

Workshop #2:

Intro to NumPy and Pandas



Pandas



Quick Review - Lists and Dictionaries

List:

Collections of items surrounded by brackets []

```
my_list = [1, "Hello", 2.125]
```

Dictionary:

Collections of items assigned to labels, called "keys"

```
my_dict = {  
    'colors': ['red', 'blue', 'green'],  
    'numbers': [1, 2, 3],  
    'favorite food': 'pizza'  
}
```

Also recall: strings, integers and floats!

Quick Review - Indexing

Indexing means to retrieve an element from a collection (such as lists or dictionaries)

```
my_list = [1, "Hello", 2.125]
```

```
my_list[0]
```



```
1
```

```
my_list[2]
```



```
2.125
```

```
my_dict = {  
    'colors': ['red', 'blue', 'green'],  
    'numbers': [1, 2, 3],  
    'favorite food': 'pizza'  
}
```

```
my_dict['colors']
```



```
['red', 'blue', 'green']
```

```
my_dict['colors'][0]
```



```
'red'
```

Quick Review - CSV's

```
nsql_csv_file_sample_2021_04_08.csv - Notepad
File Edit Format View Help
Keyword,Min Monthly Volume,Max Monthly Volume,Specific Monthly Volume,Difficulty,Rank
perfect tower 2 improve chance to find modules,0,10,10.5370846,1,33
straight-forward analytics solution,0,10,,1,34
bi-soft,11,50,16.71429414,1,42
vantagens self service,11,50,27.24240562,1,46
turn key analytics,0,10,,2,26
southwest virtual agents,0,10,,3,34
coming out bi 7 watch online free,11,50,27.24240562,3,36
coming out bi 7 watch online,11,50,27.24240562,3,49
power music login,101,200,121.5019653,4,18
bi rapportages,51,100,58,4,38
legal dashboard,0,10,1,5,18
caso de exito big data netflix,11,50,27.24240562,5,21
consultora de bi,0,10,,5,32
power bi consulting london,0,10,,6,15
adobe analytics danismanlik,0,10,,6,16
spend analytics dashboard,0,10,,6,18
syscon online login,11,50,38.68984882,6,23
spend analysis dashboard,11,50,27.24240562,6,24
escalabilidade em saas,0,10,,6,27
usa ge cnovember 2019,0,10,10.5370846,6,34
Ln 6, Col 1 100% Windows (CRLF) UTF-8
```



Author	User Rating	Reviews	Price	Year	Genre
JJ Smith	4.7	17350	8	2016	Non Fiction
Stephen King	4.6	2052	22	2011	Fiction
Jordan B. Peterson	4.7	18979	15	2018	Non Fiction
George Orwell	4.7	21424	6	2017	Fiction
National Geographic Kids	4.8	7665	12	2019	Non Fiction
George R. R. Martin	4.4	12643	11	2011	Fiction
George R. R. Martin	4.7	19735	30	2014	Fiction
Amor Towles	4.7	19699	15	2017	Fiction
James Comey	4.7	5983	3	2018	Non Fiction
Fredrik Backman	4.6	23848	8	2016	Fiction
Fredrik Backman	4.6	23848	8	2017	Fiction
Larry Schweikart	4.6	460	2	2010	Non Fiction

Quick Review - CSV's

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Larry Schweikart	4.6	460	2	2010	Non Fiction

We usually have tidy data, this means:

- Each row is a new observation
- Each column is a feature/variable

What Are Packages?



Base Python



NumPy



Pandas



What Are Packages?



`np.array(my_list)`

`my_array1 + my_array2`

`my_array.sum()`

`data = pd.read_csv()
data.head()`

`data["column_name"].mean()`

`data.info()`

Important Structures

NumPy Array:

VERY similar to to a list

```
np.array([1, 2, 3, 4, 5])
```



```
array([1, 2, 3, 4, 5])
```

```
my_list = [1, 2, 3, 4, 5]  
np.array(my_list)
```



```
array([1, 2, 3, 4, 5])
```

```
np.array([[1, 2, 3],  
         [4, 5, 6],  
         [7, 8, 9]])
```



```
array([[1, 2, 3],  
       [4, 5, 6],  
       [7, 8, 9]])
```


Important Structures

```
np.array([[1,2,3],  
         [4,5,6],  
         [7,8,9]])
```



```
array([[1, 2, 3],  
       [4, 5, 6],  
       [7, 8, 9]])
```

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Here, we have 3 rows and 3 columns

Thus, we call this a "3x3 array"

Indexing an Array

```
my_array = np.array([1,2,3,4,5])
```

Recall that indexing starts at 0!

```
my_array[0]
```



1

```
my_array[2]
```



3

How can we retrieve multiple elements?

```
my_array[0:3]
```



```
array([1, 2, 3])
```

Indexing an Array

```
my_array = np.array([1,2,3,4,5])
```

0 1 2 3 4

```
my_array[0:3]
```



```
array([1, 2, 3])
```

List slicing will **NOT** include the last specified element (here we excluded the four element, which was at index 3)

```
my_array[:3]
```



```
array([1, 2, 3])
```

```
my_array[3:]
```



```
array([4, 5])
```

Leaving the first slot blank means we will select from the start until the specified index. Leaving the second slot blank means we will select from the specified value until the end.

