Accelerating Information Technology

http://aiti.mit.edu

Ghana Summer 2012
Lecture 8 – Inheritance

MISTI

Agenda

- Goal
  - Use objects to represent everyone in this course
  - Include:
    - Instructors
    - Students
    - Teaching assistants
- Learn about
  - Inheritance
  - Multiple inheritance
  - Private Variables

```
class Academic:
    def __init__(self, name, university,
                 status, year, area, salary, gpa):
                self.name = name
                 self.university = university
                 self.status = status
                 self.year = year
                 self.area = area
                 self.salary = salary
                 self.gpa = gpa
    def identify(self):
                 print 'Name:' + self.name
                 print 'Uni:' + self.university
                 print 'Status:' + self.status
                 print 'Year:' + str(self.year)
                 print 'Area of Study:' + self.area
                print 'Salary:' + str(self.salary)
                print 'GPA:' + str(self.gpa)
```

```
>>> Student1 = Academic("Louis Sobel", "MIT",
            "Student", 3, "Computer Science", 0, 5.0)
>>> Student1.identify()
Name:Louis Sobel
Uni:MIT
Status:Student
Year:3
Area Of Study: Computer Science
Salary: 0
GPA: 5.0
```

```
>>> professor = Academic("Tomas Lozano", "MIT",
  "Professor", 0, "Computer Science", 1000, 0)
>>> professor.identify()
Name:Tomas Lozano
Uni:MIT
Status:Instructor
Year:0
Area of Study: Computer Science
Salary: 1000
GPA: 0
```

But we have extra fields we do not always need

```
class Student:
    def __init__(self, name, university,
                 status, year, area, gpa):
        self.name = name
          self.university = university
          self.status = status
          self.year = year
          self.area = area
          self.gpa = gpa
    def identify(self):
          print 'Name:' + self.name
          print 'Uni:' + self.university
          print 'Status:' + self.status
          print 'Year:' + str(self.year)
          print 'Area Of Study:' + self.area
          print 'GPA:' + str(self.gpa)
```

```
class Professor:
    def __init__(self, name, university, status,
                 area, salary):
            self.name = name
            self.university = university
            self.status = status
            self.area = area
             self.salary = salary
    def identify(self):
            print 'Name:' + self.name
            print 'Uni:' + self.university
            print 'Status:' + self.status
            print 'Area of Study' + self.area
             print 'Salary' + str(self.salary)
```

But wait, Students and Instructors share similar attributes!

What's wrong with both approaches?

