Mini-workshop LaTeX and Git

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Introduction to LaTeX

Intro

Initial notions

- What is it?
  - A document preparation system for high-quality typesetting.
- It has some advantages when compared to Office platforms:
  - Free.
  - Easy reference and citation management.
  - Potent mathematical writing.
  - Very commonly used in science and engineering.
  - It's as cross-platform as you can get.

Initial notions

- What is needed for it to work?
  - A TEX distribution (MiKTeX, MacTex, etc).
  - Some text editor: WinEdt, Texmaker, TeXworks, TeXShop, Overleaf and Sharelatex (online editor).
- What is handy to have?
  - Citation manager (JabRef, Mendeley, Bibdesk or other).
  - A decent PDF reader (Sumatra PDF, Foxit Reader, Adobe Acrobat or other).
- Whenever you have any doubts, Google `en.wikibooks.org/wiki/LaTeX`.

What is a command

- A command has the following structure:

```
\commandname[option1, option2]{argument1}{argument2}
```

- Examples:

```
\documentclass[11pt]{report}
\usepackage[utf8x]{inputenc}
```

- The \usepackage command includes packages in the document, these packages give meaning to a few commands. Example:

`\usepackage{amsmath}` allows for equation writing.

What is an environment

```
\begin{environment}
 ...ambient content...
\end{environment}
```

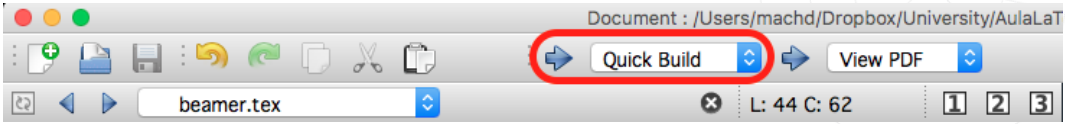
- There is plenty of code that only functions inside a specific environment. Example:

```
\begin{document}
 ...document content...
\end{document}
```

How to start a document

Offline LaTeX compilation

- The code to be compiled should be in a .tex file.
- Compilation can be done with a .tex editor or in the command line.



- When using an offline compiler, save the .tex file and run the compiler inside a folder, LaTeX generates a bunch of support files.

Offline LaTeXcompilation

- This is what a LaTeXcode looks like.

```
1  \documentclass{report}
2  \usepackage[utf8]{inputenc}
3
4  \begin{document}
5  Isto é um documento com uma linha de texto.
6  \end{document}
```

Isto é um documento com uma linha de texto.

- Compilation usually returns a .pdf file.

Simple text editing

bold, *italics*, underline, colourful

- \textbf{Bold text}
- \textit{Italicised text}
- \underline{Underlined text}
- \textcolor{Colourname}{Colourful text}
  - Colour names can be found here→en.wikibooks.org/wiki/LaTeX/Colors.

Paragraphs, line breaks and sections

- \\ Breaks the line, doesn't start a new paragraph.
- \par Breaks the line and starts a new paragraph.
- \chapter{Chapter name} Starts a chapter.
- \section{Section name} Starts a section.
  \subsection{Subsection name},
  \subsubsection{Subsubsection name}
- All of these are numbered, writting a * before the {} suppresses this.

Titles, authors and tables of contents

- All of these can be generated automaticaly by LaTeX, their appearance depends on the template.
- In this case, you need to give LaTeX the necessary information, in the preamble write:
  - \title{Title}
  - \author{Author or Authors}
  - \date{Date}
- For the title to appear you need to use the\maketitle command, usually right after: \begin{document}
- You may be given a template where the title is defined explicitly, in that case just alter the corresponding text.
- To generate the index just write the command \tableofcontents, usually right after the \maketitle.

Changing the language of the document

- Some compilers have a spell checker, set it to the language you are using.

- The language of the document can be changed with the babel package.

```
\documentclass{report}
\usepackage[utf8]{inputenc}
\usepackage[portuguese]{babel}

\title{Isto é um título}
\author{Eu escrevi isto}
\date{\today}

\begin{document}
\maketitle
\tableofcontents
\chapter{Isto é um capítulo}
\section{Isto começa uma secção}
\subsection*{Esta subsecção não é numerada}
Isto é um documento com uma linha de texto.
\chapter{Isto é outro capítulo}
\end{document}
```

Making tables

Tables - the hard way

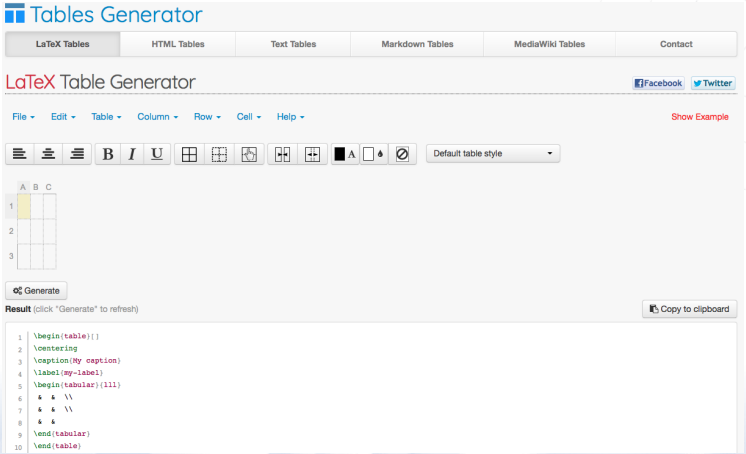
- You need to use the {table} environment.
- You need to use the {tabular} environment.
- You need to set the column alignment and if you want to have vertical lines between them.
- You have to set the horizontal lines you want.

```
\begin{table}[]
\begin{tabular}{c|cl}
cell1 & cell2 & cell3 \\ \hline
cell4 & cell5 & cell6
\end{tabular}
\end{table}
```

- You can declare merged cells, partial horizontal and vertical lines, this easily becomes way too complex.

