Lab 10

- Classes
- Lists
- Dictionaries
- Files

Review

- How can you get all the values from a dictionary?
  - How can you turn it into a list?
- What are other operations/methods you can perform on dictionaries?
- Why do we create classes?
- What is our process for creating a class?
  - What are important methods to implement?
  - How do we implement them?
  - What does `self` represent?
- What is the design of our social network application?

Implementing a Card Method

```
def getCardColor(self):
    if self._suit == "hearts" or self._suit == "diamonds":
        color = "red"
    else:
        color = "black”
    return color
```

Implementing a Card Method

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        color = "red"
    else:
        color = "black”
    return color
```

Alternative:

Calling a method on the self object

```
def getCardColor(self):
    if self.getSuit() == "hearts" or self.getSuit() == "diamonds":
        color = "red"
    else:
        color = "black”
    return color
```

Recall: what data type is `self`?

Implementing a Card Method

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```
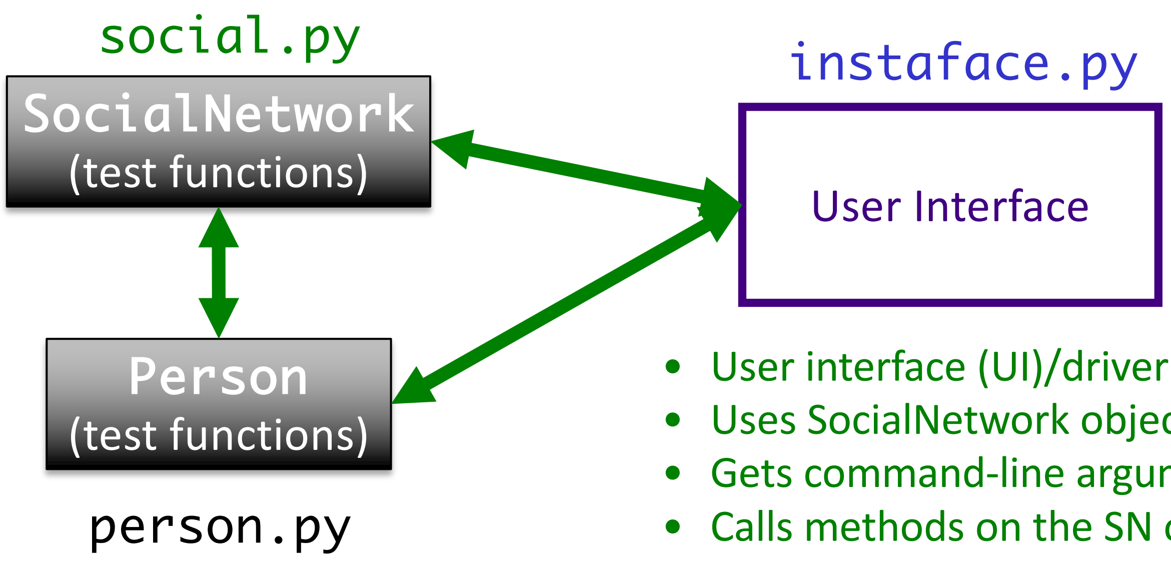

