OBJECT ORIENTED PROGRAMMING AND S.O.L.I.D. PRINCIPLES

Universidad de La Laguna ~ PAI 2020-2021
Viren Sajju Dhanwani Dhanwani and J. Daniel Escánez Expósito

WHO ARE WE?

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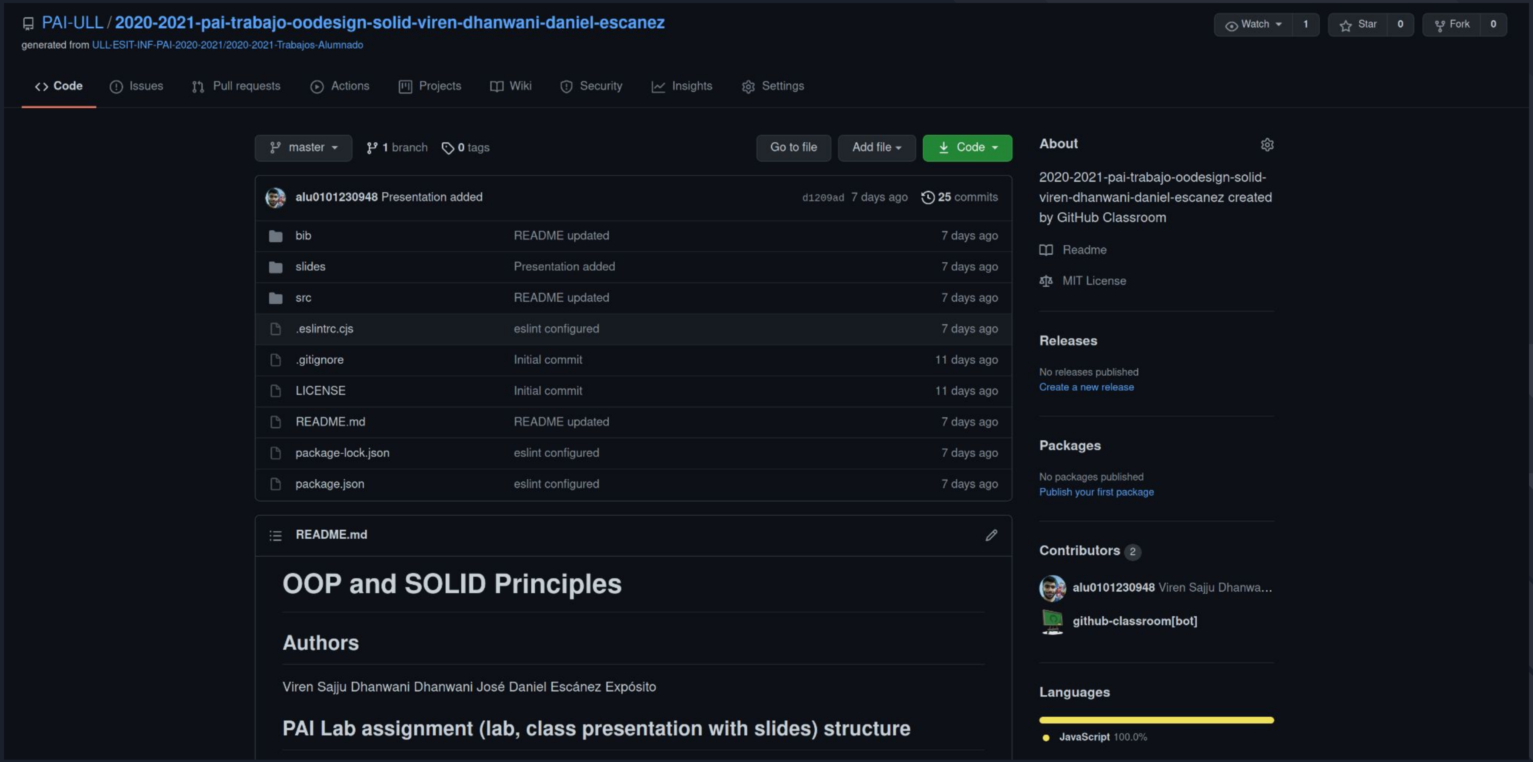
REPOSITORY



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alu0101230948 Presentation added d1209ad 7 days ago 25 commits

bib	README updated	7 days ago
slides	Presentation added	7 days ago
src	README updated	7 days ago
.eslintrc.cjs	eslint configured	7 days ago
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LICENSE	Initial commit	11 days ago
README.md	README updated	7 days ago
package-lock.json	eslint configured	7 days ago
package.json	eslint configured	7 days ago

README.md

OOP and SOLID Principles

Authors

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PAI Lab assignment (lab, class presentation with slides) structure

About

2020-2021-pai-trabajo-oodesign-solid-viren-dhanwani-daniel-escanez created by GitHub Classroom

Readme

MIT License

Releases

No releases published
Create a new release

Packages

No packages published
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Contributors 2

alu0101230948 Viren Sajju Dhanwa...

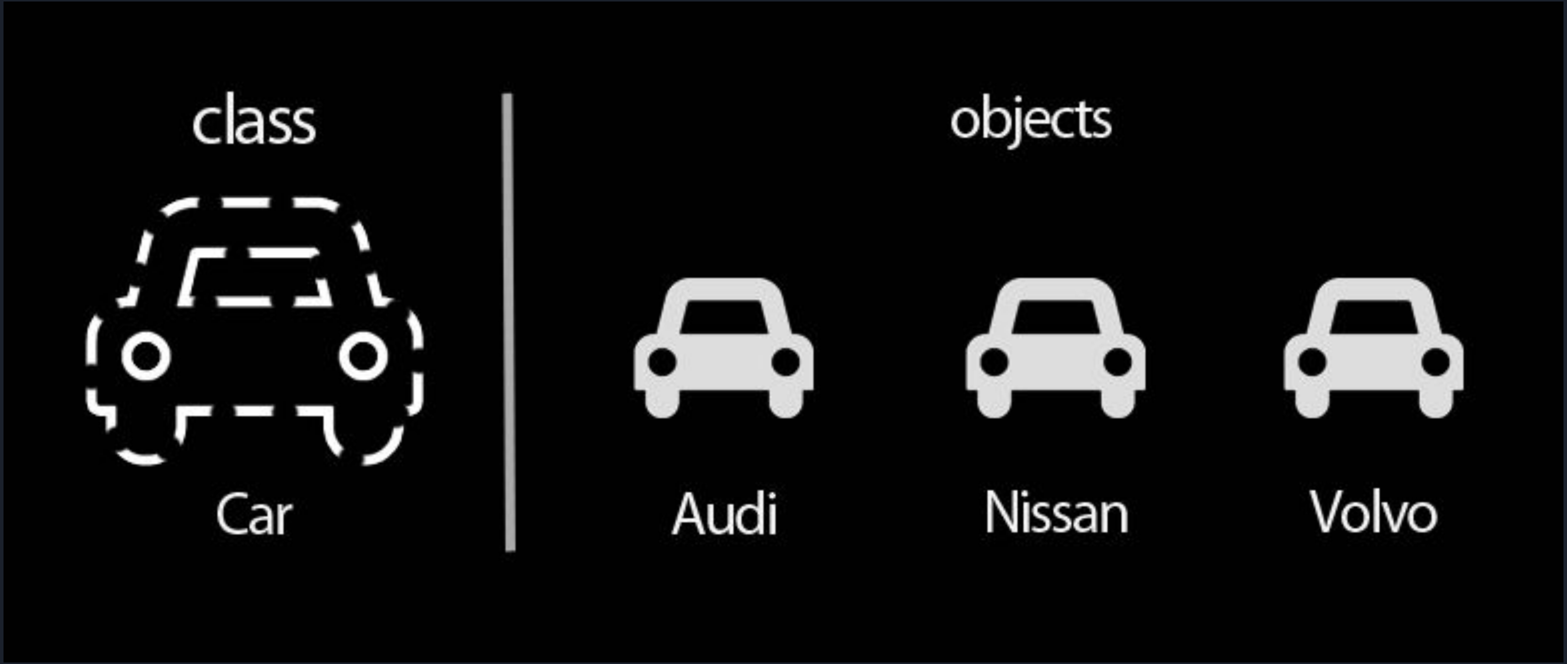
github-classroom[bot]