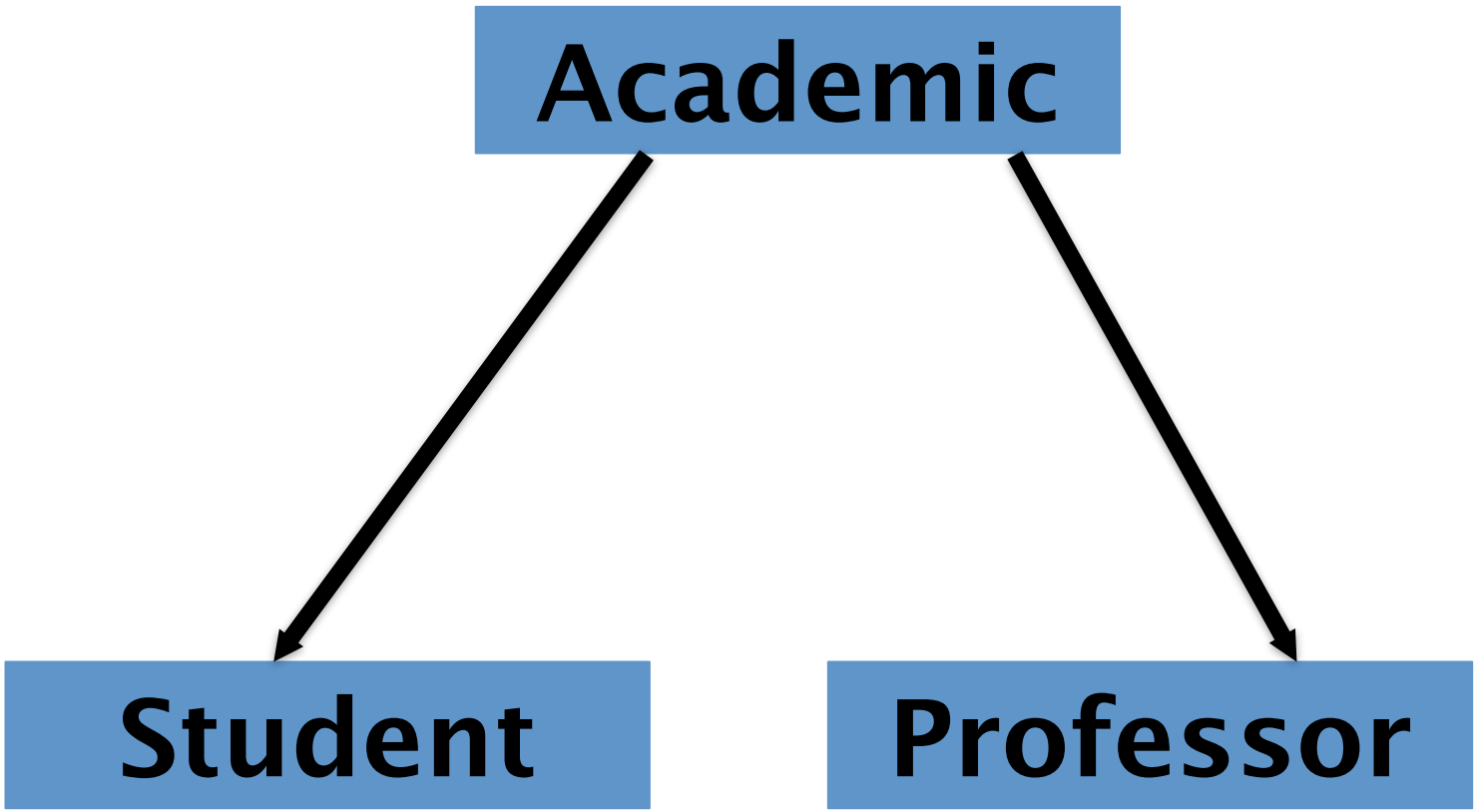
One class

- Sometimes variables are irrelevant
- A very large, complex class

Two classes

- Repeated behavior
- Increases our work
- We might not implement shared features the same way in the two classes

Inheritance



```
class Academic:
    def __init__(self, name, university,
                 status, area):
        self.name = name
        self.university = university
        self.status = status
        self.area = area
    def identify(self):
        print 'Name:' + self.name
        print 'Uni:' + self.university
        print 'Status:' + self.status
        print 'Area of Study:' + self.area
```

```
class Student(Academic):
    def __init__(self, name, university, year, area, gpa):
        Academic.__init__(self, name, university,
                                "Student", area)
        self.year = year
        self.gpa = gpa
    def identify(self):
        Academic.identify(self)
        print 'Year:' + str(self.year)
        print 'GPA:' + str(self.gpa)
class Professor(Academic):
    def __init__(self, name, university, area, salary):
        Academic.__init__(self, name, university,
                                "Instructor", area)
        self.salary = salary
    def identify(self):
        Academic.identify(self)
        print 'Salary:' + self.salary
```

```
>>> Student1 = Student("Louis Sobel","MIT",3,
   'Computer Science', 5.0)
>>> Student1.identify()
Name:Louis Sobel
Uni:MIT
Status:Student
Area of Study: Computer Science
Year:3
GPA: 5.0
>>> prof = Instructor("Tomas Perez", "MIT",
   "Computer Science", 1000)
>>> prof.identify()
Name:Tomas Perez
Uni:MIT
Status:Instructor
Area of Study: Computer Science
Salary: 1000
```

