# Why inheritance

- Frequently, a class is merely a modification of another class. In this way, there is minimal repetition of the same code
- Localization of code
  - Fixing a bug in the base class automatically fixes it in the subclasses
  - Adding functionality in the base class automatically adds it in the subclasses
  - Less chances of different (and inconsistent) implementations of the same operation



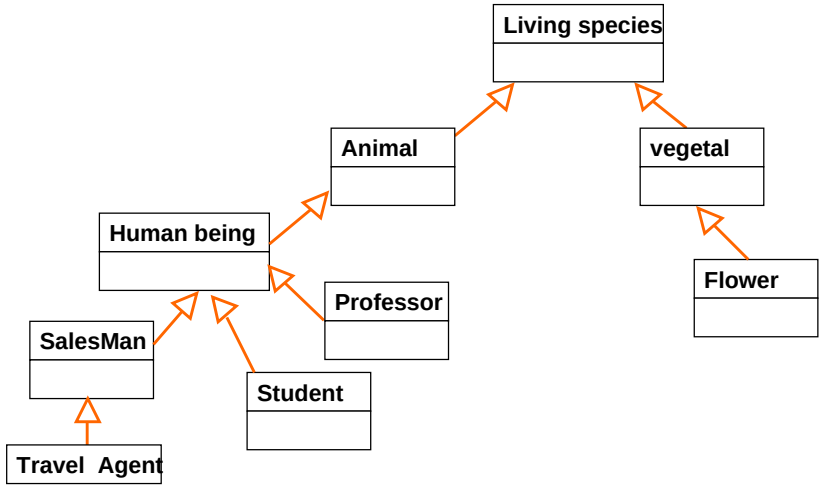


# Inheritance in real Life

- A new design created by the modification of an already existing design
  - The new design consists of only the changes or additions from the base design
- CoolPhoneBook inherits PhoneBook
  - Add mail address and cell number



# Example of inheritance tree





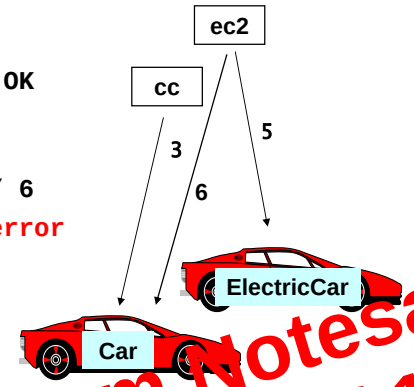

# Inheritance terminology

- Class one above
  - Parent class
- Class one below
  - Child class
- Class one or more above
  - Superclass, Ancestor class, Base class
- Class one or more below
  - Subclass, Descendent class

# Messy example (cont'd)

```
ec2 = c; // NO Downcast
ec2 = (ElectricCar) c; // 5, OK
ec2. recharge();  // OK

ec2 = (ElectricCar ) cc ;  // 6
ec2.recharge();  // runtime error
```








# Avoid wrong down-casting

- Use the instanceof operator

```
Car c = new Car();
ElectricCar ec;

if (c instanceof ElectricCar ){
   ec = (ElectricCar) c;
   ec.recharge();
}
```

*was*
`((ElectricCar)c).recharge();`



# Upcast to Object

- Each class is either directly or indirectly a subclass of Object
- It is always possible to upcast any instance to Object type (see Collection)

```
AnyClass foo = new AnyClass();
Object obj;
obj = foo;
```



# Abstract classes

SOftEng
http://softeng.polito.it

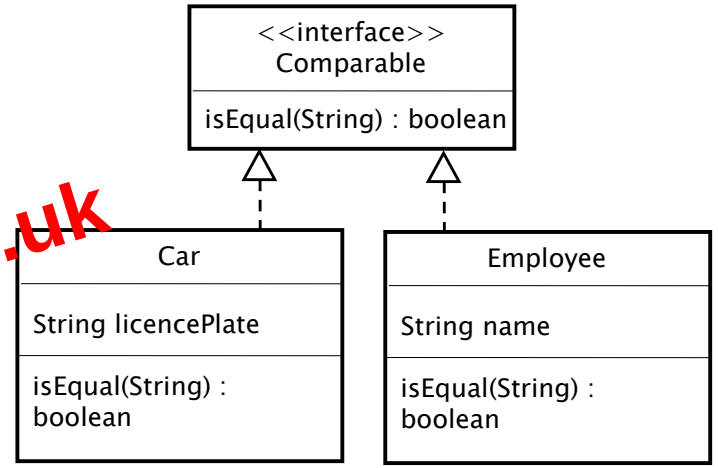
# Java interface

- An interface is a special type of "class" where methods and attributes are implicitly public
  - Attributes are implicitly static and final
  - Methods are implicitly abstract (no body)
- Cannot be instantiated (no new)
- Can be used to define references





# Example






# Example (cont'd)

```
public interface Comparable {
   void isEqual(String s);
}
```

Public

```
public class Car implements Comparable {
  private String licencePlate;
  public void isEqual(String s){
    return licencePlate.equals(s);
  }
}
```

```
public class Employee implements Comparable{
  private String name;
  public void isEqual(String s){
    return name.equals(s);
  }
}
```



# Example

```
public class Foo {
  private Comparable objects[];
  public Foo(){
    objects = new Comparable[3];
    objects[0] = new Employee();
    objects[1] = new Car();
    objects[2] = new Employee();
  }
  public Comparable find(String s){
    for(int i=0; i< objects.length; i++)
      if(objects[i].isEqual(s)
                        return objects[i];
  }
}
```