Languages

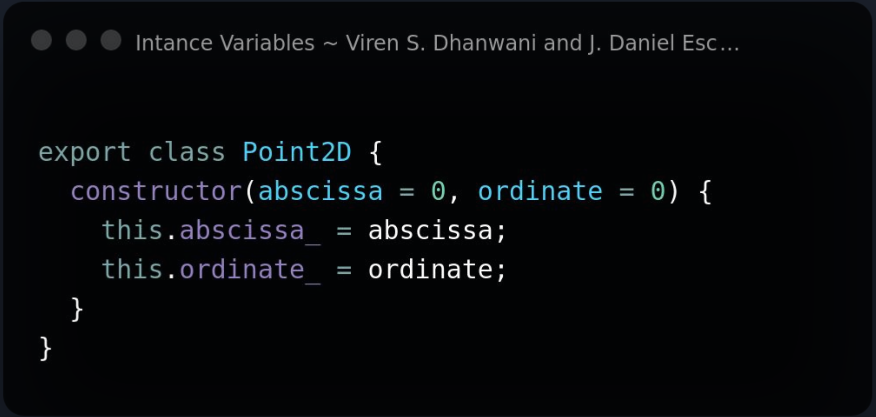
JavaScript 100.0%

OBJECT ORIENTED PROGRAMMING TERMS

OOP TERMS: CLASSES AND OBJECTS



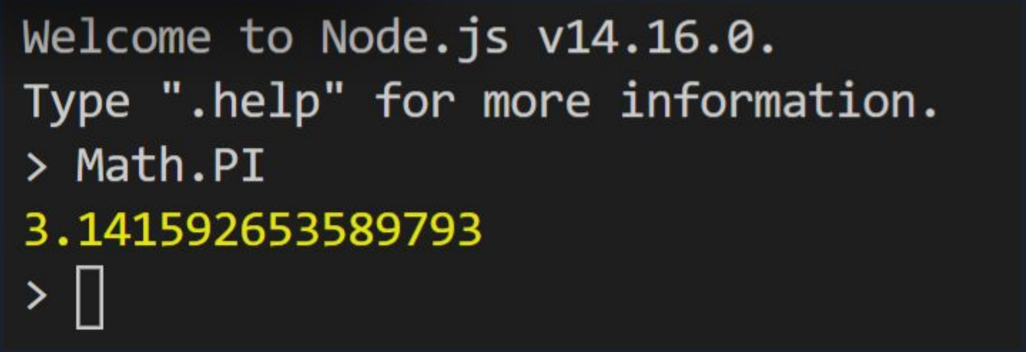
OOP TERMS: INSTANCE AND CLASS VARIABLES


Intance Variables ~ Viren S. Dhanwani and J. Daniel Esc…

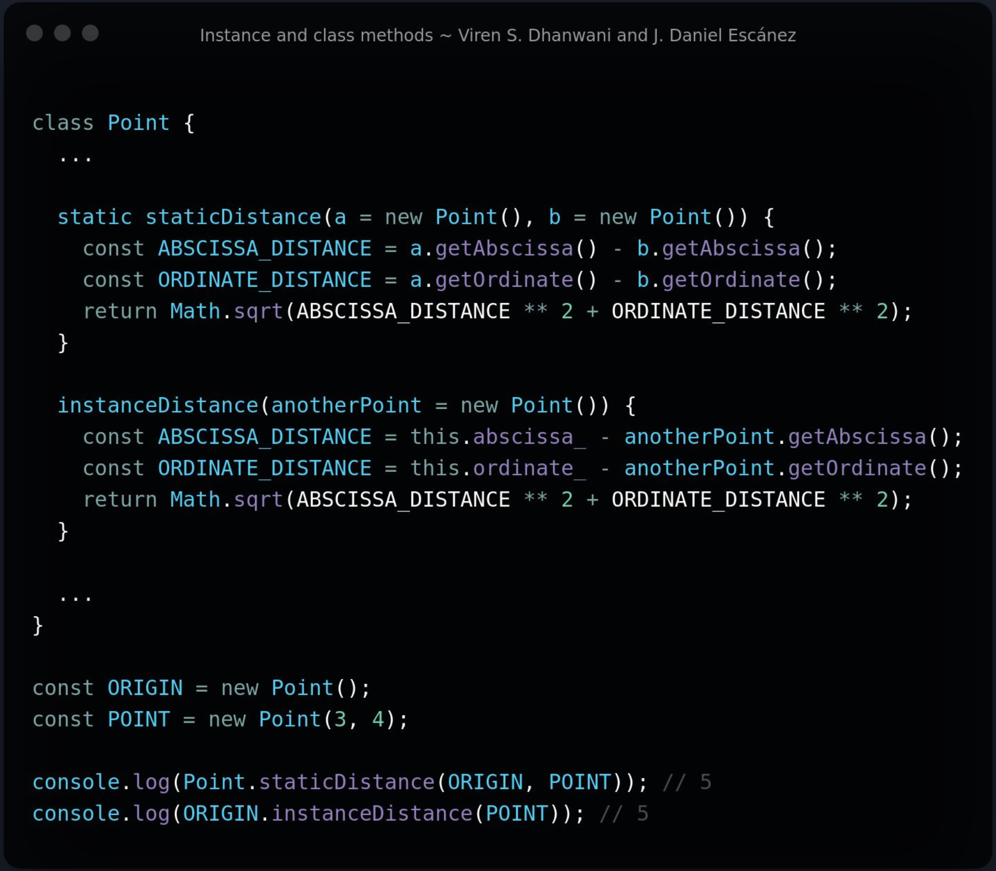
```
export class Point2D {
  constructor(abscissa = 0, ordinate = 0) {
    this.abscissa_ = abscissa;
    this.ordinate_ = ordinate;
  }
}
```

INSTANCE

CLASS


```
Welcome to Node.js v14.16.0.
Type ".help" for more information.
> Math.PI
3.141592653589793
> 
```

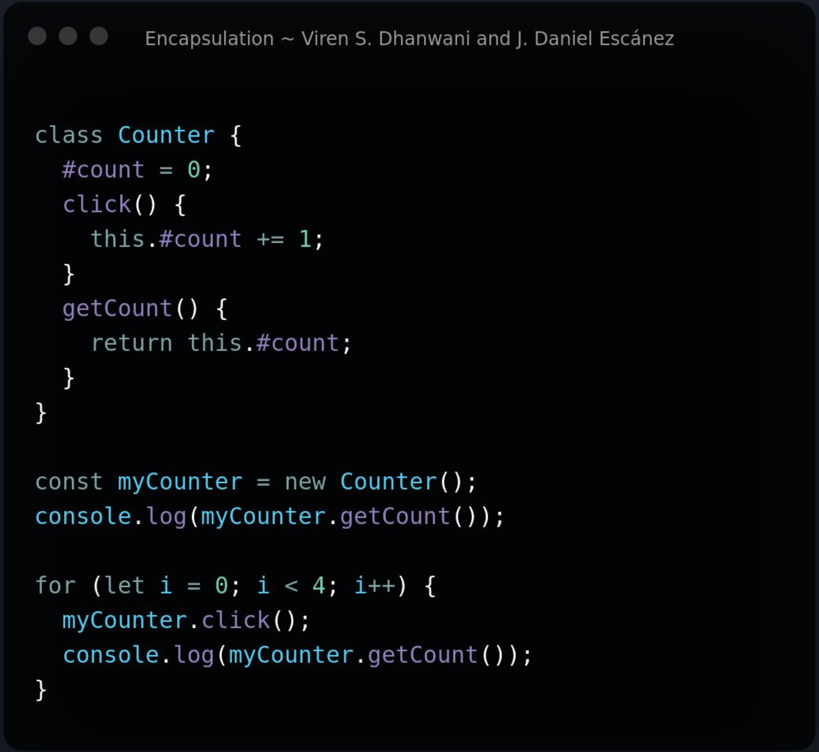
OOP TERMS: INSTANCE AND CLASS METHODS


Instance and class methods ~ Viren S. Dhanwani and J. Daniel Escánez

```
class Point {
  ...

  static staticDistance(a = new Point(), b = new Point()) {
    const ABSCISSA_DISTANCE = a.getAbscissa() - b.getAbscissa();
    const ORDINATE_DISTANCE = a.getOrdinate() - b.getOrdinate();
    return Math.sqrt(ABSCISSA_DISTANCE ** 2 + ORDINATE_DISTANCE ** 2);
  }

  instanceDistance(anotherPoint = new Point()) {
    const ABSCISSA_DISTANCE = this.abscissa_ - anotherPoint.getAbscissa();
    const ORDINATE_DISTANCE = this.ordinate_ - anotherPoint.getOrdinate();
    return Math.sqrt(ABSCISSA_DISTANCE ** 2 + ORDINATE_DISTANCE ** 2);
  }

  ...
}

const ORIGIN = new Point();
const POINT = new Point(3, 4);

console.log(Point.staticDistance(ORIGIN, POINT)); // 5
console.log(ORIGIN.instanceDistance(POINT)); // 5
```

