Version control with git for Mathematicians

https://github.com/gabindu/git-intro

Gabriel Indurskis, based on slides by Max Joseph

January 23, 2020

What is your current version control system?

1. How do you manage different file versions?

What is your current version control system?

1. How do you manage different file versions?
2. How do you work with collaborators on the same files?

What is your current version control system?

1. How do you manage different file versions?
2. How do you work with collaborators on the same files?
3. How much would your science/teaching/life suffer if your workstation exploded right now? (scale from 1-10)

Version control system (VCS)

- manage different versions of files

Version control system (VCS)

- manage different versions of files
- collaborate with yourself

Version control system (VCS)

- manage different versions of files
- collaborate with yourself
- collaborate with other people

Version control system (VCS)

- manage different versions of files
- collaborate with yourself
- collaborate with other people
- in principle a commandline tool, but can use convenient graphical interfaces and websites (GitHub/GitLab/BitBucket)

Version control system (VCS)

- manage different versions of files
- collaborate with yourself
- collaborate with other people
- in principle a commandline tool, but can use convenient graphical interfaces and websites (GitHub/GitLab/BitBucket)
- many modern editors support it directly without the need of external software

Why use git

"Always remember your first collaborator is your future self, and your past self doesn't answer emails"

- Christie Bahlai

What is git good for?

- backup

What is git good for?

- backup
- reproducibility

What is git good for?

- backup
- reproducibility
- collaboration

What is git good for?

- backup
- reproducibility
- collaboration
- organization

What is git good for?

- backup
- reproducibility
- collaboration
- organization
- transparency

1. - **On Mac OS**, git and ssh should already be available on the commandline. If not, install with Homebrew, using

   ```
   brew install git
   ```

1. - **On Mac OS**, git and ssh should already be available on the commandline. If not, install with Homebrew, using

     ```
     brew install git
     ```

   - **On Windows:** Git Bash & GUI:

1. • **On Mac OS**, git and ssh should already be available on the commandline. If not, install with Homebrew, using

   ```
   brew install git
   ```

   • **On Windows:** Git Bash & GUI:
     • includes Git Bash, a command-line terminal which simulates that of a Unix machine and includes the git commandline client & a SSH client

1. • **On Mac OS**, git and ssh should already be available on the commandline. If not, install with Homebrew, using

   ```
   brew install git
   ```

   • **On Windows:** Git Bash & GUI:
     - includes Git Bash, a command-line terminal which simulates that of a Unix machine and includes the git commandline client & a SSH client
     - if Atom is installed, select it as default editor

1. - **On Mac OS**, git and ssh should already be available on the commandline. If not, install with Homebrew, using

     `brew install git`

   - **On Windows:** Git Bash & GUI:
     - includes Git Bash, a command-line terminal which simulates that of a Unix machine and includes the git commandline client & a SSH client
     - if Atom is installed, select it as default editor

2. GitHub Desktop: a simple & very convenient GUI

1. - **On Mac OS**, git and ssh should already be available on the commandline. If not, install with Homebrew, using

     ```
     brew install git
     ```

   - **On Windows:** Git Bash & GUI:
     - includes Git Bash, a command-line terminal which simulates that of a Unix machine and includes the git commandline client & a SSH client
     - if Atom is installed, select it as default editor

2. GitHub Desktop: a simple & very convenient GUI

   Optionally, create yourself an account on GitHub and log in on GitHub Desktop. (We will actually use GitLab for most things, but having access to GitHub directly is nice as well.)

Installation on Linux

- usually nothing to do!

Installation on Linux

- usually nothing to do!
- if necessary, `apt-get install git`

- usually nothing to do!
- if necessary, `apt-get install git`
- use your favourite editor (e.g. Emacs)

- usually nothing to do!
- if necessary, `apt-get install git`
- use your favourite editor (e.g. Emacs)
- use git on the commandline

Installation on Linux

- usually nothing to do!
- if necessary, `apt-get install git`
- use your favourite editor (e.g. Emacs)
- use git on the commandline
- GUI alternatives:

Installation on Linux

- usually nothing to do!
- if necessary, `apt-get install git`
- use your favourite editor (e.g. Emacs)
- use git on the commandline
- GUI alternatives:
    - if you use Emacs, install `magit` package.

