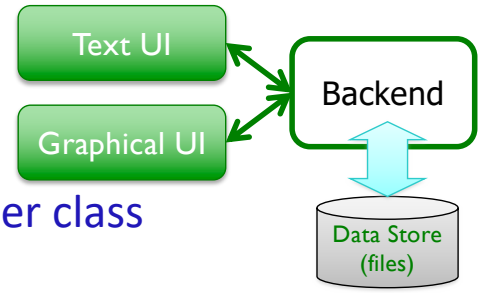
Reviewing Lab 10



- Created two classes
  - Used one class within another class
  - Tested them
  - Example of a backend to a **real** application
    - Could add a different user interface
- "Good judgment comes from experience"
  - Test methods after writing method
  - Remember your data types
  - Refer to the data type's API

Lab 10 Feedback

- Problem solving bonanza!
  - Solving lots of different small problems in a variety of ways
- Use methods you've already written
  - Example: use `addPerson` in `addPeople`
  - Who has this functionality? Do I have access to that object in this method?
- Adhere to interface
  - Accepted parameter types
  - Type of what is returned

Lab 11 Pairs

Name (alphabetically)	Partnered with		Name (alphabetically)	Partnered with
Aiden	Ford		Jack	Cole
Amanda	Lakpa		Jenna	Shelby
Cassandra	Patrick		Lakpa	Amanda
Cole	Jack		Mac	Mary
Declan	Renan		Mary	Mac
Elle	Han		Patrick	Cassandra
Ford	Aiden		Renan	Declan
Han	Elle		Shelby	Jenna

Pair Programming

- Talk with your partner about
  - What worked well (and you want to continue)
  - What didn't work well (and you want to prevent)

Lab 11: Three Parts

- Linux practice:
  - Using the `wc` command
- Social Network extensions
  - Exception handling
  - Binary search – find people with a certain name
  - UI: add search functionality
- Two-dimensional lists
  - Including Connect Four

`wc` Command

- **`wc`**: Word Count
  - Used to count
    - The lines of Social Network code from Lab 10
    - The lines of code for the whole semester
- Example:
  - `wc -l ../lab10/*.py`
- Specific directions are in the lab

Searching Our Social Network

In InstaFace, we want to find *person* who has a certain name.

Consider what happens when **searchlist** is a list of *Persons* and key is a name (a `str`)

We want to find a `Person` whose name matches the key and return the *Person*

Binary Search Implementation

```
def search(searchlist, key):
   low=0
   high = len(searchlist)-1
   while low <= high :
      mid = (low+high)//2
      if searchlist[mid] == key:
         return mid
      elif key > searchlist[mid]:
         # look in upper half
         low = mid+1
      else:
         # look in lower half
         high = mid-1
   return -1
```

List of Person objects

0	1	2	3	4
Person Id:“1” “Gal”	Person Id:“2” “Scarlett”	Person Id:“3” “Tom”	Person Id: “4” “Ben”	Person Id: “5” “Samuel”

Example: looking for a person with the name “Tom”…

List of Person objects

0	1	2	3	4
Person Id:“1” “Gal”	Person Id:“2” “Scarlett”	Person Id:“3” “Tom”	Person Id: “4” “Ben”	Person Id: “5” “Samuel”

0	1	2	3	4
Person Id: “4” “Ben”	Person Id: “1” “Gal”	Person Id:“5” “Samuel”	Person Id:“2” “Scarlett”	Person Id:“3” “Tom”

Extensions to Solution

```
def search(searchlist, key):
    low=0
    high = len(searchlist)-1
    while low <= high :
        mid = (low+high)//2
        if searchlist[mid] == key:
            return mid
        elif key > searchlist[mid]:
            # look in upper half
            low = mid+1
        else:
            # look in lower half
            high = mid-1
    return -1
```

Consider what happens when **`searchlist`** is a list of *Persons*, ***`key`*** is a ***`str`*** representing a name
Goal: return a Person object with that name (key)

0	1	2	3	4
Person Id: "4" "Ben"	Person Id: "1" "Gal"	Person Id:"5" "Samuel"	Person Id:"2" "Scarlett"	Person Id:"3" "Tom"

Extensions to Solution

```
def search(searchlist, key):
    low=0
    high = len(searchlist)-1
    while low <= high :
        mid = (low+high)//2
        if searchlist[mid] == key:
            return mid
        elif key > searchlist[mid]:
            # look in upper half
            low = mid+1
        else:
            # look in lower half
            high = mid-1
    return -1
```

Consider what happens when **`searchlist`** is a list of *Persons*, ***`key`*** is a ***`str`*** representing the name

Goal: find a *Person* with a certain name

What should we do to make search results more intuitive?

