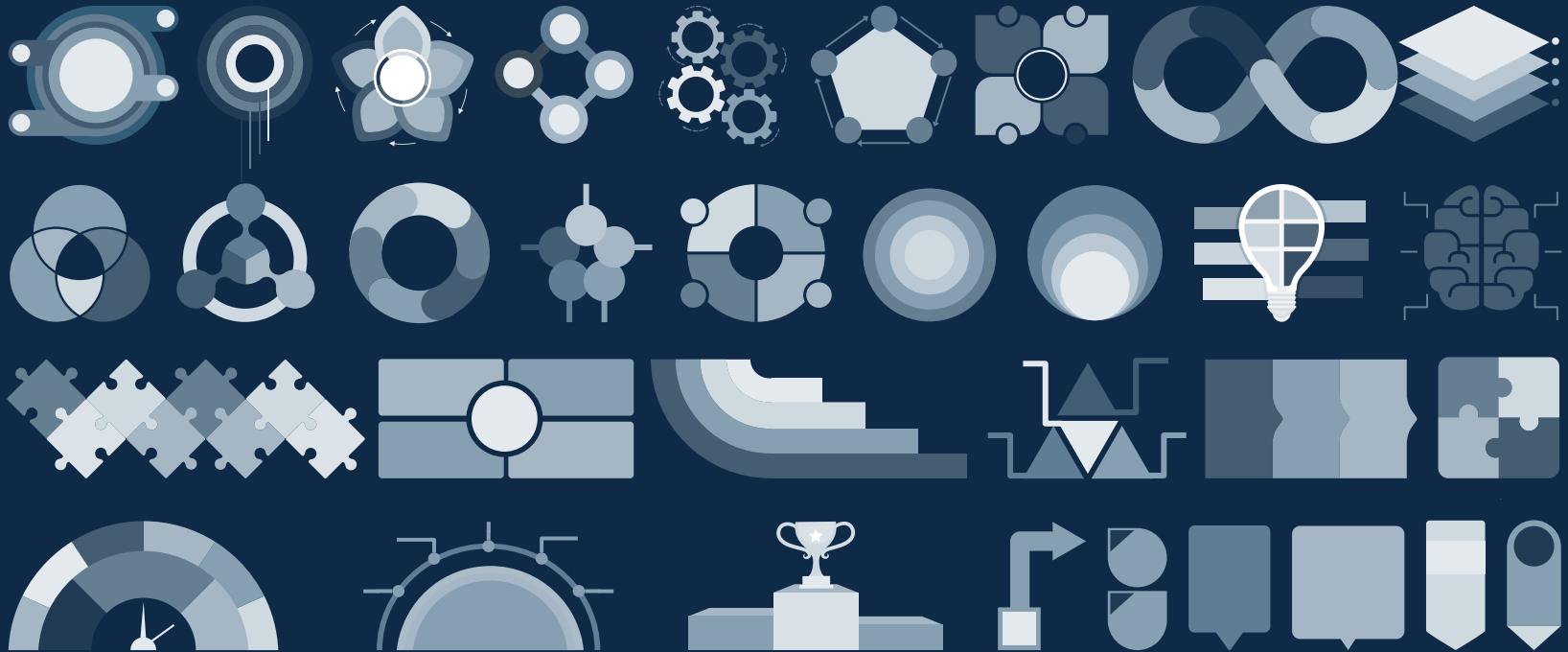
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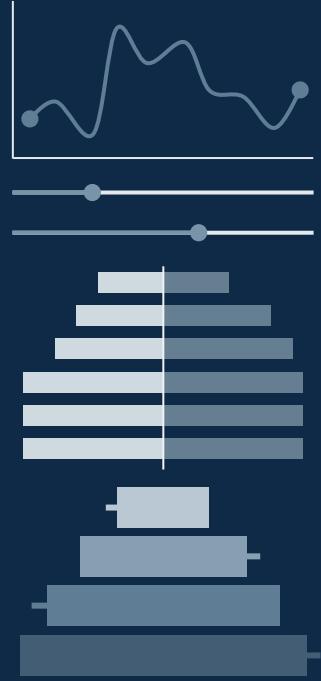
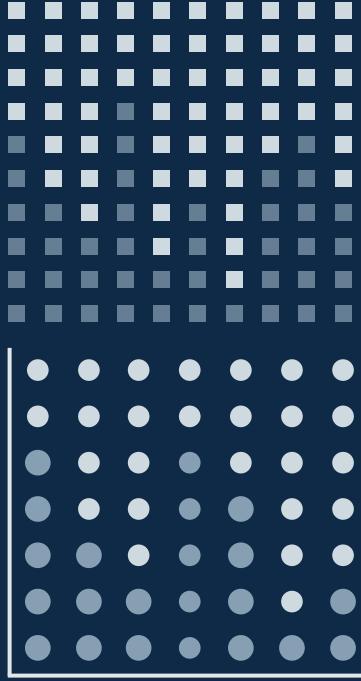












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## Medical Icons



# Business Icons



# Teamwork Icons



## Help & Support Icons



## Avatar Icons



## Creative Process Icons



## Performing Arts Icons



# Nature Icons



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