Lecture 5: Collaborative Programming and Basic HTML

Collaborative Programming

How do we code collaboratively?

Learning to code in collaboration with others is a very important skill to learn for your life as a developer.

We can code collaboratively by using a combination of version control software, ticketing systems, and workflows to distribute work amongst our team members.

What is version control?

Version control is a system that records sets of changes over time. It allows you to keep track of a history of your files in a very detailed manner.

Version control allows you to see a detailed log of all your changes, as well as roll changes back. It allows you a great deal of control over the state of your files; you can make many, many versions of your code and change between the versions with ease!

- This allows for easy feature development.

What is Git?

Git is an extremely popular version control software that is commonly used both personally and professionally. It is the most widely used version control software at the current point in time.

It was originally created by Linus Torvalds, who happens to also be the creator of the Linux Kernel.

Git is a distributed version control system: everyone will make a copy of a codebase to work off of on their local machine, and changes on one machine will not affect changes on another machine.

How can we use Git?

Git is a command line program, so we will use it from our terminal (much like node)

- https://git-scm.com/

Most of our commands are simple, and we will use Git to work collaboratively.

We will, in general, use Git by setting up a centralized repository that we will publish code to and we will synchronize changes in our local repositories.

For most of our work, we will be using Github to store an online copy of our repository.

Distributing Work

The easiest way to work in a team is to distribute work.

Very often, work is distributed in one of the following forms:

1. Feature based; each team member owns a portion of the features and does all the work for that area. This includes: server routes, data code, HTML, CSS, and frontend JavaScript
2. Architectural ownership; each team member takes a region of the code to own. One user will work on authentication, one will work on routes, one will work on CSS, one on JS, etc.
3. Ticket based; a series of tickets are created regarding each issue, bug, feature, etc., and developers claim tickets to work on.

Using a ticket system

Ticketing systems are a popular way to keep track of issues and features. Project managers often use this software to manage the team workload. You may find this useful for your projects.

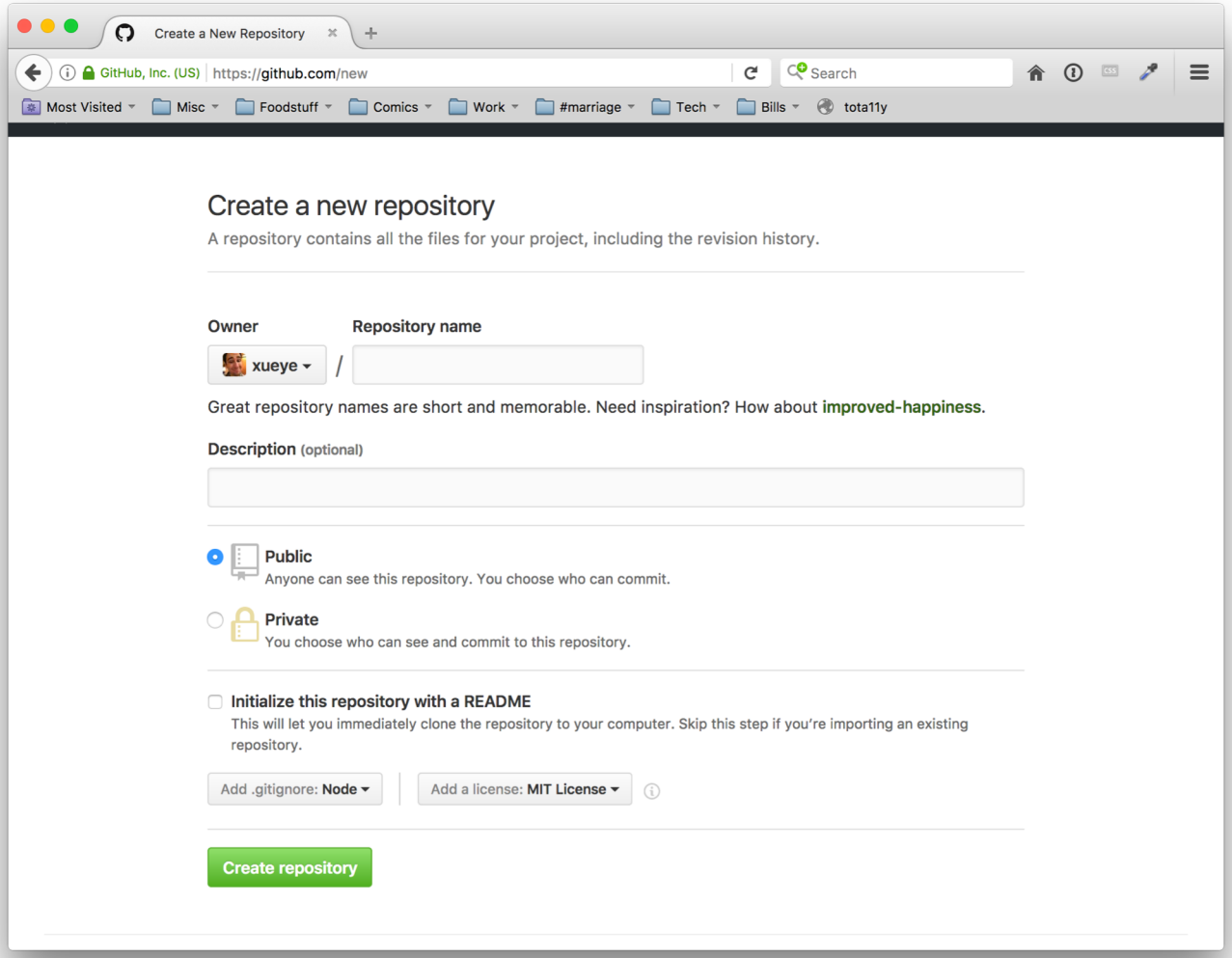
Some popular ticket systems / project management apps:

