Documentation, version control, & collaborating on code

BILD 62

Goals for today

- Define guidelines for writing and documenting good code
- Provide information on collaborating on code via Git
- Describe code review

Writing good code
# and documenting it

How do we write good code for humans?

- **Use good structure**
  - If you design your program using separate functions for each task, avoid copying + pasting (functions and loops instead), and consider structure beforehand, you'll be set up for success
- **Use good naming**
- **Use code comments and include documentation**

Ideas: Shannon Ellis (COGS 18)

What does this code do?

```python
def ff(jj):
    oo = list(); jj = list(jj)
    for ii in jj: oo.append(str(ord(ii)))
    return '+'.join(oo)
ff('Hello World.')
```

clear function name

separate lines

some comments

```python
def return_unicode(input_list):
    string = list() # []
    input_list = list(input_list)

    for character in input_list:
        string.append(str(ord(character)))

    output_string = '+'.join(string)
    return output_string

return_unicode('Hello World.')
```

better names!

Ideas: Shannon Ellis (COGS 18)

Writing useful comments

- Good code has good documentation - but code documentation should *not* be used to try and fix unclear names, or bad structure.
- Rather, comments should add any additional context and information that helps explain what the code is, how it works, and why it works that way.
    - focus on the how and why, over literal 'what is the code'
    - explain any context needed to understand the task at hand
    - give a broad overview of what approach you are taking to perform the task
    - if you're using any unusual approaches, explain what they are, and why you're using them

Ideas: Shannon Ellis (COGS 18)

Types of comments

Block comments

```
# this box describes block
# comments and the best way
# to write them
```

- apply to some (or all) code that follows them
- are indented to the same level as that code.
- Each line of a block comment starts with a # and a single space

Inline comments `# inline`

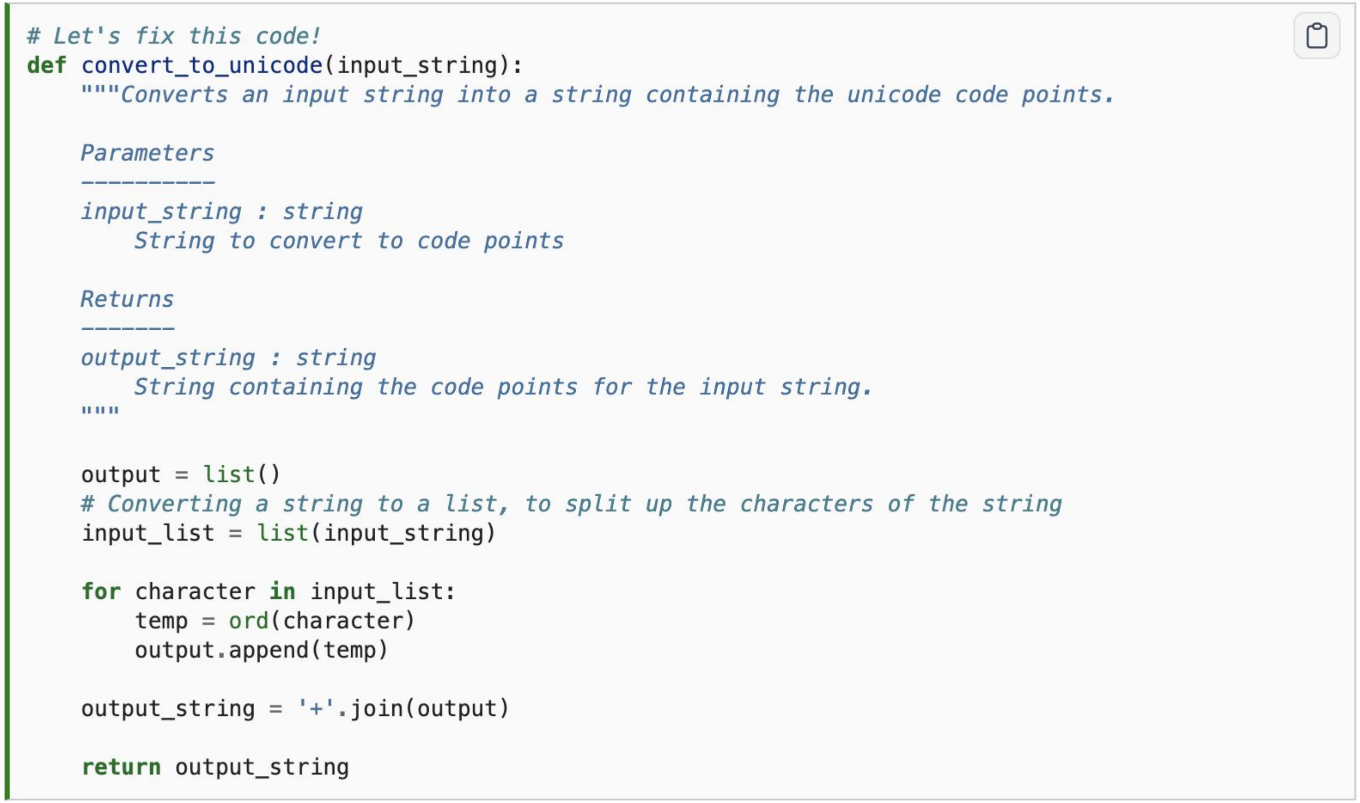
- to be used sparingly
- to be separated by at least two spaces from the statement
- start with a # and a single space

