CS 111: Program Design I

Lecture 26: None, Assignment Hints, evaluations, Law Review, etc.

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UIC

REVIEW (?): FUNCTIONS, RETURN VALUES, NONE

Which of these is a function that returns True?

```
def A(s):
    if s == s:
        print(True)

def B(s):
    if s == s:
        return True
```

C:

```
2 in [1, 2, 3]
```

A. A
B. B
C. C
D. A and B
E. All of them

How confident are you of your answer?

A. Very Highly confident: I've got this
B. Very confident
C. Somewhat confident
D. Not so confident: educated guess
E. Not confident at all: random guess and/or bullied into by the rest of my small group

Common Python beginner mistake

```
def times3(x):
    y = 3 * x
        print(y) # Bad! should use return instead
```

- *Cannot* use it as we want to, in, e.g.,

```
to_triple = 14
tripled = times3(to_triple)
print("The result of" , to_triple, " tripled is" , tripled)
```

Why a mistake: what's conceptually wrong

```
def times3(x):
    y = 3 * x
        print(y) # Bad! should use return instead
```

- Problem: It *does* print value of tripling its input *but that value not returned to place where function is called!*

Why mistake: what happens

```
def times3(x):
    y = 3 * x
        print(y) # Bad! should use return instead

>>> to_triple = 14
>>> tripled = times3(to_triple)
>>> print("The result of " , to_triple, " tripled is" , tripled)

The result of  14  tripled is  None
```

Python functions: Nonfruitful = None

- All Python functions that do not not have an explicit return statement return None
  - None is special Python value (of type NoneType) whose main use is that it is returned automagically by functions that do not execute an explicitly return statement with a return value
  - Think of None as "no value"
  - Legal to write function that explicitly returns none:
    - return None

What does the function return

```
def mult(a, b, c):
    print (a*b*c)
```

A. None (no value)
B. The value of a*b*c
C. The string 'a*b*c'

Nothingness continued

- nan (aka NaN) is a float type missing/null values
- Required to exist in *all* languages implementing current standard for float numbers (IEEE floating point)
- Can get it explicitly as math.nan and numpy.nan
- Comes up in pandas, which uses numpy "under the hood"
- Queer beasty for any purposes but printing/seeing

```
math.nan == math.nan
```

```
False
```

Reminder: Exam grade help

- If you earn at least 67 on the final exam, we will count your final exam instead of a lower midterm 1 and/or midterm 2 grade

Reminder: Extra Credit 1

- Remember, we are giving 1 point to anybody who posts a good final exam problem.
- Cutoff: Monday before exam, 11:59 pm
- Post publicly!

Reminder: Extra Credit 2 Course evaluation

- Collective action problem
- If completion rate for CS 111 Law UIC Student Course Evaluations is > 70%, we will add 1 point of extra credit to *everybody's* overall CS 111 Law course score
- As of very early Monday morning, only 42%.
  - We don't get regular updates; do get ocassional warning if very low

COMMUNITY HEATMAP HINTS

From us to you: com_count

```
def com_count(df, col, value, unique_id, com_num):
    """Returns count of unique_id in df com_num rows w/entry value in column col"""
    rows = df[ df[col] == value] # boolean slice of rows we want
    if com_num not in rows['Community Area'].values:
        return 0
    grouped = rows.groupby('Community Area')
    return grouped[unique_id].count()[com_num]
```

- What is important to you as software designer *using* this bit of code?
- Input–output arguments: # and types!

```
def com_count(df, col, value, unique_id, com_num):
```

and **`return`** an integer

You should be thinking

- 5 inputs: dataframe, column name, column value, unique id, community number
- Output: number (count) for that community

```
def com_count(df, col, value, unique_id, com_num):
```

and

return an integer

- Your (first) job: creating dictionary, with one number for *each* community: Will need to call com_count() with same 1st four values, and each commiunity number, 1 to 77

Why so many arguments? (5 seems big)

- 5 inputs: dataframe, column name, column value, unique id, community number

```
def com_count(df, col, value, unique_id, com_num):
```

- value parameter lets you try different crimes & we know about community number. Seems reasonable to pass in dataframe. Why 2 more (col and unique_id)
- To also work with other databases! Let's us count different dataframes, with different names for column of interest (crime db: "Primary Type") and different unique identifiers. E.g., City of Chicago 311 database

community_count: Hierarchical design; big software

- Your chance to be one part of software design team, focusing on visualization and predictive policing; we played role of pandas experts