- Asana
  - http://asana.com/
- Trello
  - http://trello.com/
- Github issues
  - https://developer.github.com/v3/issues/
- Mingle
  - https://www.thoughtworks.com/mingle/
- Waffle
  - https://waffle.io/

Git

Terms

Term	Meaning
Repository	A repository is a location that stores the information about the project's file and folder structure, as well as its history
Branch	A branch is a pointer to a certain chain of file change histories; you can have many branches, but will always have at least one. Traditionally, the original branch is called *master*
Commit	A commit is a snapshot of your repository at a point in time.
Remote	A reference to a repository stored outside of your current local machine; ie, the repository on Github
Push	Pushing is the act of taking your commits and uploading them to a remote repository
Pull	Pulling is the act of taking commits from a remote repository and bringing the changes down to your local repository
Merging	Merging is the act of bringing one set of changes from one branch to another, and creating a new version of the code with both histories.
Pull request	A pull request is a request to bring a series of changes from one branch to another



Making a repository on Github

The first step to using Git is making a repository. A repository is a data structure that stores information about the files and folder of a project, as well as the history of the structure.

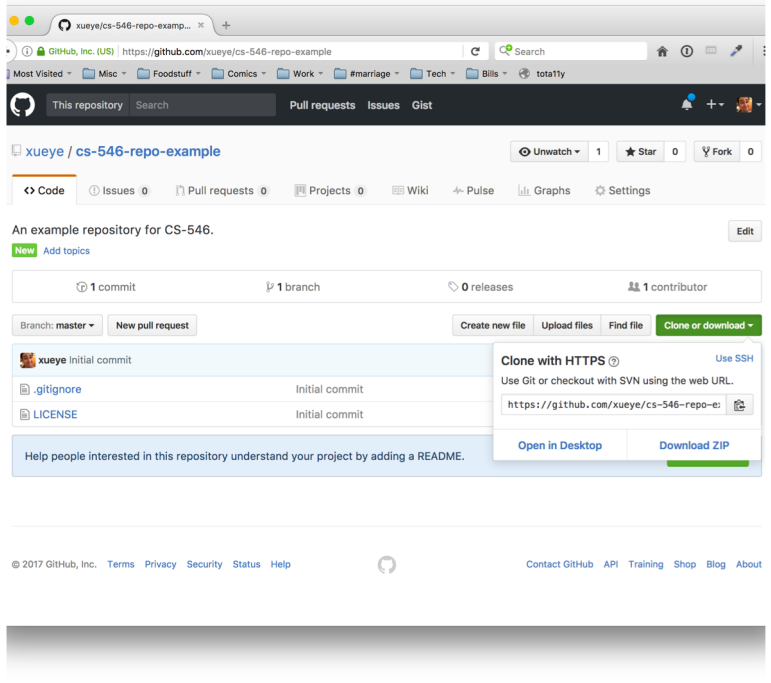
The easiest way to make a repository is to start on Github, with the following settings:

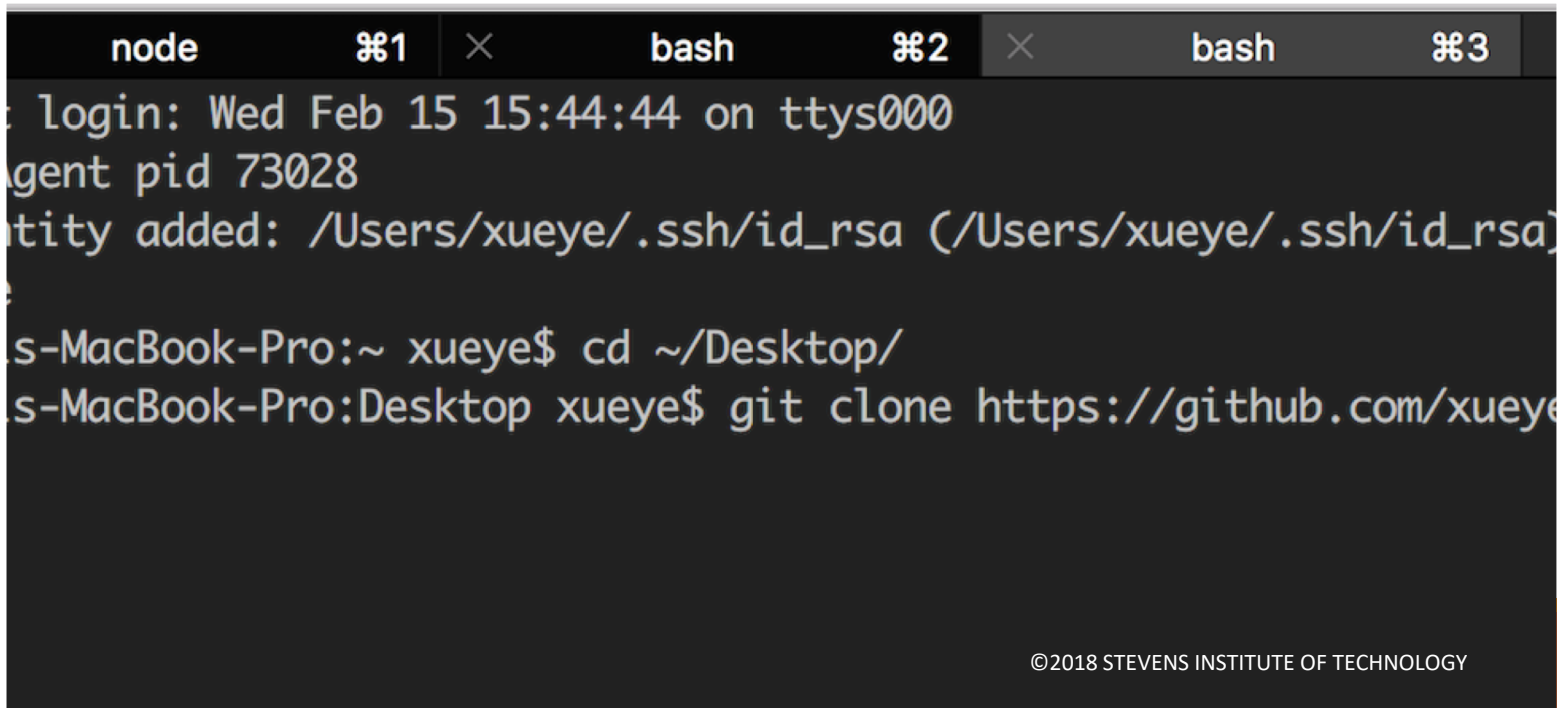
- https://github.com/new

Cloning a repository

Once the repository is created on Github, we can clone it to our local machines using the git command line.

