Objectives

- Lab 10 Review
- Overriding methods
- Helper methods
- Search strategies

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Lab 10 Review

- Solving a real problem
- Started with designing the solution from a vague specification
- Broke into smaller problems (different classes, different responsibilities)
- Implementing smaller components
  - Following the specification
- Building to large component

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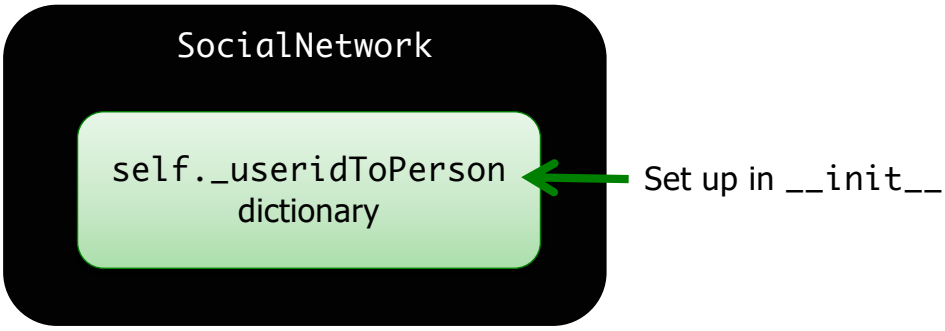
Lab 10 Discussion

- How can we call *other* methods of that data type when we're in one method of the data type?
  - Example: If I'm in the `__str__(self)` method of the `Person` class, how can I call the `getNumFriends()` method?
- How do the `SocialNetwork` class and `Person` class work together?

Lab 10: `SocialNetwork`



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`.

Notice How Problems Broke Down…

- In `Person` class
  - Concatenating strings was probably the hardest part
- In `SocialNetwork` class
  - What can I do with a dictionary? How do I do this on a dictionary?
  - What can I do with a file?
- Big problems break down into problems that you can easily solve, if you are comfortable with strings, dictionaries, files, …

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The Common Conundrum

- You have a large tool box.
- Keep track of all the tools you have in your box
  - You will be combining a variety of tools in different ways

*This is **Problem Solving**!*

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The Common Conundrum

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- Keep track of all the tools you have in your box
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*This is **Problem Solving**!*

- How can you figure out what tool to use?
  - What information do I have? What do I need?
  - How is the information represented? What is its type?
  - What operations/methods/functions are available?
  - When I ran into this situation before, how did I solve it?
  - How can I make it clearer what is going on?

Lab 10 FAQ for common issues

Testing Mutators

1. Create object
2. Run mutator
3. Use getter to test that it worked

References

- Check out the slides for lab10
  - Hints on reading in files
- Lab 10 FAQ
- What problem is this similar to?

__LT__ and __EQ__ METHODS

`__eq__`: Compare Objects of Same Type

- Header: `def __eq__(self, other)`
  - **Assumption: `other`** is another object of the *same type*
- Returns
  - `True` if `self` is equivalent to `other`
  - `False` otherwise
- If *override* the method in your class, can use objects in comparison expressions with ==

How would you determine if two `Card` objects are equivalent?

`__lt__`: Compare Objects of Same Type

- Header: `def __lt__(self, other)`
  - **Assumption: `other`** is another object of the *same type*
- Returns
  - `True` if `self < other`
  - `False` otherwise
- If *override* method in your class, can use objects in comparison expressions:
  - `<`, `sort`

How do you compare two `Card` objects?

Comparing Objects of the Same Type

```
def __eq__(self, other):
    """ Compares Card objects by their ranks and suits """
    if type(self) != type(other):
        return False

    return self._rank == other._rank and self._suit == other._suit
```

```
def __lt__(self, other):
    """ Compares Card objects by their ranks """
    if type(self) != type(other):
        return False

    return self._rank < other._rank

# Could compare by black jack or rummy value
```


DataFrequency Object

```
def __lt__(self, other):
    """
    Compares this object with other, which is also a
    DataFrequency object.
    Used by default when using the list's sort method.
    """

    return self._count < other._count
```

Could then sort the list of DataFrequency objects as

```
myDataFreqList = … #create list
myDataFreqList.sort()
```

Automatically calls the `__lt__` method

The key parameter to sort adds flexibility/customization

HELPER METHODS

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Helper Methods

- Part of the class
- **Not** part of the API
- Make your code easier but others outside the class shouldn't use
- Convention: method name begins with "_"

Let's create a method that determines if a Card is a face card!