Important Structures

Pandas Data Frame:

Similar to a dictionary, but in a larger scale and much more organized

```
pd.DataFrame({
    'colors': ['red', 'blue', 'green'],
    'numbers': [1,2,3],
    'favorite food': ['pizza', 'spaghetti', 'apples']
})
```



	colors	numbers	favorite food
0	red	1	pizza
1	blue	2	spaghetti
2	green	3	apples

```
my_dict = {
    'colors': ['red', 'blue', 'green'],
    'numbers': [1,2,3],
    'favorite food': ['pizza', 'spaghetti', 'apples']
}

pd.DataFrame(my_dict)
```



	colors	numbers	favorite food
0	red	1	pizza
1	blue	2	spaghetti
2	green	3	apples

Important Structures

Pandas Series:

(Usually) a single column of data

```
pd.Series([1,2,3,4,5])
```



	0
0	1
1	2
2	3
3	4
4	5

Indexing a Data Frame

	Movie	Rating	Genre
0	Cars 2	4.2	Family
1	The Exorcist	4.1	Horror
2	Click	4.7	Comedy

Indexing a Column:

```
movies["Genre"]
```



	Genre
0	Family
1	Horror
2	Comedy

Indexing a Data Frame

	Movie	Rating	Genre
0	Cars 2	4.2	Family
1	The Exorcist	4.1	Horror
2	Click	4.7	Comedy

Indexing a Row:

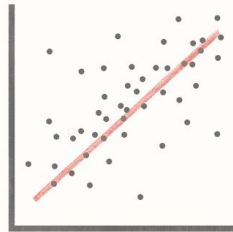
```
movies.iloc[0]
```



	0
Movie	Cars 2
Rating	4.2
Genre	Family

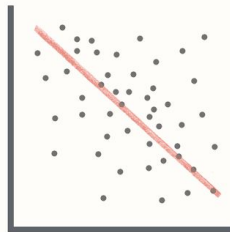
Correlation Coefficient

Correlation Coefficient



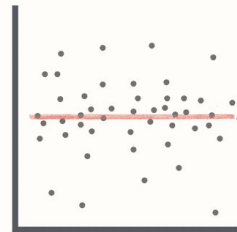
Positive Correlation

`.corr() = 1`



Negative Correlation

`.corr() = -1`



No Correlation

`.corr() = 0`

Negative correlation does not mean there less correlation! The close our value gets to 0, means there is less of a relationship between the two variables

A screenshot of a website homepage for the Data Science Collaborative. The page has a light blue background with a white header. The header contains navigation links: "Calendar", "Projects", "Meetings", "Blog", and "About" with a dropdown arrow, and a search icon on the right. The main content area features a large illustration of a vintage computer system (monitor, tower, keyboard, mouse) with a red arrow pointing upwards to the left. To the right of the illustration, the text "DATA SCIENCE COLLABORATIVE" is displayed in a bold, dark blue font. Below this, there is an orange button with the text "Click Here to Join as a Member!". At the bottom of the page, there is a paragraph of text describing the organization's mission.

Calendar Projects Meetings Blog About ▾

DATA SCIENCE COLLABORATIVE

[Click Here to Join as a Member!](#)

At the Data Science Collaborative (DS Collab for short), our goal is to make data science accessible for everyone. We are dedicated to providing accessible resources and services through one-on-one mentorships, career check-ins, study halls, foundational project workshops, and most importantly, a community full of like-minded people. We promise a deliverable that will be presented at our year-end showcase featuring guest lecturers and industry employers. Join us today to develop your passion in the world of statistics!



Brief story

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



745,145

Big numbers catch your audience's attention

13,119

Big numbers catch your audience's attention



Milestones reached

Mars

Despite being red, Mars is a cold place, not hot

Saturn

It's composed mostly of hydrogen and helium

2007

Mercury

Mercury is the closest planet to the Sun

2010

2014

Venus

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

2018

Milestone reached



Saturn is the
ringed planet

Saturn

Mars

Mars is a cold
place, not hot



Venus has a
beautiful name

Venus

Earth

Earth is where
we all live



Our process

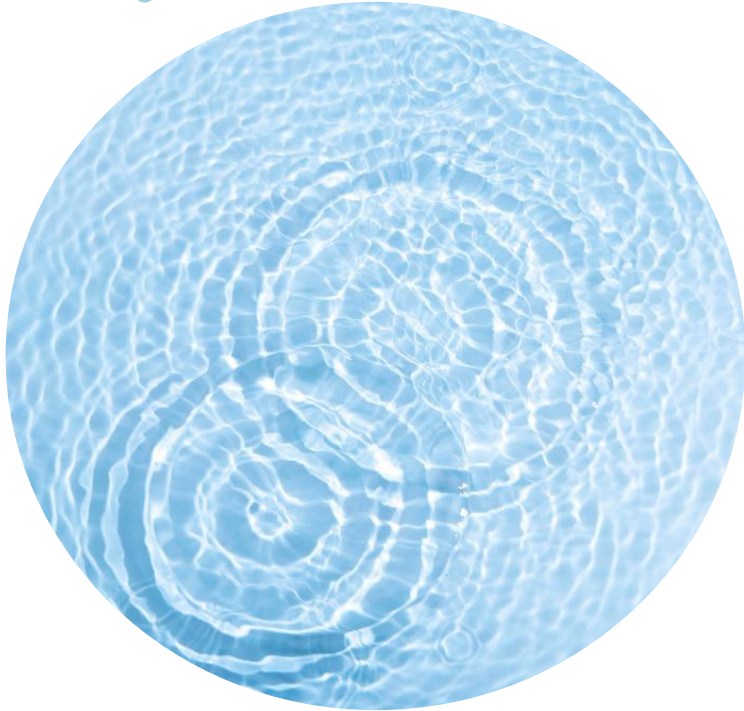
For the staff

- You can write your idea here
- You can write your idea here
- You can write your idea here
- You can write your idea here
- You can write your idea here

For the center

- You can write your idea here
- You can write your idea here
- You can write your idea here
- You can write your idea here
- You can write your idea here

Our process



Do you know what helps you make your point clear? Lists like this one:

- They're simple
- You can organize your ideas in a very clear way
- You'll never forget to buy milk!