On the home page of a repository (see example) there will be a button to clone or donwload the repository. Copy the url, and use the *git clone URL* command to clone the repository.



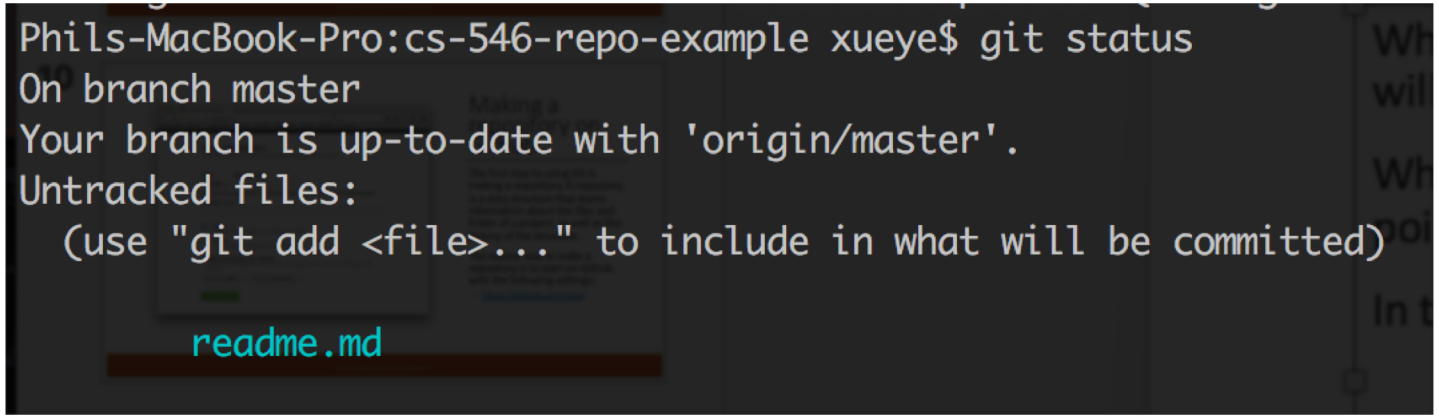


Getting status

While in our project directory, we can make changes as needed to our repository. These changes will not appear online until we commit and push these changes.

When we want to see what changes we have since our last commit (a snapshot of our code at a point in time), we can use the *git status* command.

In the screenshot, we can see that we have an untracked file; this means a file that is brand new to the repository.



Adding changes to be included in a commit

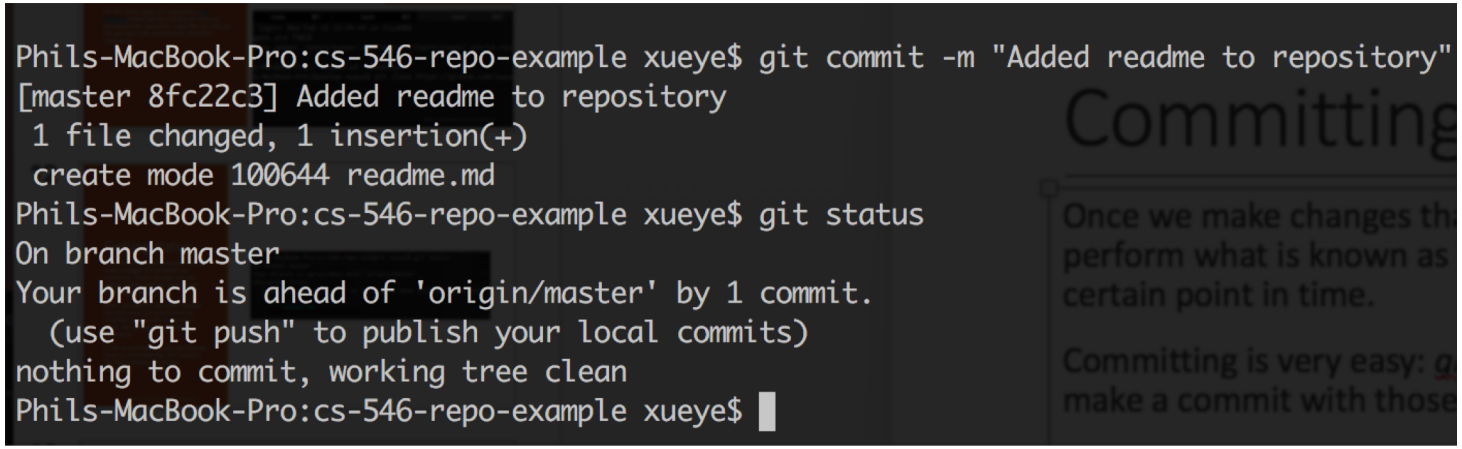
```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git add readme.md
warning: LF will be replaced by CRLF in readme.md.
The file will have its original line endings in your working directory.
Phils-MacBook-Pro:cs-546-repo-example xueye$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        new file:   readme.md
```

Before we commit changes, we need to explicitly tell Git which files we want to track the changes of. We do this with the *git add PATH/TO/FILE.EXT* command.