Initial Git & SSH configuration

- Set your name and email in Git:

Initial Git & SSH configuration

- Set your name and email in Git:
  - in GitHub Desktop: Options -> Git

Initial Git & SSH configuration

- Set your name and email in Git:
    - in GitHub Desktop: Options -> Git
    - or, on the commandline:
      ```
      git config --global user.name "Vlad Dracula"
      git config --global user.email "vlad@tran.sylvan.ia"
      git config --list
      ```

Initial Git & SSH configuration

- Set your name and email in Git:
  - in GitHub Desktop: Options -> Git
  - or, on the commandline:
    ```
    git config --global user.name "Vlad Dracula"
    git config --global user.email "vlad@tran.sylvan.ia"
    git config --list
    ```
- Create yourself an SSH key pair:

- Set your name and email in Git:
  - in GitHub Desktop: Options -> Git
  - or, on the commandline:
    ```
    git config --global user.name "Vlad Dracula"
    git config --global user.email "vlad@tran.sylvan.ia"
    git config --list
    ```
- Create yourself an SSH key pair:
  - On the commandline (Git Bash on Windows), do:
    ```
    ssh-keygen -t ed25519
    ```

Initial Git & SSH configuration

- Set your name and email in Git:
  - in GitHub Desktop: Options -> Git
  - or, on the commandline:
    ```
    git config --global user.name "Vlad Dracula"
    git config --global user.email "vlad@tran.sylvan.ia"
    git config --list
    ```
- Create yourself an SSH key pair:
  - On the commandline (Git Bash on Windows), do:
    ```
    ssh-keygen -t ed25519
    ```
- Upload your public SSH key to GitLab (and/or GitHub):

Initial Git & SSH configuration

- Set your name and email in Git:
  - in GitHub Desktop: Options -> Git
  - or, on the commandline:
    ```
    git config --global user.name "Vlad Dracula"
    git config --global user.email "vlad@tran.sylvan.ia"
    git config --list
    ```
- Create yourself an SSH key pair:
  - On the commandline (Git Bash on Windows), do:
    ```
    ssh-keygen -t ed25519
    ```
- Upload your public SSH key to GitLab (and/or GitHub):
  - After logging on the website, click on your profile image, User Settings, SSH Keys

Initial Git & SSH configuration

- Set your name and email in Git:
    - in GitHub Desktop: Options -> Git
    - or, on the commandline:
      ```
      git config --global user.name "Vlad Dracula"
      git config --global user.email "vlad@tran.sylvan.ia"
      git config --list
      ```
- Create yourself an SSH key pair:
    - On the commandline (Git Bash on Windows), do:
      ```
      ssh-keygen -t ed25519
      ```
- Upload your public SSH key to GitLab (and/or GitHub):
    - After logging on the website, click on your profile image, User Settings, SSH Keys
    - Copy & Paste your **public** key, usually found in `~/.ssh/id_ed25519.pub` (or maybe `id_rsa.pub` if you already had an older key)

Initial Git & SSH configuration

- Set your name and email in Git:
    - in GitHub Desktop: Options -> Git
    - or, on the commandline:
      ```
      git config --global user.name "Vlad Dracula"
      git config --global user.email "vlad@tran.sylvan.ia"
      git config --list
      ```
- Create yourself an SSH key pair:
    - On the commandline (Git Bash on Windows), do:
      ```
      ssh-keygen -t ed25519
      ```
- Upload your public SSH key to GitLab (and/or GitHub):
    - After logging on the website, click on your profile image, User Settings, SSH Keys
    - Copy & Paste your **public** key, usually found in `~/.ssh/id_ed25519.pub` (or maybe `id_rsa.pub` if you already had an older key)
    - in Git Bash, you can use the command
      ```
      cat ~/.ssh/id_ed25519.pub | clip
      ```
      to easily copy the relevant text.

It's best to play around with git on the commandline at first, to better understand what it does. (Then it's ok to switch to a GUI.)

Command line git

It's best to play around with git on the commandline at first, to better understand what it does. (Then it's ok to switch to a GUI.)

Make a directory with a file:

```
mkdir test
cd test
echo "This is a fancy test!" > welcome.txt
```

Create other files, of whatever type you want (LaTeX, Markdown, HTML, Python scripts, . . .) - binary files are ok as well!

Tell git to keep track of your files

Initializing a repository

`git init`

Notice the .git/ directory which was created!

