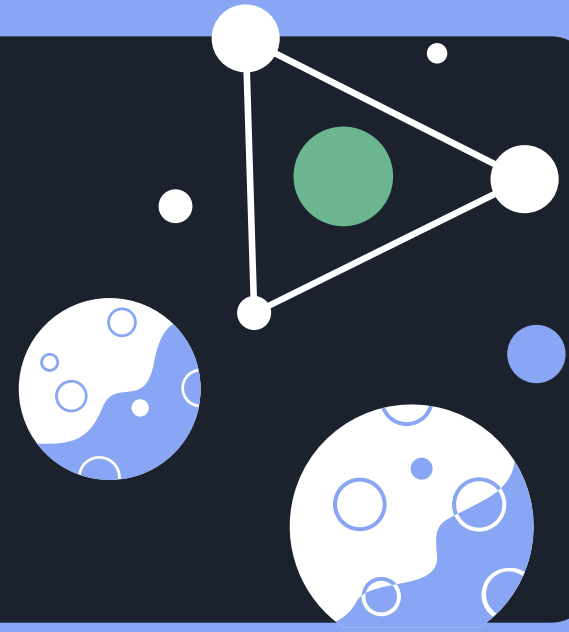
Data Science Basics using Calc I & JS



By: Josiah Paintsil '23

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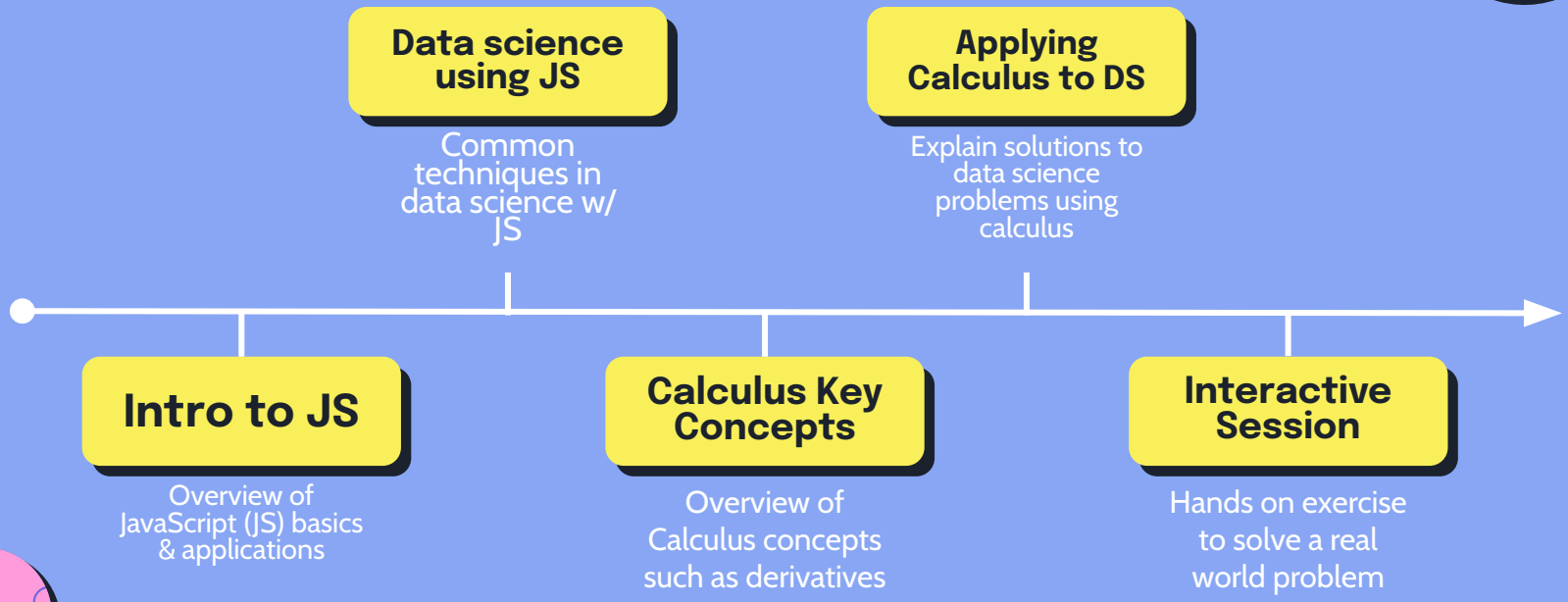
Overview


Data science using JS
Common techniques in data science w/ JS
Applying Calculus to DS
Explain solutions to data science problems using calculus
Intro to JS
Overview of JavaScript (JS) basics & applications
Calculus Key Concepts
Overview of Calculus concepts such as derivatives
Interactive Session
Hands on exercise to solve a real world problem

Intro to JS

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JS Overview

What is JavaScript?

