

CMSC 132: Object-Oriented Programming II



Object-Oriented Programming Intro

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Object-Oriented Programming (OOP)

- **Approach to improving software**
 - **View software as a collection of objects (entities)**
- **Motivated by software engineering concerns**
 - **To be discussed later in the semester**
- **OOP takes advantage of two techniques**
 - **Abstraction**
 - **Encapsulation**

Techniques – Abstraction

■ Abstraction

- Provide high-level **model** of activity or data

■ Procedural abstraction

- Specify what actions should be performed
- Hide algorithms

■ Data abstraction

- Specify data objects for problem
- Hide representation

Techniques – Encapsulation

■ Encapsulation

- Confine information so it is only visible / accessible through an associated external interface

■ Approach

- For some entity **X** in program
 - Abstract data in **X**
 - Abstract actions on data in **X**
 - Collect data & actions on **X** in same location
- Protects and hides **X**

■ Extension of **abstraction**

Abstraction & Encapsulation Example

■ Abstraction of a Roster

■ Data

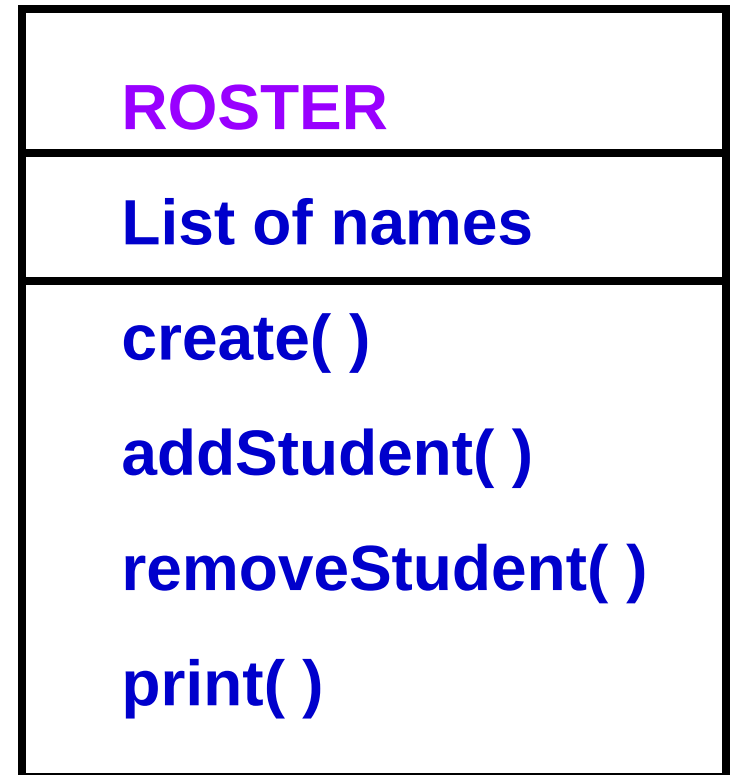
- List of student names

■ Actions

- Create roster
- Add student
- Remove student
- Print roster

■ Encapsulation

- Only these actions can access names in roster



Java Programming Language

- **Language constructs designed to support OOP**

- **Example**

- **Interface – specifies a contract**

- **Class – implements/defines contracts, supports encapsulation of implementation**

- **Class libraries designed using OOP principles**

- **Example**

- **Java Collections Framework**

- **Java Swing**

Java Interface

- An Interface defines a contract
 - Collection of
 - Constants
 - Abstract methods; no implementations
 - Can not be instantiated
- Classes can **implement** interfaces
 - Must implement **all** methods in interface
 - Example
 - `class Foo implements Bar { ... }`
- Similar to abstract class
 - But class can “inherit” from multiple interfaces

Java Collections Framework

■ Collection

- Object that groups multiple **elements** into one unit
- Also called container
- Example: ArrayList

■ Collection **framework** consists of

- Interfaces
 - Abstract data type
- Implementations
 - Reusable data structures
- Algorithms
 - Reusable functionality

■ Collection – Java Interface

- See Java API entry for Collection
- Example (CollectionExample.java)