Ideas: Shannon Ellis (COGS 18)

Docstrings are in-code text that describe modules, classes and functions. They describe the operation of the code.

- Numpy style docs are a particular type of docstring
- available to you outside of the source code using `help()`
- get stored as the `__doc__` attribute and can be accessed from there too
- Common structure:
    - starts and ends with triple quotes: `''' '''`
    - one sentence overview at the top - the task/goal of function
    - **Parameters** : description of function arguments, keywords & respective types
    - **Returns** : explanation of returned values and their types

Ideas: Shannon Ellis (COGS 18)



```python
# Let's fix this code!
def convert_to_unicode(input_string):
    """Converts an input string into a string containing the unicode code points.

    Parameters
    ----------
    input_string : string
        String to convert to code points

    Returns
    -------
    output_string : string
        String containing the code points for the input string.
    """

    output = list()
    # Converting a string to a list, to split up the characters of the string
    input_list = list(input_string)

    for character in input_list:
        temp = ord(character)
        output.append(temp)

    output_string = '+'.join(output)

    return output_string
```

Now with a docstring!

Ideas: Shannon Ellis (COGS 18)

What should be included in a docstring?

- ❑ A brief overview sentence about the code
- ❑ Input arguments/parameters and their types
- ❑ Returned variables and their types

Naming conventions

- `CapWords` (leading capitals, no separation) for Classes
- `snake_case` (all lowercase, underscore separator) for variables, functions, and modules

Spacing conventions

- Put one (and only one) space between each element
- Index and assignment don’t have a space between opening & closing ‘ `()` ’ or ‘ `[]` ’
- One statement per line
- Blank line conventions:
    - Use 2 blank lines between functions & classes, and 1 between methods
    - Use 1 blank line between segments to indicate logical structure

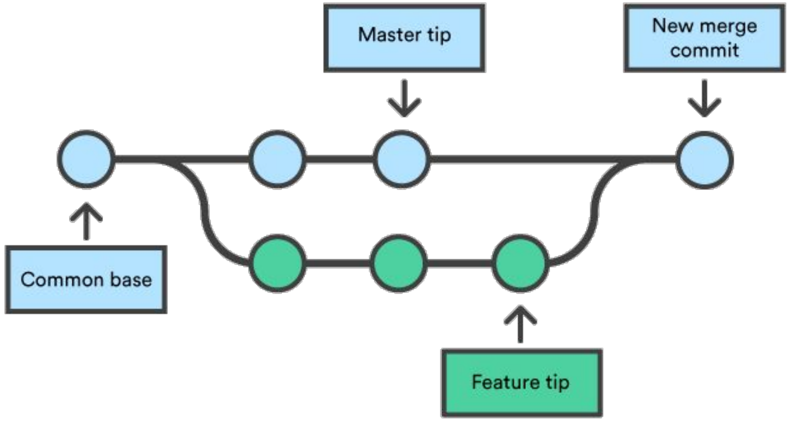
Collaborating on code

Options for collaboration

- **Google Colab** (https://research.google.com/colaboratory/)
    - Notebook can be shared with multiple people and viewed simultaneously
    - *However* multiple people cannot edit simultaneously (unlike Google docs)
- **Git & Github**
    - Github is a cloud storage service for the files that you maintain with Git.
    - Professional way to share code & implement version control!
    - First step: set up a GitHub account and *one repository for your project*

