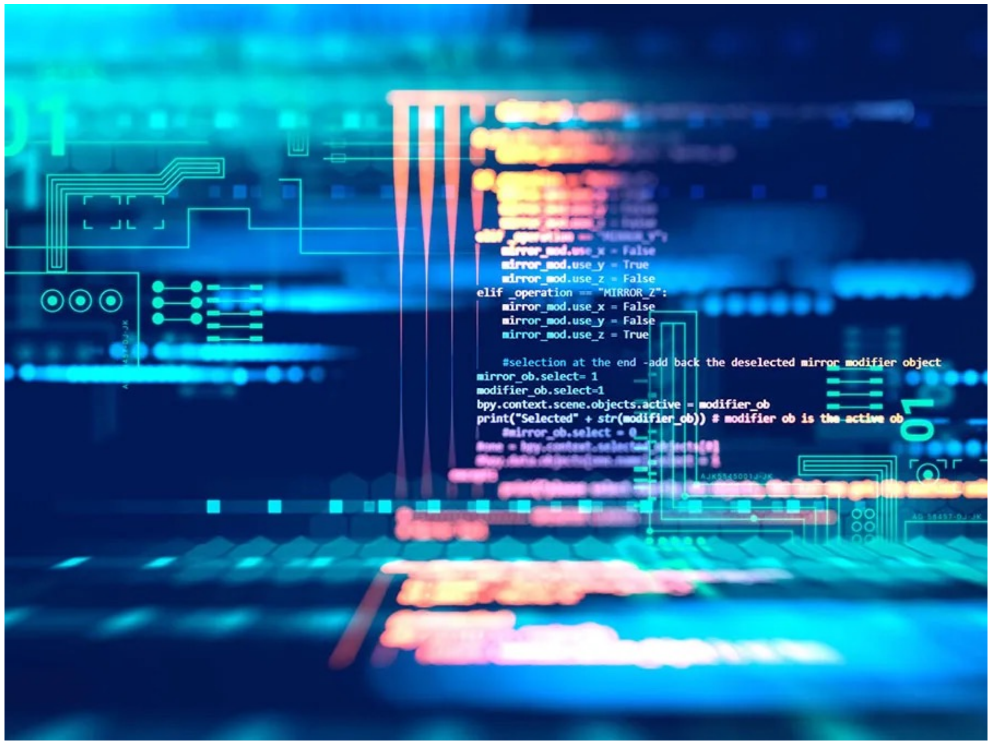
Lecture 16: Exceptions

CS 51P

November 6, 2023

Programming

Except when they *don't*
Because, sometimes, they *won't*



```
    mirror_mod.use_x = False
    mirror_mod.use_y = True
    mirror_mod.use_z = False
elif _operation == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = False
    mirror_mod.use_z = True

    #selection at the end -add back the deselected mirror modifier object
mirror_ob.select= 1
modifier_ob.select=1
bpy.context.scene.objects.active = modifier_ob
print("Selected" + str(modifier_ob)) # modifier ob is the active ob
    #mirror_ob.select = 0
```

Common Types of Errors

- **Syntax Errors:** there is something wrong with the structure of the program, and Python doesn't understand it
- **Runtime Errors:** something goes wrong while the program is running (Exceptions)
- **Semantic Errors:** the program runs, but it doesn't do what you want it to do

Example Runtime Errors

- NameError: Python doesn't recognize a (variable) name
- TypeError: Python can't perform that operation/function on values of that type
- ValueError: Python can't perform that operation/function on that particular value
- IOException: Python can't find (or can't open) a filename you gave it

What if your code depends on inputs you don't control?

```
def example2(filename):
    s = 0

    file = open(filename, "r")
    for i in file:
        s = s + int(i)
    file.close()

    return s
```

- what if the file doesn't exist?
- what if it does exist but you don't have access permissions?
- what if the file exists and you can open it for reading, but it doesn't contain integers?

