Introduction to Object-Oriented Paradigm

By: Laams Innovation Lab

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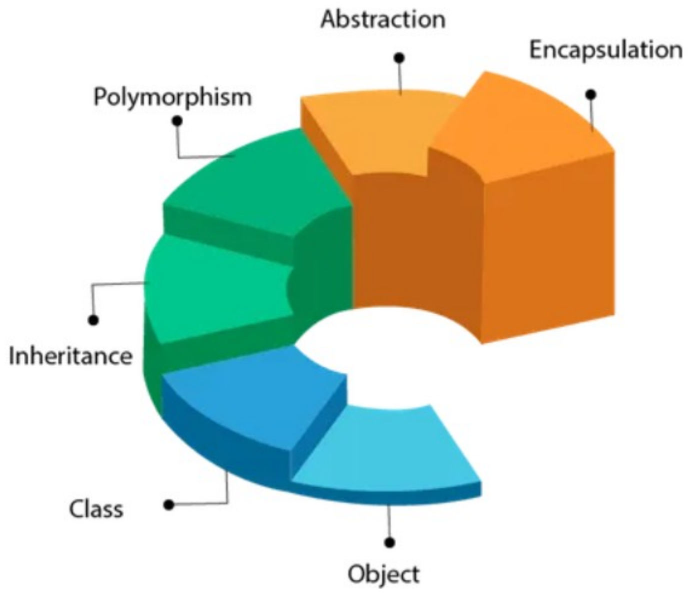
What You Will Learn throughout This Month

OOP & Gand of Fours Design Patterns

The primary focus of this semester is to introduce you to **OOP & design principles**, and then help you practice with **Gang of Fours Design Patterns**.

You will not only learn to **develop well-designed software**, **refactor** your code based on design principles and **test** your software, but also learn to **read** other peoples code.



Technologies You Will be Familiarized With

You will be introduced to **Browser** technology, and start using **HTML**, **CSS** and a bit of **JavaScript** & create a **Dart Compiled to JavaScript** client-side Application.

You will learn to **version control** your code, commit your repositories online, and work in teams using **Git & GitHub**.

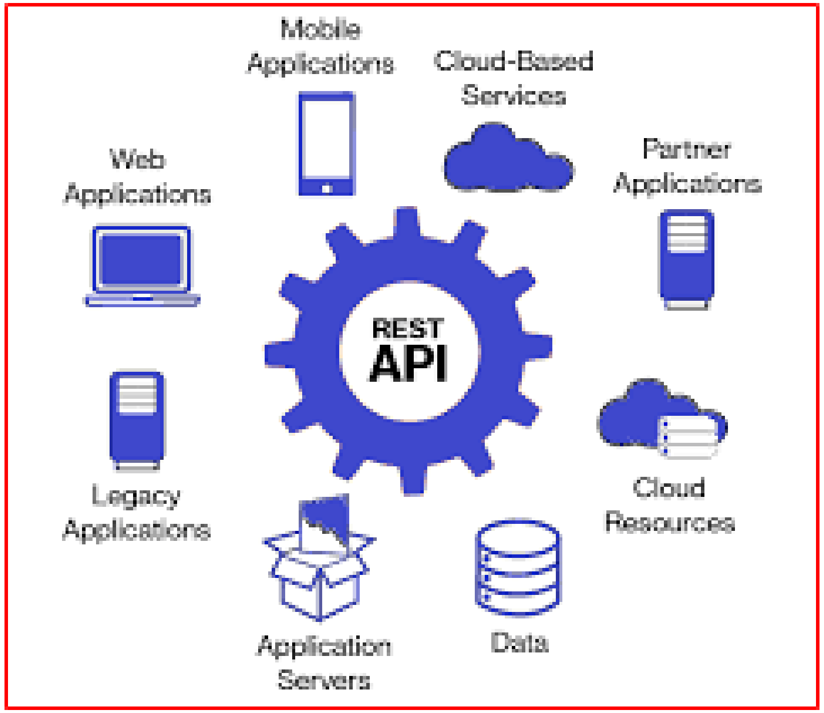
You will learn to use **MongoDB** as a **database** for caching your applications users' data.

You will learn to use **Docker** to **containerize** your back-end REST API services.