Version Control

- **Version control** is conceptually similar to track changes in Word — it keeps track of who makes changes, and what they did.
- A really common way to do this with code is a program called **git**.
    - GitHub is an online code hosting service that uses git and has a friendly user interface and a couple other features
- git can be used to track any type of text.
- Git can be used locally and/or with a remote repository of code

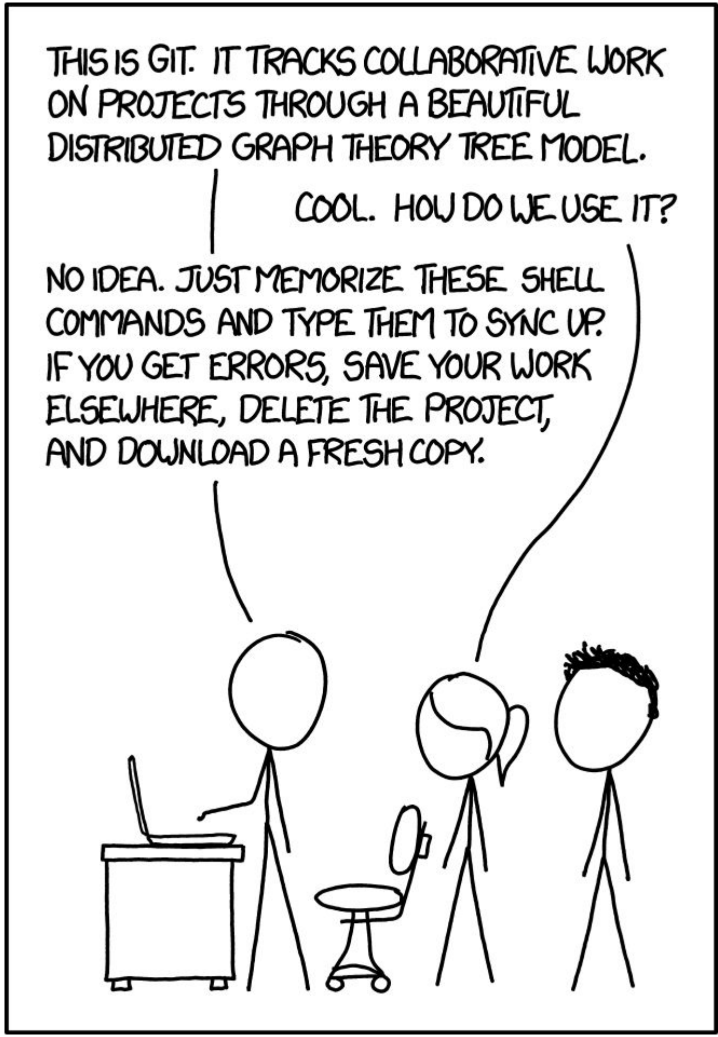


Using git

git helps you collaborate on code & track changes

In other words, it implements **version control**.

More information: Git/Github Introduction - VOYTEKlab


THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.
COOL. HOW DO WE USE IT?
NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.

https://xkcd.com/1597/

Steps for creating your project repository

1. Make an account on GitHub
2. **Team Member #1** creates a new **public** repository

3. **Team Member #1** adds initial code to the repository (by uploading on Github)
4. **Other team members** **clone** repository via terminal in DataHub
5. **Other team members** **add, commit, and push** their code (either as separate files, when that makes sense, or to scripts/notebooks)
6. **Team Member #1** **pulls** changes
7. BEFORE ANYONE EDITS CODE use **git pull** to get changes

Typical git workflow

1. **clone** code from a remote source to your local computer
   (or in our case, to your server space)

terminal prompt name

```
jaljadeff@dsmlp-jupyter-jaljadeff:~$ git clone https://github.com/aljdf/BILD62_ProjectExample.git
```