`self` is automatically passed in by Python and represents the object being acted upon.

Lab 10 Social Network Design

- 2 classes: Person and SocialNetwork
- 3 files



- User interface (UI)/driver
- Uses SocialNetwork object
- Gets command-line arguments
- Calls methods on the SN object

Review: Social Network Classes/UI Data

- Person
  - User id
  - Name
  - Friends
- Social Network
  - People in network
- UI
  - Social network

What are the data types for each class's data?

Review: Social Network Classes/UI Data

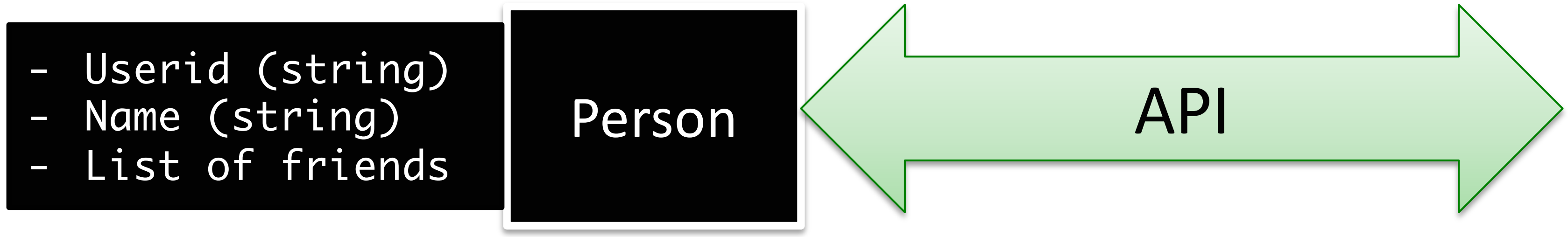
- Person
  - User id – str
  - Name - str
  - Friends – list of Person objects
- Social Network
  - People in network – dictionary, mapping userid to Persons
- UI
  - Social network - SocialNetwork

SN Classes/Driver Functionality

- Person
  - Getters (accessors)
  - String rep
  - Setters
- Social Network
  - Getters
  - String rep
  - Add people to network
  - Add connections
  - Writing to a file
- UI
  - Getting user input to
    - Read people, connections files
    - Store social network to file
    - Add a person
    - Add connections
  - Summary: call appropriate methods on classes to do above

Review API Handout

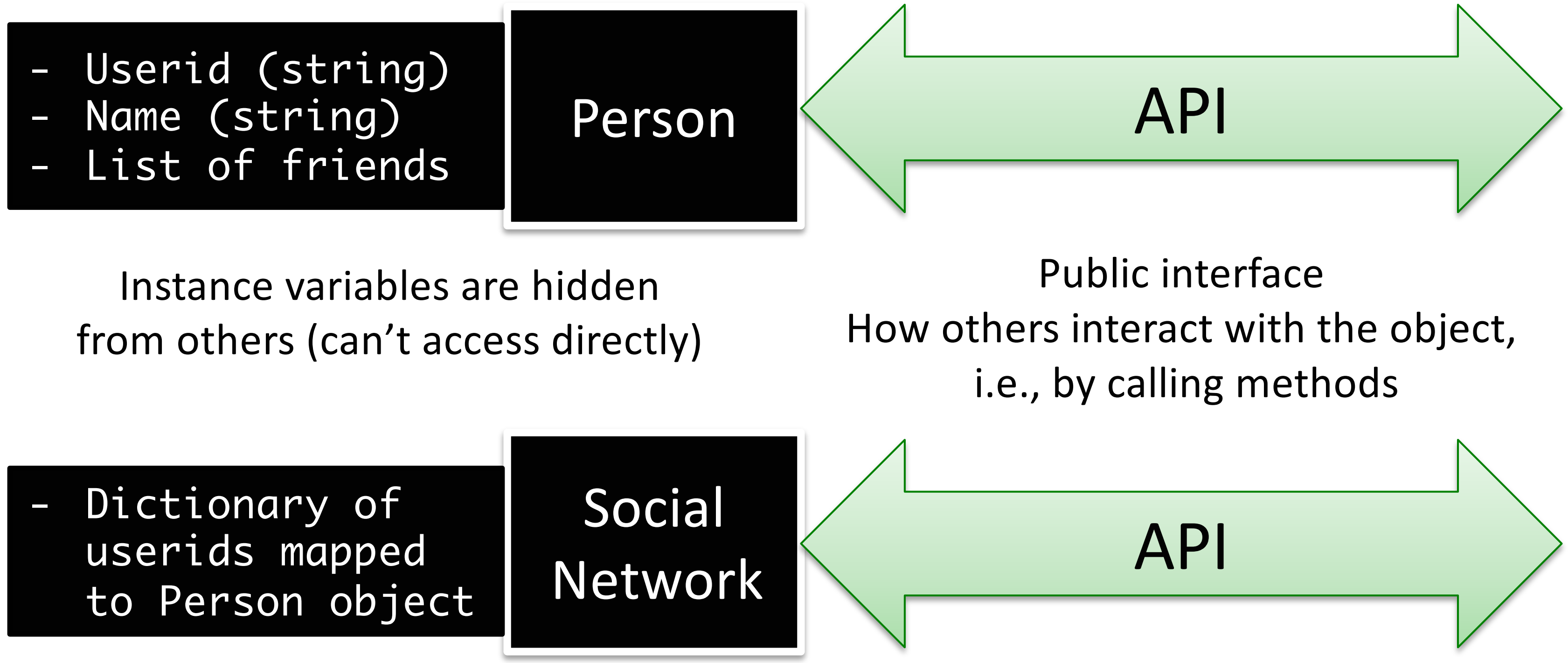