0	1	2	3	4
Person Id: "4" "Ben"	Person Id: "1" "Gal"	Person Id:"5" "Samuel"	Person Id:"2" "Scarlett"	Person Id:"3" "Tom"

Summary of Search Additions

- Add a search method to `SocialNetwork` class
  - Takes as a parameter the name to search for
    - Need to lowercase that name for more intuitive results
  - Original binary search function took a list as a parameter; our method does not
    - Where should we get our list to search?
  - The list to search must be sorted in alphabetical order by name
- Check the *name* of the Person that is at the midpoint, lowercased
  - If they match, return that Person
  - Otherwise, …
- Represent (in method) and handle (in UI) when no person has that name

Social Network Searching Overview

- Allows you to search for people by their name–lowercased—for more intuitive results
- Update `Person` and `SocialNetwork` classes and UI appropriately
  - Specific directions are in the lab

SocialNetwork Code

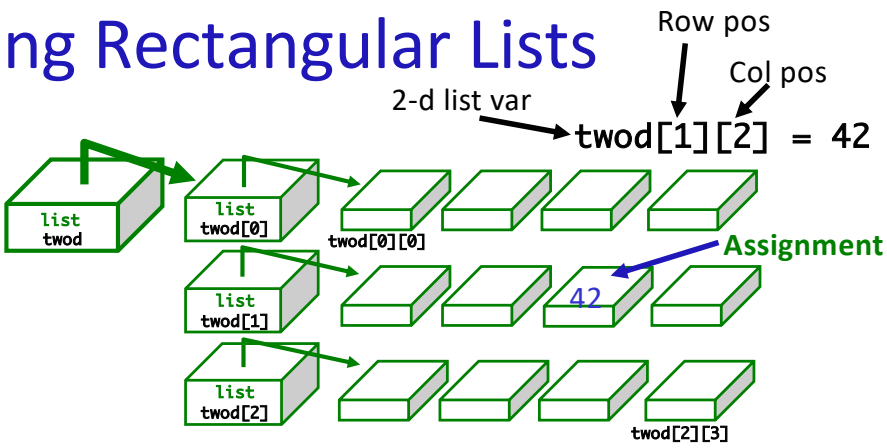
- Fix the major problems in your code first
- Or, use the code in the `lab10_solution` directory
  - `person.py, social.py, instaface.py`

2D LISTS

Review

- How do you create a 2D list?
- How do you get the 2nd element in the 3rd "row" of a list?
- How do you find the number of lists in a 2D list?
- How do you find the number of elements in one of those lists?
- What was tricky about how csplot displays 2D lists?

Handling Rectangular Lists



- What does each component of `twod[1][2]` mean?
- How many rows does `twod` have, in general?
  - `rows = len(twod)`
- How many columns does `twod` have, in general?
  - `cols = len(twod[0])`

Game Board for Connect Four

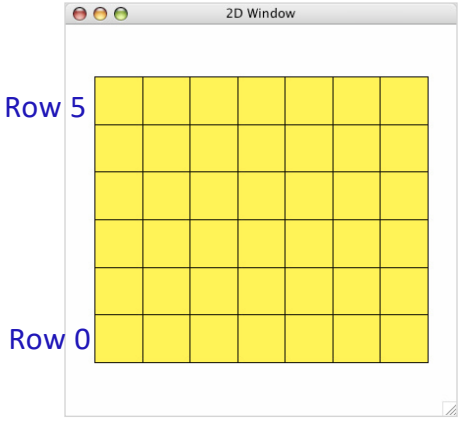
- 6 rows, 7 columns board
- Players alternate dropping red/black checker into slot/column
- Player wins when have four checkers in a row vertically, horizontally, or diagonally

How do we represent the board as a 2D list, using a graphical representation?