OBJECT ORIENTED PROGRAMMING FEATURES

OOP FEATURES: ENCAPSULATION

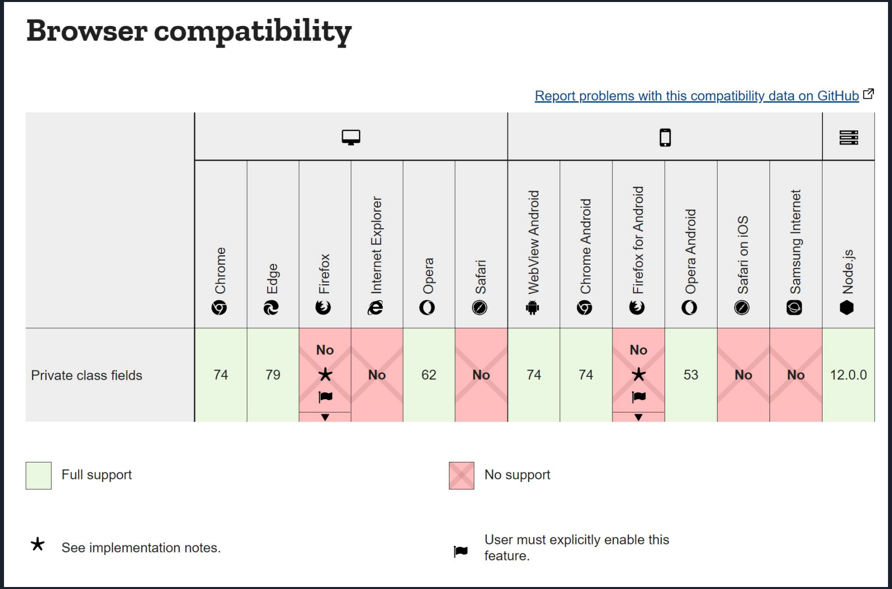

Encapsulation ~ Viren S. Dhanwani and J. Daniel Escánez

```
class Counter {
  #count = 0;
  click() {
    this.#count += 1;
  }
  getCount() {
    return this.#count;
  }
}

const myCounter = new Counter();
console.log(myCounter.getCount());

for (let i = 0; i < 4; i++) {
  myCounter.click();
  console.log(myCounter.getCount());
}
```

PUBLIC, PROTECTED AND PRIVATE IN JS (EXPERIMENTAL FEATURE)

- In the constructor
  - PUBLIC VARIABLE
    - variableName
  - PROTECTED VARIABLE
    - variableName_

- In the class body
  - PRIVATE VARIABLE
    - #variableName



Browser compatibility

Report problems with this compatibility data on GitHub

	Chrome	Edge	Firefox	Internet Explorer	Opera	Safari	WebView Android	Chrome Android	Firefox for Android	Opera Android	Safari on iOS	Samsung Internet	Node.js
Private class fields	74	79	No ★ ⚑	No	62	No	74	74	No ★ ⚑	53	No	No	12.0.0

🟩 Full support

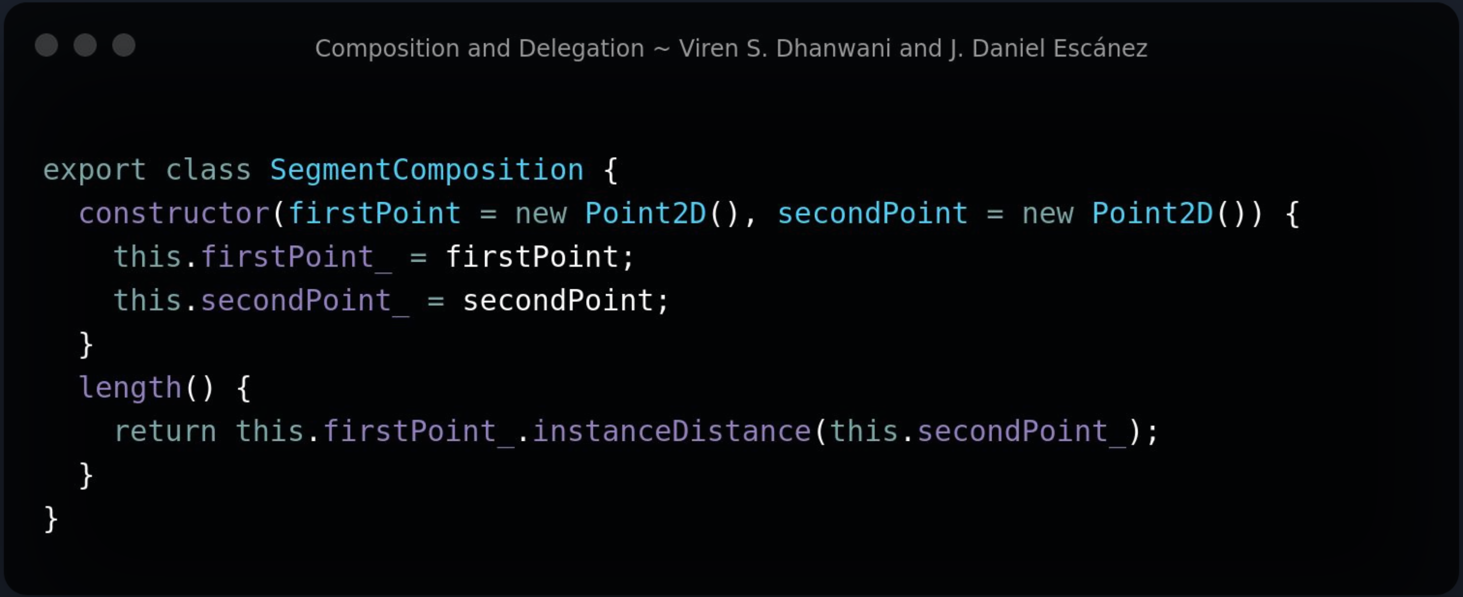
🟥 No support

★ See implementation notes.

⚑ User must explicitly enable this feature.

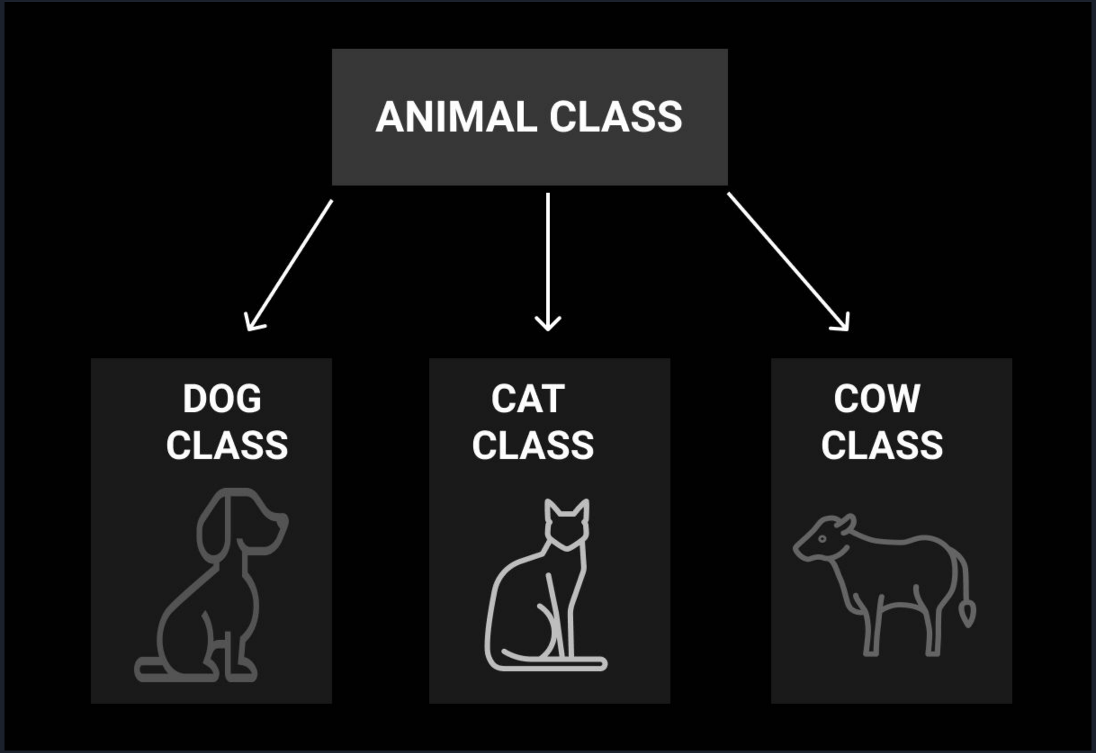
https://developer.mozilla.org/es/docs/Web/JavaScript/Reference/Classes/Private_class_fields