Tell git to keep track of your files

Initializing a repository

`git init`

Notice the .git/ directory which was created!

Checking repository status

`git status`

Tell git to keep track of your files

Initializing a repository

`git init`

Notice the .git/ directory which was created!
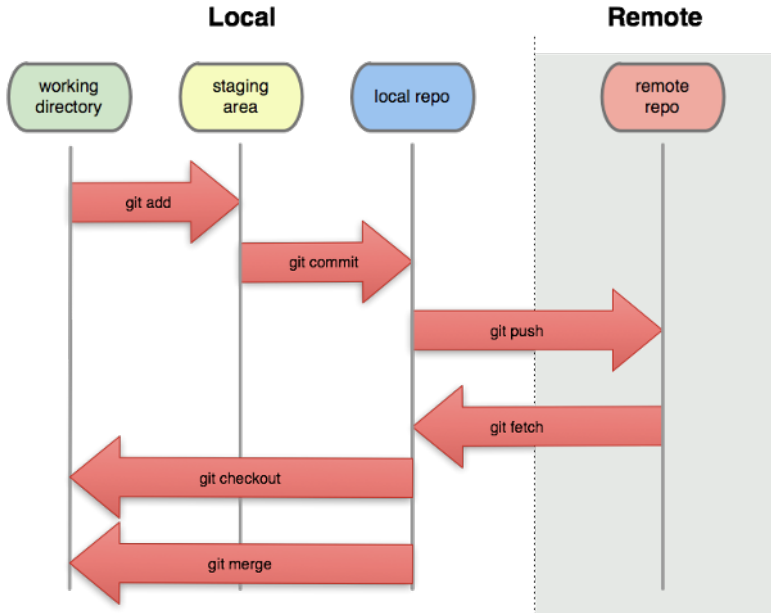
Checking repository status

`git status`

Adding your file to be tracked by git

`git add welcome.txt`

or, to add all changed/new files (careful, this might add undesired temporary files):

`git add --all`

Committing

Changes aren't final until they're committed

`git status`

Committing

Changes aren't final until they're committed

`git status`

Committing

Once you're sure that your changes are worth saving
(THIS WILL GO ON YOUR PERMANENT RECORD)
`git commit -m 'changed x, y, and z'`

Commit messages

- Describe why and the what "in a nutshell"

Commit messages

- Describe why and the what "in a nutshell"
- Note to your future self (and to anyone else who you're collaborating with)

Commit messages

- Describe why and the what "in a nutshell"
- Note to your future self (and to anyone else who you're collaborating with)

Commit messages

- Describe why and the what "in a nutshell"
- Note to your future self (and to anyone else who you're collaborating with)

	COMMENT	DATE
○	CREATED MAIN LOOP & TIMING CONTROL	14 HOURS AGO
○	ENABLED CONFIG FILE PARSING	9 HOURS AGO
○	MISC BUGFIXES	5 HOURS AGO
○	CODE ADDITIONS/EDITS	4 HOURS AGO
○	MORE CODE	4 HOURS AGO
○	HERE HAVE CODE	4 HOURS AGO
○	AAAAAAAA	3 HOURS AGO
○	ADKFJSLKDFJSDKLFJ	3 HOURS AGO
○	MY HANDS ARE TYPING WORDS	2 HOURS AGO
○	HAAAAAAAAANDS	2 HOURS AGO

AS A PROJECT DRAGS ON, MY GIT COMMIT
MESSAGES GET LESS AND LESS INFORMATIVE.

What did we do?

Commands to investigate changes

```
git status
git log
git diff
git diff file
```

Make another change

1. Change file

Make another change

1. Change file
2. Add ("stage") changes

Make another change

1. Change file
2. Add ("stage") changes
3. Commit changes

Make another change

1. Change file
2. Add ("stage") changes
3. Commit changes
4. View updated log

- "Accidentally" introduce some errors to your file (or even delete a file!)