JavaScript Data Structures

JavaScript Capabilities

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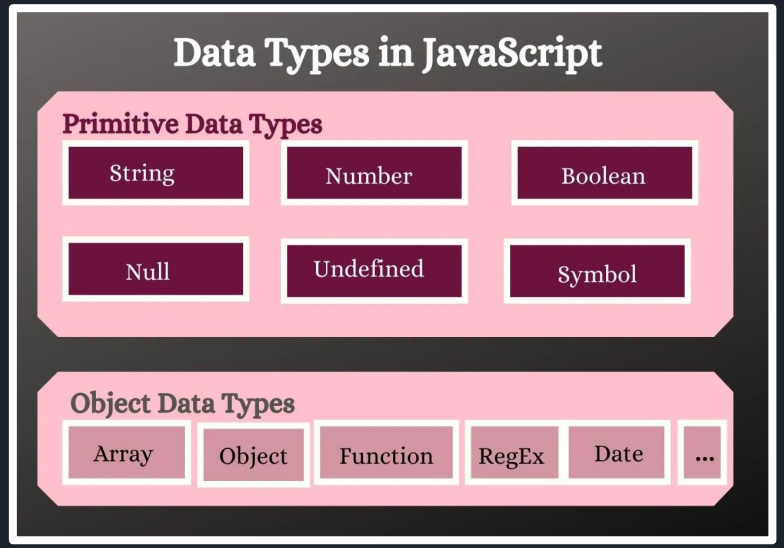
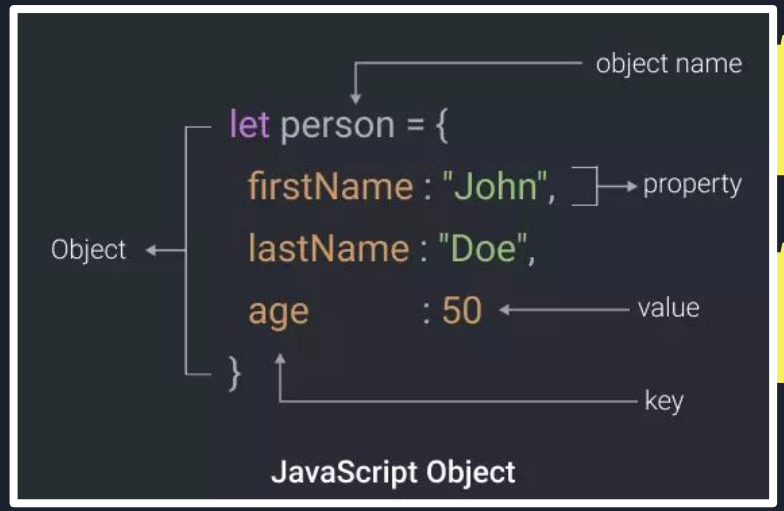

Data Types in JavaScript
Primitive Data Types
String
Number
Boolean
Null
Undefined
Symbol
Object Data Types
Array
Object
Function
RegEx
Date
...


object name
let person = {
firstName : "John",
property
Object
lastName : "Doe",
age : 50
value
}
key
JavaScript Object

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Benefits of JavaScript

- Everything is an object!
- Lots of useful libraries
- Website Data (JSON)
- Animated/Interactive Visuals
- Many more...

JS for Data Science

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JS Overview

What is Data Science?