The Applications You Will Create

You will learn to create a **REST API** using **Shelf Router** for the **Laams Teams** app, whose GUI we will develop in flutter later in the course. The app features includes:

1. User Authentication
2. Data Retrieval Using JSON
3. A Console Client App
4. Other functionalities..



The Third-Party Packages You Will Self-Learn

You will **self-learn** the following and multiple other **third-party packages** available on pub.dev:

- Characters Package
- Args Package
- Derry Package
- Ferry Package
- Puppetear Package
- Dio Package
- Source Gen Package
- Hive Package
- Universal HTML Package
- Markdown & Yaml Packages
- UUID & Faker Packages
- Equatable Package
- Path Package
- Path Provider Package
- Crypto & Encrypt Packages
- Logger & Logging Packages
- PDF Package
- Email Validator
- Mockito Package
- English Words & translator
- Intl & ShamsiDate Package
- BuiltValue & Build Collection
- Lint Package
- Googleapis Package
- Ansicolor Package
- Cryptography Package
- RxDart Package
- Mockito Package
- RxDart Package
- Redux Package

Revision of the Dart Language

The Why of Dart, Real Life Usage

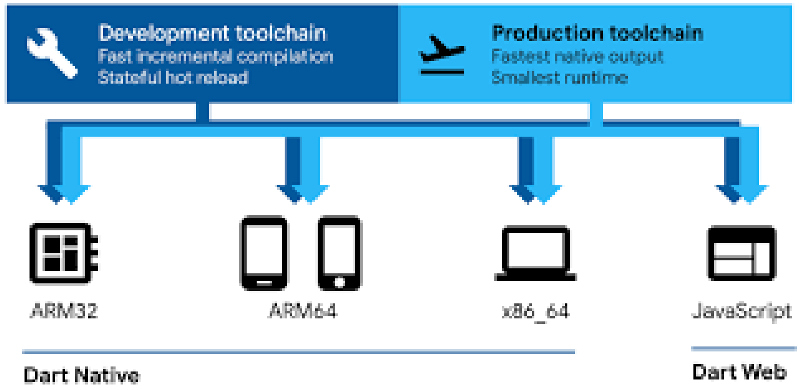
Dart is one of the most **practical** and **productive** languages ever created. You can use **Flutter SDK** (written in Dart) to develop very **efficient GUI applications** (60 frames per second) for **Android**, **IOS**, **Web**, **Mac**, **Linux**, **Windows**, **Fuchsia** & other IoT devices & platforms.

It is pretty **easy to learn**, and a lot **resources** (documentations, book, articles and videos) are available online to help you learn.

The Why of Dart, Technical

Dart is **small & modern Java** (my experience), which takes the **best** of other languages. It takes **null safety** from Swift, **package management** from Rust & Go, and **type inference** from dynamic languages (JavaScript & Python).

Dart also solves the problems faced by other languages. It has features such as **Isolates**, **native compilation** to any platform, even to JavaScript, and is also equipped with **JIT** & **AOT** compilers.



The Why of Dart, Maintenance

Dart is developed and maintained by **Google Engineers**, and adapted by numerous **big companies**, such as Microsoft, Grab, Toyota...

It means that more **features** & **packages** will be added to the language. Also, companies are starting to use it for creating efficient **back-end services** and for the **cloud**, As it is supported in **GCP** and **AWS**.

The Why of Dart, Personal

I **love** this language, **after Go**, and it is used in **Laams LLC** for its **efficiency** and **productivity**. Learn it to get a job at Laams, or **many other companies** around the world. It should **always** be the language of your **choice**.

Dart is the future.

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Revision of Class Principles

No Self-victimization

The **world** and **nature** are **cruel**,
so don’t be a crying baby!

Don’t be *leaded* by your **emotions**,
*lead your **emotions**!*

Be Disciplined

"We are what we **repeatedly do**. **Excellence**, then, is not an **act**, but a **habit**."

Will Durant

Stay Curious

“Always go **beyond** memorizing formulas, passing tests, to always **go deep into** the **underlying principles** of a subject, to track any problem down to the root cause buried in the dirt and the dark.”

Elon Musk

Practice, Practice, Practice!

Talent is Overrated. The difference between a 10x Programmer and a normal one is their **practice** **level**.

Learn to Work in Teams

“**Teamwork** begins by building **trust**. And the only way to do that is to overcome our need for **invulnerability**”

Patrick Lencioni

New Class Schedule

Part 01: Warm up questions (10-15 minutes)
Part 02: Design Principle or Pattern (40-60 minutes)
Part 02: Working on Project (30 Minutes)
Part 03: Package Introduction (30 Minutes)