For example, to add our new readme, it would be: *git add readme.md*

After the file is added, it is now in a state known as *staging*; this means that it's a change that will be included in a new commit. We can continue to edit this file and the new changes will not be included in that staging version of the file until we explicitly run *git add* again.

Committing Code



Once we make changes that we want to group together and store in our repository, we will perform what is known as a commit. A commit can be seen as a snapshot of our repository at a certain point in time.

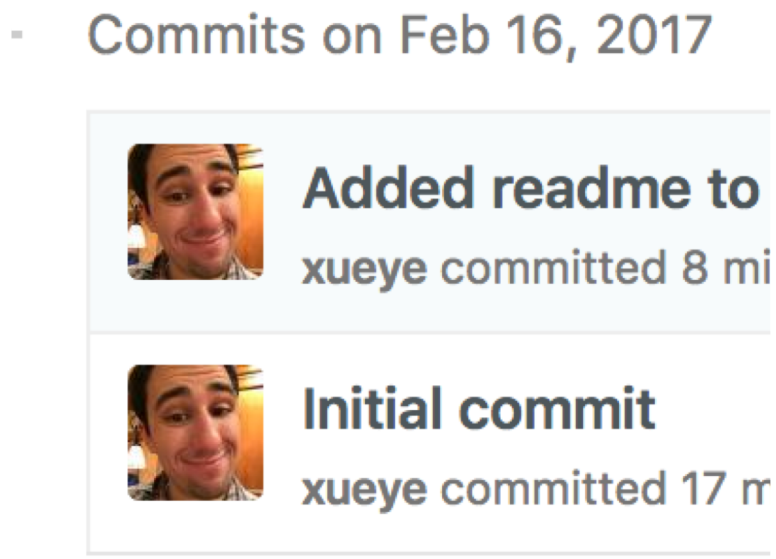
Committing is very easy: *git commit -m "Our message here"* will snapshot all **staged** changes and make a commit with those changes.

Pushing up our changes

Version control is incredibly useful when using a single computer, but shines even more when we push our changes up to a remote repository. By default, when we clone, a reference to the online repository will be created; this repository is named *origin*.

We can push our changes by using the *git push REPOSITORY_NAME BRANCH_NAME*, like *git push origin master*

After pushing, our commits will be seen online




```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git pu
Counting objects: 3, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 336 bytes | 0 bytes/s,
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/xueye/cs-546-repo-example.git
   5d5d6fd..8fc22c3  master -> master
Phils-MacBook-Pro:cs-546-repo-example xueye$
```

Pulling changes

```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git pull origin master
From https://github.com/xueye/cs-546-repo-example
 * branch            master     -> FETCH_HEAD
Already up-to-date.
```

We can pull down changes in the same manner, by issuing a *git pull REPOSITORY_NAME BRANCH_NAME* command. If there are changes, you will automatically pull and merge these changes into the branch your are currently in.

An easy workflow

Let us pretend for a moment that we want to make a series of updates to our readme file. A common workflow is:

- Make a new branch devoted to all changes to the readme, such as *git checkout -b feature/readme*
- Make relevant updates to the codebase
- Make as many commits as needed until satisfied with the result
- As you commit, push your changes up to a remote branch; the first time you push to a new branch online, it will be created online!
- When done with the feature, issue a pull request for the code to be reviewed.
- When the code is reviewed and accepted, merge it into the main branch.

Workflow Demonstration: Branching and saving changes

At this point, we have created a new branch using the *git checkout -b feature/readme* command; this creates a new branch named *feature/readme*; if we already had that branch and were just moving to the branch, we would omit the *–b* flag.

```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git checkout -b feature/readme
Switched to a new branch 'feature/readme'
Phils-MacBook-Pro:cs-546-repo-example xueye$ nano readme.md
Phils-MacBook-Pro:cs-546-repo-example xueye$ git status
On branch feature/readme
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   readme.md
```