Social Network Classes



Instance variables are hidden from others (can't access directly)

Public interface
How others interact with the object, i.e., by calling methods

Social Network Classes



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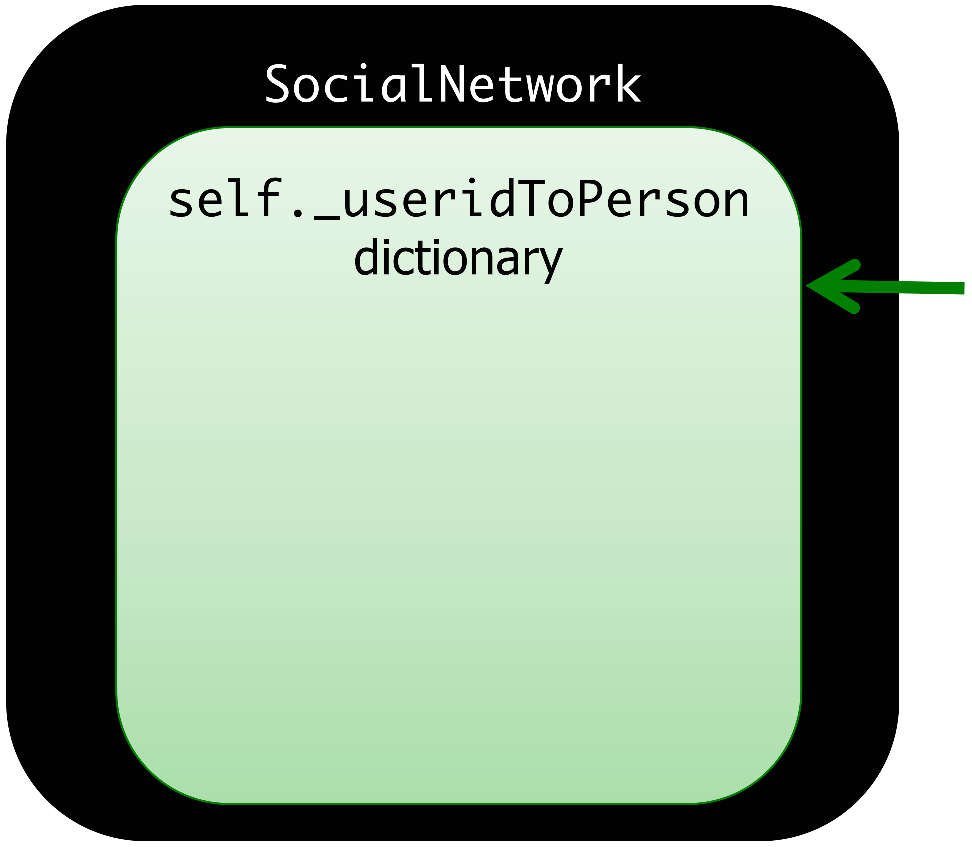
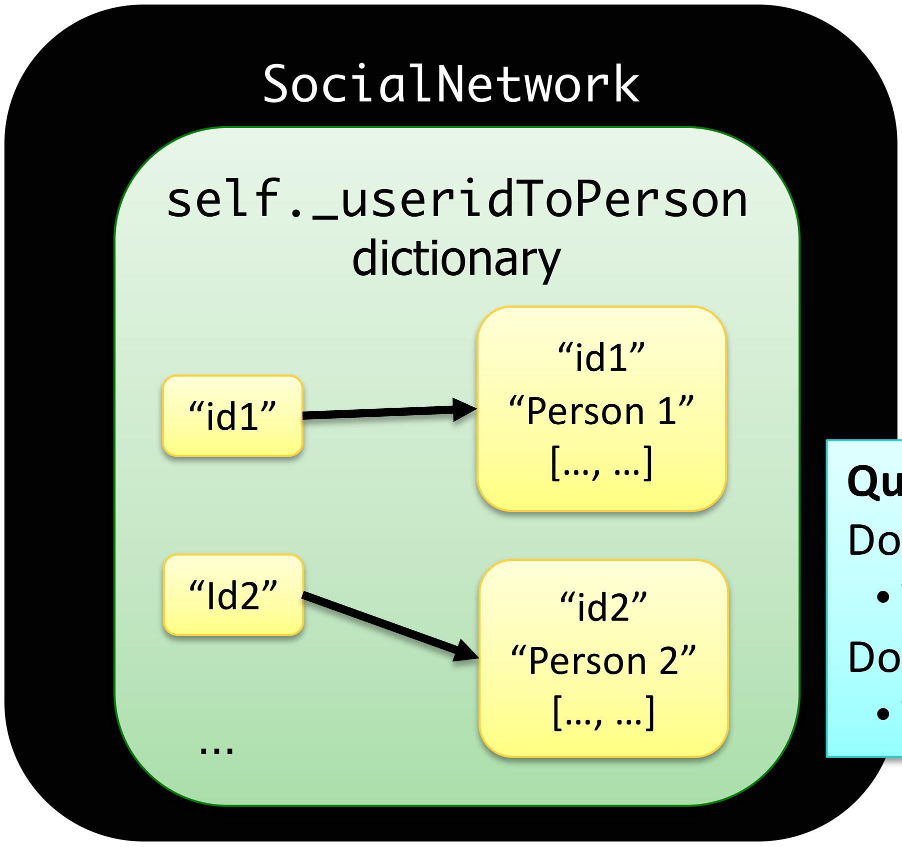
SocialNetwork



Set up in __init__

SocialNetwork



Questions to ask yourself:

Do I need to do operations on the dictionary?

- Then operate on `self._useridToPerson`

Do I need to do operations on a `SocialNetwork`?

- Then, call methods on `self`.

Towards a Solution and Hints

- Given "stubs" for both of the class files
- `social.py` is the most filled out
  - Has the methods and docstrings defined
  - **BUT** still refer to the description on the lab web page for all information

For every problem you're trying to solve, think about the variables you're dealing with and their data types

- Is there a method/operation/function I can use to solve this problem?
  - Consult the SocialNetwork API handout as appropriate
  - Update your Person class's API on the handout

Problem: People Files

- Given the file name of a people file that has the format