And the most important thing: the audience won't miss the point of your presentation



Patient care

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

Patient care



Venus has a beautiful name and is the second planet from the Sun. It's hotter than Mercury, and its atmosphere is extremely poisonous

Our process

01 Venus

Venus has a beautiful name



02 Saturn

Saturn is a gas giant with rings

Mars 03

Mars is a cold place, not hot

Jupiter 04

Jupiter is the biggest planet

Our process

Saturn

Saturn is a gas giant and
has several rings



Jupiter

It's the biggest planet in
the Solar System



Venus

Venus is the second
planet from the Sun



Mars

Despite being red, Mars
is actually a cold place



Services



Mercury

Mercury is the smallest planet



Venus

Venus has a beautiful name



Mars

Despite being red, Mars is a cold place



Jupiter

It's the biggest planet of them all



Saturn

Saturn is a gas giant with several rings



Neptune

Neptune is far away from Earth



Services

Mercury

Mercury is the closest planet to the Sun

Jupiter

It's the biggest planet in the Solar System

Mars


Despite being red, Mars is a cold place

Saturn

Saturn is a gas giant and it has rings

Neptune

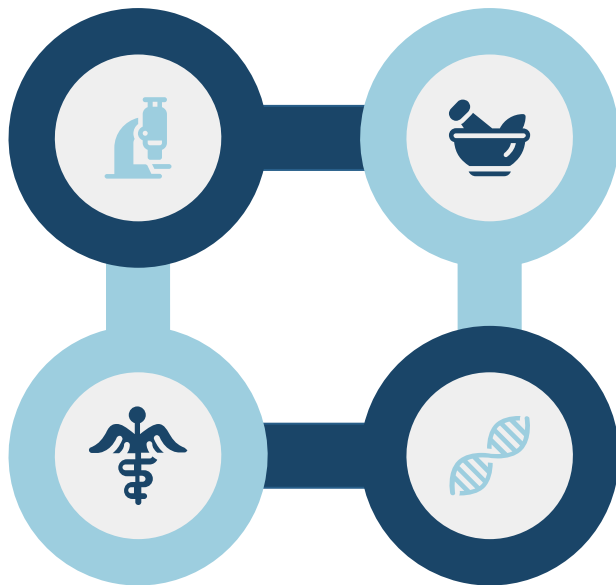
It's the farthest planet from the Sun



Areas we cover

30% **Mercury**

Mercury is the smallest planet



Mars **20%**

Despite being red,
Mars is cold

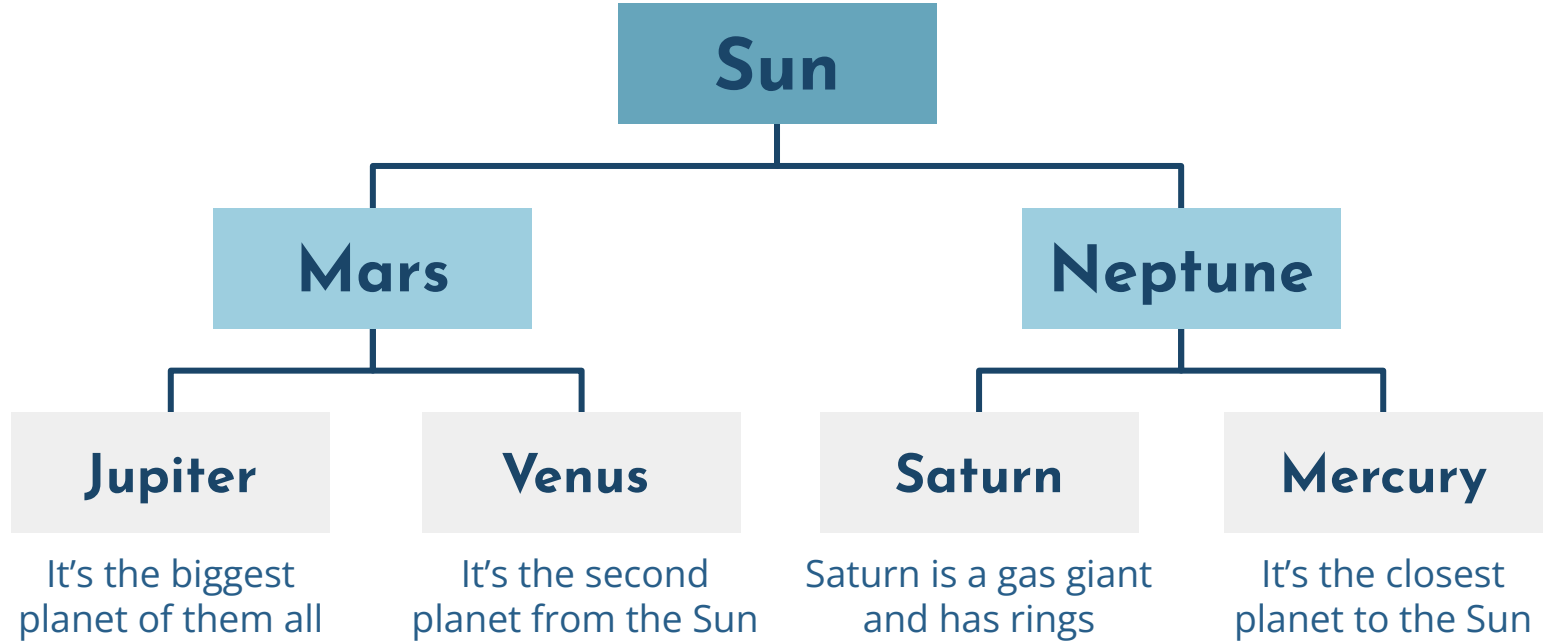
10% **Jupiter**

Jupiter is the biggest planet

Neptune **40%**

Neptune is far away from Earth

Areas we cover



**A picture is worth
a thousand words**



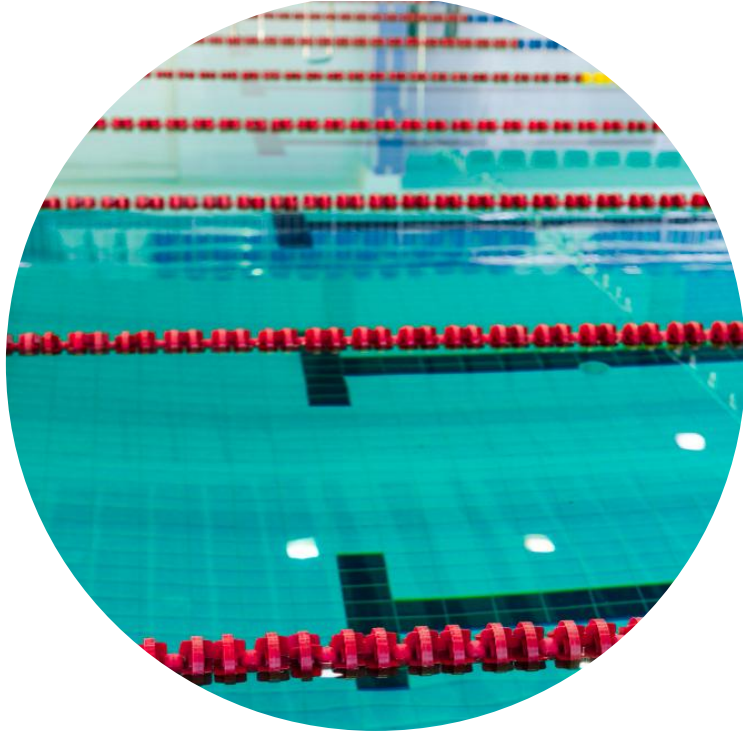


**A picture is worth
a thousand words**

A picture always reinforces the concept

Images reveal large amounts of data, so remember: use an image instead of a long text. Your audience will appreciate it





A picture always reinforces the concept

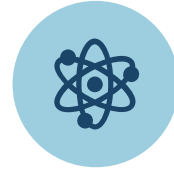
Images reveal large amounts of data, so remember: use an image instead of a long text. Your audience will appreciate it

Key accomplishments



Mercury

Mercury is the smallest planet



Venus

