

# Object-oriented design

Computer & Information Sciences

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# Overview

- Targeted design.
- Design standards.
- UML class diagrams.
- Design tools.
- Summary.

# Targeted design

- Rarely design everything within a program before it is implemented.
- Birds eye view within an architecture description document.
- Reverse engineer data model design from code.
- Design key aspects of the data model.
- Data that are saved to or read from storage.
- Data that are passed from one block of functionality to another.

# Design standards

- Unified modelling language (UML).
- Several diagram standards that are used for different purposes.
- Take a quick look at class diagrams.
- Data schema diagrams (Crow's foot).
- Used to describe relational storage tables.
- Beyond this course.

# UML class diagrams: a class

Class name
Visibility Attribute [type] [=default] Visibility Attribute [type] [=default]
Visibility Operation[arguments] [return type] Visibility Operation[arguments] [return type]

## Visibility:

- + => Public
- # => Protected
- - => Private

DataElement
+PublicData: int = 10 #ProtectedData: string = "A string" -PrivateData: bool = True
+MultiplyNumbers(x:int=3): float +TestSomething(): bool

# UML and Python

```
class DataElement:
    def __init__(self):
        self.publicData = 10
        self._protectedData = "A string"
        self.__privateData = True

    def multiplyNumbers(x = 3):
        return 0.

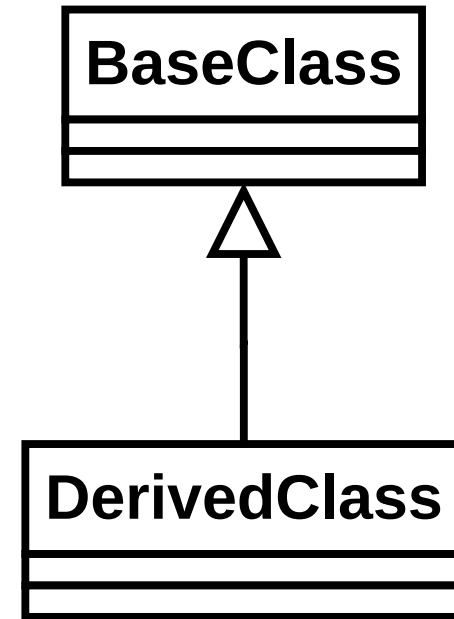
    def testSomething():
        return False
```

DataElement
+PublicData: int = 10 #ProtectedData: string = "A string" -PrivateData: bool = True
+MultiplyNumbers(x:int=3): float +TestSomething(): bool

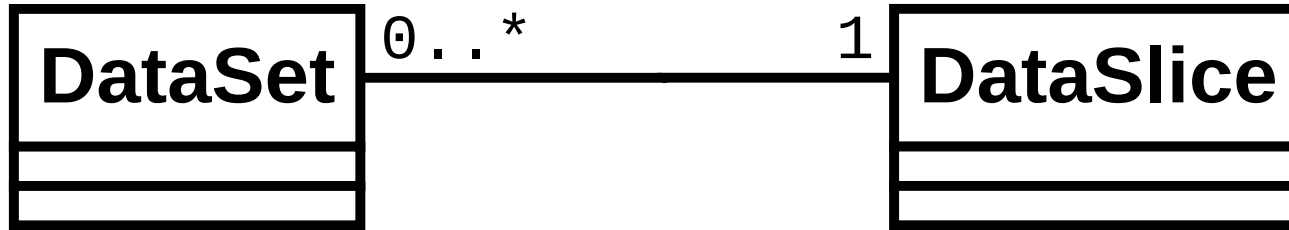
- Normally do not include default values or input arguments.

# UML: class relationships

- Classes can inherit from others.
- Define inherited attributes or operations only in the base class.



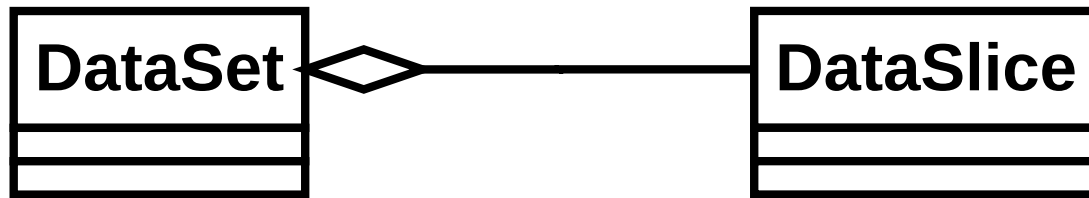
# UML: class association



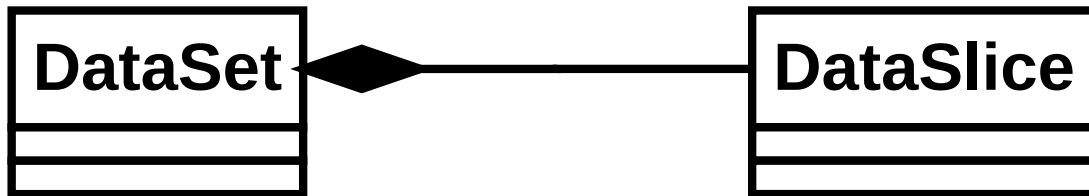
- Define multiplicities in association:
- 0..\* - Zero or more.
- 1 - Exactly one.
- 1..\* - One or more.
- 0..1 - Zero or one.



# UML: class composition



**Aggregation:** may contain 0 or more.



**Composition:** may contain 1 or more.

- Used to express that classes are part of another class.

# UML Tools

- Create UML diagrams with:
  - Dia Diagram Editor (Windows, Linux, Mac).
  - <https://app.diagrams.net/> (Online).
  - UML Designer.
  - Microsoft Visio Pro.
- Can autogenerate UML from code.
  - Pyreverse, Doxygen.

# Summary

- Discussed targeted design.
- Discussed class design tools.
- Introduced UML class diagrams.