# Hack 1.0

## Computer Science I – Honors

**Department of Computer Science & Engineering**
**University of Nebraska–Lincoln**

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## Introduction

Hack session activities are small weekly programming assignments intended to get you started on full programming assignments. Collaboration is allowed and, in fact, *highly encouraged*. You may start on the activity before your hack session, but during the hack session you must either be actively working on this activity or *helping others* work on the activity. You are graded using the same rubric as assignments so documentation, style, design and correctness are all important.

For correctness:

- Code itself needs to be correct: 4 pts
- There should be more than one commit: 4 pts
- All commits should have a descriptive comment: 3 pts
- There must be at least 2 contributors: 5 pts

## Problem Statement

An essential tool when developing software is a *version control system* (VCS). As you develop software you will make changes, add features, fix bugs, etc. and it is necessary to keep track of your changes and to ensure that your code and other artifacts are backed up and protected by being stored on a reliable server (or multiple servers) instead of just one machine.

A *version control system* allows you to "check-in" or *commit* changes to a code project. It keeps track of all changes and allows you to "branch" a code base into a separate copy so

that you can develop features or enhancements in isolation of the main code base (often called the "trunk" in keeping with the tree metaphor). Once a branch is completed (and well-tested and reviewed), it can then be *merged* back into the main trunk and it becomes part of the project.

These systems are not only used for organizational and backup purposes, but are absolutely essential when developing software as part of a team. Each team member can have their own working copy of the project code without interfering with other developer's copies or the main trunk. Only when separate branches have to be merged into the trunk do conflicting changes have to be addressed. Such a system allows multiple developers to work on a very large and complex project in an organized manner.

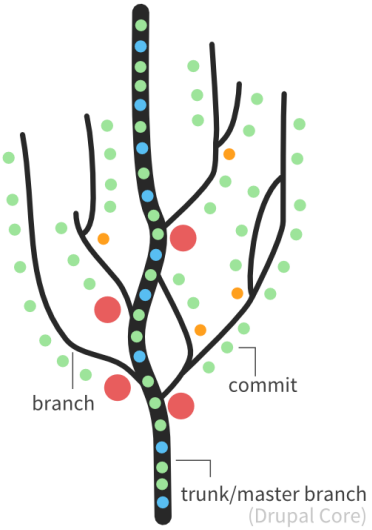



Figure 1: Trunk, branches, and merging visualization of the Drupal project

There are several widely used revision control systems including CVS (Concurrent Versions System), SVN (Apache Subversion), and Git. SVN is a *centralized* system: there is a single server that acts as the main code repository. Individual developers can check out copies and branch copies (which are also stored in the main repository).

Git is a *distributed* VCS meaning that multiple servers/computers act as full repositories. Each copy on each developer's machine *also* contains a complete revision history. This makes git a decentralized system. Code commits are committed to a local repository. Merging a branch into another requires a push/pull request. Decentralizing the system means that anyone's machine can act as a code repository and can lead to wider collaboration and independence since different parties are no longer dependent on one master repository.

Git has become the de facto VCS system in software development. We have provided several external resources below, but this Hack will walk you through the basics of getting started. You will setup a project with git using GitHub (`https://github.com`) as your remote server. You will then collaborate with someone else to commit changes.

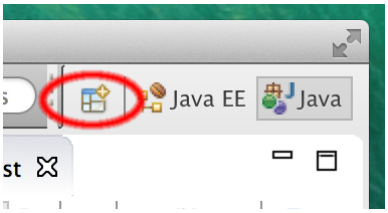
# 1 Installation

Support for Git comes standard with Eclipse. Instead of using a command line interface, however, you use Eclipse's graphical user interface to perform the standard git operations.