Workflow Demonstration: Staging and Committing

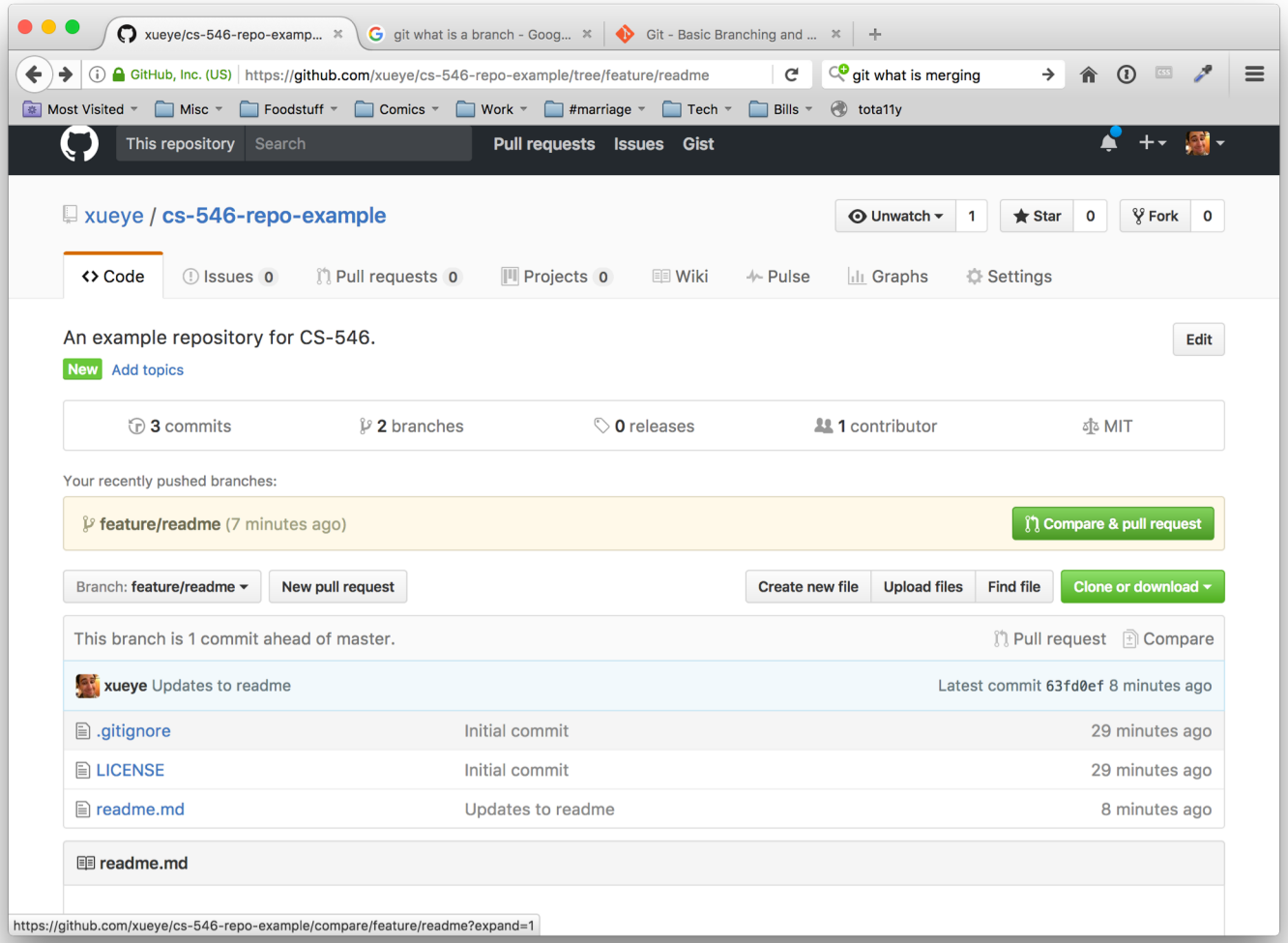
On our new branch, we now stage the files by adding them to be committed; then, we commit the code.

```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git add readme.md
warning: LF will be replaced by CRLF in readme.md.
The file will have its original line endings in your working directory.
Phils-MacBook-Pro:cs-546-repo-example xueye$ git status
On branch feature/readme
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   readme.md

Phils-MacBook-Pro:cs-546-repo-example xueye$ git commit -m "Updates to readme"
[feature/readme 63fd0ef] Updates to readme
 1 file changed, 4 insertions(+)
```

Workflow Demonstration: Pushing code

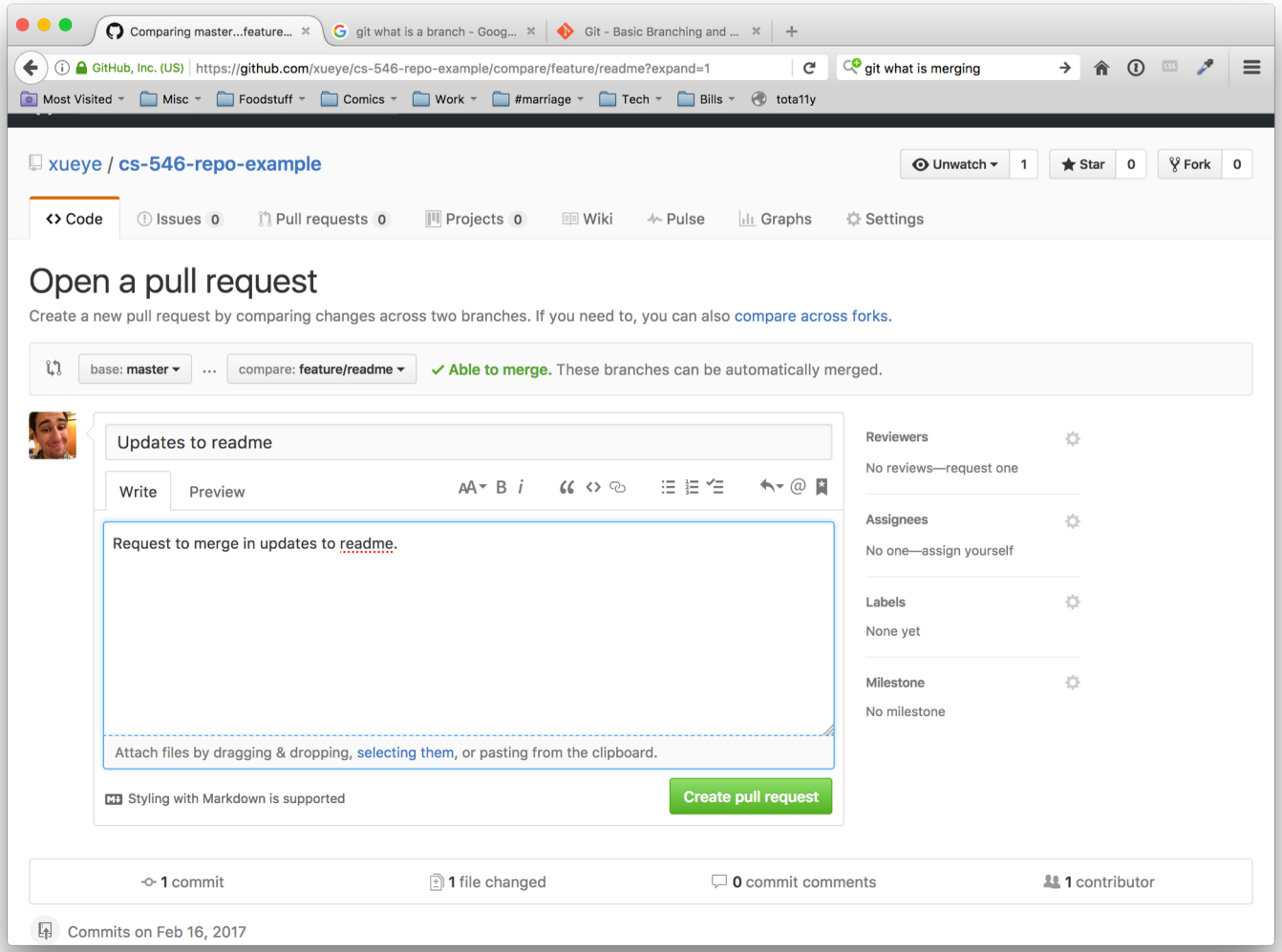
We push the code online to our remote repository; we should remember to do this often!

```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git push origin feature/readme
Counting objects: 3, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 365 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local objects.
To https://github.com/xueye/cs-546-repo-example.git
 * [new branch]      feature/readme -> feature/readme
Phils-MacBook-Pro:cs-546-repo-example xueye$
```