What if your code depends on inputs you don't control?

- Best answer: check whether input will work before using it
  - `if str.isdigit(user_in)`
- Alternate answer: try it and crash if an error occurs
- Alternate answer: try it and recover if an error occurs
  - Warning: very inefficient

Exception Handling

- A flexible mechanism for handling errors

```
try:
    # code to execute
except:
    # what to do if there's an error
```

Example: Exception Handling

```
def exception_v0(filename):
    s = 0

    try:
        file = open(filename, "r")
        for i in file:
            s = s + int(i)
        file.close()
    except:
        print("An error occurred")
        s = -1

    print(s)
```

Exercise 1: Exception Handling

- Write a function `return_int` that asks the user to enter an integer. If the user enters an integer, the function returns that integer. If the user does not enter an integer, the function returns 0.

- Use exceptions to handle the case where the user does not enter an integer. Do not use an if statement.

Example: Exception Handling

```
def exception_v0(filename):
    s = 0

    try:
        file = open(filename, "r")
        for i in file:
            s = s + int(i)
        file.close()
    except:
        print("An error occurred")
        s = -1

    print(s)
```

Handling Multiple Exceptions

- A flexible mechanism for handling errors

```
try:

ex
```

```
try:
    # code to execute
except <Error1>:
    # what to do if Error1 occurs
except <Error2>:
    # what to do if Error 2 occurs
```

Example: Handling Multiple Exceptions

```
def exception_v1(filename):
    s = 0
    try:
        file = open(filename, "r")
        for i in file:
            s = s + int(i)
        file.close()
    except IOError:
        print("problem opening file")
        s = -1
    except ValueError:
        print("file contained non-integer value")
        file.close()
        s = -1
    print(s)
```

Exercise 2: Handling Multiple Exceptions

- Define a function list_avg that takes one parameter lst (a list) and returns the average of that list. If the list contains non-numeric values, the function should print a message explaining the error and then return -1. If the list is empty, the function should print an explanation and then return 0.
- Use exceptions to handle the two corner cases. Do not use an if statement in your function definition.

Handling the non-exception case

- A flexible mechanism for handling errors

```
try:
    # code to execute
except <Error1>:
    # what to do if Error1 occurs
except <Error2>:
    # what to do if Error 2 occurs
else:
    # additional code if no errors
```

Example: Handling the non-exceptional case

```
def exception_v2(filename):
    s = 0
    try:
        file = open(filename, "r")
    except IOError:
        print("problem opening file")
        s = -1
    else:
        for i in file:
            try:
                s = s + int(i)
            except ValueError:
                print("problem with non-integer")
                s = -1
        file.close()
    print(s)
```

Exercise 3: Exception Handling

```
def f(x,y):
    try:
        try:
            for i in x:
                print(int(i))
            print(x[y])
        except ValueError:
            print(1)
        except TypeError:
            print(2)
        except IndexError:
            print(3)
        else:
            print(4)
        print(5)
    except:
        print(6)
```

- What happens when you evaluate `f("abc","a")`?
- What happens when you evaluate `f([1,2,3],4)`?
- What happens when you evaluate `f([4,5,6],1)`?

Raising Exceptions

- You can use the raise keyword to throw your own exceptions
  - raise Exception("CS51P Exception")
  - raise ValueError("Invalid filename")

Example: Raising Exceptions

```
def exception_v3(filename):
    s = 0
    try:
        file = open(filename, "r")
        for i in file:
            s = s + int(i)
        file.close()
    except IOException:
        raise ValueError("Invalid filename")
    except ValueError:
        file.close()
        raise ValueError("file contained non–int")
    print(s)
```

Exercise 4: Raising Exceptions

Write a function `return_pos_int_onetry` that asks the user to enter a positive integer. If the user enters a positive integer, the function returns that integer. If the user does not enter a positive integer, the function raises a ValueError.