OOP FEATURES: COMPOSITION AND DELEGATION

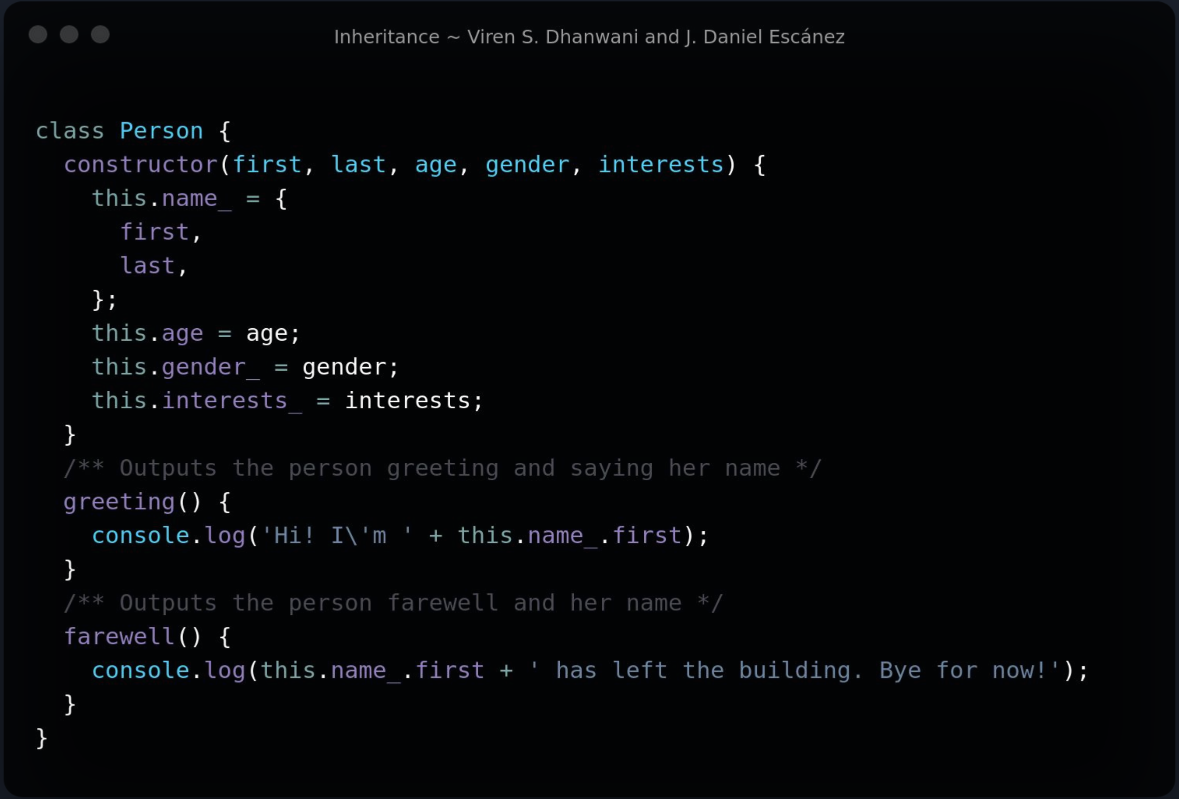

Composition and Delegation ~ Viren S. Dhanwani and J. Daniel Escánez

```
export class SegmentComposition {
  constructor(firstPoint = new Point2D(), secondPoint = new Point2D()) {
    this.firstPoint_ = firstPoint;
    this.secondPoint_ = secondPoint;
  }
  length() {
    return this.firstPoint_.instanceDistance(this.secondPoint_);
  }
}
```

OOP FEATURES: INHERITANCE

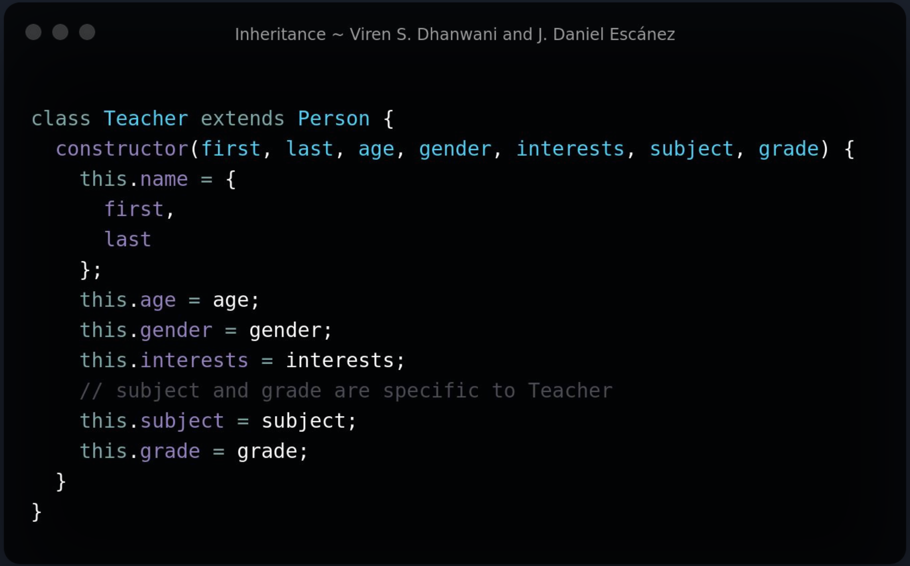


OOP FEATURES: INHERITANCE


Inheritance ~ Viren S. Dhanwani and J. Daniel Escánez

```
class Person {
  constructor(first, last, age, gender, interests) {
    this.name_ = {
      first,
      last,
    };
    this.age = age;
    this.gender_ = gender;
    this.interests_ = interests;
  }
  /** Outputs the person greeting and saying her name */
  greeting() {
    console.log('Hi! I\'m ' + this.name_.first);
  }
  /** Outputs the person farewell and her name */
  farewell() {
    console.log(this.name_.first + ' has left the building. Bye for now!');
  }
}
```

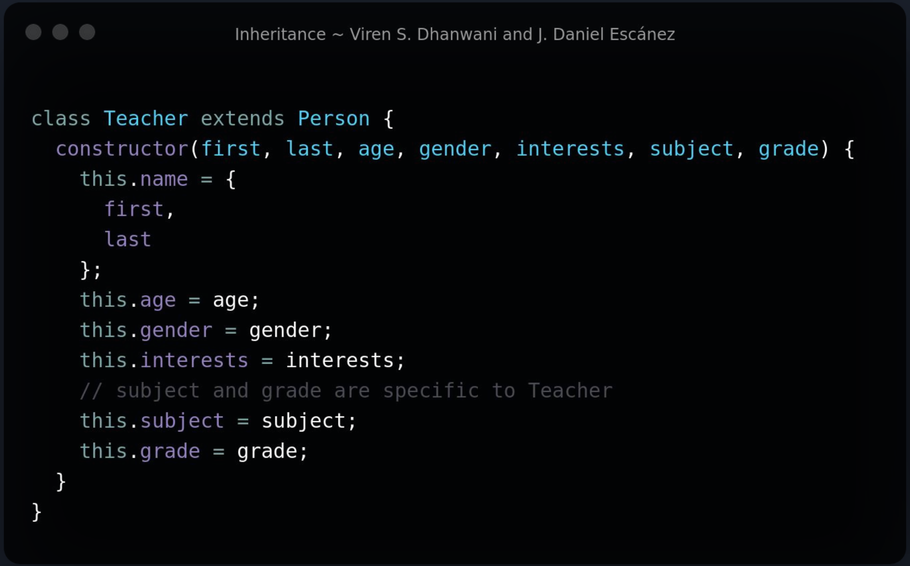
OOP FEATURES: INHERITANCE



Inheritance ~ Viren S. Dhanwani and J. Daniel Escánez

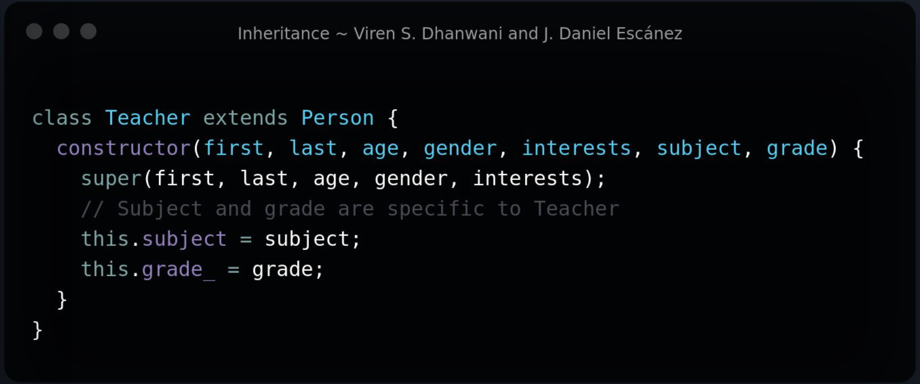
```
class Teacher extends Person {
  constructor(first, last, age, gender, interests, subject, grade) {
    this.name = {
      first,
      last
    };
    this.age = age;
    this.gender = gender;
    this.interests = interests;
    // subject and grade are specific to Teacher
    this.subject = subject;
    this.grade = grade;
  }
}
```

