Lecture 2: Object-Oriented Programming (OOP)

CSC 1214: Object-Oriented Programming

Outline

- **Object-Oriented Programming:**
  - Objects and Classes
  - Attributes and Behaviors
  - Creating a Class

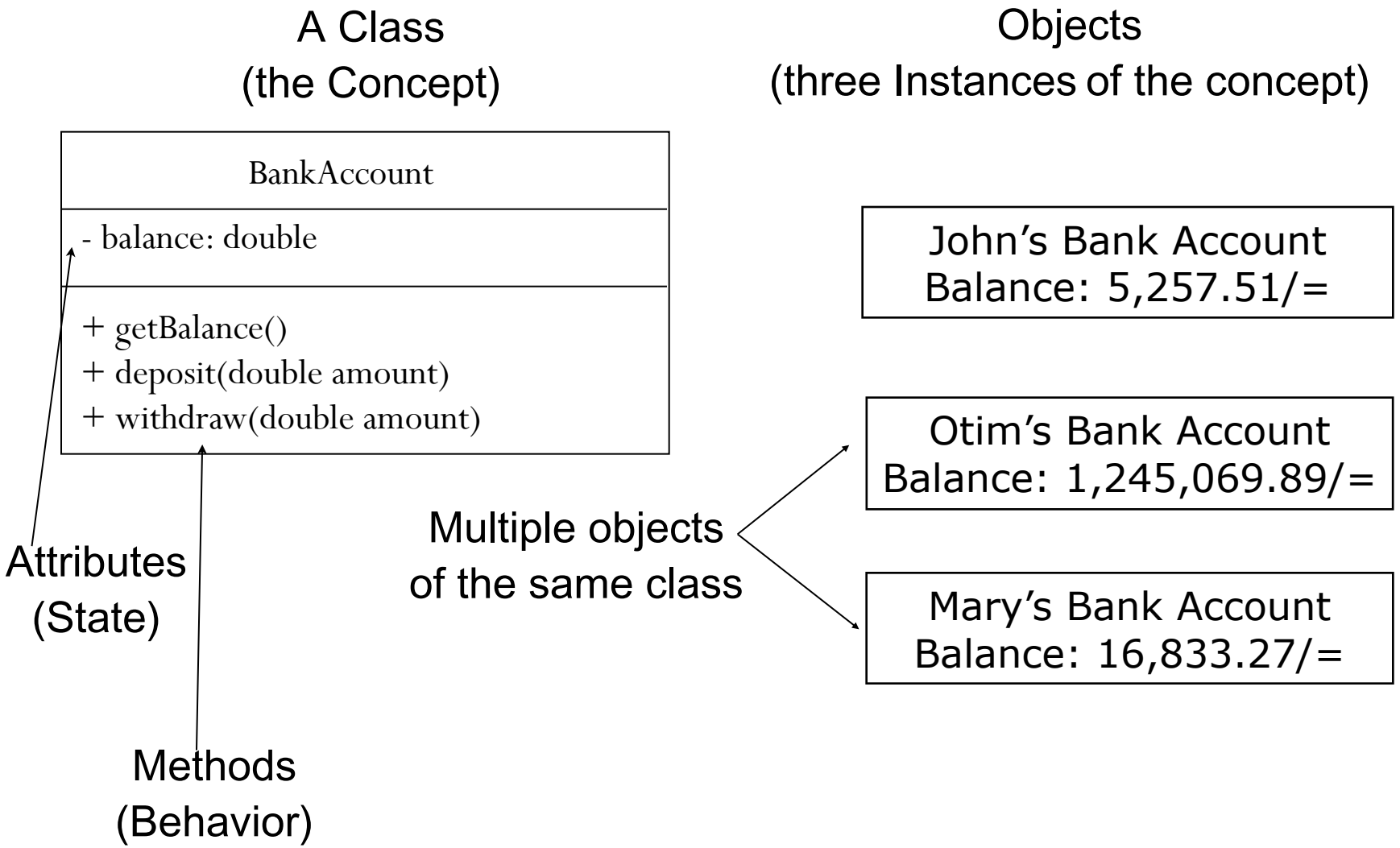
Object-Oriented Programming: Classes and Objects

In an object-oriented programming language you use *classes* and *objects* to organize your program and data.

- Class
  - A *class* is a template used to create an object. Every object created from the same class has similar features.
  - A class is a blueprint of an object.
  - Think of a class as a plan for a house. Before you build a house, you should have a plan. Once you have a plan, however, you can build any number of houses that follow that plan.

- Object
  - An object is an instance of a class.
  - An *object* has state i.e., descriptive characteristics
  - An *object has behaviours i.e., what it can do (what can be done to it)*

Object-Oriented Programming: Classes and Objects



Object-Oriented Programming: Attributes and Behavior

- A class for representing a university student could have the following attributes (*state*):
  - Name
  - Student No
  - Course
- In a class, attributes are defined by variables—places to store information in a computer program. Instance variables are attributes that have values that differ from one object to another.

Object-Oriented Programming: Attributes and Behavior

- An instance variable defines an attribute of one particular object. The object's class defines what kind of attribute it is, and each instance stores its own value for that attribute. Instance variables also are called object variables.
- The following defines an instance variable of a university student:
  - Name: Mary
  - Age: 20
  - Student No: 204000596
  - Course: Computer Science
- For example, the UniversityStudent class defines an age instance variable. This must be an instance variable because each student has a different age. The value of a student's age instance variable could be changed to as year in-out.