Venus has a beautiful name



Jupiter

It's the biggest planet of them all



Saturn

Saturn is a gas giant with rings

Key accomplishments

Mercury

Mercury is the closest planet to the Sun

Saturn

Saturn is a gas giant and has rings

Mars

Despite being red, Mars is a cold place

Jupiter

Jupiter is the biggest planet of them all

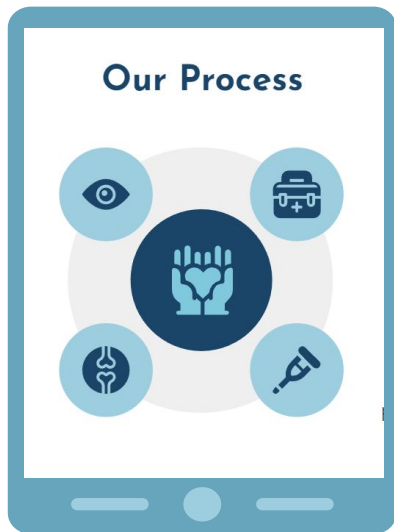
Neptune

It's the farthest planet from the Sun

Desktop mockup

You can replace the image on the screen with your own work



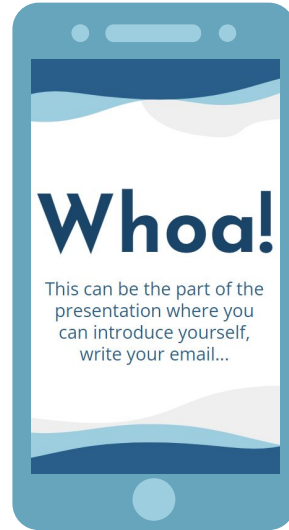


Tablet mockup

You can replace the image on the screen with your own work

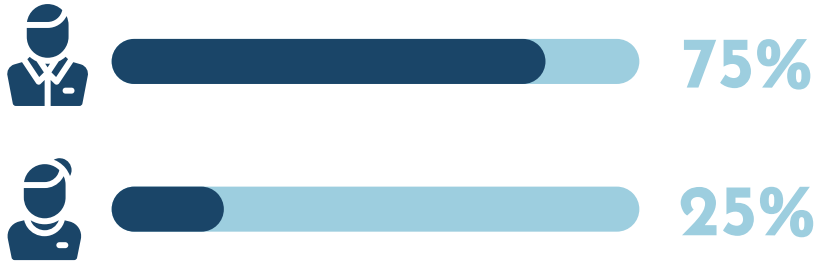
Phone mockup

You can replace the image on the screen with your own work

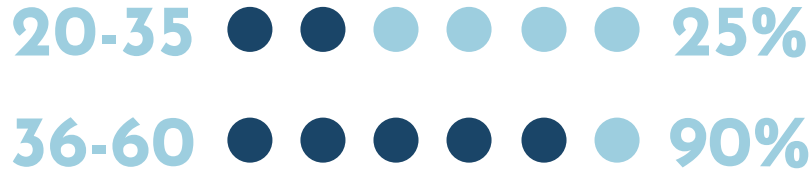


Patient satisfaction

Gender



Age



Results

Venus

Venus is the second planet from the Sun

01

Mars

Despite being red, Mars is a cold place, not hot

02

Mercury

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

03

Core customers

Gender



25%



75%

Age



Interest



Saturn is a gas giant and has rings



Mars is actually a cold place, not hot



Venus has a beautiful name

Testimonial

Jenna Doe, 25

"Mercury the closest planet to the Sun and it's only a bit larger than the Moon"

John James, 36

"Venus has a beautiful name, but it's hot, even hotter than Mercury"

Fred Blogs, 31

"Despite being red, Mars is a cold place, not hot. It's full of iron oxide dust"

Helena Smith, 58

"Saturn is a gas giant, composed mostly of hydrogen and helium"

Testimonials

Claire Blair

“Mercury is the smallest planet”

John Stone

“Despite being red, Mars is a cold place”

Mike Mills

“Jupiter is the biggest planet”

Bob Charlton

“Saturn is a gas giant and has rings”

Kate Poe

“Neptune is far away from Earth”

Lilly Roberts

“Venus is the second planet from the Sun”

Quality improvement measures

	Venus	Saturn	Jupiter	Mars
Measure 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Measure 2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Measure 3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Measure 4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