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    - **Students who assist instructors**
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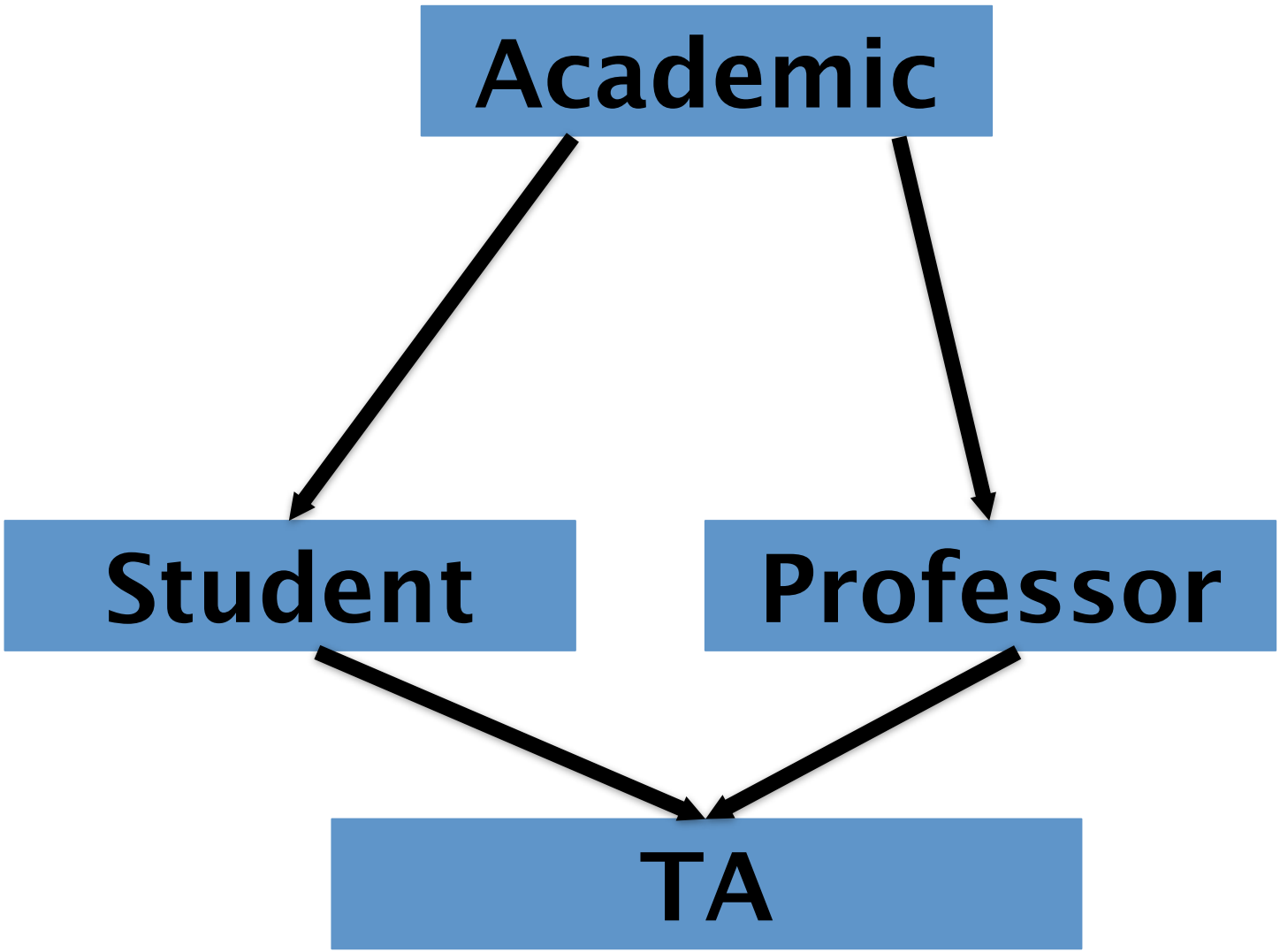
  - Multiple inheritance
  - Private Variables

Multiple Inheritance



```
class Academic:
    def __init__(self, name, university,
                 status, area):
        self.name = name
        self.university = university
        self.status = status
        self.area = area
    def identify(self):
        print 'Name:' + self.name
        print 'Uni:' + self.university
        print 'Status:' + self.status
        print 'Area of Study:' + self.area
```

```
class Student(Academic):
    def __init__(self, name, university, year, area, gpa):
        Academic.__init__(self, name, university,
                                "Student", area)
        self.year = year
        self.gpa = gpa
    def identify(self):
        Academic.identify(self)
        print 'Year:' + str(self.year)
        print 'GPA:' + str(self.gpa)
class Professor(Academic):
    def __init__(self, name, university, area, salary):
        Academic.__init__(self, name, university,
                                "Instructor", area)
        self.salary = salary
    def identify(self):
        Academic.identify(self)
        print 'Salary:' + self.salary
```

```
class TeachingAssistant(Student, Professor):
      def __init__(self, name, university, year, area,
  gpa, salary):
          Professor.__init__(self, name, university,
                             area, salary)
          Student.__init__(self, name, university, year,
  gpa)
          self.status = "Teaching Assistant"


>>> TA = TeachingAssistant("Jovana Knezevic",
                  "MIT", 5, "Computer Science", 5.0, 100)
>>> TA.identify()
Name:Jovana Knezevic
Uni:MIT
Status:Teaching Assistant
>>> print TA.year
4
>>> print TA.salary
100
```

```
class NN:
    def __init__(self):
        self.n = 0
    def get(self):
        self.n += 1
        return str(self.n)
    def reset(self):
        self.n = 0
class NS(NN):
    def get(self, s):
        return s + NN.get(self)
foo = NS()
print foo.get('a')          a1
print foo.get('b')          b2
foo.reset()
print foo.get('c')          c1
```

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