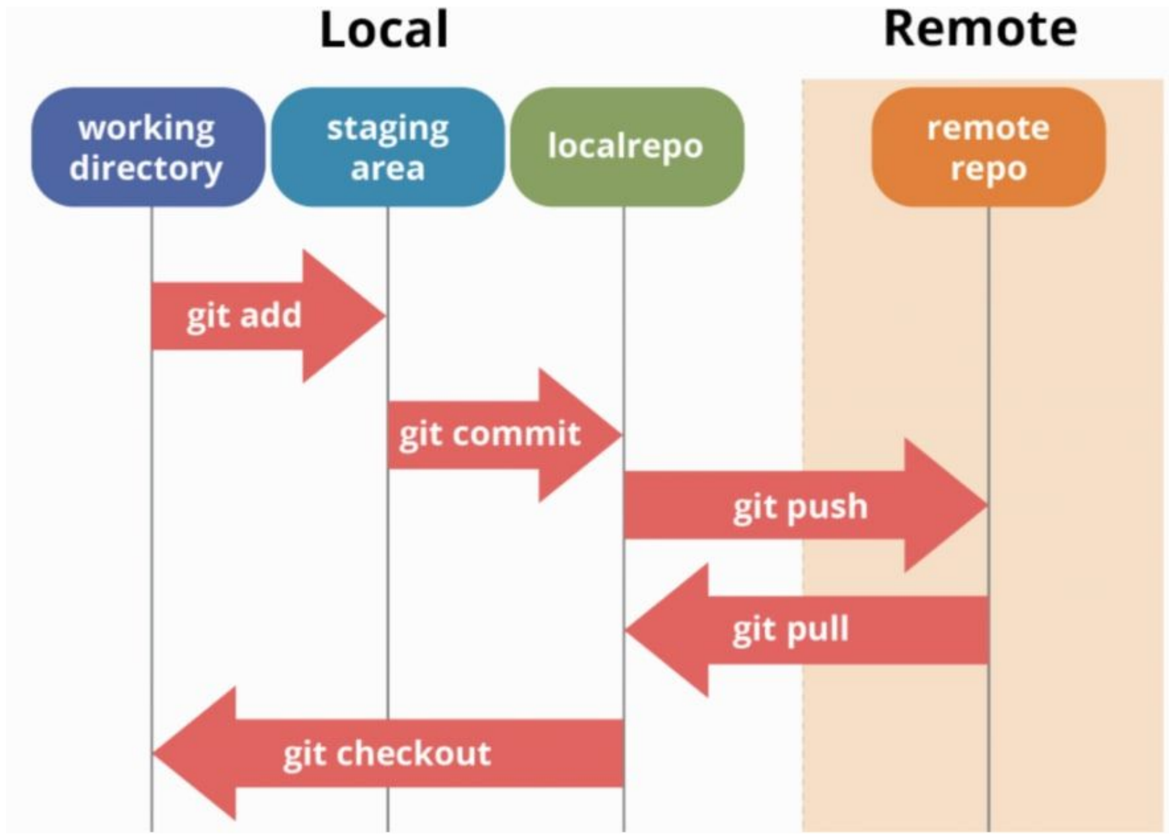
2. Edit code locally on your machine (**add** & **commit**)
3. **push** code back to a remote source

```
git status

git checkout <filename>
```

Tells you whether you're up to date

Discard your changes (only use this if necessary!)



Git flow for a simple project (from here)

Goals for today

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- Provide information on collaborating on code via Git
- **Describe code review**

Code review is a process for systematically reviewing someone else's code.

Negative criticism usually fails in one or more the following ways

1. **It isn't strategic.** The critic does not think about what specifically they want to change or what goals and solutions they can offer.
2. **It isn't improvement oriented.** The critic doesn't make suggestions as to how to improve.
3. **It attacks self-esteem.** The critic uses labels (such as "lazy"), speaks in absolutes, and does not allow the recipient to save face.
4. **It uses the wrong words.** The critic uses negative statements and words like "should" instead of "could."
5. **It comes with no supporting evidence.** Critic does not support comments with evidence or fair comparisons.

https://www.science.org/content/article/joy-criticism

Categories for code review

1. Functionality: Does the code work as intended? Is it robust? If not, where is the issue?

2. Documentation & Style: Is the code properly documented and commented? Where should the documentation be better? Does spacing & capitalization follow PEP-8 guidelines?

3. Error handling: Does the code handle errors properly? Where could the error-handling be better?

4. Other suggestions: Are there areas where the code could be more concise? Functions that could have been used, but weren't?