JavaScript for Data Science

Data Science Goals w/ Code

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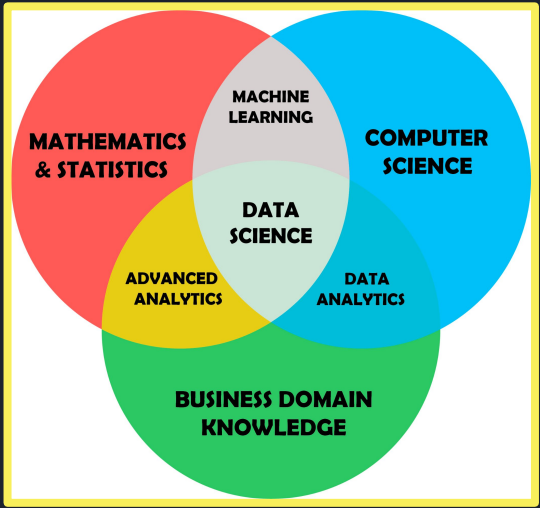
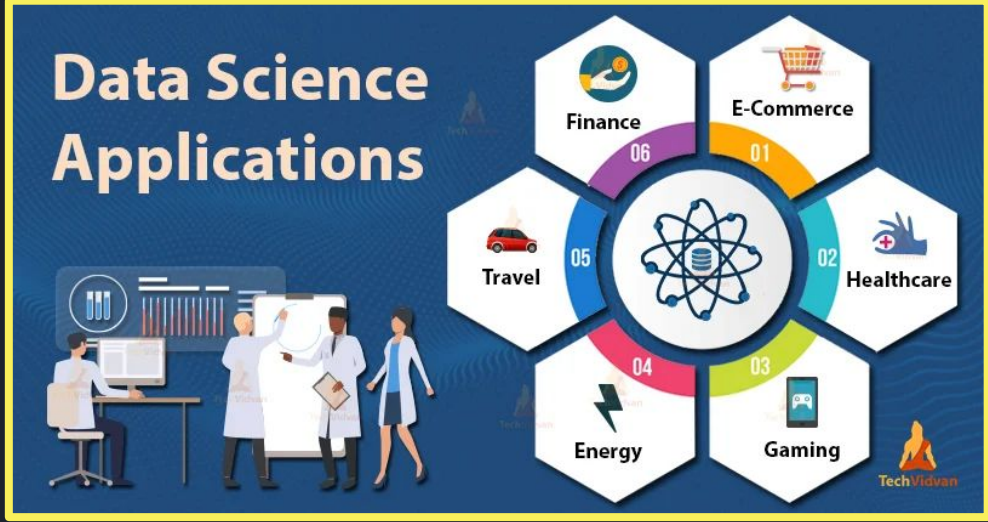

MATHEMATICS & STATISTICS
MACHINE LEARNING
COMPUTER SCIENCE
DATA SCIENCE
ADVANCED ANALYTICS
DATA ANALYTICS
BUSINESS DOMAIN KNOWLEDGE


Data Science Applications
Finance
E-Commerce
Travel
Healthcare
Energy
Gaming
01
02
03
04
05
06
TechVidvan

Visualization Libraries

https://d3js.org/

https://www.chartjs.org/

Data Science Goals w/ Code

- Format Real World Data
- Convert Math to Code
- Find Meaningful Patterns Using Math
- Visualize Those Patterns

Calculus Key Concepts

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Limits

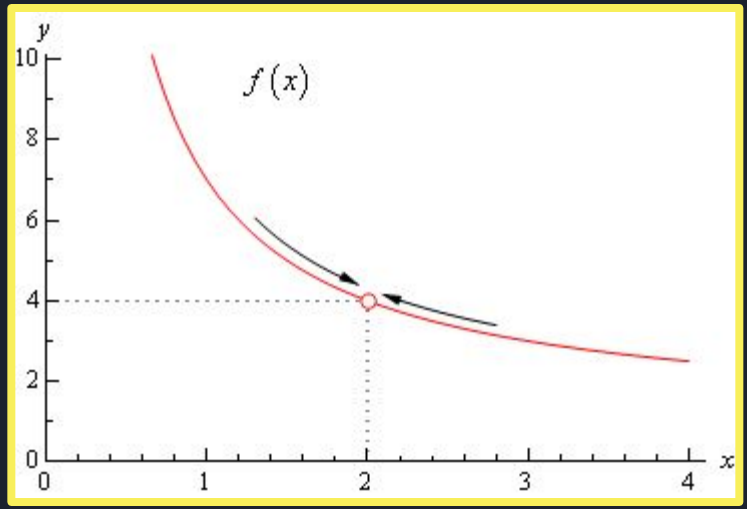
$$\lim_{x \to a} f(x) = L$$

function

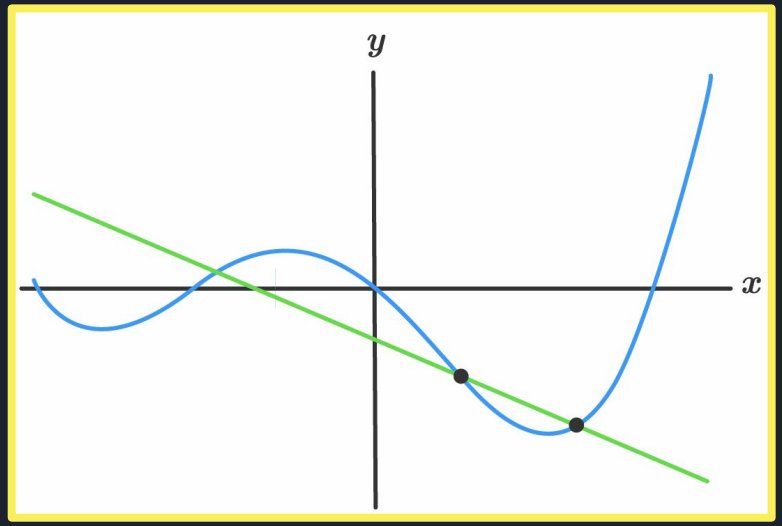
"What is the y-value getting closer to?"