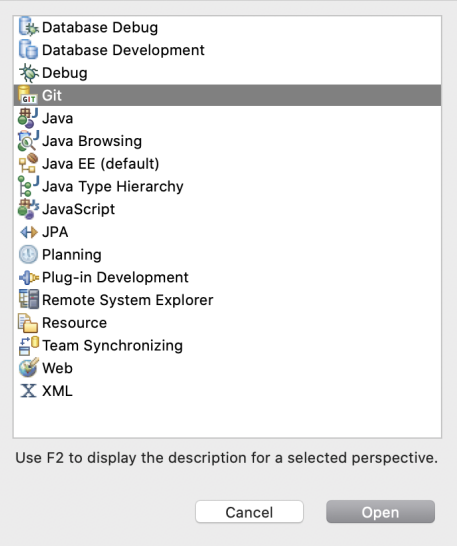
# 2 Setting Up a Repository

To focus on the git process, you will create and work with a simple "Hello World"-style program but instead of printing "Hello World", it will print your name.

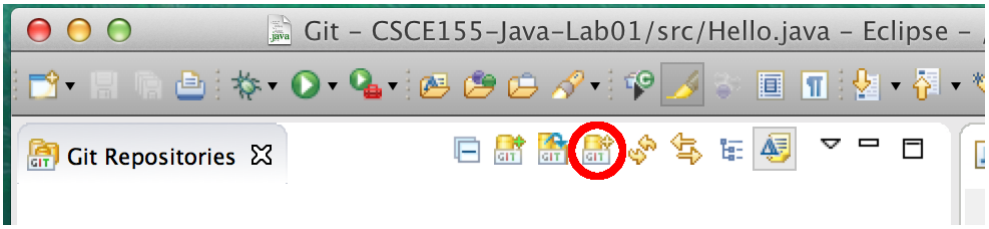
1. Create a new Java project (call it `HelloGit`) in Eclipse. Add a `Hello.java` source file with code in it that prints your name.
2. First we need a Git *perspective* (a context in the Eclipse User Interface that will allow us to work with Git). To open the Git perspective, click on the "Open Perspective" tab in the upper right:



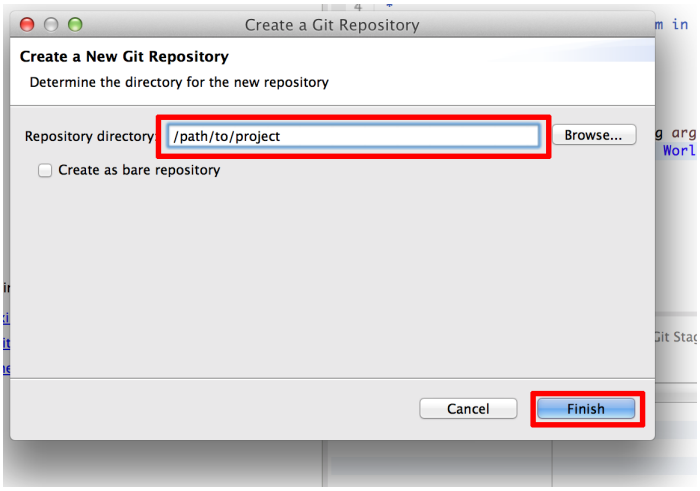

3. Select "Git" from the menu and click OK




4. Click the "Create a new repository and add it to this view" icon:




5. Select the project folder for the Eclipse project you want to add as a git repo




## 2.1 Git Ignore

Before we make our first commit, let's setup a `.gitignore` file. Often times there will be files or *artifacts* that you want to create, save and work with in your project *but* you don't want them committed to the repository. For example, when you compile your programs you don't want the compiled `.class` files committed to the repository. The binary files are not part of your source code, but an *artifact* of your code. In general, we want git to *ignore* these artifacts.

Eclipse creates a default `.gitignore` file when you create a new repository. Unfortunately it is not very complete (usually it only ignores the `bin` or "binary" directory). The following URL has a more comprehensive standard `.gitignore` file for Java Eclipse projects:

https://github.com/github/gitignore/blob/master/Global/Eclipse.gitignore

Open the `.gitignore` file in the "Git Staging" tab (see Figure 2, item marked A.) and in the left-hand editor copy-paste the contents of the `.gitignore` file and save.

## 2.2 Staging & Committing

Let's continue and make our first commit to our new repository.