- "Accidentally" introduce some errors to your file (or even delete a file!)
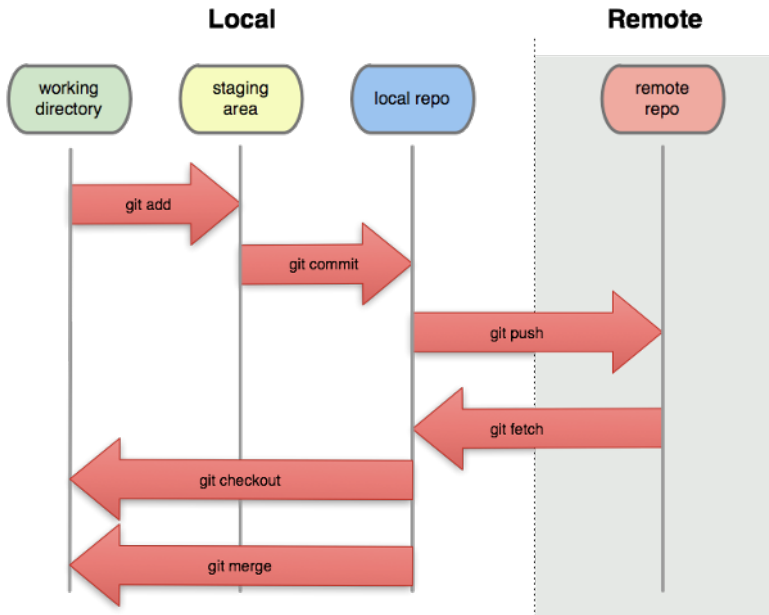- Whoops! *If only we had access to a time machine...*

Now, do something really stupid

- "Accidentally" introduce some errors to your file (or even delete a file!)

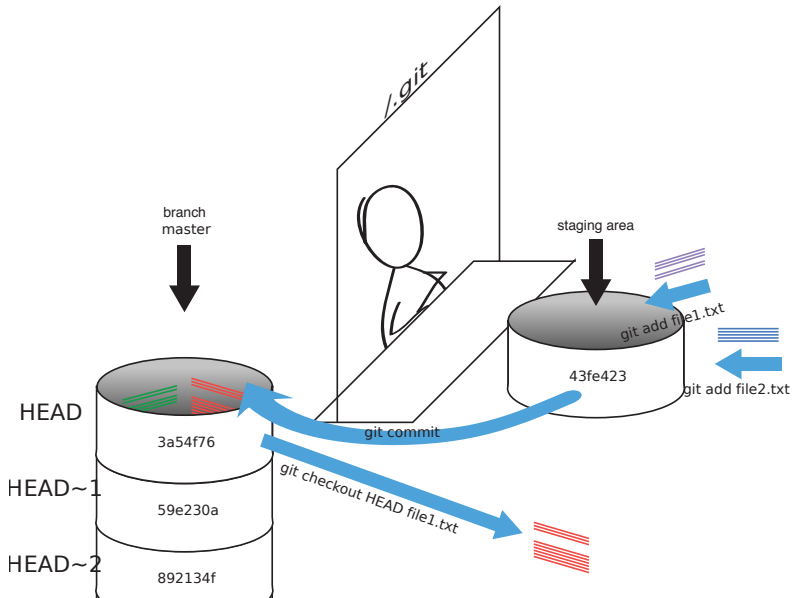- Whoops! *If only we had access to a time machine. . .*

- Hang on, we do!

  ```
  git diff
  git checkout HEAD welcome.txt
  ```

What happened?

Wait, what does HEAD refer to?

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)

Mirroring your repository on the internet

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

Mirroring your repository on the internet

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

- all very similar, but differences include:

Mirroring your repository on the internet

GitHub vs. GitLab vs. BitBucket

Private repos:

- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

- all very similar, but differences include:
    - feature set included in free vs. paid plan

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

- all very similar, but differences include:
  - feature set included in free vs. paid plan
  - open source vs. closed source

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

- all very similar, but differences include:
    - feature set included in free vs. paid plan
    - open source vs. closed source
    - Popularity & user base

GitHub vs. GitLab vs. BitBucket

Private repos:
- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

- all very similar, but differences include:
  - feature set included in free vs. paid plan
  - open source vs. closed source
  - Popularity & user base

GitHub vs. GitLab vs. BitBucket

Private repos:

- (only very recently) free on GitHub, but only < 4 collaborators.
- free on BitBucket (w/ < 6 collaborators)
- free on GitLab (**unlimited** collaborators)

- all very similar, but differences include:
  - feature set included in free vs. paid plan
  - open source vs. closed source
  - Popularity & user base

You can use all three if you want! (But I personally find GitLab the best free offer at the moment.)