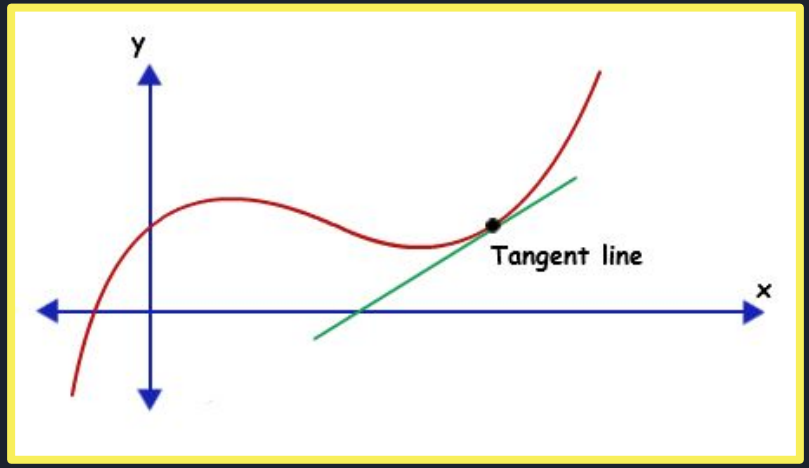
"As you approach a along the x-axis"

Calcworkshop.com



Derivatives





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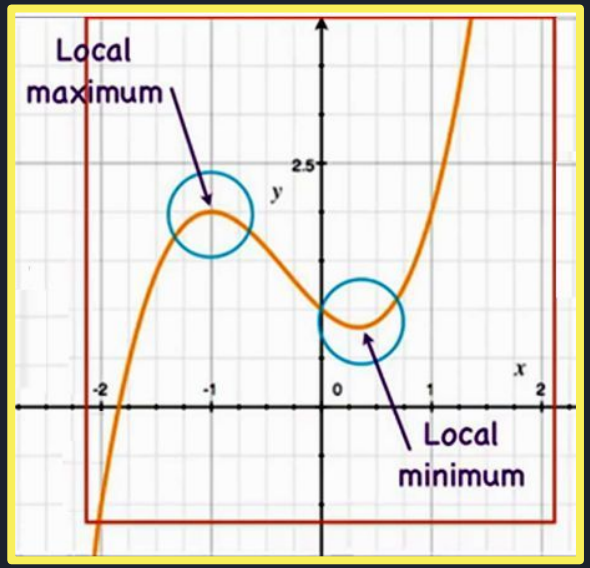
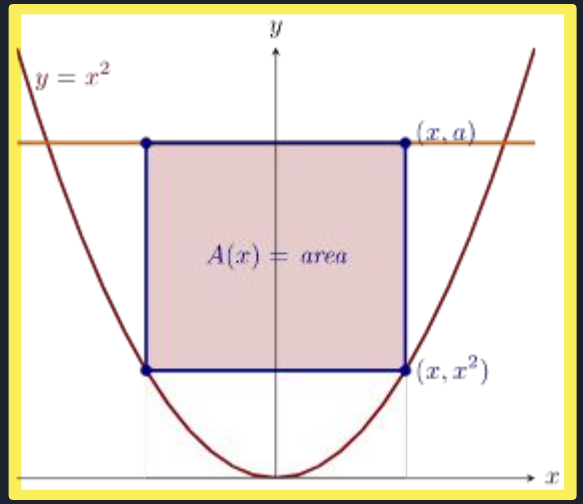
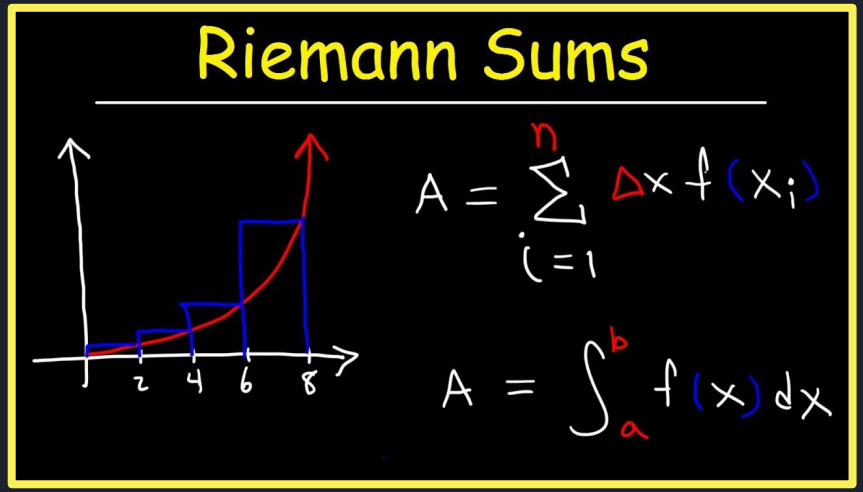
Differentiation Rules	
Constant Rule	$\frac{d}{dx}[c] = 0$
Power Rule	$\frac{d}{dx} x^n = nx^{n-1}$
Product Rule	$\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$
Quotient Rule	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$
Chain Rule	$\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$