MAP BEAUTIFICATION (OPTIONAL)

The tuple thing with fig, ax

- Recall built-in Python function **divmod** returns *pair* (i.e., *tuple of two elements)* consisting of integer quotient and remainder of its two int inputs
  - divmod(11, 5) → (2, 1)
- Can write: `quot, rem = divmod(11, 5)`
  - and both quot and rem assigned values
- Same story with
  - `fig, ax = plt.subplots()`
  - ax is the axis, used to connect to geopandas plot

Using fig, ax

- Can save line of typing by giving plt.subplots figsize optional argument

```
fig, ax = plt.subplots()
fig.set_size_in_inches(10, 10)
```

- equivalent to single line

```
fix, ax = plt.subplots(figsize=(10, 10))
```

  - **Note**: That 10, 10 size is what we found by trial and error looked nice for Chicago map and legend. This is a matter of playing around with visual design

ax is handle to the axes

- ax=ax argument in .plot() is why plot shows up on that canvas instead of a new one!
- To turn off the axes and associated numbers, since usually they detract from the overall picture:
  - ax.axis('off')
  - Important that it's *axis*

How to color in the boxes

- You're welcome to choose any of the color schemes we discussed last time from Perceptually Uniform Sequential, Sequential, or Sequential(2) groups we discussed last time
- Syntax:

```
geodf.plot(column='<something>', cmap='summer', rest)
```

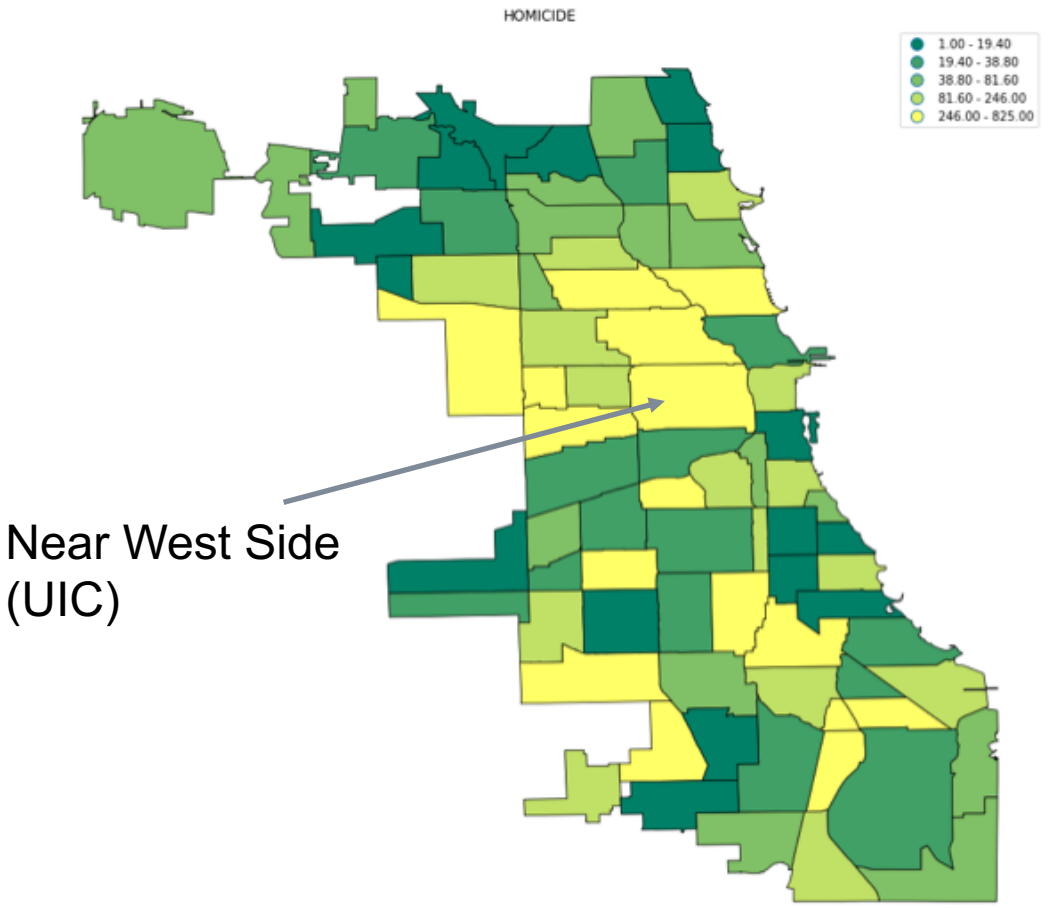
- cmap is for color map; 'summer' could be 'Reds', 'cool', 'viridis', etc.