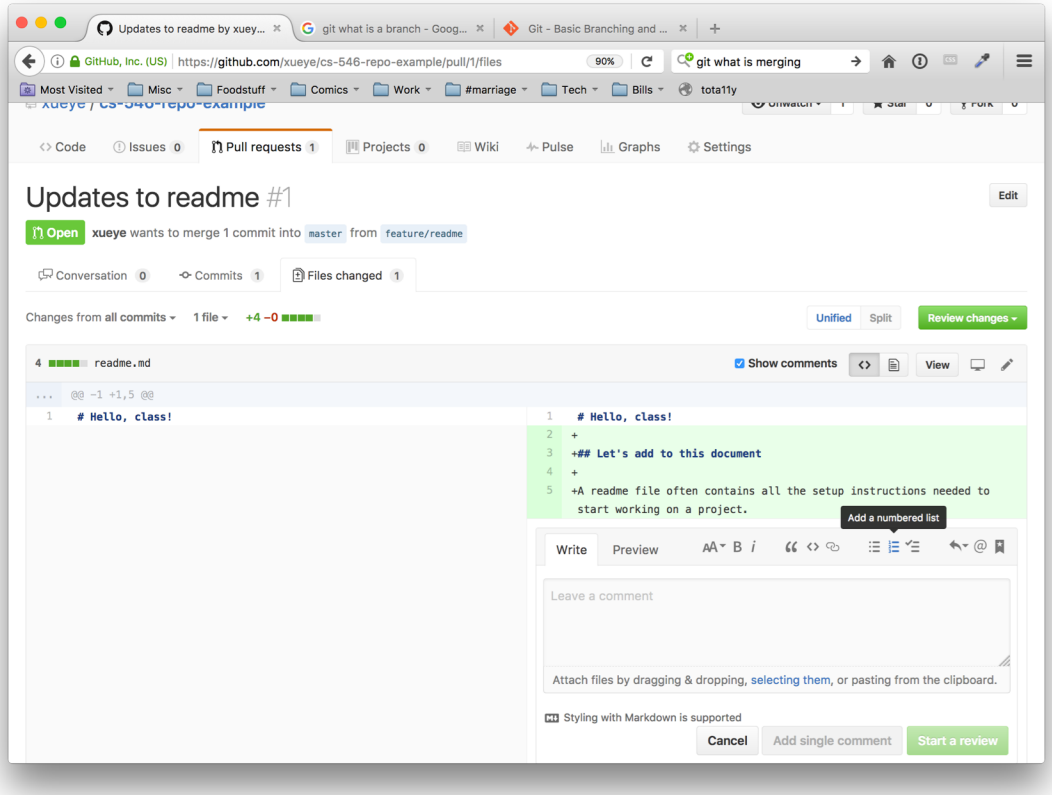
Making a pull request

On Github, we can create a pull request based on the branch. This will issue a request to have this changes merged into a different branch (in our case, *master*).



Making a pull request

Pull requests should have a description of the set of changes, and when created will show the changes in that branch.