```
<num_users>
<user_id>
<name>
…
<user_id_n>
<name_n>
```

Example:

```
3
captain
Brie Larson
widow
Scarlett Johannsen
warmachine
Don Cheadle
```

- Write algorithm to create `Person` objects to represent each person, add to `SocialNetwork` object

Algorithm: People Files

```
<num_users>
<user_id>
<name>
…
<user_id_n>
<name_n>
```

- Algorithm:
  - Open file
  - Read the [first] line in the file
    - that represents the number of users in the file
  - Repeat <number of users> times
    - Read the line → that's the userid of the person
    - Read the line → that's the name of the person
    - Create a Person object
      - Update the Person's name
    - Add the Person object to the social network
  - Close the file

File's `readline()` always reads in the ***next*** line of the file

Problem: Connection Files

- Given a connection file that has the format

```
<user_id> <user_id>
<user_id> <user_id>
…
<user_id> <user_id>
```

Example:

```
captain widow
widow warmachine
```

- Each line represents a friend/connection
  - ➢ Symmetric relationship
  - ➢ Each is a friend of the other
- Update `SocialNetwork` object

Algorithm: Connection Files

- Given a connection file that has the format

```
<user_id> <user_id>
<user_id> <user_id>
…
<user_id> <user_id>
```

Example:

```
captain widow
widow warmachine
```

- For each line in the file
    - Split the line into the two ids
    - Add connection between the two people

UI Specification

- Checks if user entered command-line argument
    - Default files otherwise
- Read people, connections from files
- Repeatedly gets selected options from the user, until user quits
- Repeatedly prompts for new selection if invalid option
- Executes the appropriate code for the selection
- Stops when user quits
- Stores the social network into the file

Demo

UI Pseudocode

```
Use default files if only one command-line argument
Read people, connections from files
while True:
    display menu options
    prompt for selection
    while invalid option
        print error message
        prompt for selection
    break if selected quit
    otherwise, do selected option
Store social network to designated file
```

Why not a GUI?

Implementation Plan

1. Implement `Person` class
   - Test (write test function, e.g., `testPerson()`)
2. Implement `SocialNetwork` class
   - Example runs in lab write up
   - Note: Methods for classes will **not** prompt for input; Use **input parameters**
   - Test
3. Implement user interface program

Plan for Implementing a Class

- Write the constructor and string representation/print methods first
- Write function to test them
  - See card.py for example tests
- While more methods to implement …
  - Implement method
  - Test
  - REMINDER: methods should not be using input function but getting the input as parameters to the method

Export SocialNetwork to Files

- I provide method to write connections to a file
    - Because only want connection once
- You handle writing to people file
    - Must be in **same format** that you read in
    - Just “undoing” the read
- Good test: if you read in a people file, export it to another file → original and exported file should look similar
    - If you read in that exported file, should see same social network
    - Files themselves may not be exactly the same because of order printed out

Test Data

- SocialNetwork requires: People file, Connections file
- Social Networks:
  - Simple
  - Hollywood
  - Randomly generated files
    - From W&L first and last names, randomly combined, connected
- Can combine multiple files (with unique usernames) to create larger social networks

COMMAND-LINE ARGUMENTS

Motivating Command-Line Arguments

- To make it easier to use the social network with different files, we’re going to use command-line arguments
- How?
  - Rather than typing out file names, we can use tab-completion on the command line
  - To run the program with the same files, hit up to run the command again

Motivating Command-Line Arguments

- Ease executing Instaface
- Examples:

```
python instaface.py
```

Uses the default files

Template:

```
python instaface.py <peoplefile> <connectionsfile>
```

Uses the files specified

Example:

```
python instaface.py data/hollywood.txt data/hollywood_connections.txt
```

Command-line Arguments

- We can run programs from terminal (i.e., the "command-line") and from IDLE
- From the command-line, can pass in arguments, similar to how we use Unix commands
  - Ex: cp $\underbrace{\texttt{<source> <dest>}}$

    Command-line arguments

  - Ex: python $\overbrace{\texttt{myprog.py 3}}$
- Makes input easier
  - Don't have to retype each time executed

Command-line Arguments

- Examples:

$$\texttt{python } \underbrace{\texttt{myprogram.py 3}}$$

$$\texttt{python } \underbrace{\texttt{command\_line\_args.py <filename>}}_{\textbf{List}\text{ of arguments, named }\texttt{sys.argv}}$$

- How can we access `<filename>`?
  - Then we can use in our program!

Using Command-line Arguments

- Using the **`sys`** module

```
python command_line_args.py <filename>
```

`sys.argv` →

command_line_args.py	<filename>
0	1

- How can we access `<filename>`?
  - `sys.argv` is a ***list*** of the arguments
  - `sys.argv[0]` is the name of the program
  - `sys.argv[1]` is the filename

`command_line_args.py`

Using Command-line Arguments

- In general in Python:
  - `sys.argv[0]` is the Python program's name
- Have to run program from terminal (not from IDLE)
  - Can still *edit* program in IDLE though
- ➔ Useful trick:
  - If can't figure out bug in IDLE, try running from command-line
    - May get different error message

Demo

Lab 10 Notes

- READ the instructions and given code carefully!
- SocialNetwork: given a bunch of code, so development process changes a bit
  - See class's doc string for more info
- Pause, deep breaths, read, review

Looking Ahead

- Lab 10 due on Friday