CS2110 Lecture 42 May 3, 2021

- HW 11 has been published, due **5pm**, Sunday, May 9
- DS 11 is available Monday, due 5pm Thursday, May 6. It is helpful practice for the "markers" part of HW11
- Once again: Course grading scales on next slide. Please email me as soon as you know whether you expect to take the final.

Today:

- HW11 and Twitter

The rest of the week

- More on HW11
- Some interesting/fun CS theory/advanced topics
  - The Halting Problem, P vs NP, Turing machines, …

Final Exam is optional. The default is that you are NOT taking it. You must OPT IN and notify me if you want to take it

Grade scales the same percentage-wise except for rounding differences

Without final

Possible points: 165

Grade	Points	approx %
A+	160	97
A	145	87.9
A-	139	84.2
B+	131	79.4
B	120	72.7
B-	112	67.9
C+	107	64.8
C	90	54.5
C-	82	49.7
D+	79	47.9
D	72	43.6
D-	66	40

With final

Possible points: 200

Grade	Points	approx %
A+	194	97
A	174	87
A-	166	84
B+	159	79.5
B	145	72.5
B-	135	67.5
C+	130	65
C	110	55
C-	100	50
D+	96	48
D	88	44
D-	80	40

IMPORTANT: To take the final, you MUST notify me by email by noon, Monday, May 10. **If you sign up for the final you will be graded on the "with final" scale**. You cannot choose the "without-final" scale after you opt-in for the final exam.

NOTE: **POINTS** ARE THE OFFICIAL SCALE – NOT PERCENTAGE

HW11 Full Assignment Todo list

1. Complete HW10. Do not do anything beyond this step until it is complete and working! Email me/TA when you can't figure things out!
2. Do the "enabling steps" – get Twitter account, credentials, "install" Oauth related modules. Make sure twitteraccess.py functions work for you. (HW11 page will provide *easy* way to install the necessary Oauth-related modules.)
3. add new Entry for search term (***don't*** add a new button for this! Original button should now read both entries, execute Twitter search, and retrieve and show map)
4. good practice: rename readEntryAndDisplayMap to, for example, readEntriesSearchTwitterAndDisplayMap?
5. Before trying to actually display tweets on GUI and markers for tweets on map, test basic integration of twitter search. Upon button press, the readEntriesSearchTwitterAndDisplayMap callback function (command) should now read **both** Entry widgets, and *initially* just:
    - print tweet information the python shell
    - Maybe initially print whole tweet dictionary, but next extract just needed parts – text, name, screen_name and print those
    - Show the basic map, disregarding tweet information for now.
6. Once basic twitter integration has been checked, work on displaying tweet information in GUI and enabling "stepping through" tweets:
    - Save the retrieved tweets in a property of Globals. E.g. Globals.tweets
    - set a value to indicate which is the "current tweet". E.g. use another property such as Globals.currentTweetIndex. Set it to 0 when you first retrieve the tweets.
    - add widget(s) to GUI where tweet information can be displayed. Could be Label(s) but Text widget might be better (more on this later).
    - Implement a function displayTweet that updates relevant GUI widget(s) with information from 'current tweet"
    - Thus, readEntriesSearchTwitterAndDisplayMap should now read two Entries, call search Twitter, set some Globals properties, and call displayTweet *and* displayMap
7. Add GUI widget(s) to change "current tweet". If prior things are done well, this should be easy. Much like zoom buttons. Might have 'Next tweet', 'Prev tweet" buttons that simply change Globals.currentTweetIndex, and then call ???
8. Make sure to constrain tweet search by location. Pass the lat/lng of the specified location in your call to searchTwitter. Experiment with "radius" argument. Default radius is 2km. Large and very small radii don't seem to work well.
9. Add additional GUI widget(s) to display more tweet information, including the URLs within a tweet. This adds another layer of complication. Tweets can contain multiple URLs and you should be able to step through these as well. So, in addition to Globals.currentTweetIndex, you'll probably want another property such as Globals.currentTweetURLIndex, along with widgets to change this
10. Add code to allow opening of current tweet URL:
    - E.g. a button and callback/command function that simply executes webbrowser.open(relevant URL). Note: your code will need to import webbrowser module
11. Add markers (pins) for tweets - this is what DS11 helps you do.

Needed for HW11 right away

1. GET A TWITTER DEVELOPER ACCOUNT! Free
   - https://developer.twitter.com/
   - If you are worried about us seeing your personal tweets, make a different Twitter account just for this class
   - It used to be simpler. Now you need to answer a bunch of questions. Just say you things like "For a university class project, learning about Twitter API and writing a Python program to search for tweets based on keywords and general location". *The answers DO MATTER* – some students have had their requests denied based at least partly on these answers I think.
   - For any required URLs (website, callback, etc.) when you are in the app creation screen, can just use http://www.uiowa.edu or similar
   - *Some email addresses* (maybe particularly some international ones) *seem problematic* – result in delayed or denied approval.
2. Add required keys to twitteraccess.py. Test that searchTwitter() in twitteraccess.py works for you.
3. Then start working on HW11…
   - More important than ever: do not write many lines of code before testing! *This assignment has a lot of code and many little things can go wrong*. If you add a lot of lines and then it crashes/doesn't work, it can be very difficult to debug/find where the error is.
   - Add a few lines, test, add a few lines, test, …

Working with Twitter – twitteraccess.py

1. Twitter uses a very common authorization scheme called OAuth.
   - After you have a developer account, you need to create/register a Twitter app. Do that here: https://developer.twitter.com/en/apps
   - Once the app has been created, copy the four keys/tokens for the app and put them in the appropriate places in twitteraccess.py
     - API key, API secret, Access token, Access token secret
2. Before trying any other functions in twitteraccess.py, execute:
   - authTwitter() to enable access to the Twitter API by sending your authorization information
3. Try various functions in twitteraccess.py
   - Most importantly, learn to use the searchTwitter(…). It is key to retrieving Tweets for HW11
   - searchTwitter(…) constructs a string (like geocodeAddress and getMapURL but now for the Twitter Search API rather than Google APIs) that gets sent to Twitter.
   - Study the Search API docs here: https://developer.twitter.com/en/docs/tweets/search/api-reference/get-search-tweets to understand the structure of the string sent to the Twitter Search API
   - The Twitter Search API returns a JSON object that contains as list of JSON Tweet objects as the value of its "statuses" key. The structure of a JSON Tweet object is detailed here: https://developer.twitter.com/en/docs/tweets/data-dictionary/overview/tweet-object

HW11: things to consider/keep in mind as you get to various parts

- *recommendation*: use Text widget rather than Label for displaying tweets.
  - in GUI initialization

    ```
    tweetText = tkinter.Text(width=…, height = …)
    tweetText.configure(state=tkinter.DISABLED)
    ```

  - in code to display tweet:

    ```
    tweetText.configure(state=tkinter.NORMAL)
    tweetText.delete(1.0, tkinter.END)
    tweetText.insert(…)
    tweetText.configure(state=tkinter.DISABLED)
    ```

- Few tweets have non-null 'coordinates' field, so many of your markers will likely be in the middle of the maps. That's okay.
  - *recommendation*: to get more tweets *with* non-null coordinates field, it seems to help to use small search radius – e.g. 2km rather than 5 or 10.
  - Search in popular location of, say, large city. E.g. "Times Square" and "party"
- Handling Unicode characters in tweets:
  - Printing "raw" text of some tweets in Python shell will cause errors
  - see "printable" function in twitteraccess.py for "hacky" approach to eliminating unprintable characters

Next time

- More HW 11 and twitter
- Intro to some advanced CS topics