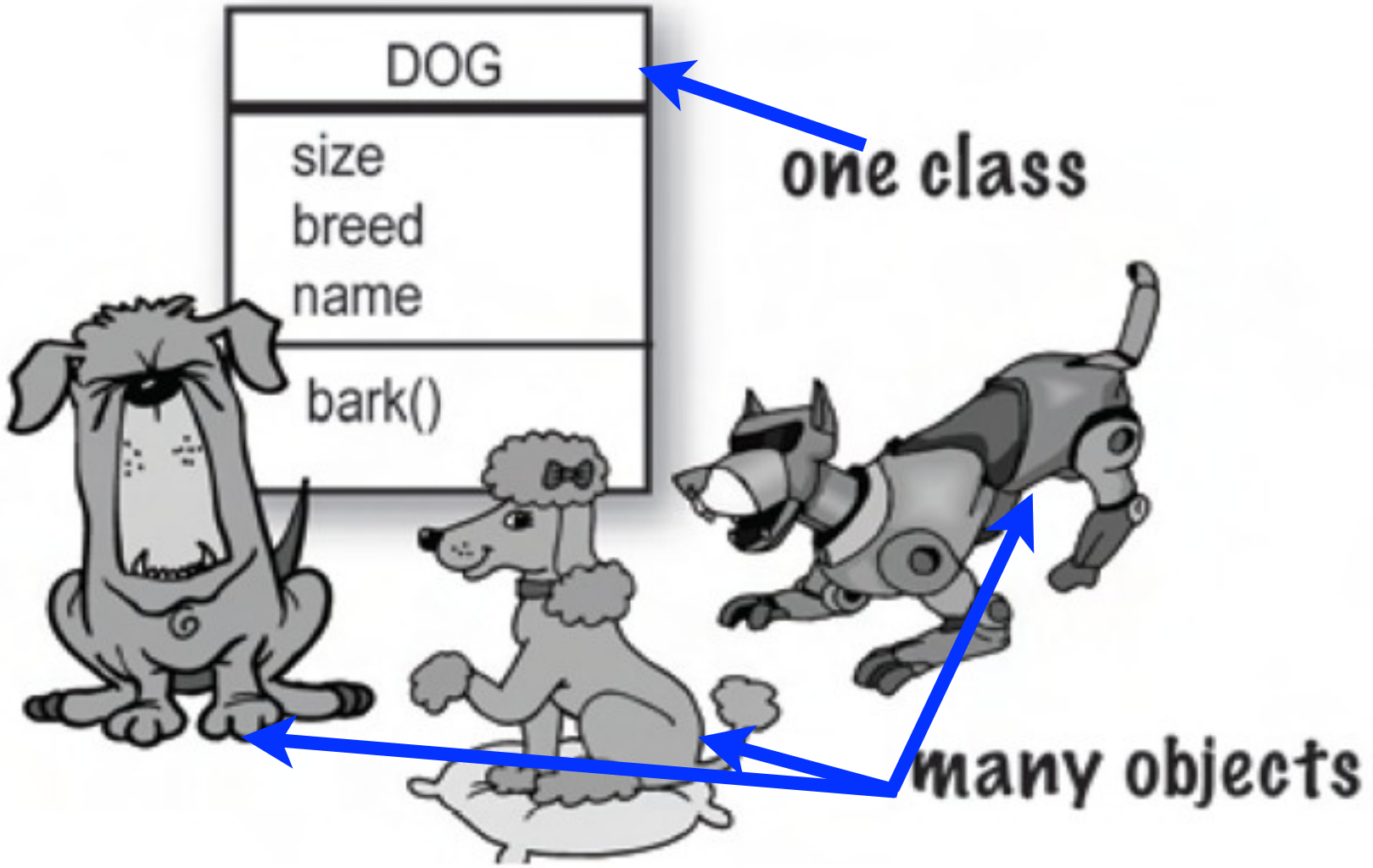
Object-Oriented Programming: Attributes and Behavior

- Behavior of a Class of Objects - Behavior refers to the things that a class of objects can do to themselves and other objects. Behavior can be used to change the attributes of an object, receive information from other objects, and send messages to other objects asking them to perform tasks.
- A UniversityStudent class could have the following behavior:
  - Attend classes
  - Seat for tests
  - Submit assignments
  - Pay university fees
  - Communication
- Behavior for a class of objects is implemented using methods.

Object-Oriented Programming: Attributes and Behavior

- Methods are groups of related statements in a class that perform a specific task.
- Objects communicate with each other using methods. A class or an object can call methods in another class or object for many reasons, including the following:
  - To report a change to another object
  - To tell the other object to change something about itself
  - To ask another object to do something
  - For example, two students could use methods to ask a fellow student to discuss an assignment between them and even submit in group if need be, and a student could ask another to take him/her for lunch/ dinner.

More Examples of Classes and Objects



More Examples of Classes and Objects

Lion

Class : Cat
Attributes: Cat name Habitat Weight Diet Physical appearance
Operations: Hunt type of noise

African-golden

Tiger

Cheetah

OOP in Java

- The biggest challenge for a new Java programmer is learning object-oriented programming at the same time the Java language.
- The identification of classes and objects is the hardest part of object-oriented design.
- One simple technique for identifying classes is to write a description of the problem, list all the nouns (attributes) that appear in the description, and then choose your possible classes from the list.
- Classification means that objects with the same data structure (attributes) and behavior (operations) are grouped into a class.