How to color in the boxes (2)

- Inside plot, optional argument scheme= *puts colors into buckets, instead of continuous range of colors.*
- scheme='quantiles' — break into groups so roughly same number *map regions* in each
- scheme='equalinterval' — break into groups so *values' range* about same in each
- For both, defaults to 5 colors, but can change that with optional argument k=<number>
- Can look very different!

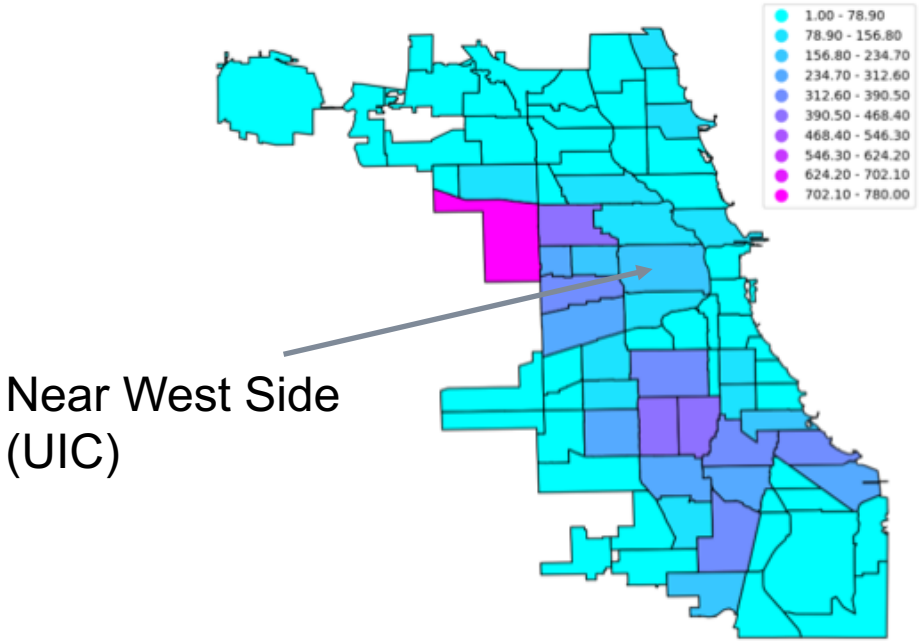
Statistics can be political!

- Chicago crime maps with **scheme='quantiles'** and implicit **k=5** will have 1/5 of communities in each color (by definition!)
- Range visually not striking among all 77 communities
- Near West Side (UIC) in worst group
- (FYI, summer cmap, homicides 2001–2018)