Reviewing a pull request

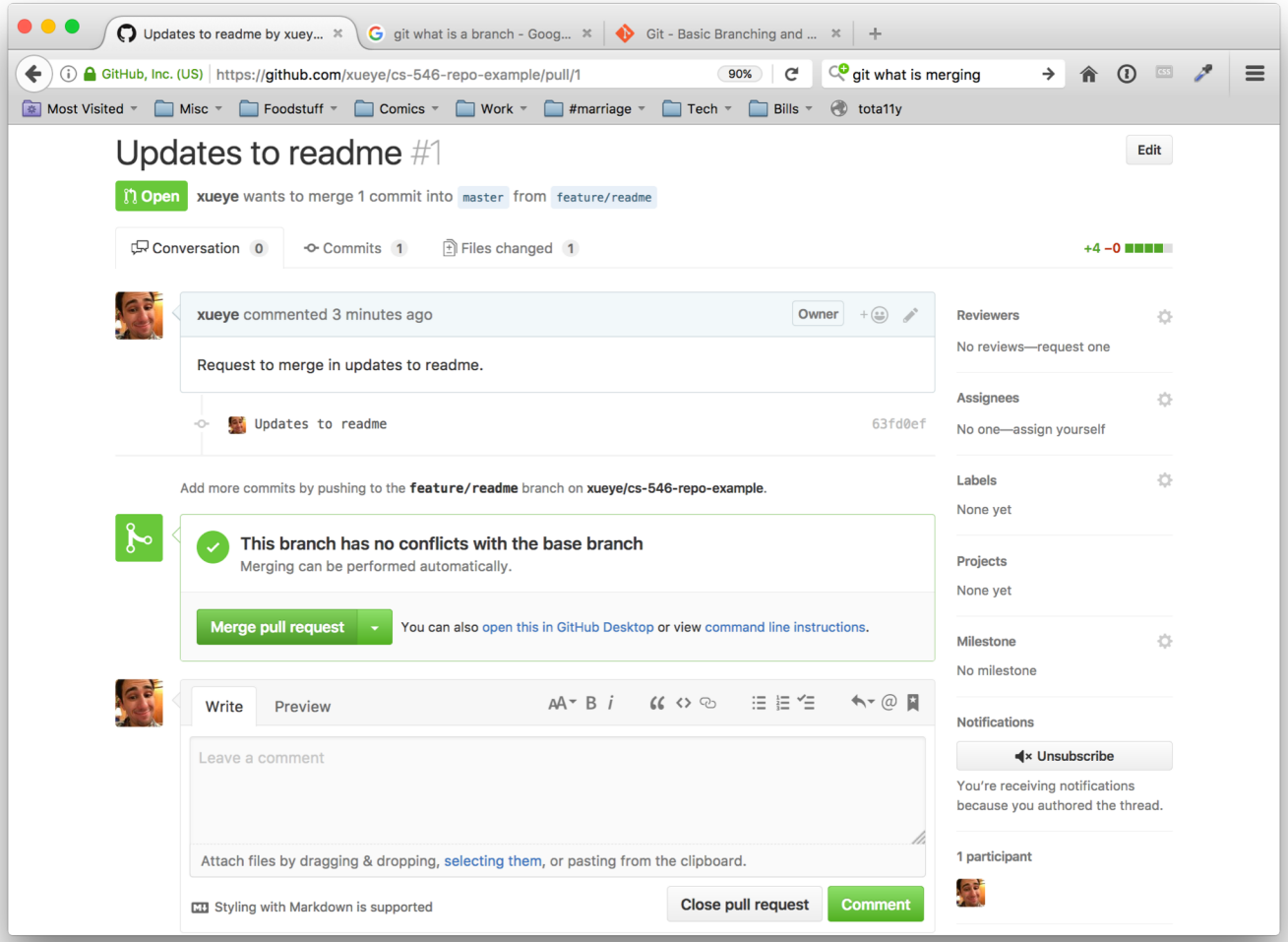
All pull requests should be reviewed by a different developer (and it's also good to have it reviewed by more than one developer); by clicking the *files changed* tab on the pull request page, we can leave comments to the developer about their pull request.

This is very useful for identifying inefficiencies, logical errors, bugs, etc. It also forces multiple developers to look at the approach to solving a problem or making a feature, so that more than one developer is familiar with each portion of the code in a project.

Merging in the pull request

If a pull request can be safely merged in without conflicts occurring, Github will allow you to merge in the changes when all developers are satisfied with the changes.

This will add the new commit data to the master branch of the online repository.



Pulling changes

At this point, the only repository with the new commit on the *master* branch is the online version; even the repository that we developed on does not have those changes on the master branch.

We need to routinely pull from the *master* branch to stay up to date.

```
Phils-MacBook-Pro:cs-546-repo-example xueye$ git pull origin master
remote: Counting objects: 1, done.
remote: Total 1 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (1/1), done.
From https://github.com/xueye/cs-546-repo-example
 * branch            master     -> FETCH_HEAD
   8fc22c3..0d8099c  master     -> origin/master
Updating 8fc22c3..0d8099c
Fast-forward
 readme.md | 4 ++++
 1 file changed, 4 insertions(+)
```

Avoiding Issues

Many issues can occur when using version control, due to the nature of many people editing the same sets of files.

There are a few easy tricks to avoiding most common issues with Git:

- **Never develop on the master branch**; do all development in your own feature branches, and issue pull requests.
- **Pull master into your own feature branches commonly**; merge errors will occur that you will need to resolve by hand, but you will ultimately have to resolve these issues far less than if you were all working on the master branch
- **Isolate your work into small chunks**; do not wait to do a whole feature before you commit. Commit often, as you accomplish small, incremental changes.
- **Make new feature branches off of master**; master should always be the most up-to-date **working** code; it is prudent when starting a new feature to get an updated version of the master branch and make a new branch from that up-to-date master branch.
- **Pull often**; this is so important, that we're listing it twice. **Pull often!**

References

http://rogerdudler.github.io/git-guide/

https://git-scm.com/doc

Intro to HTML

Making an HTML document

HTML (Hyper Text Markup Language) is a markup language; it is a way of describing content. A file written in HTML is referred to as an HTML document.

Our first HTML documents will exist on our desktops, rather than on a server.

HTML documents are simply text files that are formed following the HTML standard. HTML is composed of a series of tags to describe the content.

An HTML document is a text document that describes a **web page**.

Your browser will interpret this document and render it!

What's in an HTML Document?

An HTML has a series of elements
- Open tag plus attributes and properties
- Nested elements

Some very important
- HTML Doctype
- HTML Element
  - Head Element
  - Body Element

Elements can be identified by an ID
- ID can only be used once per document

Elements can identify a group by their class

Elements are described in the document and rendered in the DOM

Starting an HTML document

All HTML documents start with the following barebones structure. Content to be visible on your page will go inside the body tag. (Colored formatted screenshot on left; copyable on right)

```
1   <!DOCTYPE html>
2   <html lang="en">
3     <head>
4       <meta charset="utf-8">
5       <title>title</title>
6     </head>
7     <body>
8       <!-- page content -->
9     </body>
10  </html>
11
```