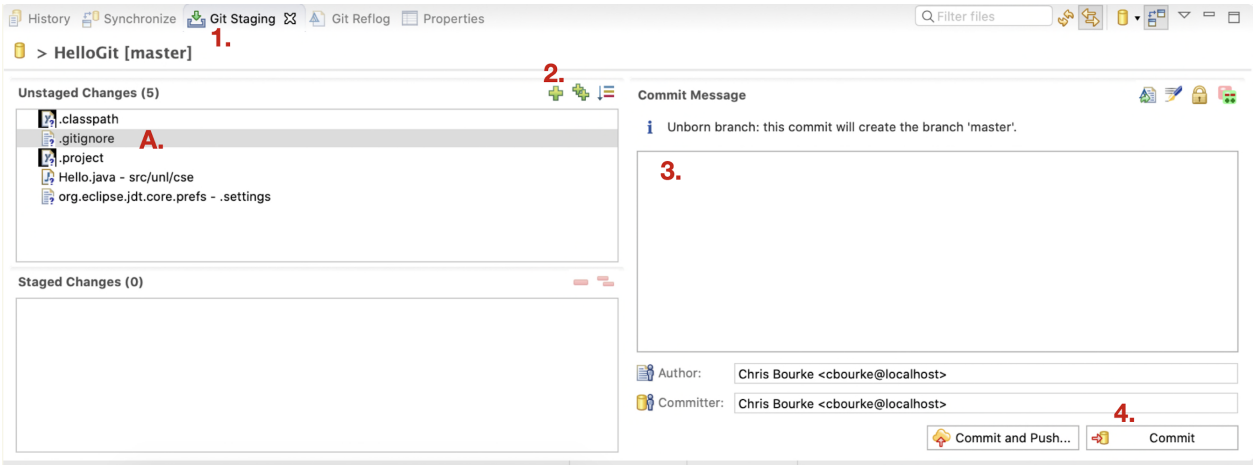



Figure 2: Git Staging Tab

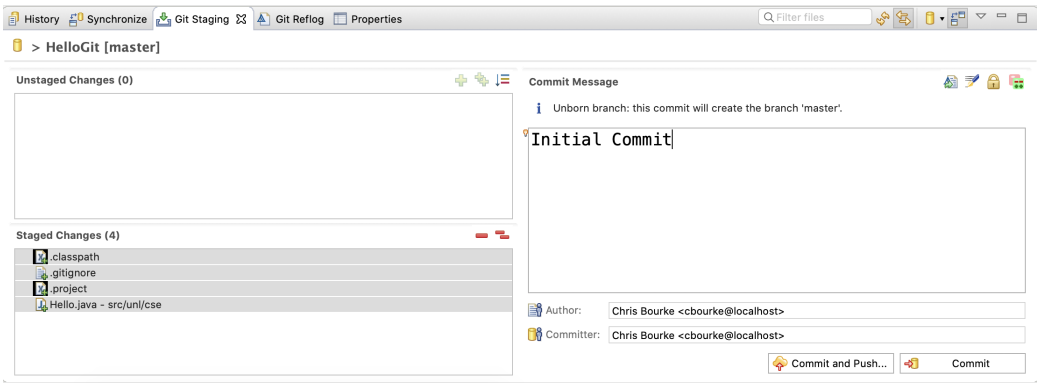
1. First, we need to "stage" files for our commit. In the Git Staging tab (see Figure 2, label 1.), select the file(s) you wish to commit and press the plus icon (see label 2.) *or* click the double plus to automatically stage all files at once.

   Note: in general, commits should be as small as possible. If you make a series of unrelated changes you should make separate commits instead of staging and committing all changes at once.

2. Write a commit message (see label 3.) describing the changes. For this first commit, a commit message of `Initial Commit` is good enough. Make future commit message descriptive and thoroughly document the changes that have been made.

3. Commit the changes by clicking "Commit" (see label 4.)

Just prior to committing, your Git Staging tab might look something like:

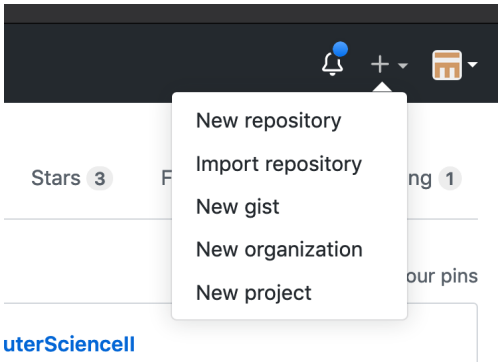


## 2.3 Pushing Changes

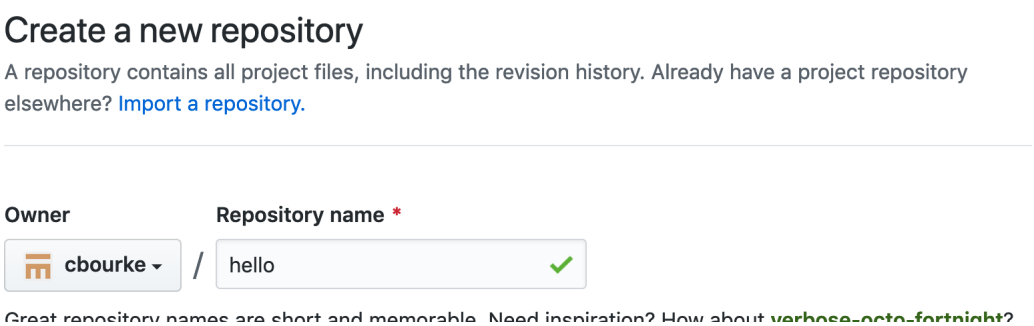
Though we have committed changes to our repository, those changes are only to your *local* repository on your own computer. The changes still need to be *pushed* to GitHub.

### 2.3.1 Create a Repository on Github

1. Go to your GitHub page (`https://github.com/login` where `login` is replaced with your GitHub login) and in the upper right, select `New repository`.

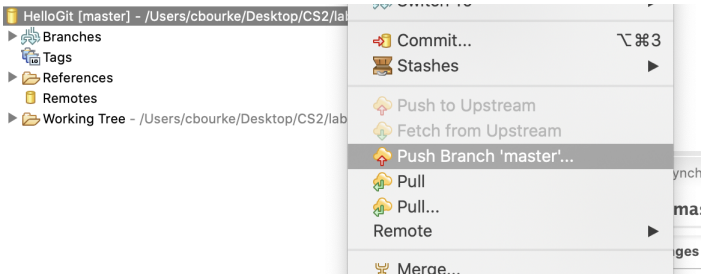



2. Name your repo `HelloGit`

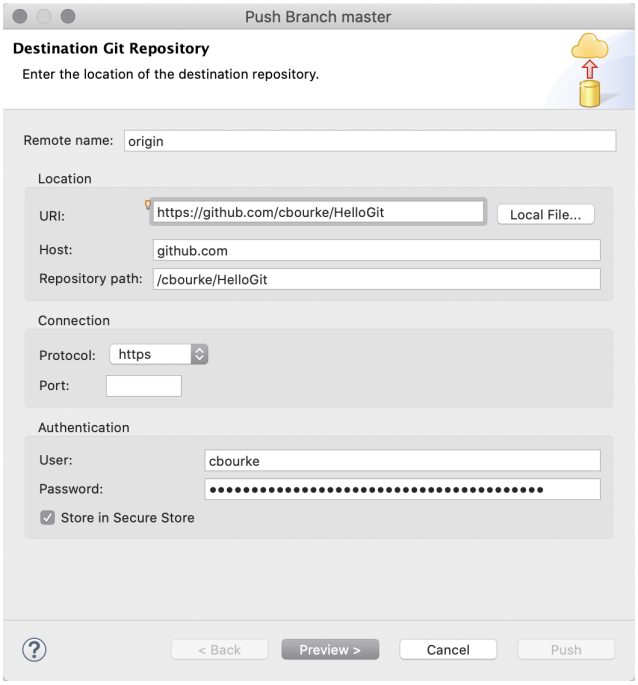



### 2.3.2 Push to Github

1. In Eclipse, go back to your git perspective
2. Right-click your Git Repository and select "Push Branch master..."



3. In the dialog, fill out the URI of the repository that you created on Github and your *Github* user name and password.




4. Click preview until you can click "Push" to finish.

### 2.3.3 Making Changes

1. In Eclipse, return to your Java perspective and add a line to your code to print your major.
2. Go back to your git perspective and you'll see that the change is reflected in your Git Staging tab.
3. Repeat the Commit-Push process to push this change to your Github repo.