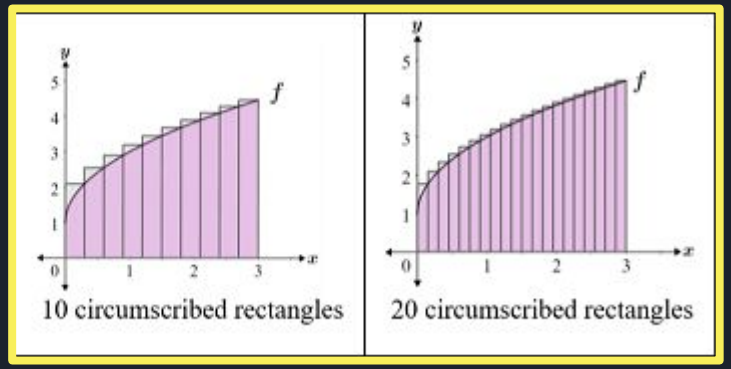
Optimization





Integrals





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Applying Calculus to Data Science

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Best Applications of Calculus in Data Science

- Optimization: min/maxing
- Curve Fitting & Prediction: regression
- Total Gain/Requirements: integrals
- Predicting Correlations: differential equations

Interactive Session

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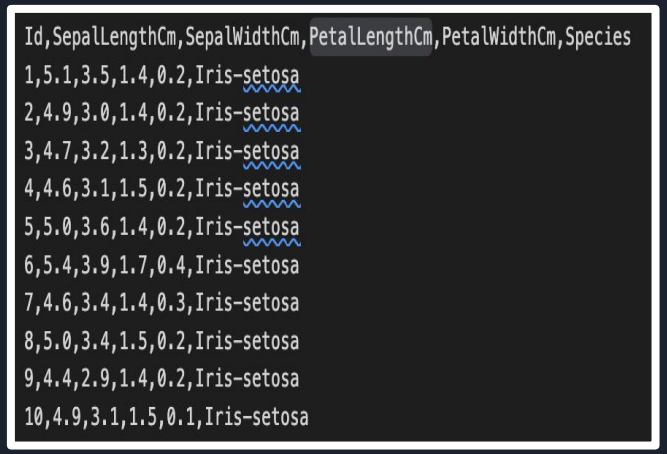
Interactive Session

Goal: Create Simple Visualization for a Popular Movie

- Find Our Community (https://www.jsdelivr.com/)
- Gather Our Data
- Find Patterns using Calculus
- Visualize these Patterns using JS

Gather Our Data

- D3 has methods to retrieve data from all kinds of sources
  - The most popular ones are CSV and JSON



Iris dataset

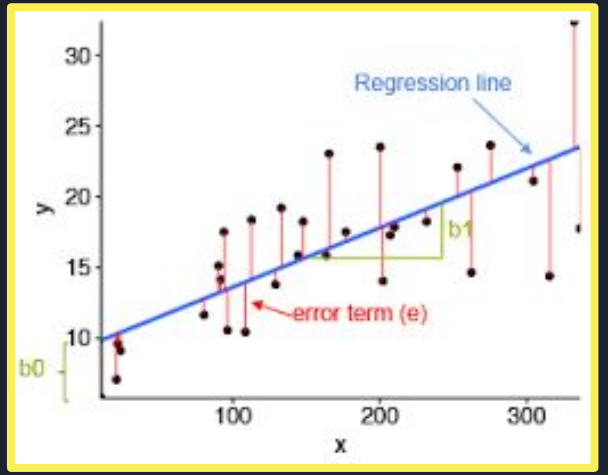
Finding Patterns using Calculus: Min/Maxing

- D3 has methods to find the min and max of resources

```
d3.min(petalWidths);
d3.max(petalWidths);
```

Finding Patterns using Calculus: Regression

- We can use regression methods by including an external library to our code
  - We will be using D3 regression library (https://github.com/harrystevens/d3-regression)



Finding Patterns using Calculus: Integrals

- We can use integrals methods by including an external library to our code
    - We will be using mathJS simple integral extension (https://github.com/joelahoover/mathjs-simple-integral)

Thanks!