Awesome words

Awesome words



Innovations



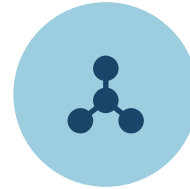
Mercury

Mercury is the closest planet to the Sun



Venus

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



Mars

Despite being red, Mars is a cold place



Innovations



Mercury

Mercury is the closest planet to the Sun



Saturn

Saturn is a gas giant and has rings



Mars

Despite being red, Mars is a cold place

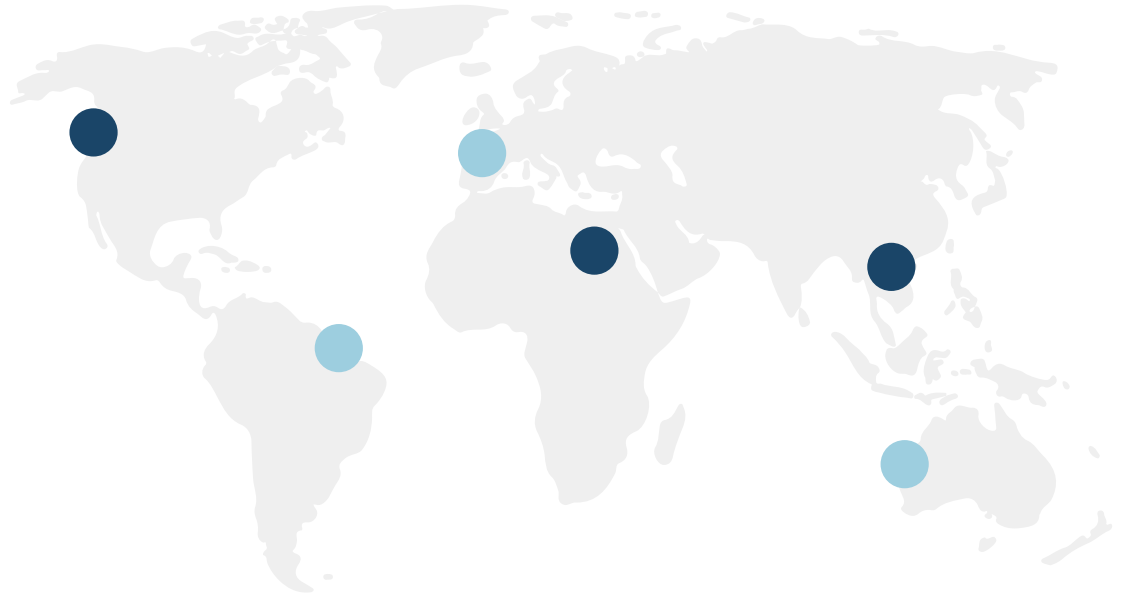
Location center

● Mars

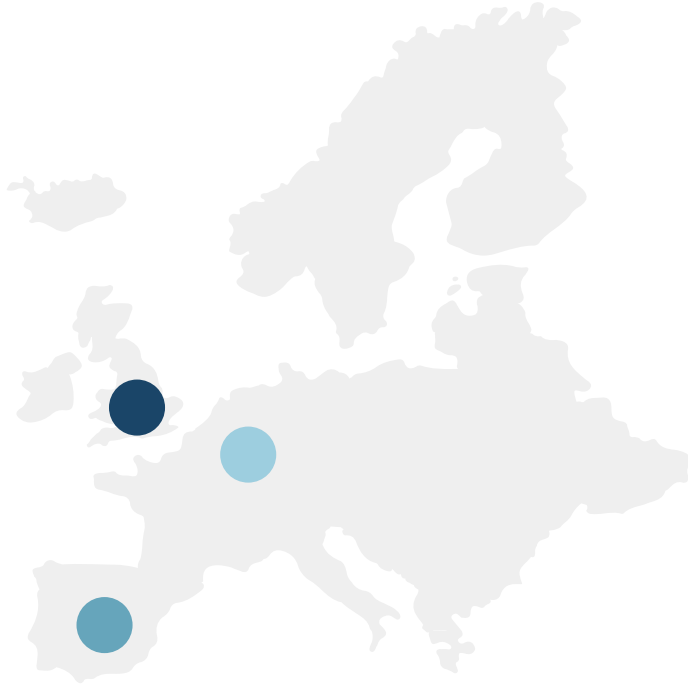
Despite being red, Mars is a cold place, not hot

● Venus

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



Location center



Mars

Mars is a cold place, not hot



Jupiter

It's the biggest planet of them all



Saturn

Saturn has several rings

Awards

2011-2012



Mars

Mars is a cold place,
not hot

2015-2016



Saturn

Saturn is composed
mostly of hydrogen

2018-2019



Venus

Venus has a
beautiful name

Awards

Project	Award	Year
Mercury	Name of the award	2016
Mars	Name of the award	2018
Jupiter	Name of the award	2020
Venus	Name of the award	2021

Our team



Jenna Doe

You can talk a bit about
this person here



John James

You can talk a bit about this
person here

Our team

James Rice

You can talk a bit about
this person here



Lena Jordan

You can talk a bit about
this person here

Anna Grey

You can talk a bit about
this person here



Peter Miles

You can talk a bit about
this person here

Thanks

Do you have any questions?
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Icon pack



Alternative resources



Alternative resources



Alternative infographic resources





Alternative resources

Photos

- High angle of male swimmer in the water pool
- Smiley male swimmer posing with goggles and cap in the pool
- High angle of male swimmer swimming in water pool
- Front view young man at basin stretching
- High angle male stretching before swimming

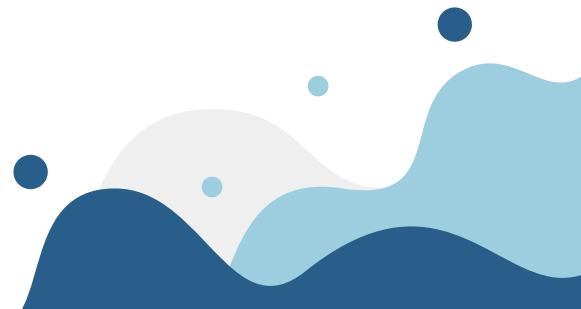
Alternative resources

Photos

- Full shot athlete in pool
- Athlete underwater full shot
- Front view of beautiful dreamer
- Mid shot man splashing out of water
- Full shot swimmer in pool
- Full shot athlete swimming underwater

Vectors

- Abstract waves banner



Resources

Photos

- Male swimmer floating in the pool
- Male swimmers swimming in the pool
- Woman at latino hair salon
- Close up smiley man in therapy
- Woman swimmer swimming close up
- Side view smiley girl in pool
- Photo of modern indoor swimming pool