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>title</title>
  </head>
  <body>
    <!-- page content -->
  </body>
</html>
```

Improving our HTML Documents

This week we're going to create a meaningful document about different types of coffee, and explain how to make it marked up in a sensible way.

We will learn about:

- Formatting text
- Organizing our data
- Lists
- Tabular data

Reusability, repetition

For web programming, it's very necessary to think of everything based in terms of reusable components. There's a lot of repetition in web programming, where you're displaying many different instances of similar data

- Every tweet has all the same info
- Every blog post has a title, time, body, etc.
- Product descriptions all have prices, titles, etc.

Because of this, we're going to look at our programming in terms of:

- Is this reusable? If so, how?
- How can I make this component accessible?
  - More on this when we get to forms next week.

The Browser's Only Half The Battle

The web isn't just accessible via a browser. As modern web developers, we have to care about:

- Screen readers
- Search Engine Crawlers / Other AI

There is a growing movement to make the web more accessible

- Leveraging HTML's strengths
  - Navs in the nav
  - Labels in forms
  - Using headings properly
  - Attributes to help screen readers
- Making designs accessible
- Tables for tabular data only
- Make sure you can navigate via keyboard

Separating Style and Content

Before we can think in terms of organizing our data meaningfully, we need to understand what HTML does *not* accomplish; the way your document looks.

- **Elements are used to describe your data; CSS is used to style your data.**
- While browsers give many native styles to elements by default, elements are not inherently used for styling. This is why tags for bolding and italicizing text, or changing fonts, were deprecated in HTML5.
- There needs to be a clear separation between style and content; any overlap is a happy coincidence.

While writing HTML, thinking in terms of content first, then styling often leads to more logical, and easier to style documents.

Types of Text

Across the web, text is used to portray many different types of things.

- Headings / Titles in your content (h1, h2, h3, h4, h5, h6)
- Regular paragraph (p)
- Generic groups of text / adding custom definitions or functionality to text (span)
- Emphasized text (em)
- Important text (strong)
- Addresses (addr)
- Citations (cite)
- Abbreviations (abbr)
- Quotes (blockquote)

Using the right kind of element to describe text is very important for SEO, non-browser accessibility, and readable code.

- Even without different styles, those tags help readers understand their document.

The layout of your content

There are many elements that describe the layout of your content

- How to navigate content / your document (nav)
- Grouping your content into sections that have something to do with each other (main, section)
- Denoting a header for content or your document (header)
- Denoting a footer for content or your document (footer)
- Grouping content into a self-contained article (article)
- Stating that certain content is secondary (aside)
- Grouping divisions of content (div)

List Data

Lots of data you'll see and create is some form of a list

- Unordered lists state that the order of the items in the list don't matter (ul)
- Ordered lists state that the order of the items in the list have some sort of meaning (ol)
- Each entry in a list is a list item

You'll very often find see nested lists

```
<ul>
   <li>Item 1</li>
   <li>Item 2
        <ul>
           <li>Subitem</li>
        </ul>
    </li>
</ul>
```

Tabular data

Data is also often presented in a table format. Each table has:

- A table element (table)
  - A table header (thead) (optional)
    - A table row (tr)
      - Multiple table header cells (th)
  - A table footer (tfoot) (optional)
    - A table row (tr)
      - Multiple tada table cells (td)
  - A table body
    - Multiple table rows (tr)
      - Multiple table data cells (td)

Meaningfully grouping a news article

A news article is easily represented properly in HTML.

- Article
  - Header
  - By line (Subheader)
  - Body paragraphs
  - Footer with comment form

Meaningfully grouping a recipe

Just because the tag is ‘article’ doesn’t mean it just has to be news! The article is “an article of content”.

- Article
  - Header: title of recipe, possibly details like cooking skill required
  - A list of ingredients
  - Body paragraphs explaining how to cook recipe
  - An aside with nutritional information

Referencing Assets

Relative: When you specify a path as a relative location, the browser attempts to find these assets relative to your current location.

- When you are at http://localhost/blogs/ and use a relative path of my_image.jpg and styles/background.png, your browser will attempt to find the resources at http://localhost/blogs/my_image.jpg and http://localhost/blogs/styles/background.png respectively.

Root Relative: Similar to relative, you can have *root relative* paths; these will be relative locations based on the root of your host (it will not take the current path into account)

- When you are at http://localhost/blogs/ and use a root relative path of /images/my_image.jpeg your browser will attempt to find the resources at http://localhost/images/my_image.jpg

Absolute: You can reference elements by an entire URL (protocol, host, path, etc) and your browser will look for these directly

- When you are at http://localhost/blogs/ and use an absolute path of http://localhost/images/my_image.jpeg your browser will use that URL to locate the image

Referencing External Assets

Images

- You reference images as normal HTML elements. The image tag is the *img*

Stylesheets

- In the head of your document, you can specify CSS stylesheets to apply to your document using the *link* tag; these will be loaded in order of tag appearance

Scripts

- You reference scripts using the *script* tag.
- Your script files should almost always be placed right before your closing body tag; this will allow your browser to render the page and *then* add function to it, rather than locking the page up to perform JavaScript tasks while the page is still loading. Scripts will be referenced in the order you include them.

Validating HTML

For this course, the validity of your HTML is highly important.

Having valid HTML means your browser does not have to guess how to fix it, which can lead to drastically wrong web pages and pages that cannot be made sense of.

The w3 website has an easy to use validation service that tells you issues and proposed solutions:

- https://validator.w3.org/#validate_by_input

You should view the source of your page, copy, and paste it all into the HTML validator's 'direct input' section before submitting HTML in this class.

You should strive to write as perfect HTML as possible.

Attributes and properties

Elements can have many classes and properties attached to them to further describe them.

The difference between the two of those are nuanced and deals with the state of the page.

- This is an example of how browsers had to adapt to a set of standards that were not always fully thought out.

Attributes appear in key-value fashion when writing HTML:

- Go To Google

The *href* attribute is set to Google's home page

Elements are parsed and, as they are changed, keep track of the set of properties. Some properties come from their attributes, others come from user input.

Classes and IDs

Elements will often be described with classes and IDs to signify them in some way

Many elements can share a *class*, and each element can have many *classes*

-
  - Has two classes, panel and panel-default
-
  - Has two classes, panel and panel-danger

However, only one element can have a particular ID:

-

Classes and IDs are most often used to style elements and target elements with JavaScript to add functionality.