OOP FEATURES: INHERITANCE



Inheritance ~ Viren S. Dhanwani and J. Daniel Escánez

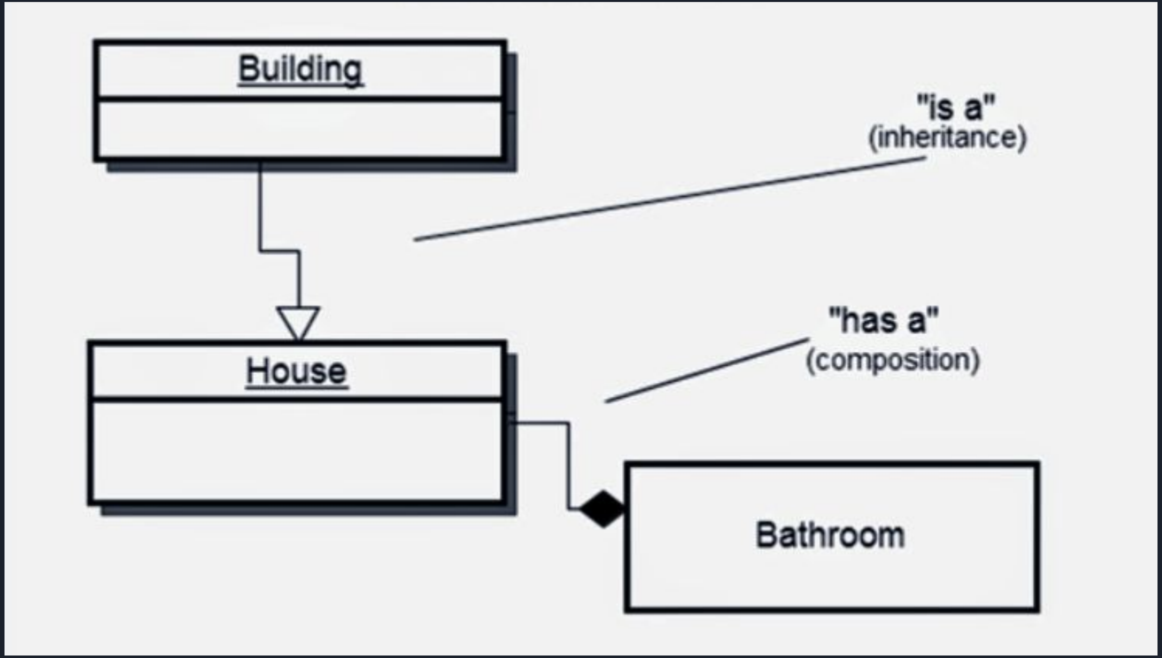
```
class Teacher extends Person {
  constructor(first, last, age, gender, interests, subject, grade) {
    this.name = {
      first,
      last
    };
    this.age = age;
    this.gender = gender;
    this.interests = interests;
    // subject and grade are specific to Teacher
    this.subject = subject;
    this.grade = grade;
  }
}
```



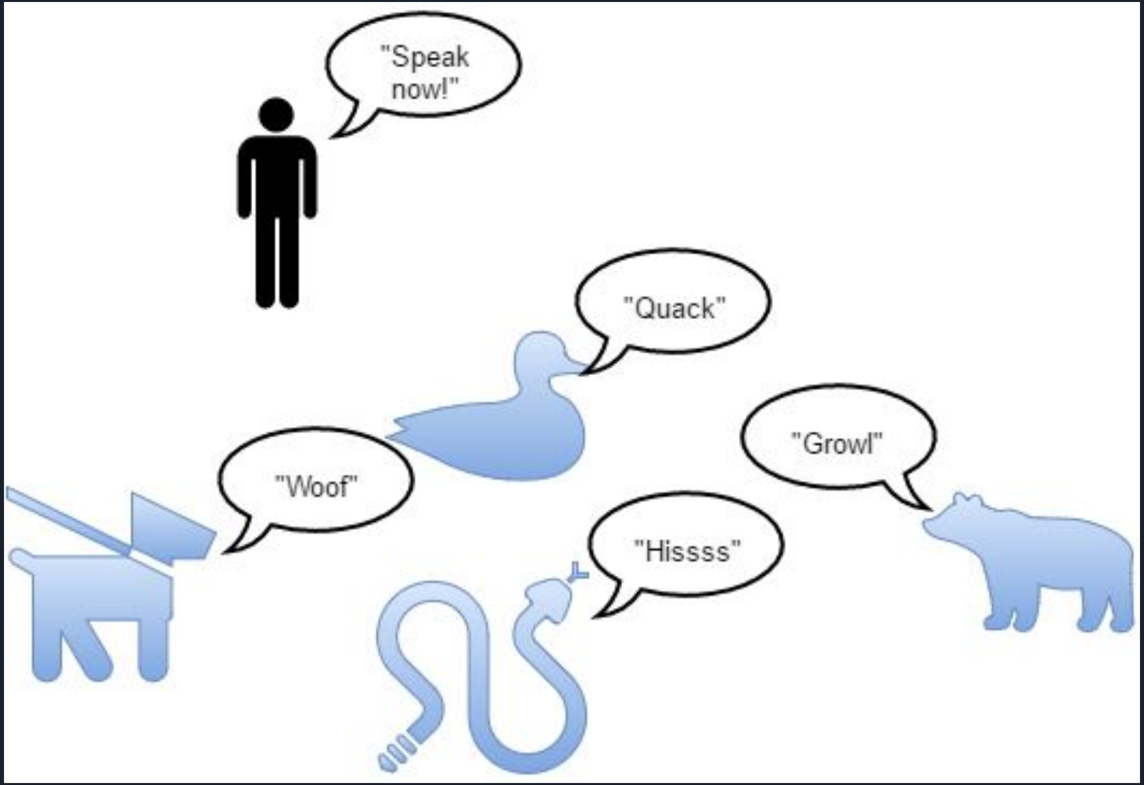
Inheritance ~ Viren S. Dhanwani and J. Daniel Escánez

```
class Teacher extends Person {
  constructor(first, last, age, gender, interests, subject, grade) {
    super(first, last, age, gender, interests);
    // Subject and grade are specific to Teacher
    this.subject = subject;
    this.grade_ = grade;
  }
}
```