Vectors

- Abstract rounded shape business card template
- Dynamic poster collection

Resources

Photos

- Medium shot woman with swimming equipment
- Top view modern swimming pool
- Top view clear ocean water texture
- Portrait of handsome man outdoors
- Smiley man posing medium shot
- Mid shot woman therapist with clipboard inviting patient in cabinet
- Medium shot woman in studio
- Clear ocean water texture
- Woman doing front crawl swimming in pool
- Photo of swimming pool with delimitation cordons

Vectors

- Geometric background
- Abstract colorful background
- Map of europe with colors in flat style
- Gradient steps infographic
- Timeline infographic design

Icon

- Spa



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(<https://fonts.google.com/specimen/Josefin+Sans>)

Open Sans

(<https://fonts.google.com/specimen/Open+Sans>)

#1a4568

#285e89

#9dcedf

#66a5bb

#80c9dd

#efefef

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



Bro



Rafiki



Cuate

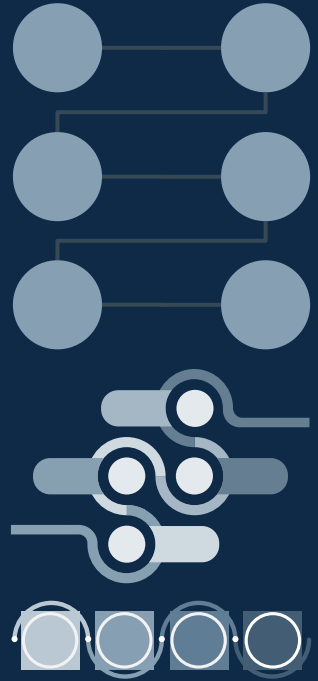
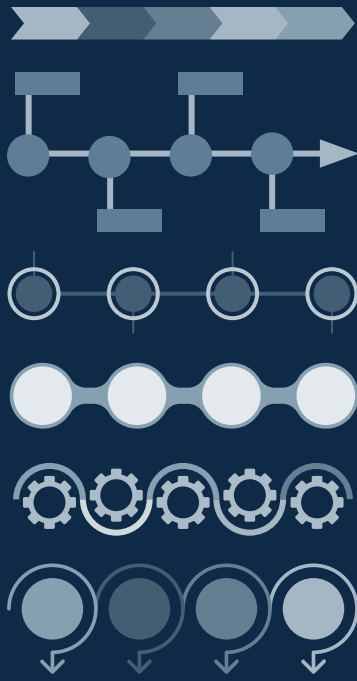
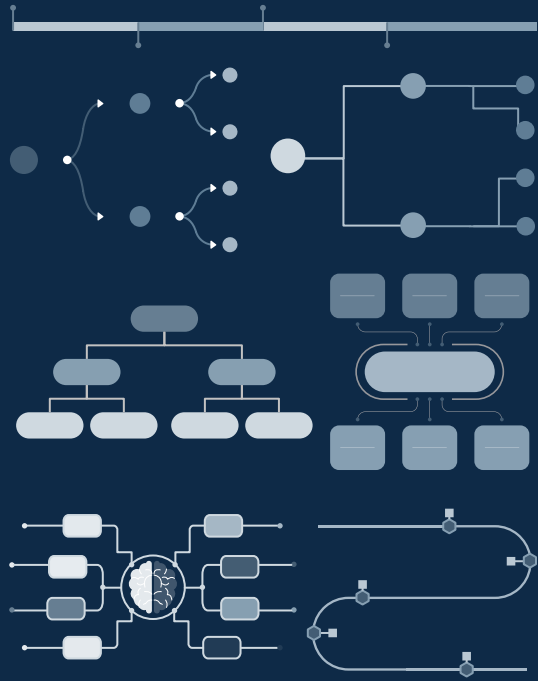
Use our editable graphic resources...

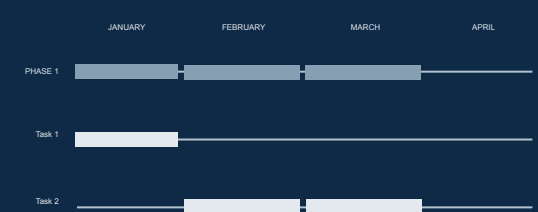
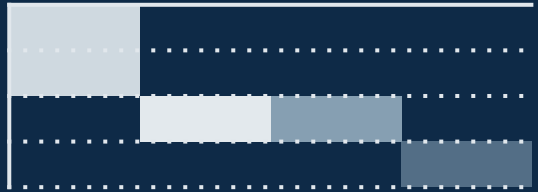
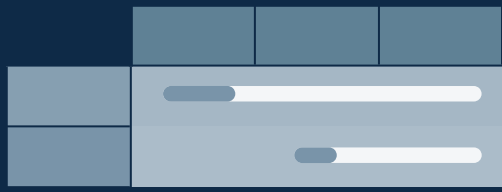
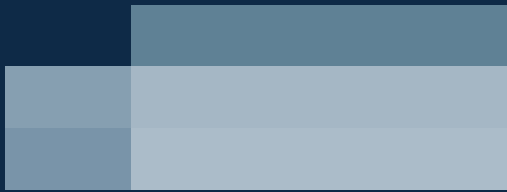
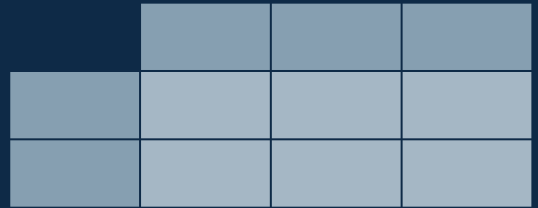
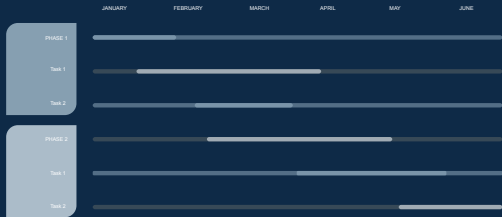
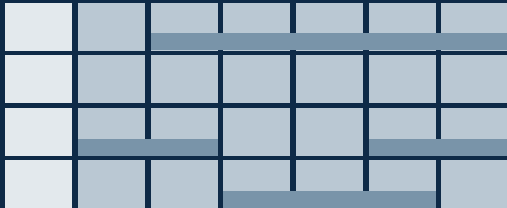
You can easily [resize](#) these resources without losing quality. To [change the color](#), just ungroup the resource and click on the object you want to change. Then, click on the paint bucket and select the color you want.