Does anyone have any questions?

jpaintsil@colgate.edu

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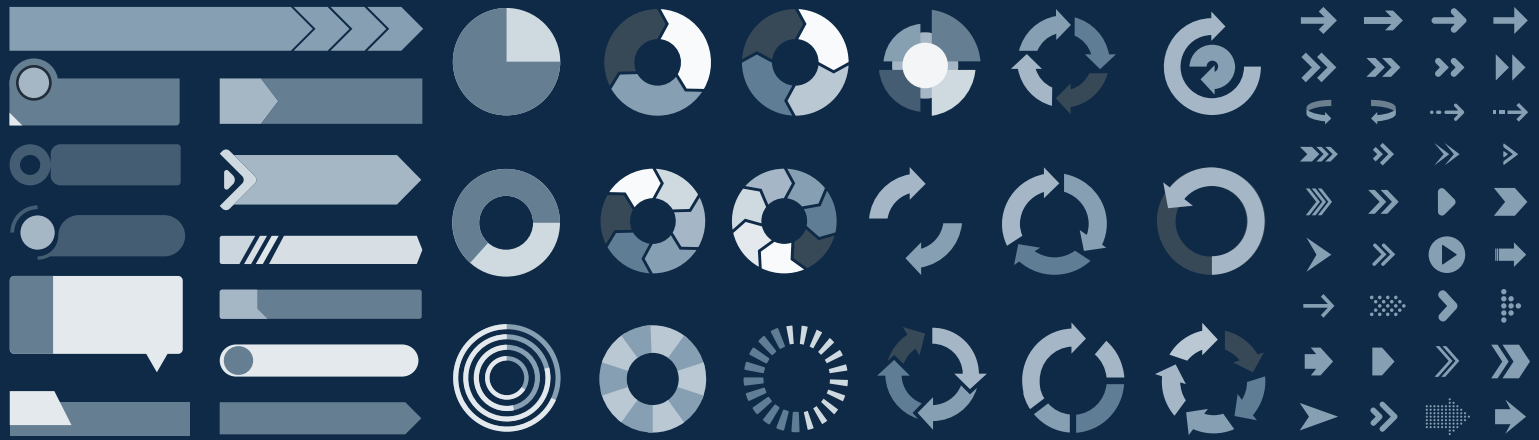
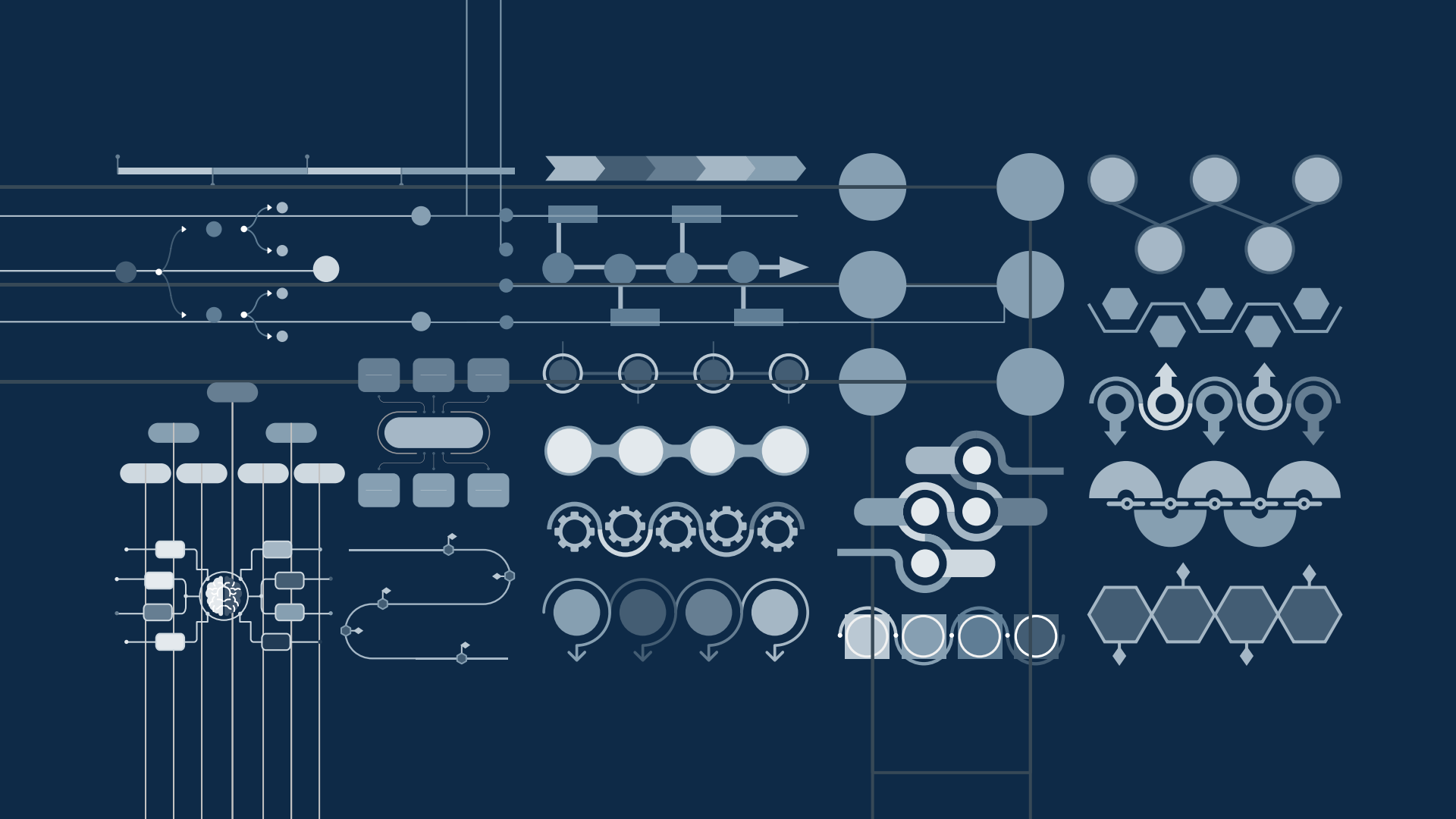
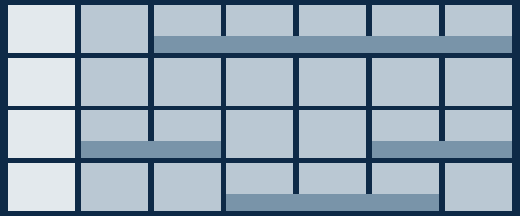
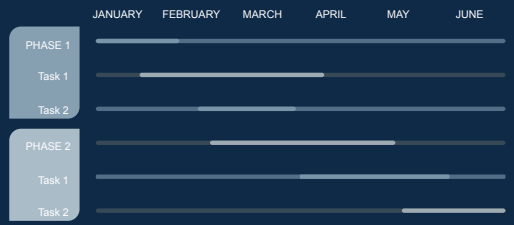