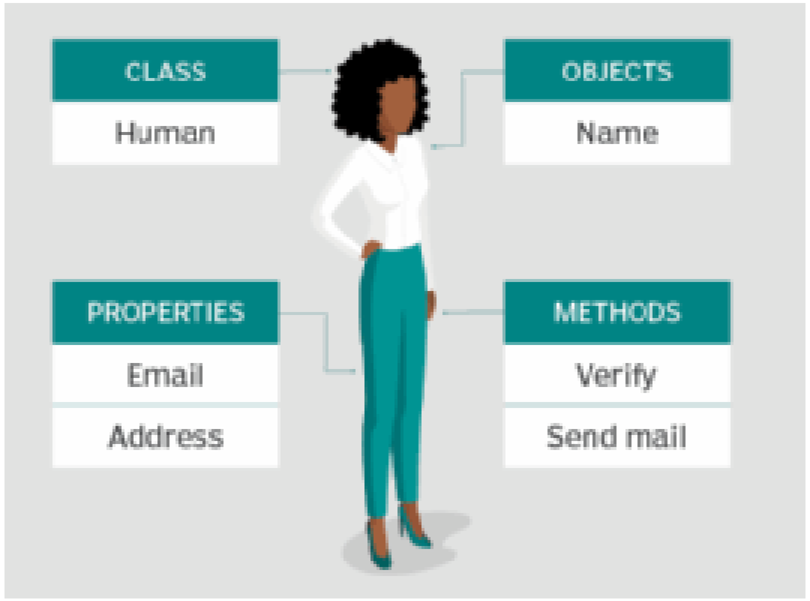
OOP Part I: Object-Oriented Modeling

Object-Oriented Modeling

Object Oriented Modeling is about **thinking** of everything in **terms of objects**. it is about representing **key concepts** in software through **objects**.

When thinking of objects, know that they have **properties**, **behaviors**, and are **self-aware**. Also there are three types of objects: **entity** objects, **control** objects and **boundary** objects. They are what holds **space** in **memory**.

Object Oriented Modeling helps your code be **flexible**, **reusable** and **maintainable**.



Look around you, identify and list all the **objects** you see, choose one of the listed objects and define all its **properties** and **behaviors**!

Object Oriented Modeling Principles

To better **model** objects, you should follow OOM design principles, which include: **Abstraction**, **Encapsulation**, **Decomposition** and **Generalization**.

Abstraction Principle

Abstraction principle is about **simplifying** a **concept** to its **essentials** within **some context**.

Abstraction helps you *better understand* the concept by breaking it down to its *simplified description*, and ignore *unimportant details*.

When abstracting you must apply **the rule of least astonishment**, which is about **not** defining anything behind the **scope** of the **concept**, and capturing its **essential** **properties** and **behaviors**.