   **NOTE**: you can view the differences in a file before committing them by double-clicking on the file!

# 3 Collaborating With a Team

In this exercise, you'll need to team up with at least one other person. You'll make them a collaborator on your project so they can make changes and commit/push them to *your* repository on GitHub. Alternatively you can have them make a *pull request*, but these instructions do not cover that; refer to one of the resources in the Additional Resources section for how how to make push/pull requests.

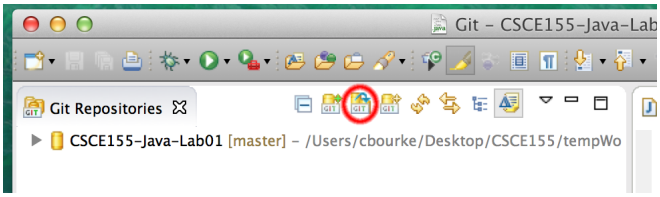
1. On the GitHub webpage, click `Settings` in your project.

2. In the left menu, click `Manage access`
3. Click `Invite a collaborator` and type in your partner's GitHub user name and click `Add`

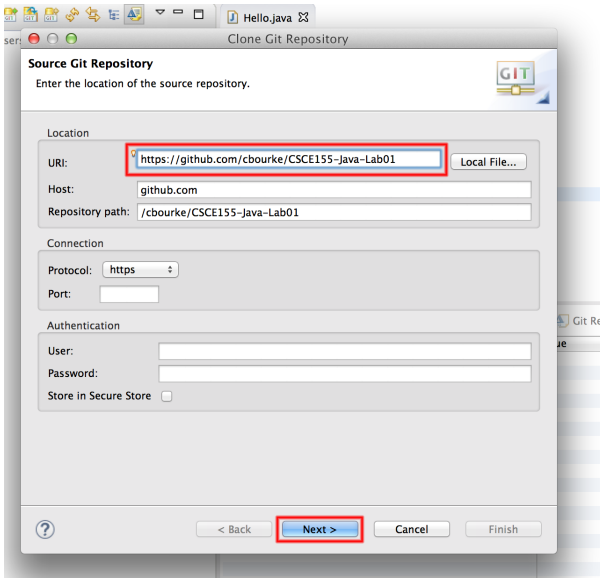
## 3.1 What your collaborator needs to do

Together with your partner, walk through the following steps. These steps should be done on *their* computer.

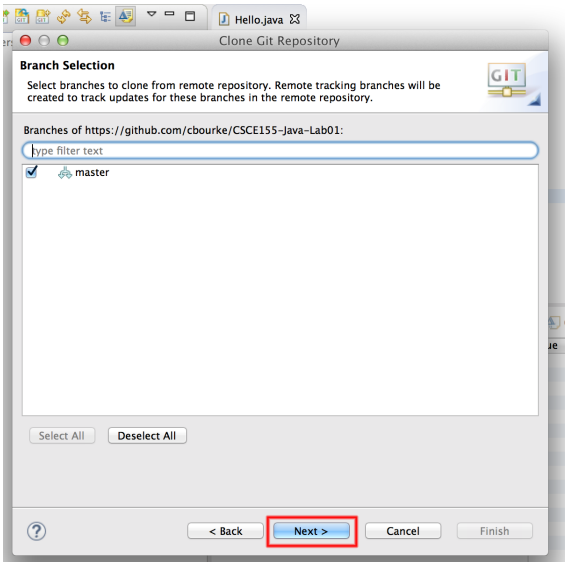
1. Once you've sent an invite to collaborate, they need to accept it.
2. Your partner will *clone* your repository in Eclipse
3. Click the "Clone a Git repository" in the Git Repositories navigation menu:



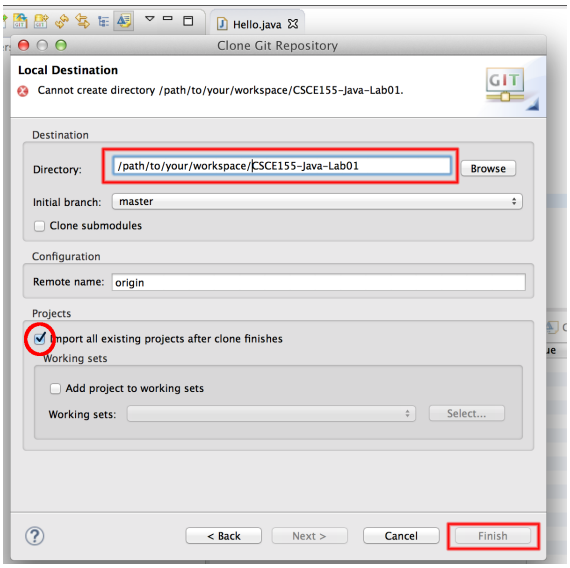

4. Copy/paste or type into the URI field, the URL of the project that you want to clone, then click "Next"




5. Once Eclipse has cloned the project, the "master" branch should be selected (checkbox); click "Next" again.




6. Select the directory where you want your project to be saved. Caution: the default option may not correspond to your default workspace. You will want to change it to your workspace. Also mark the "Import all existing projects after clone finishes" checkbox option or you will need to manually import the cloned project into Eclipse.



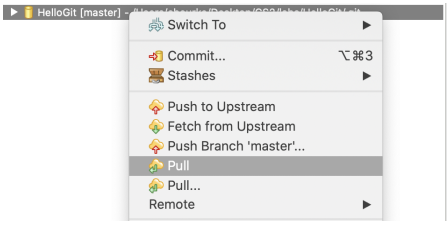

7. Switch back to your Java perspective and you can see your cloned project.
8. Your partner should add 2 lines of code to print their name and their major.
9. Your partner should follow the same procedure to commit and push their changes to *your remote* repository using the same procedure as they did with theirs.
10. Verify their changes by refreshing your repository on GitHub. If you did everything correctly you should be able to see the changes in the file as well as multiple commits by multiple individuals. If you click on `History` you can see the changes for each commit.

## 3.2 Pull Changes

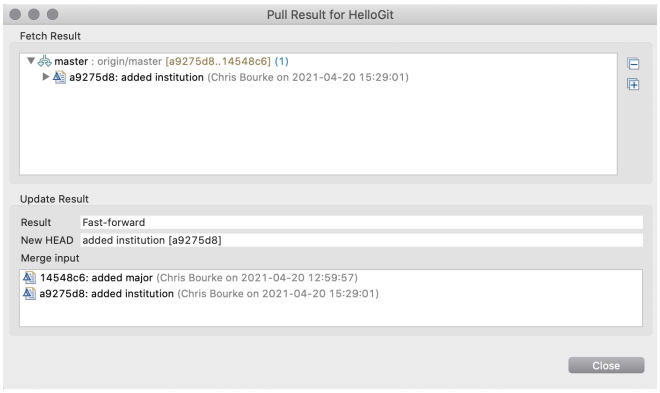
Now, go back to *your* Eclipse. Remember, your partner's changes were *pushed* to your *remote* repository hosted on GitHub. If you look at the code on your own computer you won't see their changes because this is your *local* repository.

In order to get your partner's changes you'll need to *pull* their changes from your remote repository to your local repository. To do this:

1. Change to your git perspective
2. Right click your repository and select "Pull"




3. If successful a dialog will popup that looks something like this.




4. Change back to your Java perspective and you can observe the changes.

## 3.3 Finishing Up

1. Put *your* GitHub URL into a plain text file named `readme.md`. Turn this file in using webhandin. Each individual student will need to hand in their own copy and will receive their own individual grade.
2. Verify what you handed in by running the webgrader which will display the contents of your file.

## Additional Instructions

- You are encouraged to collaborate with any number of students before, during, and after your scheduled hack session.
- Each student is responsible for *their* repository, so when you team up with a partner, you'll need to go through this Hack at least twice: once as the primary repository owner and once as a collaborator.

## Additional Resources

- My video tutorial for using Eclipse/git (from CS2): https://www.youtube.com/watch?v=8bjtf6TZZGA&list=PL4IH6CVPpTZXOMCZRaFy_WRc-GvANOZfk&index=2
- Interactive git tutorial: https://try.github.io/levels/1/challenges/1
- Pro Git, free online book: https://git-scm.com/book/en/v2