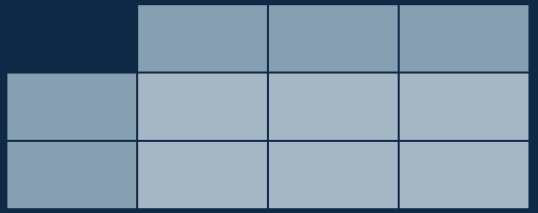


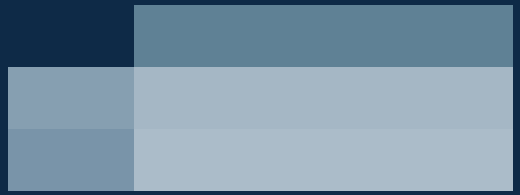


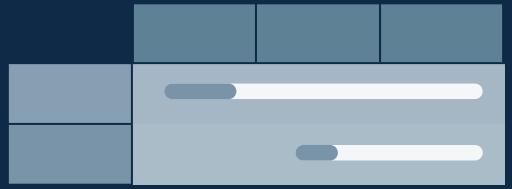



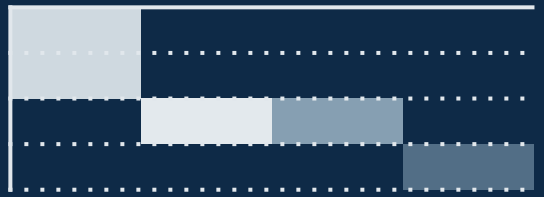


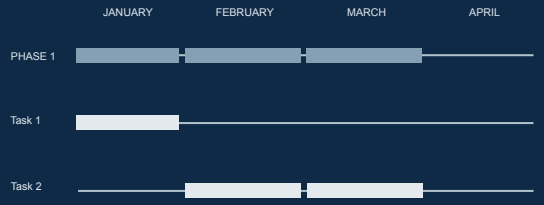

JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
PHASE 1
Task 1
Task 2
PHASE 2
Task 1
Task 2