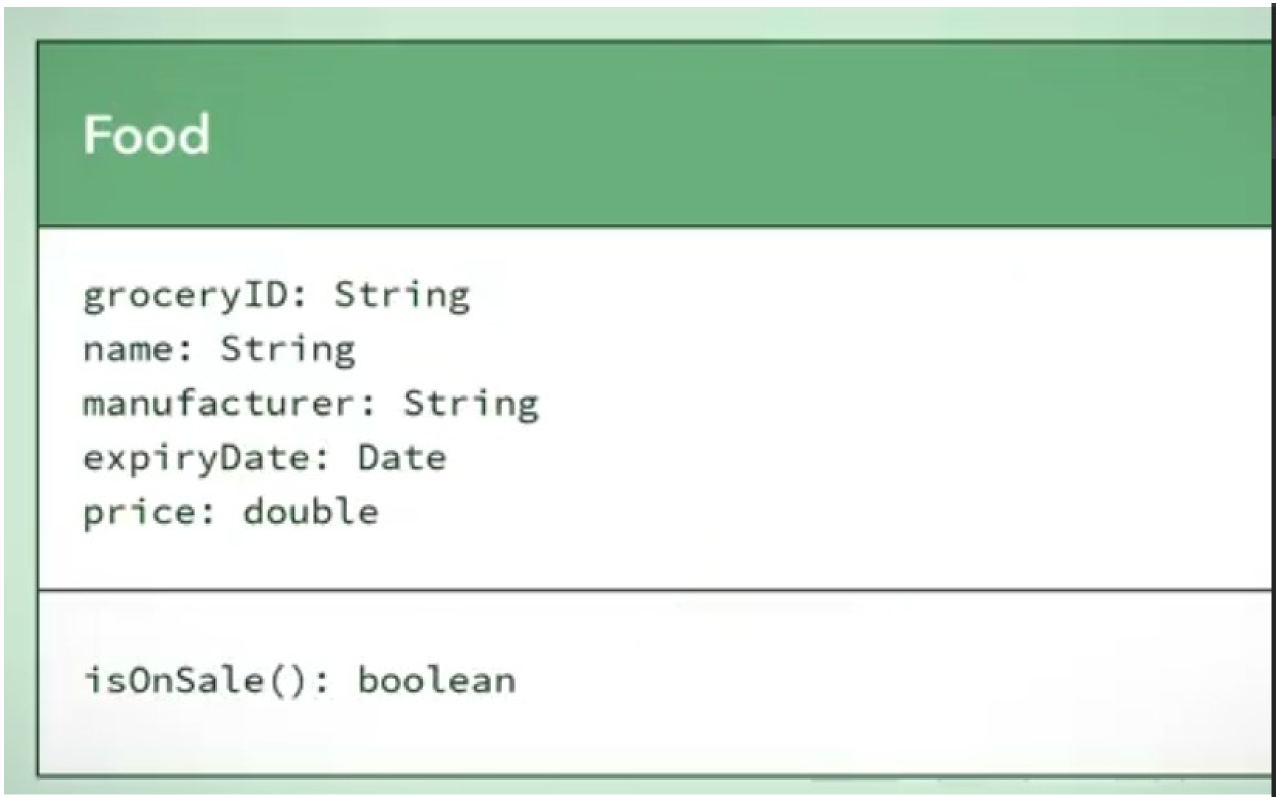
Abstraction UML Class Diagram

Class Name

Attributes | Properties | Instance Variables
Syntax: Property Identifier: Property Type
Example: firsName: String

Operations | Behaviors | Instance Methods
Syntax: Behavior Name (parameters): Return Type
Example: getFullName(userType: String): String

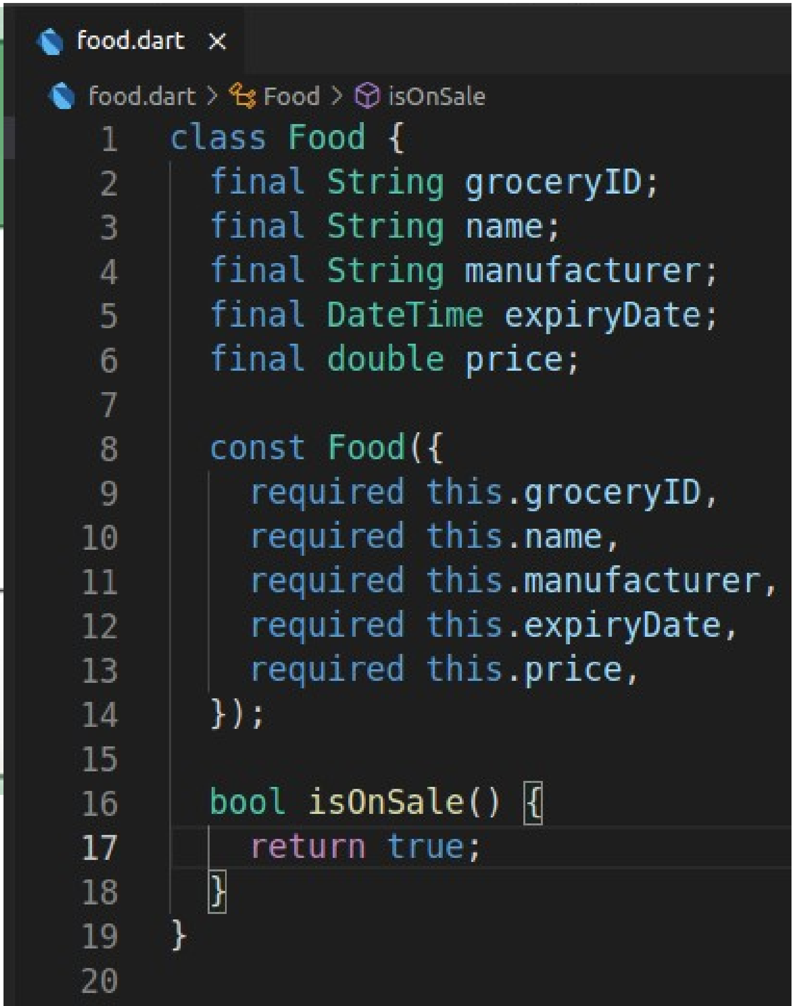
Abstraction UML Class Diagram Example



```
Food

groceryID: String
name: String
manufacturer: String
expiryDate: Date
price: double

isOnSale(): boolean
```



```dart
class Food {
  final String groceryID;
  final String name;
  final String manufacturer;
  final DateTime expiryDate;
  final double price;

  const Food({
    required this.groceryID,
    required this.name,
    required this.manufacturer,
    required this.expiryDate,
    required this.price,
  });

  bool isOnSale() {
    return true;
  }
}
```

Define the properties and behaviors of **Variable** in Dart, create a **class diagram** for it, and change diagram to **code**!

Dart Commands and Tools

The IO Package

File: create, read, delete, update.

Directory: create, read, delete, update.

Platform: isIOS, isAnroid, isWindows, isLinux, isMac, isFuschia

HttpServer: creating a server.