Mirroring your repository on the internet

Setting up a "remote"

1. Create repository on GitHub/GitLab/BitBucket with no .gitignore, no README, and no license

Mirroring your repository on the internet

Setting up a "remote"

1. Create repository on GitHub/GitLab/BitBucket with no .gitignore, no README, and no license
2. Add that as a remote: `git remote add origin URL` (use the URL created for your project on the website, best the one using SSH, to avoid having to type in passwords all the time.)

Mirroring your repository on the internet

Setting up a "remote"

1. Create repository on GitHub/GitLab/BitBucket with no .gitignore, no README, and no license
2. Add that as a remote: `git remote add origin URL` (use the URL created for your project on the website, best the one using SSH, to avoid having to type in passwords all the time.)

Mirroring your repository on the internet

Setting up a "remote"

1. Create repository on GitHub/GitLab/BitBucket with no .gitignore, no README, and no license
2. Add that as a remote: `git remote add origin URL` (use the URL created for your project on the website, best the one using SSH, to avoid having to type in passwords all the time.)

How to check:

`git remote -v`

Mirroring your repository on the internet

Setting up a "remote"

1. Create repository on GitHub/GitLab/BitBucket with no .gitignore, no README, and no license
2. Add that as a remote: `git remote add origin URL` (use the URL created for your project on the website, best the one using SSH, to avoid having to type in passwords all the time.)

How to check:

`git remote -v`

Once your repository has been linked to remote

Push (or "publish") your changes:

`git push -u origin master`

(after the first time, you can simply use `git push`)

Mirroring your repository on the internet

Setting up a "remote"

1. Create repository on GitHub/GitLab/BitBucket with no .gitignore, no README, and no license
2. Add that as a remote: `git remote add origin URL` (use the URL created for your project on the website, best the one using SSH, to avoid having to type in passwords all the time.)

How to check:

`git remote -v`

Once your repository has been linked to remote
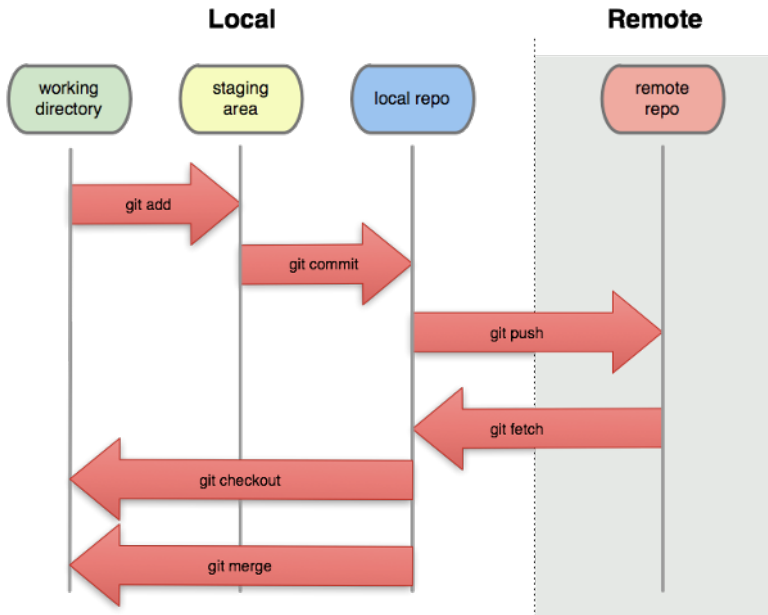
Push (or "publish") your changes:

`git push -u origin master`

(after the first time, you can simply use `git push`)

Check the remote website to see new changes.

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .
- Collaborate with others!

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .
- Collaborate with others!

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .
- Collaborate with others!

Synchronize and continue work on a different computer

- Start from scratch by cloning your remote repo.

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .
- Collaborate with others!

Synchronize and continue work on a different computer

- Start from scratch by cloning your remote repo.
- Otherwise, update the local repo by doing: `git pull`

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .
- Collaborate with others!

Synchronize and continue work on a different computer

- Start from scratch by cloning your remote repo.
- Otherwise, update the local repo by doing: `git pull`
- Important rule to remember: Always `git pull` before starting to edit your local files!