Representing Connect Four Game Board

- Using a 2D list

Number	Meaning	Color
0	Free	Yellow
1	Player 1	Red
2	Player 2	Black



ConnectFour Class

- Data
  - Constants
  - Board
    - 6 rows, 7 columns
    - All spaces FREE to start
- Methods
  - Constructor
  - Display the board
  - Play the game
  - Get input/move from user
  - Check if valid move
  - Make move
  - Check if win

ConnectFour Constants

```
class ConnectFour:
    """ Class representing the game Connect Four. """

    # Represent different values on the board
    FREE = 0
    PLAYER1 = 1
    PLAYER2 = 2

    # Represent the dimensions of the board
    ROWS = 6
    COLS = 7
```

To reference constants, use `ConnectFour.CONSTANT`

ConnectFour Class

- Implementation of play the game method
  - Repeat:
    - Get input/move from user (depending on whose turn it is)
    - Make move
    - Display board
    - Check if win
    - Change player

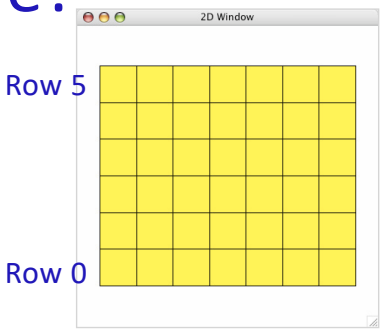
```
def play(self):
    won = False
    player = ConnectFour.PLAYER1

    while not won:
        print("Player {:d}'s move".format(player))
        if player == ConnectFour.PLAYER1:
            col = self._userMakeMove()
        else: # computer is player 2
            # pause because otherwise move happens too
            # quickly and looks like an error
            sleep(.75)
            col = self._computerMakeMove()

        row = self.makeMove(player, col)
        self.showBoard()
        won = self._isWon(row, col)

        # alternate players
        player = player % 2 + 1
```


Problem: C4 - Valid move?

- Need to enforce valid moves
  - In physical game, run out of spaces for checkers if not a valid move
- How can we determine if a move is valid?
  - How do we know when a move is ***not*** valid?

Problem: C4 - Valid move?

- Solution: check the "top" spot
  - If the spot is FREE, then it's a valid move




```
def _isValidMove(self, col):
    """
    Return True iff the dropping a checker in this col (an int)
    represents a valid move.
    """
    return self._board[ConnectFour.ROWS-1][col] == ConnectFour.FREE
```


Connect Four (C4): Making moves

- User clicks on a column
  - "Checker" is filled in at that column

```
# gets the column where user clicked
col = csplot.sqinput()
```

```
def _userMakeMove(self):
    col = csplot.sqinput()
    validMove = self._isValidMove(col)
    while not validMove:
        print("NOT A VALID MOVE.")
        print("PLEASE SELECT AGAIN.")
        print()
        col = csplot.sqinput()
        validMove = self._isValidMove(col)
    return col
```

ConnectFour Class

- Implementation of play the game method
  - Repeat:
    - Get input/move from user (depending on whose turn it is)
    - Make move
    - Display board
    - Check if win
    - Change player

```
def play(self):
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    while not won:
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            # pause because otherwise move happens too
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            sleep(.75)
            col = self._computerMakeMove()

        row = self.makeMove(player, col)
        self.showBoard()
        won = self._isWon(row, col)

        # alternate players
        player = player % 2 + 1
```


Problem: C4 - Making a Move

- The player clicks on a column, meaning that's where the player wants to put a checker
- How do we update the board?

Lab 11 Directory

- To start, your directory should look like
  - connectfour.py
  - csplot.py
  - instaface.py instaface.out
  - lab10_solution
  - person.py person.out
  - social.py social.out
  - test.py

Thanks to **Grace** and **Elyssa** for their help this semester!

Exam 2

	Section			Total
	A	B	C	
Average	84.28	81.79	83.76	84.92
Median	86.18	85.42	85.58	86.50