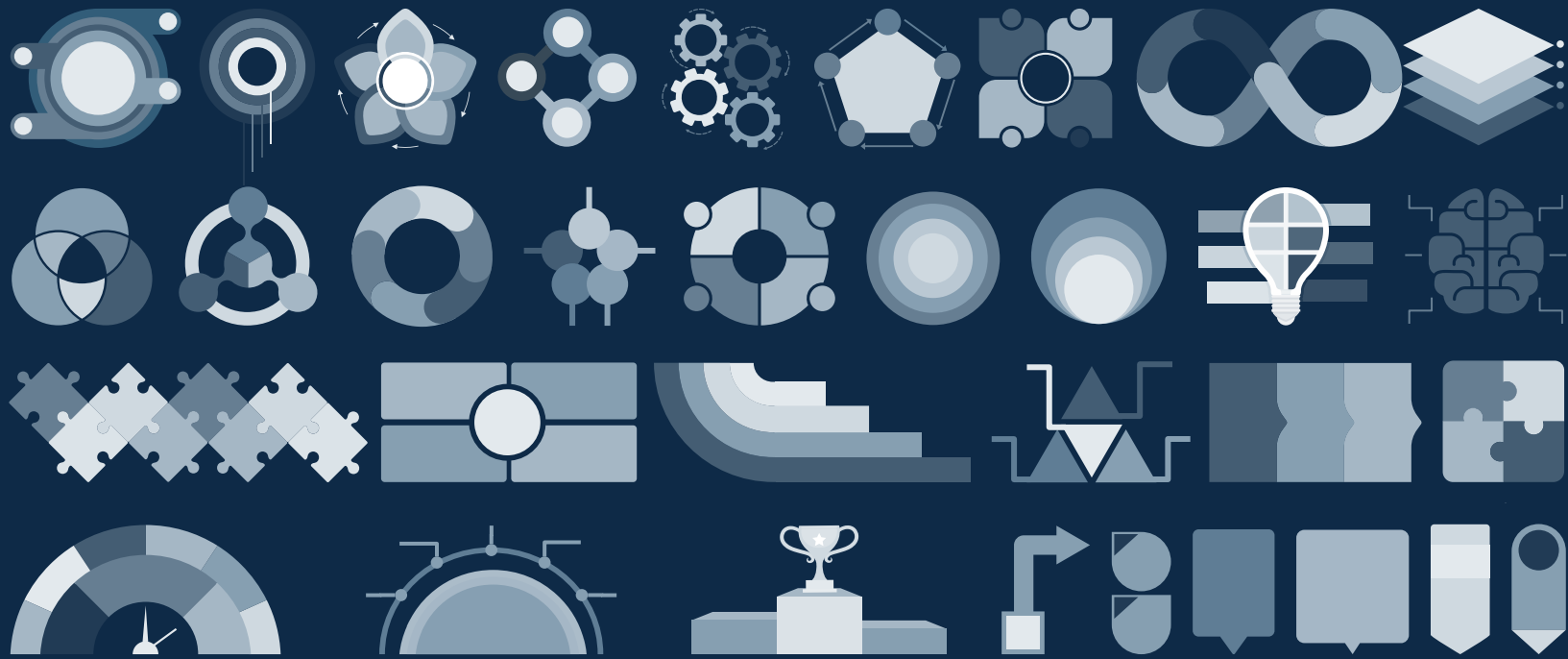
Group the resource again when you're done. You can also look for more [infographics](#) on [Slidesgo](#).

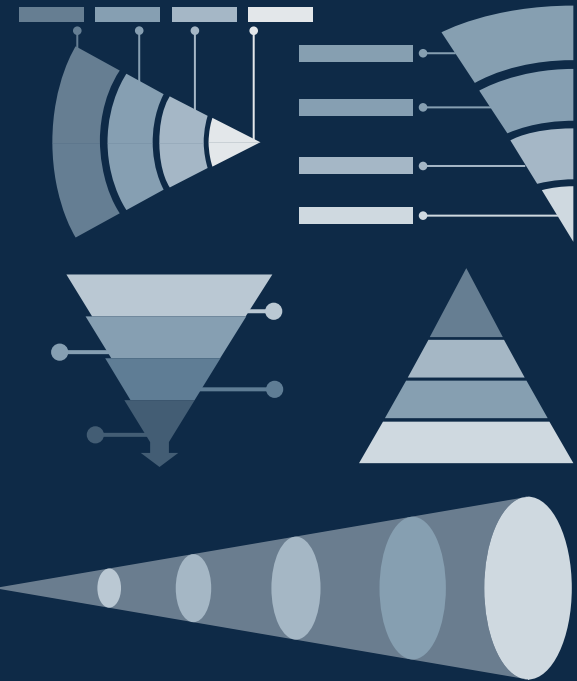
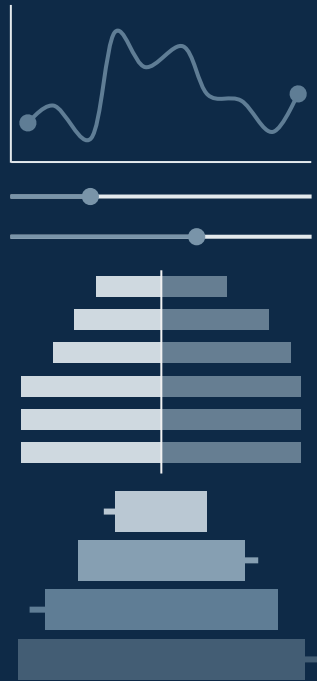
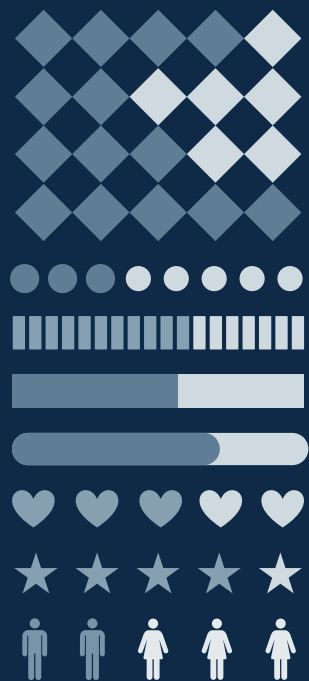
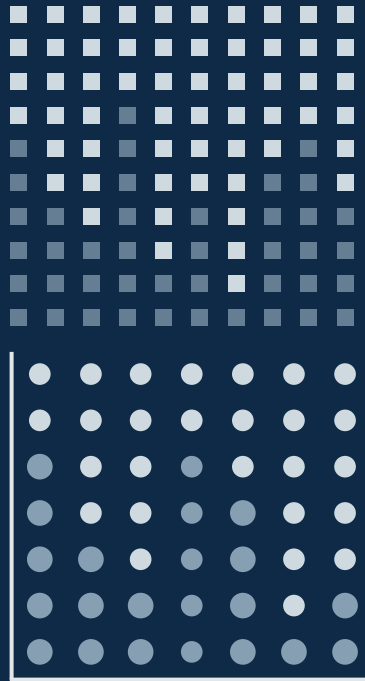