Things you can do with a remote repository

Use the fancy website interface

- examine your code, the commit log, keep track of issues, etc.!
- Interface with other services (e.g. Slack.com) to get notifications on commits, discuss changes with team members. . .
- Collaborate with others!

Synchronize and continue work on a different computer

- Start from scratch by cloning your remote repo.
- Otherwise, update the local repo by doing: `git pull`
- Important rule to remember: Always `git pull` before starting to edit your local files!
- Technical detail: `git fetch` only checks the status of the remote, while `git pull` actually moves those changes into your working copy.

Clone an already existing repository

Find the URL of a repository you want to work on.

- For example, log into GitLab and go to the main page of our CourseOutlines-Math-ChamplainStLambert repository.

Clone an already existing repository

Find the URL of a repository you want to work on.

- For example, log into GitLab and go to the main page of our CourseOutlines-Math-ChamplainStLambert repository.

- Click on "Clone" and select the URL shown under "clone with SSH" (this avoids having to type in passwords all the time).

Clone an already existing repository

Find the URL of a repository you want to work on.

- For example, log into GitLab and go to the main page of our CourseOutlines-Math-ChamplainStLambert repository.

- Click on "Clone" and select the URL shown under "clone with SSH" (this avoids having to type in passwords all the time).

- Now get the files onto your computer:

Clone an already existing repository

Find the URL of a repository you want to work on.

- For example, log into GitLab and go to the main page of our CourseOutlines-Math-ChamplainStLambert repository.

- Click on "Clone" and select the URL shown under "clone with SSH" (this avoids having to type in passwords all the time).

- Now get the files onto your computer:
  - In GitHub Desktop: "Clone repository", then enter the URL (if the SSH URL does not work, try again with the https URL)

Clone an already existing repository

Find the URL of a repository you want to work on.

- For example, log into GitLab and go to the main page of our CourseOutlines-Math-ChamplainStLambert repository.

- Click on "Clone" and select the URL shown under "clone with SSH" (this avoids having to type in passwords all the time).

- Now get the files onto your computer:

  - In GitHub Desktop: "Clone repository", then enter the URL (if the SSH URL does not work, try again with the https URL)

  - or, on the commandline:

    ```
    cd folder-where-you-want-it
    git clone URL
    ```

Clone an already existing repository

Find the URL of a repository you want to work on.

- For example, log into GitLab and go to the main page of our CourseOutlines-Math-ChamplainStLambert repository.

- Click on "Clone" and select the URL shown under "clone with SSH" (this avoids having to type in passwords all the time).

- Now get the files onto your computer:

  - In GitHub Desktop: "Clone repository", then enter the URL (if the SSH URL does not work, try again with the https URL)

  - or, on the commandline:

    ```
    cd folder-where-you-want-it
    git clone URL
    ```

- This automatically connects your new local repo with the remote, so you can directly use `git push` and `git pull`.
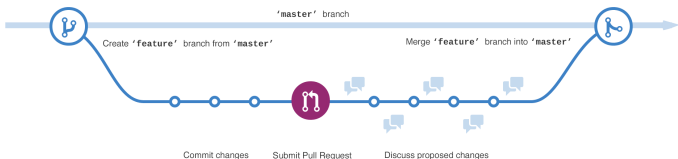
Branches

- Any repository has a default "branch" in which all files are stored, usually called "master". This branch is usually reserved for the current most up-to-date, well-working production version (good example to keep in mind: the live files for a website, e.g. http://math.mychamplain.ca)

Branches

- Any repository has a default "branch" in which all files are stored, usually called "master". This branch is usually reserved for the current most up-to-date, well-working production version (good example to keep in mind: the live files for a website, e.g. http://math.mychamplain.ca)

- But when working on new "features", it's usually not a good idea to immediately put those into the master branch!

- Any repository has a default "branch" in which all files are stored, usually called "master". This branch is usually reserved for the current most up-to-date, well-working production version (good example to keep in mind: the live files for a website, e.g. http://math.mychamplain.ca)

- But when working on new "features", it's usually not a good idea to immediately put those into the master branch!

- So, instead, you create a new branch, work in there without danger of destroying anything for others, and finally ask for the changes to be **merged** into the master branch:

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
- Work on the files as before, stage, commit, and push to the remote server.