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Example Helper Methods

- Only *loosely* enforces that other can't use
  - Doesn't show up in `help`
  - Does show up in `dir`

Helper Method:

```
def _isFaceCard(self):
    if self._rank > 10 and self._rank < 14:
        return True
    return False
```

In use:

```
def rummyValue(self):
    if self._isFaceCard():
        return 10
    elif self._rank == 10:
        return 10
    elif self._rank == 14:
        return 15
    else:
        return 5
```


SEARCHING

Search Using `in`

- Iterates through a list, checking if the element is found
- Known as ***linear search***
- **Implementation:**

```
def linearSearch(searchlist, key):
    for elem in searchlist:
        if elem == key:
            return True
    return False
```

value	8	5	3	7
pos	0	1	2	3

What are the strengths and weaknesses of implementing search this way?

Linear Search

- **Overview**: Iterates through a list, checking if the element is found
- **Benefits:**
  - Works on *any* list
- **Drawbacks**:
  - Slow -- needs to check each element of list if the element is not in the list

High-Low Game/TPIR Clock Game

- I'm thinking of a number between 1-100
- You want to guess the number as quickly as possible, i.e., in fewest guesses
- For every number you guess, I'll tell you if you got it right. If you didn't, I'll tell you whether you're too high or too low

Reminder: write down guesses

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➔What is your best guessing strategy?

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Strategy: Eliminate Half the Possibilities

- Repeat until find value or looked through all values
  - Guess middle value of possibilities
  - If match, found!
  - Otherwise, find out too high or too low
  - Modify your possibilities
    - Eliminate the possibilities from your number and higher/lower, as appropriate
- Known as ***Binary Search***

Searching…

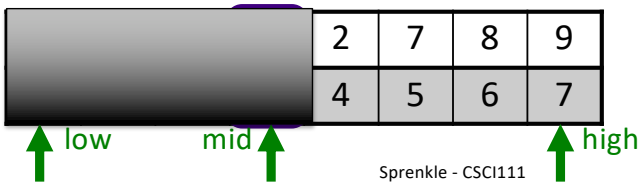
value	-3	0	0	1	2	7	8	9
pos	0	1	2	3	4	5	6	7

Use algorithm to search for key = 8

Searching for 8

-3	0	0	1	2	7	8	9
0	1	2	3	4	5	6	7

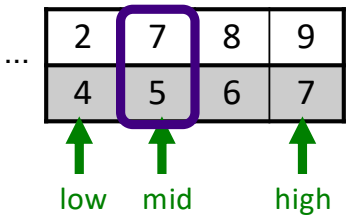
- Find the middle of the list
  - Positions: 0-7, so mid position is ((7+0)//2) = 3
- Check if the key equals the value at mid (1)
  - If so, report the location
- Check if the key is higher or lower than value at mid
  - Search the appropriate half of the list



8 > 1, so look in upper half

Searching for 8

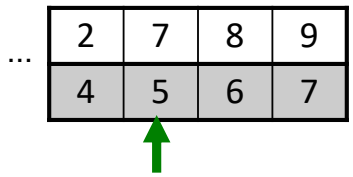
- mid is 5 ((7+4)//2), list[5] is 7



8>7,
so look in upper half

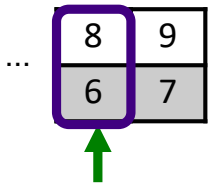
Searching for 8

- mid is 5 ((7+4)//2), list[5] is 7



8>7,
so look in upper half

- mid is 6 ((7+6)//2), list[6] is 8



8==8,
FOUND IT at position 6!

What if searched for 6 instead of 8?

Searching…

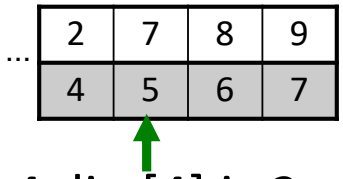
value	-3	0	0	1	2	7	8	9
pos	0	1	2	3	4	5	6	7

Use algorithm to search for key = 6

Searching for 6

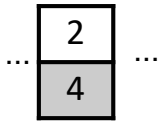
-3	0	0	1	2	7	8	9
0	1	2	3	4	5	6	7

- Will follow same execution flow, but 6 is not in the list
- mid is 6, list[5] is 7



6 < 7, so will try to look in lower half of the list

- mid is 4, list[4] is 2



6>2, so will try to look in upper half of the list, but we've already determined it's not there.

How do we know to stop looking?

Implementation Group Work

```
def search(searchlist, key):
    """Pre: searchlist is a list of integers in
    sorted order.
    Returns the position of key (an integer) in
    the list of integers (searchlist) or -1 if
    not found"""
```

- Trace through your function using examples
  - Start simple (small lists)
  - Do what the program says *exactly*, not what you *think* the program says

Looking Ahead

- Lab 10 due Friday
- No broader issue