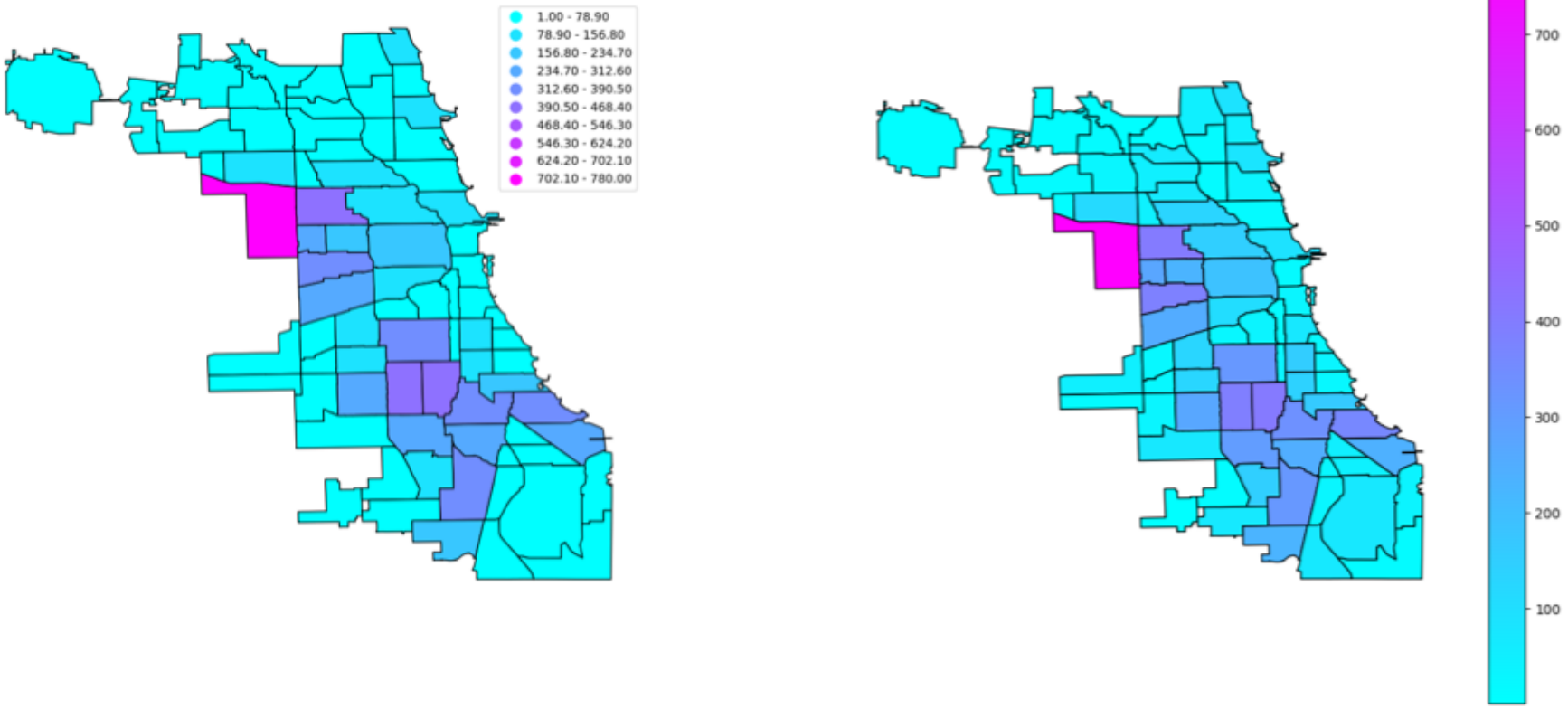


Statistics can be political!

- Chicago crime maps with **scheme='equalinterval'** and **k=10** looks very different!
- One *horrible* community, 3 pretty bad, most just fine
- Near West Side (UIC) bin 3 of 10 on 1=good, 10=horrible scale
- (FYI, cmap=10, same homicide data)



Similar but distinct: Continuous



To think about

- If you are Mayor Lightfoot, which image do you want to show at the press conference
  - To boost Chicago as a safe city for a major company to move its headquarters to?
  - To justify firing the Chief of Police yesterday?
- Austin neighborhood?! Profs. follow this sort of thing, and we though West Garfield Park had higher crime rates (wrong)
  - ????
- Our maps should be different from yours (different years)

Neighborhoods: What do they really mean?

- Population of Austin: ~97,600, 2nd largest in Chicago (after Lakeview, at about 98,200). Largest area of 77 communities
- West Garfield Park, population ~17,000
- Maybe next year we'll assign plot of ratio of homicides per population

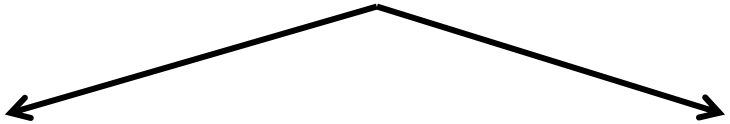
To do

- You can use any reasonable setting you like for your three chloropleth maps

REVIEW OF LAW (FOR FINAL EXAM)

Encryption

Documents (including digital files)



The government suspects you may have the documents and wants to *search* for them.
4th Amendment

The government *knows* you have the documents and wants you to hand them over.
5th Amendment

The government thinks *someone else* may have the documents and wants them to produce them.

The Fifth Amendment

- 5th Amendment: “No person . . . shall be compelled in any criminal case to be a witness against himself . . .”
- You need to show three things:
  - (1) “I am being asked to testify.”
  - (2) “I am being compelled to do so.”
  - (3) “The testimony could incriminate me.”

Two Different Requests

- Government: “Give us the key.”
  - Is being required to decrypt encrypted data being compelled to testify?
- Government: “Give us the unencrypted documents.”
  - Is the nature of the documents a “foregone conclusion”?

The 4th Amendment

- The 4th Amendment: “The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.”

What It Means

- There is a zone of privacy—“secure in their persons, houses, papers, and effects”—that cannot be invaded without a warrant.
- The point: to prevent the government from seeing too deeply into your life without a warrant.