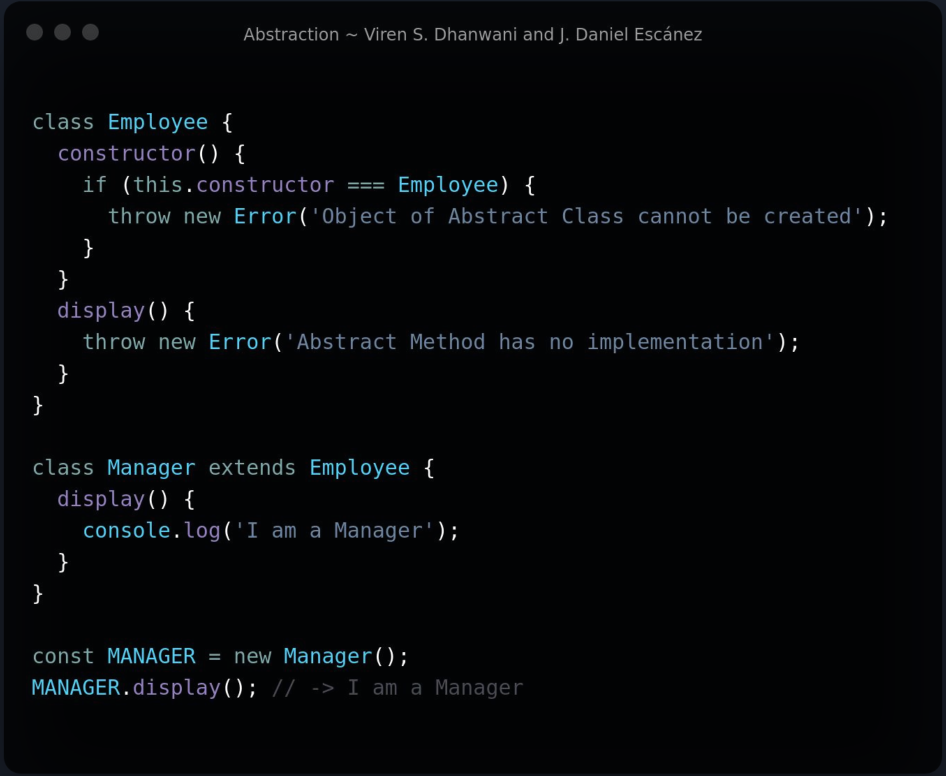
INHERITANCE VS COMPOSITION



OOP FEATURES: POLYMORPHISM



OOP FEATURES: ABSTRACTION

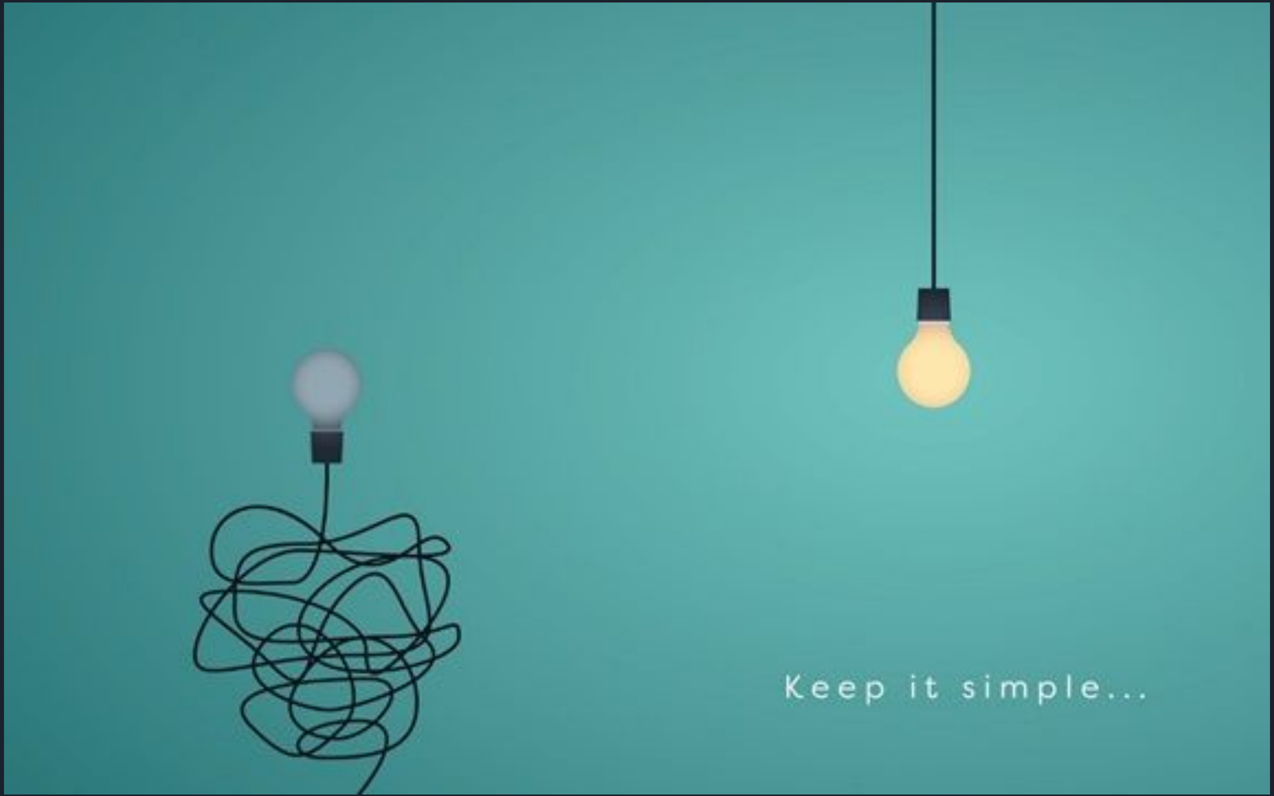


Abstraction ~ Viren S. Dhanwani and J. Daniel Escánez

```
class Employee {
  constructor() {
    if (this.constructor === Employee) {
      throw new Error('Object of Abstract Class cannot be created');
    }
  }
  display() {
    throw new Error('Abstract Method has no implementation');
  }
}

class Manager extends Employee {
  display() {
    console.log('I am a Manager');
  }
}

const MANAGER = new Manager();
MANAGER.display(); // -> I am a Manager
```

OBJECT ORIENTED PROGRAMMING PRINCIPLES

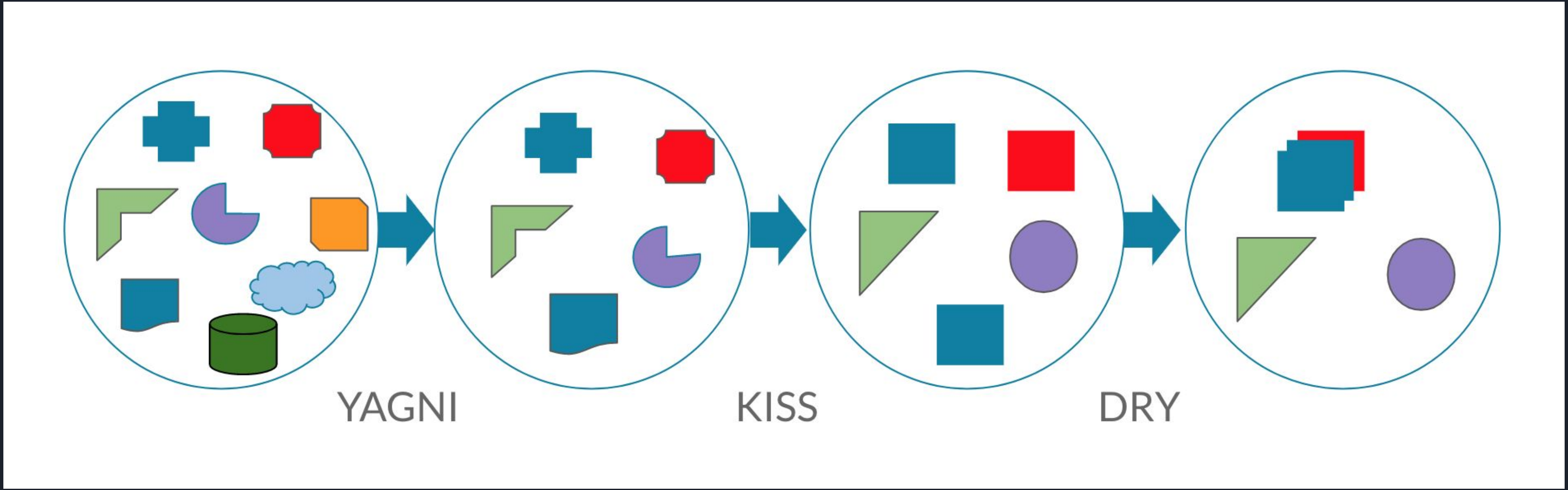
K.I.S.S. (Keep It Simple, Stupid)



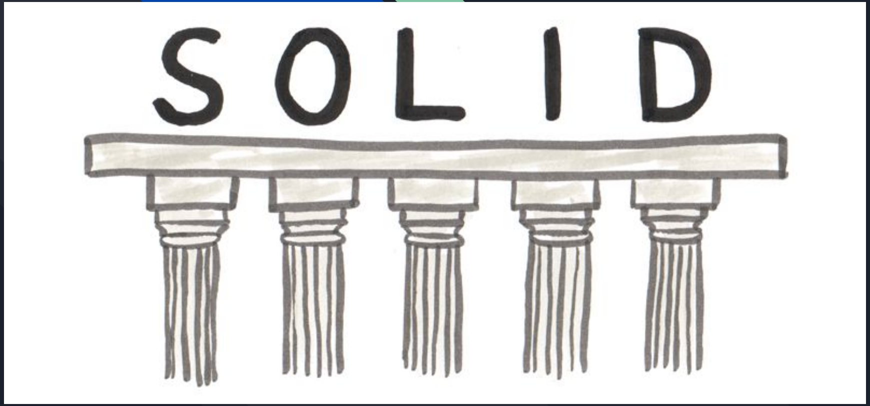
D.R.Y. (Don’t Repeat Yourself)

Y.A.G.N.I. (You Aren’t Going to Need It)

Y.A.G.N.I. - K.I.S.S. - D.R.Y.



SOLID PRINCIPLES



S ingle Resposibility Principle
A class should have only a single responsibility (i.e. only one potential change in the software's specification should be able to affect the specification of the class)

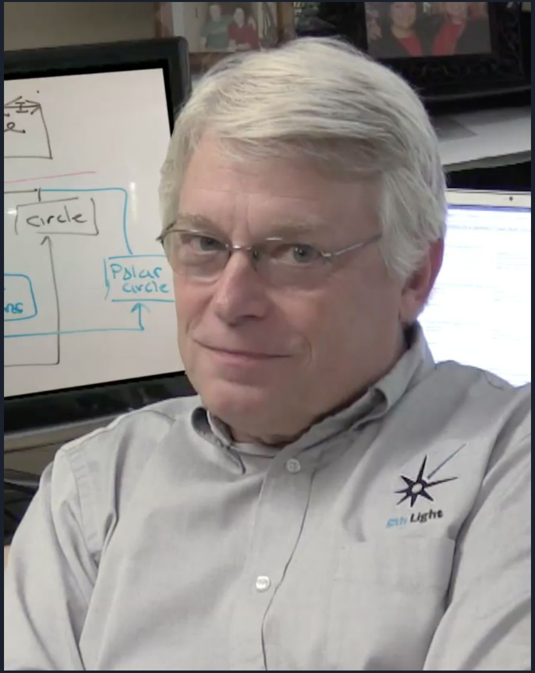
O pen / Closed Principle
A software module (it can be a class or method) should be open for extension but closed for modification.