...and our sets of editable icons

You can resize these icons without losing quality.

You can change the stroke and fill color; just select the icon and click on the paint bucket/pen.

In Google Slides, you can also use Flaticon's extension, allowing you to customize and add even more icons.



Educational Icons



Medical Icons



Business Icons



Teamwork Icons



Creative Process Icons



Performing Arts Icons



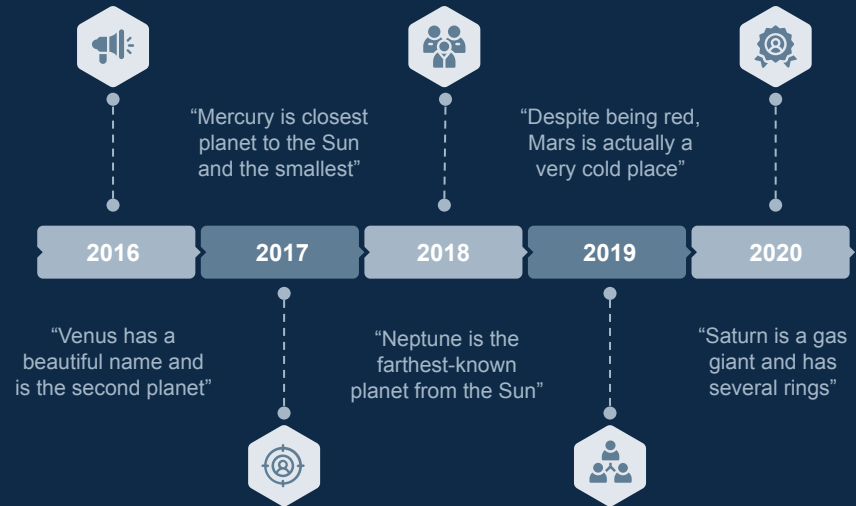
Nature Icons



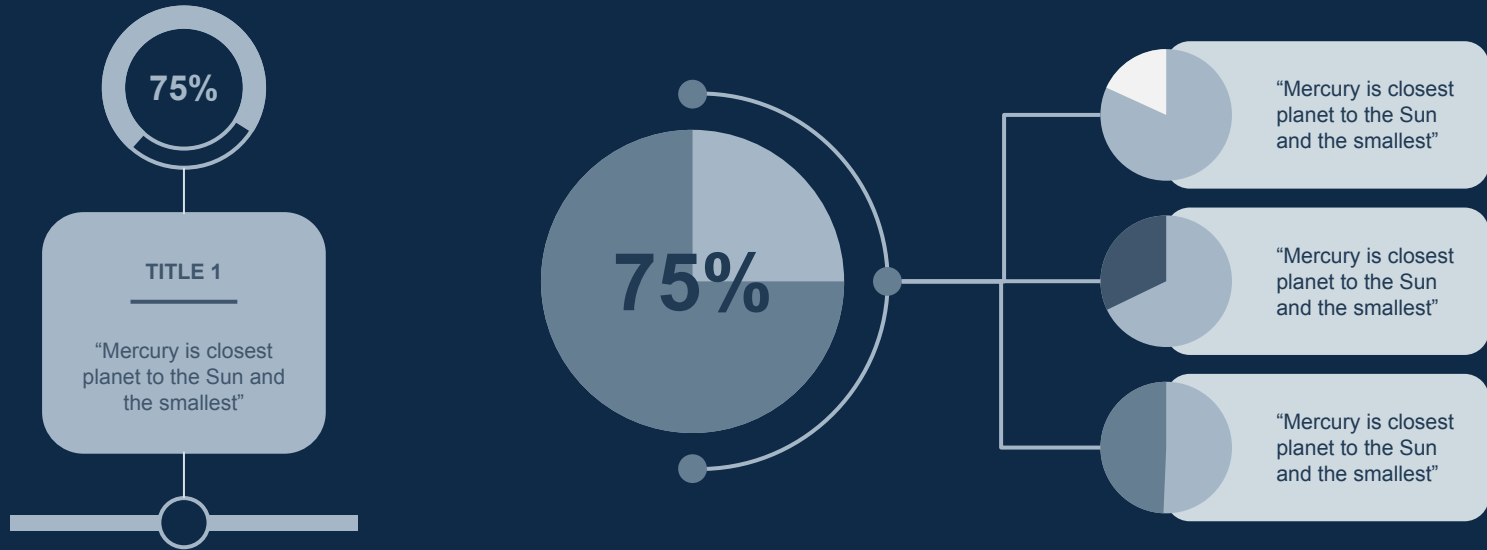
SEO & Marketing Icons



Premium infographics



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Online Learning



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