The 3rd Party Doctrine

- "The Fourth Amendment does not prohibit the obtaining of information revealed to a third party and conveyed by him to Government authorities, even if the information is revealed on the assumption that it will be used only for a limited purpose and the confidence placed in the third party will not be betrayed."
  - United States v. Miller, 425 U.S. 435, 445 (1976).

Information Others Have About Us

- How much would I know if I had all the information that you store online?
  - Would you let me look at all of it?
- If the government can see deeply enough into your life, shouldn't 4th Amendment apply?
- Recent Supreme Court cases are moving in that direction.

Computer Fraud and Abuse Act

Crawlers and scrapers--

```
import urllib.request as ur

page = ur.urlopen(url)
start = page.read ()
```

Raises CFAA issues

Computer Fraud and Abuse Act

- CFAA 18 U.S.C. § 1030(a)(2)(C):
  - Criminal and civil liability for whoever **(a)** "intentionally accesses a computer **(b)** without authorization . . , and **(c)** thereby obtains ... information from any . . . computer."
- Facebook v. Power Ventures
- hiQ v. LinkedIn

Copyright

Crawlers and scrapers--

```
import urllib.request as ur

page = ur.urlopen(url)
start = page.read () # raises copyright issues
```

Copyright: A Bundle of Rights

- The right to
  - make copies and distribute copies of the work.
  - make a derivative work.
  - publicly display the work
  - publicly perform the work
    - 17 U. S. C. § 106.

How Is The Right Created?

- Copyright exists when you create
  - an original work of authorship
  - fixed in a tangible medium of expression.
    - A work is “fixed” in a tangible medium of expression when its embodiment in a copy or phonorecord, by and under the authority of the author, is sufficiently permanent or stable to permit its to be perceived, reproduced, or otherwise communicated for a period of more than transitory duration.
- 17 U. S. C. § 101.

Why Have Copyright?

- To promote progress in the arts and sciences.
- Assumptions:
  - We want enough progress in the arts and sciences.
  - We won't have *enough* unless authors can get paid for their works.
  - They won't make enough money if people can copy their works for free.
- (Relatively) recent emphasis on transformative works emphasizes "progress in the arts and sciences.

Copyright: Fair Use

1) The purpose and character of the use,
2) The nature of the copyrighted work.
3) The amount and substantiality of the use.
4) The effect of the use upon the potential market for or value of the copyrighted work.

Transformativeness considered here

Standard Form Contracting

- The practice first flourished in the nineteenth century shortly after the rise of mass produced, standardized products.
- It has served well as a fair and efficient way to allocate the risks and benefits between buyers and sellers of hair dryers, toasters, microwaves, washing machines, home repairs, auto servicing, and a wide range of other products and services.

Clauses in Standard Form Contracts

- Three types of clauses
  - *Interactional*:
    - Parties, type of good or service, price, delivery, etc.
  - *Risk allocation*:
    - Who bears what risk
  - *Normal course*:
    - Privileges and obligations during the proper functioning of the product or provision of the service.

Three Problems

- About doctrine:
  - Offer and acceptance
  - Retroactively updatable contracts
- About power:
  - Businesses call the shots

Privacy in Public

- Privacy is *public* when your control over the collection and use of information consists in your reasonable reliance on others voluntarily refraining from collecting and using that information.

Examples of Relational Privacy

- The family dinner
- Students and teachers
- Customers and restaurants
- Journalists and confidential sources

Why Privacy In Public Matters

- Vast amounts of personal information is in the hands of others.
- Adequate privacy requires control over those others.
- That is what privacy in public gives us.
- Are new techniques of data collection and analysis consistent with privacy in public?

The Threat to Privacy

- Police use of digital techniques typically take large amounts of information as input.
- So allow police to use those techniques to combat crime does raise privacy concerns.
- The unsolved problem is how to strike an acceptable balance.

Technology	Power struggle	Law
Encryption	Individuals versus businesses and governments Businesses and governments versus hackers	4th and 5th Amendments (government only) Contractual prohibitions against encryption
Crawler/scrapper	Businesses versus businesses Governments versus hackers	Computer Fraud and Abuse Act Contractual prohibitions against crawlers/scrappers Copyright
Data analysis	Individuals versus businesses and governments Businesses versus businesses Governments versus hackers	Computer Fraud and Abuse Act Contractual prohibitions against crawlers/scrappers Copyright Notably absent: substantive, relevant privacy law