L iskov Substitution Principle
Objects in a program should be replaceable with instances of their subtypes without altering the correctness of that program.

I nterface Segregation Principle
Clients should not be forced to depend upon the interfaces that they do not use.

D ependency Inversion Principle
Program to an interface, not to an implementation.

SOLID: Single Responsibility



“There should never be more than a reason for a class to change”

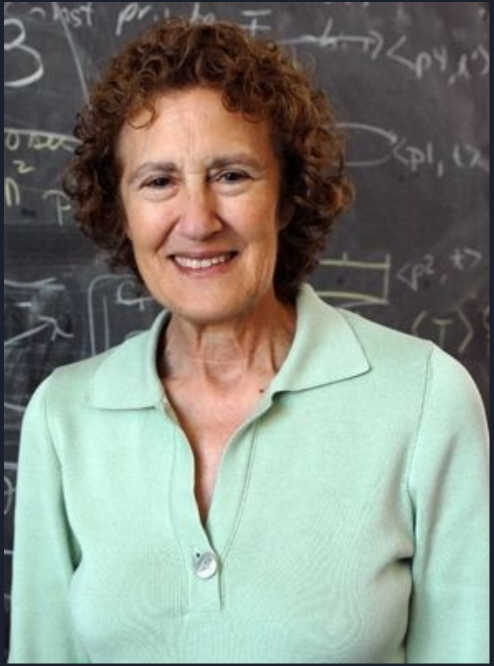
Robert C. Martin

SOLID: Open/Closed

“Software entities should be open for extension but closed for modification”

Bertrand Meyer

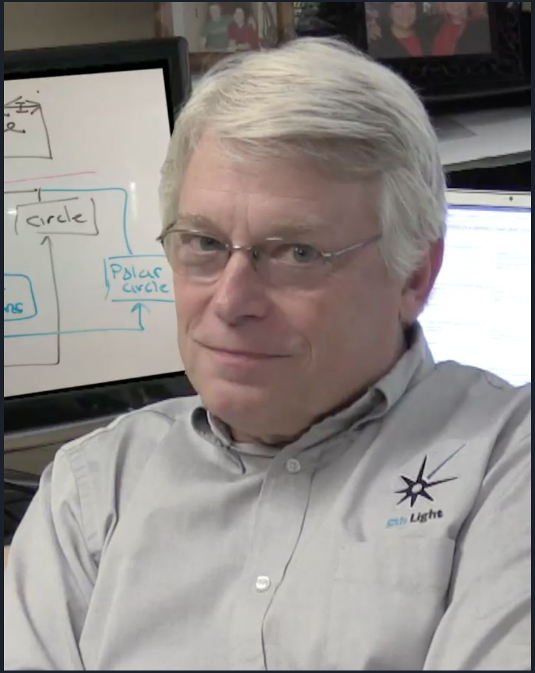
SOLID: Liskov Substitution



Objects in a program should be replaceable with instances of their subtypes without altering the correctness of that program

Barbara Liskov

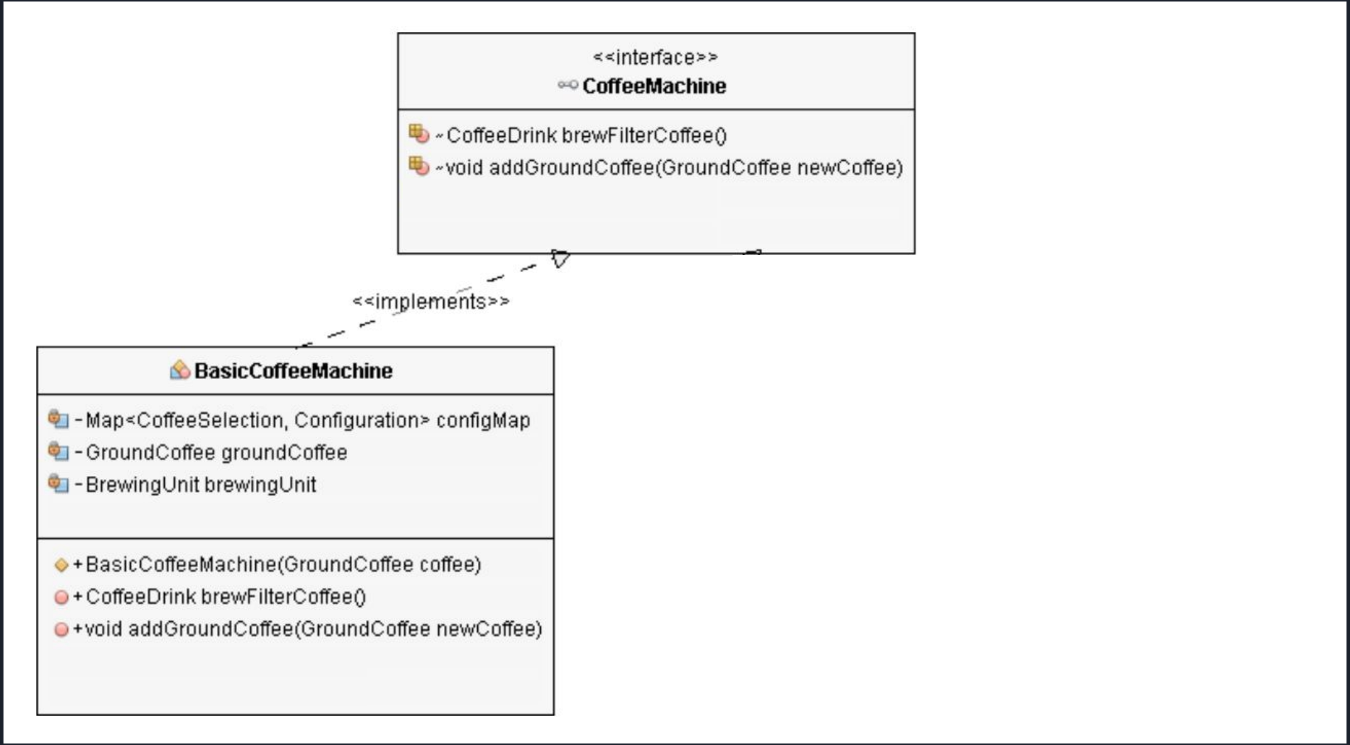
SOLID: Interface Segregation



“Clients should not be forced to depend upon the interfaces that they do not use”