JANUARY
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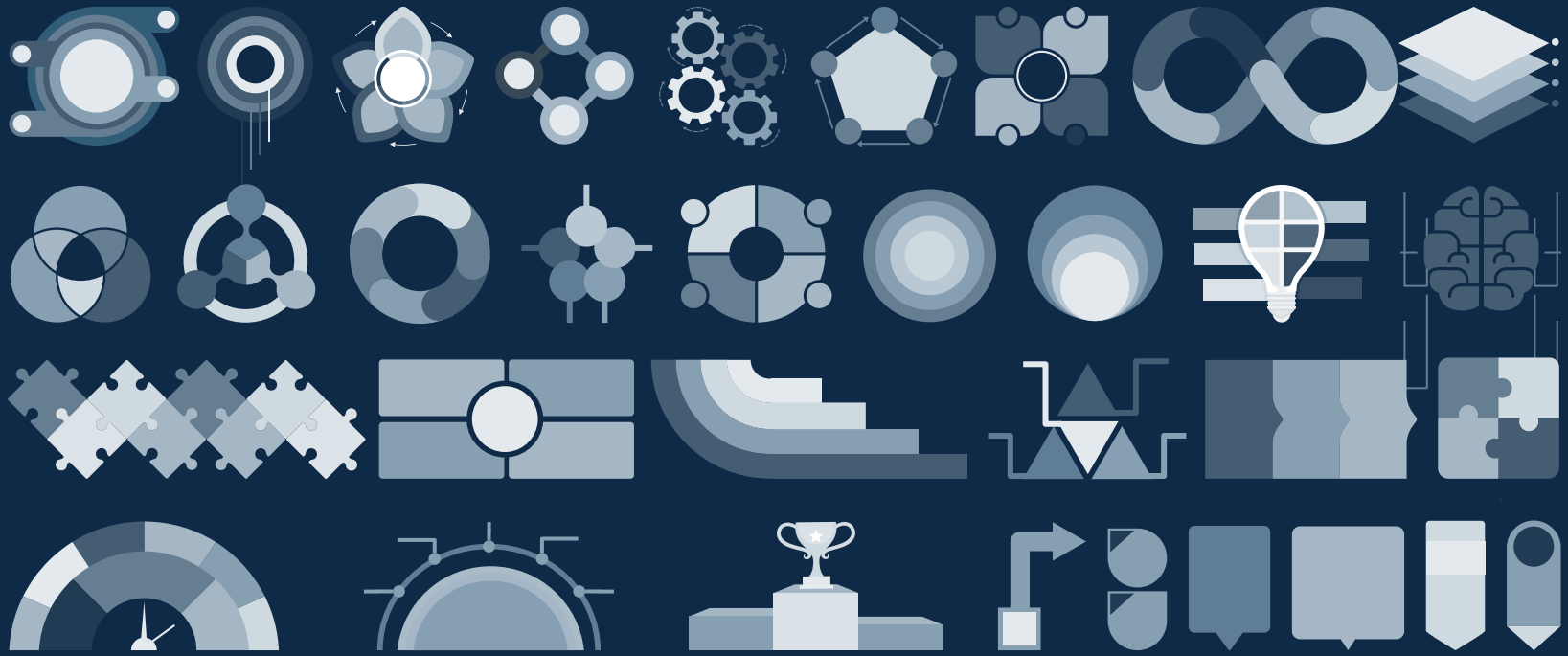
PHASE 1
Task 1
Task 2



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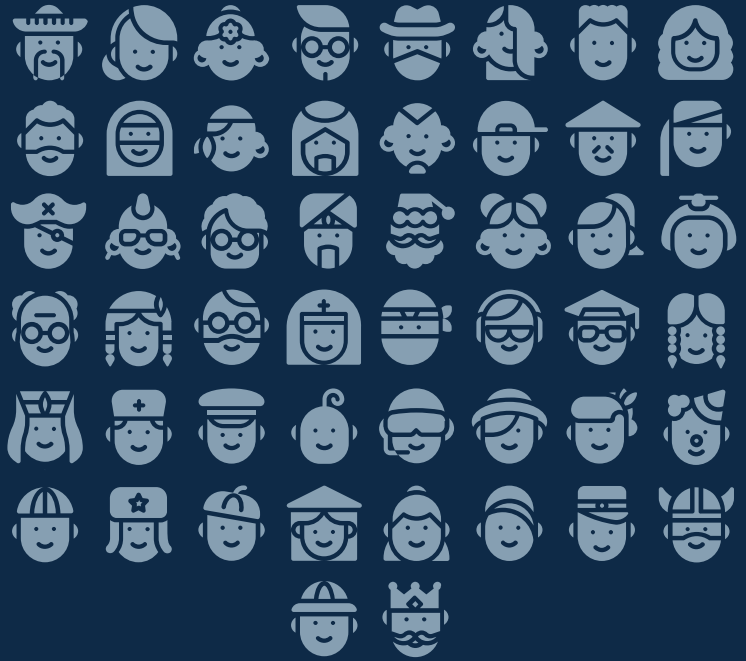
Avatar Icons



Creative Process Icons

Performing Arts Icons

Nature Icons

SEO & Marketing Icons