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
- Work on the files as before, stage, commit, and push to the remote server.
- Inspect the log to see what happened (`git log`)

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
- Work on the files as before, stage, commit, and push to the remote server.
- Inspect the log to see what happened (`git log`)

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
- Work on the files as before, stage, commit, and push to the remote server.
- Inspect the log to see what happened (`git log`)

Ask for your changes to be merged into `master`

When you're satisfied with your work (and you pushed to the remote), it's time to "merge" it into the master branch. Usually, only the maintainer of the repository is allowed to do that, so you need to **create a "Pull Request"**, which is done on the website:

On GitLab:

- go to "Repository -> Branches", it should list all branches

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
- Work on the files as before, stage, commit, and push to the remote server.
- Inspect the log to see what happened (`git log`)

Ask for your changes to be merged into `master`

When you're satisfied with your work (and you pushed to the remote), it's time to "merge" it into the master branch. Usually, only the maintainer of the repository is allowed to do that, so you need to **create a "Pull Request"**, which is done on the website:

On GitLab:

- go to "Repository -> Branches", it should list all branches
- click on "merge request" next to your branch

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
- Work on the files as before, stage, commit, and push to the remote server.
- Inspect the log to see what happened (`git log`)

Ask for your changes to be merged into `master`

When you're satisfied with your work (and you pushed to the remote), it's time to "merge" it into the master branch. Usually, only the maintainer of the repository is allowed to do that, so you need to **create a "Pull Request"**, which is done on the website:

On GitLab:

- go to "Repository -> Branches", it should list all branches
- click on "merge request" next to your branch
- fill in some details in the form to explain what you did

What else?

Slack.com

- A website with private "chat rooms" or "channels"

What else?

Slack.com

- A website with private "chat rooms" or "channels"
- enables convenient on-topic discussions (avoiding email chains and hard to find information),

What else?

Slack.com

- A website with private "chat rooms" or "channels"
- enables convenient on-topic discussions (avoiding email chains and hard to find information),
- with integration to GitLab/GitHub:

What else?

Slack.com

- A website with private "chat rooms" or "channels"
- enables convenient on-topic discussions (avoiding email chains and hard to find information),
- with integration to GitLab/GitHub:
  - show notifications about commits

What else?

Slack.com
- A website with private "chat rooms" or "channels"
- enables convenient on-topic discussions (avoiding email chains and hard to find information),
- with integration to GitLab/GitHub:
  - show notifications about commits
  - create/inspect issues directly from the chat

Slack.com

- A website with private "chat rooms" or "channels"
- enables convenient on-topic discussions (avoiding email chains and hard to find information),
- with integration to GitLab/GitHub:
    - show notifications about commits
    - create/inspect issues directly from the chat
- I've created a Slack group "CCSL Math Dept" for us, simply let me know if you'd like me to (re-)send an invitation.

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

Additional ressources

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

References

- Pro Git: free book by Scott Chacon and Ben Straub with everything you might ever want to know about git

Additional ressources

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

References

- Pro Git: free book by Scott Chacon and Ben Straub with everything you might ever want to know about git
- Git Cheat Sheet

Additional ressources

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

References

- Pro Git: free book by Scott Chacon and Ben Straub with everything you might ever want to know about git
- Git Cheat Sheet
- On undoing, fixing, or removing commits in git: A git choose your own adventure

Additional ressources

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

References

- Pro Git: free book by Scott Chacon and Ben Straub with everything you might ever want to know about git
- Git Cheat Sheet
- On undoing, fixing, or removing commits in git: A git choose your own adventure

Additional ressources

Motivation

- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

References

- Pro Git: free book by Scott Chacon and Ben Straub with everything you might ever want to know about git
- Git Cheat Sheet
- On undoing, fixing, or removing commits in git: A git choose your own adventure

Champlain St-Lambert Collaboration Ressources

- CCSL GitLab repositories: currently for Generic Course Plans and math.mychamplain.ca

Additional ressources

Motivation
- Ram K. 2013: Git can facilitate greater reproducibility and increased transparency in science.

References
- Pro Git: free book by Scott Chacon and Ben Straub with everything you might ever want to know about git
- Git Cheat Sheet
- On undoing, fixing, or removing commits in git: A git choose your own adventure

Champlain St-Lambert Collaboration Ressources
- CCSL GitLab repositories: currently for Generic Course Plans and math.mychamplain.ca
- CCSL Slack Group