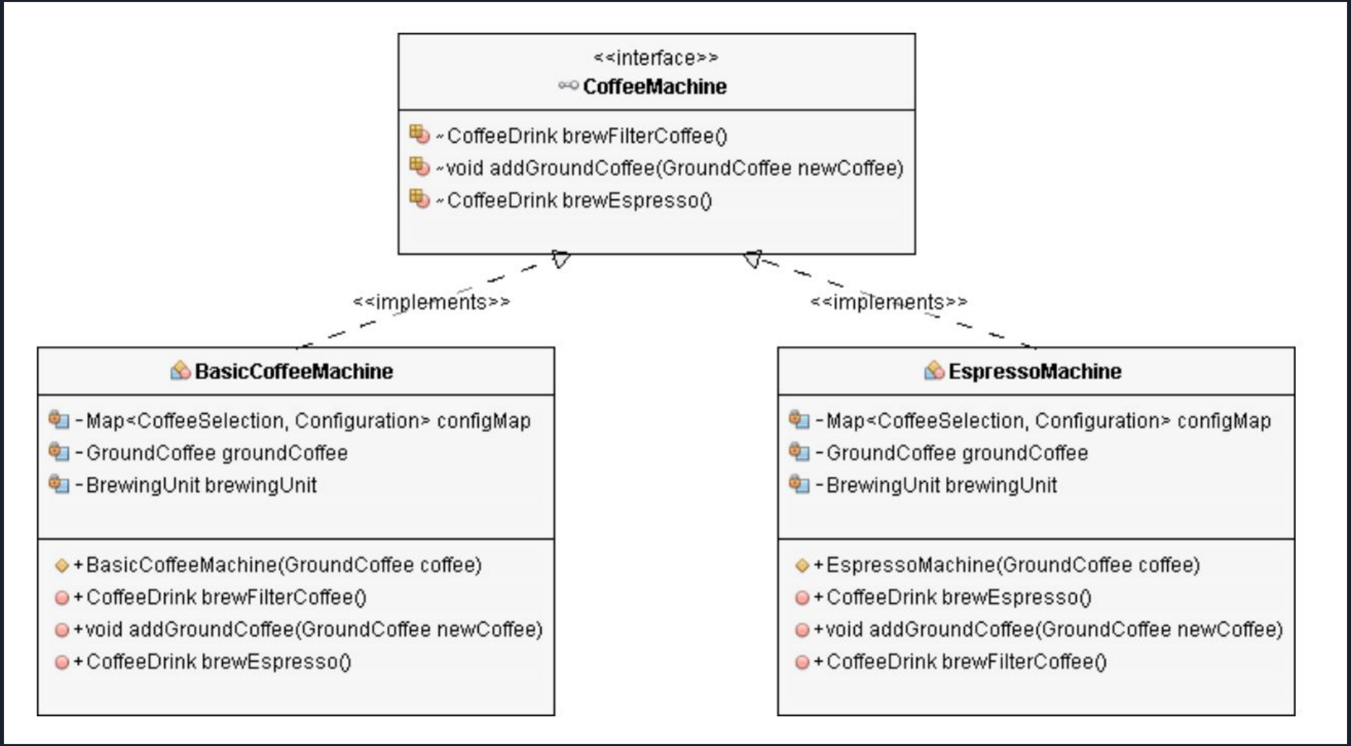
Robert C. Martin

SOLID: Interface Segregation



<<interface>>
CoffeeMachine
~CoffeeDrink brewFilterCoffee()
~void addGroundCoffee(GroundCoffee newCoffee)
<<implements>>
BasicCoffeeMachine
-Map<CoffeeSelection, Configuration> configMap
-GroundCoffee groundCoffee
-BrewingUnit brewingUnit
+BasicCoffeeMachine(GroundCoffee coffee)
+CoffeeDrink brewFilterCoffee()
+void addGroundCoffee(GroundCoffee newCoffee)

SOLID: Interface Segregation



<<interface>>
CoffeeMachine
~CoffeeDrink brewFilterCoffee()
~void addGroundCoffee(GroundCoffee newCoffee)
~CoffeeDrink brewEspresso()
<<implements>>
<<implements>>
BasicCoffeeMachine
-Map<CoffeeSelection, Configuration> configMap
-GroundCoffee groundCoffee
-BrewingUnit brewingUnit
+BasicCoffeeMachine(GroundCoffee coffee)
+CoffeeDrink brewFilterCoffee()
+void addGroundCoffee(GroundCoffee newCoffee)
+CoffeeDrink brewEspresso()
EspressoMachine
-Map<CoffeeSelection, Configuration> configMap
-GroundCoffee groundCoffee
-BrewingUnit brewingUnit
+EspressoMachine(GroundCoffee coffee)
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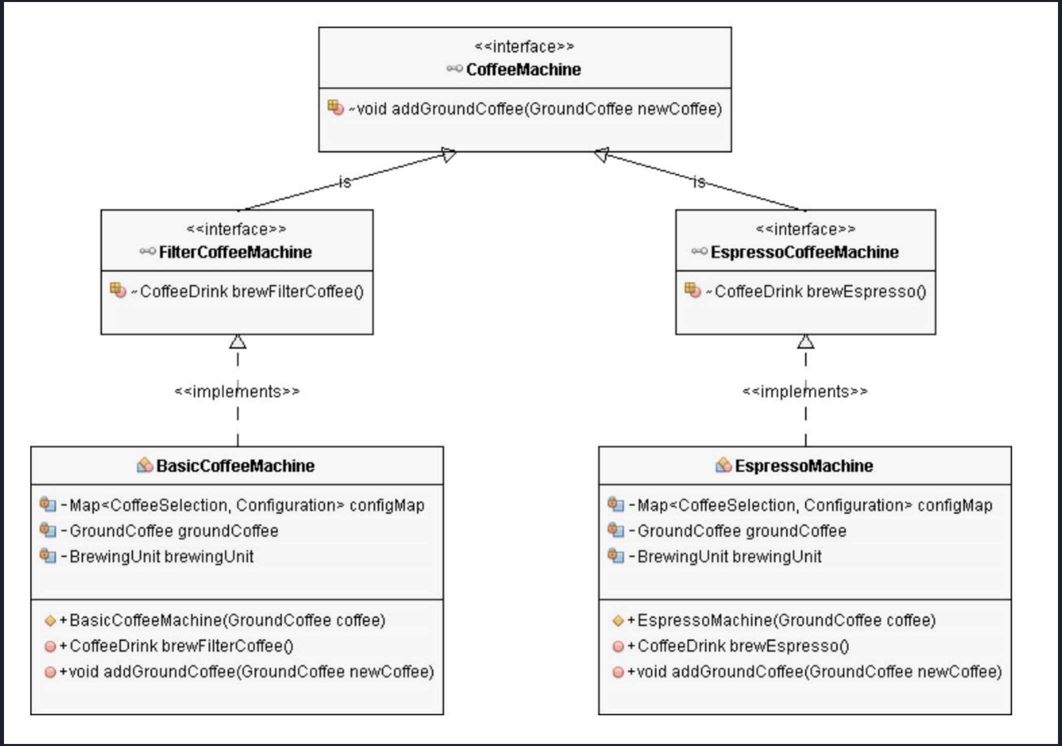
+void addGroundCoffee(GroundCoffee newCoffee)
+CoffeeDrink brewFilterCoffee()

SOLID: Interface Segregation



<<interface>>
CoffeeMachine
~void addGroundCoffee(GroundCoffee newCoffee)
is
is
<<interface>>
FilterCoffeeMachine
~CoffeeDrink brewFilterCoffee()
<<interface>>
EspressoCoffeeMachine
~CoffeeDrink brewEspresso()
<<implements>>
<<implements>>
BasicCoffeeMachine
-Map<CoffeeSelection, Configuration> configMap
-GroundCoffee groundCoffee
-BrewingUnit brewingUnit
+BasicCoffeeMachine(GroundCoffee coffee)
+CoffeeDrink brewFilterCoffee()
+void addGroundCoffee(GroundCoffee newCoffee)
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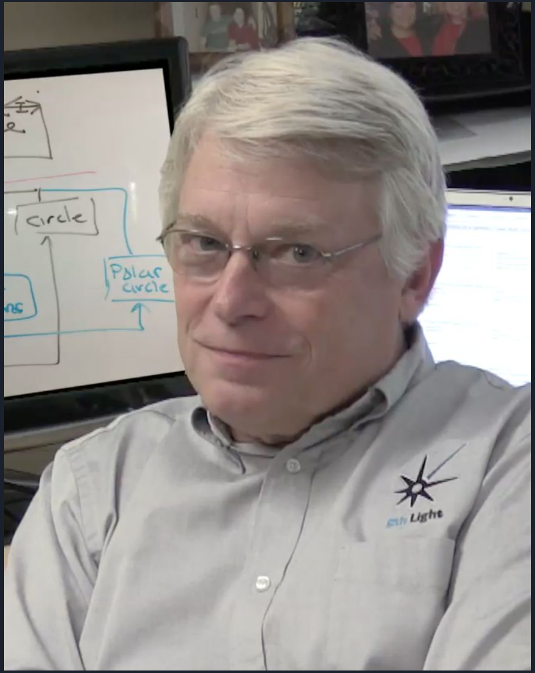
SOLID: Interface Segregation

“Clients should not be forced to depend upon the interfaces that they do not use”

Robert C. Martin

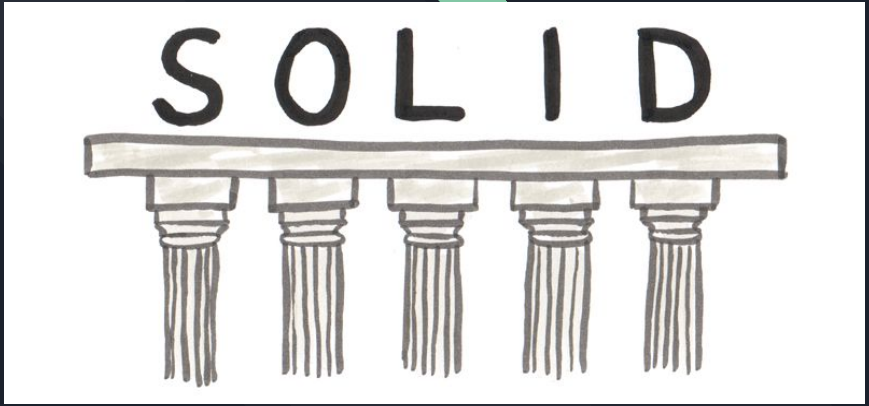
SOLID: Dependency Inversion



A. “High-level modules should not depend on low-level modules. Both should depend on abstractions”
B. Abstractions should not depend on details. Details should depend on abstractions

Robert C. Martin

SUMMARY



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BIBLIOGRAPHY

OOP and SOLID Principles Repository

Classes - JavaScript | MDN

S.O.L.I.D The first 5 principles of Object Oriented Design with JavaScript

Object-oriented programming in JavaScript #1. Abstraction

JavaScript: Object Modelling with Behavior Delegation

JavaScript Class Inheritance

KISS, DRY, and Code Principles Every Developer Should Follow

Pablo’s Topic of the Month – March: SOLID Principles

QUESTIONS?