Tables - the easy way

- Use this website www.tablesgenerator.com.



What are *floats*?

- You may have noticed a blank space in the previous code.
- With the information inside the [ ], LaTeX decides where it will draw the table.

```
1  \begin{table}[]
2  \centering
3  \caption{My caption}
4  \label{my-label}
5  \begin{tabular}{lll}
6   &  &  \\
7   &  &  \\
8   &  &
9  \end{tabular}
10 \end{table}
```

Types of *float*

- There are multiple types of *floats*:
  - H - Draws the *float* exactly where it is declared, may deform the text.
  - h - Draws the *float* close to where it is declared, this avoids deforming the text.
  - t - Draws the float at the top of the page in which it is declared.
  - b - Draws the *float* at the bottom of the page in which it is declared.
  - p - Draws the float in a page restricted to *floats*.
- The {figure} environment also uses floats *floats*.
- Use the package {float}

Figures and images

How to declare an image

- Use the {graphicx} package.
- Images need to be inside a folder where LaTeX knows it should look.

```
\graphicspath{ {pathtofolder1}{pathtofolder2} }
```

- Images should be declared inside the {figure} environment.

```
\begin{figure}[float]
\centering
\includegraphics[figure alterations]{imagename}
\end{figure}
```

- PNG, JPG, PDF are all acepted. Other file types are as well, check google in case of doubts.
- Multiple properties can be altered, check en.wikibooks.org/wiki/LaTeX/Importing_Graphics

Lists and enumerations

How to make a list

- The {itemize} environment generates unnumbered lists.
- The {enumerate} environment generates numbered lists.
- Nested lists are very much possible.
- Items are identified by the \item command.

```
\begin{itemize}
\item First item of the unnumbered list
\begin{enumerate}
\item First item of the numbered sublist
\item Second item of the numbered sublist
\end{enumerate}
\item Second item of the unnumbered list
\end{itemize}
```

Equations and other math topics

Math environments

- Use the {amsmath} package.
- $equation$ generates an inline equation, can be included in the middle of a sentence.
- $$equation$$ generates a separated, centred equation.
- The {equation} environment generates numbered equations, this is the best option.

```
\begin{equation}
equation
\end{equation}
```

- A blank line inside a math environment causes a compilation error!

Greek letters and other special symbols

- You need to use the letter names in english.
  - \alpha writes α.
  - \beta writes β.
  - etc
- There are arrows and mathematical symbols
  - \rightarrow writes $\rightarrow$.
  - \simeq writes $\simeq$.
  - etc
- All of these symbols can only be used in a math environment.
- Check the list here en.wikibooks.org/wiki/LaTeX/Mathematics

Fractions, parentheses and square roots

- Inside a math environment, it's declared as:

```
\frac{numerator}{denominator}
```

- You can have a parentheses with necessary size to envelop the fraction:

```
\left(\frac{numerator}{denominator}\right)
```

- This method for parentheses works with [, { e ".".
- Using \left.something\right) causes only the right parenthesis to be drawn.
- Having a mismatched number of \left or \right causes a compilation error!
- Roots envelop the whole radicand:

```
\sqrt[index]{radicand}
```

Superscripts, subscripts, vectors and accents

- The ^ symbol puts things in superscript, this is how you write powers.

basis^{exponent} $\Rightarrow \text{basis}^{\text{exponent}}$

- The _ symbol puts things in subscript, this is how you write indices.

basis_{subscript} $\Rightarrow \text{basis}_{\text{subscript}}$

- Vectors are declared by the $\backslash vec\{\}$ command.

$\backslash vec\{v\} \Rightarrow \vec{v}$

- For more, see en.wikibooks.org/wiki/LaTeX/Mathematics

Referencing content

What is a reference?

- To call, by a number, some equation, figure or table.
- There are 3 different commands for this:
  - \label{identificationtext}
  - \ref{identificationtext}
  - \eqref{equationidentificationtext}
- You can call the reference before and after it appears in the text.
- LaTeXdeals with the pesky problem of numbering.

Referencing equations

- Just add a label to the equation:

```
\begin{equation}\label{labeltext}
equation content
\end{equation}
```

- You then call the reference with the \eqref command:

"As demonstrated in relation \eqref{labeltext}..."

- This command is made especially for equations, the reference appears between parenthesis.

Referenciar tabelas e figuras

- The figure/table needs to have a caption.
- Just add a label to the figure/table.

```
\begin{table}[]
\caption{legend}
\label{labeltext}
\begin{tabular}{c|cl}
Table content...
\end{tabular}
\end{table}
```

- You then call the reference with the \ref command.
- Usually, table captions are placed above the table.

Referenciar tabelas e figuras

- The figure/table needs to have a caption.
- Just add a label to the figure/table.

```
\begin{figure}[float]
\centering
\includegraphics[...]{imagename}
\caption{legend}
\label{labeltext}
\end{figure}
```

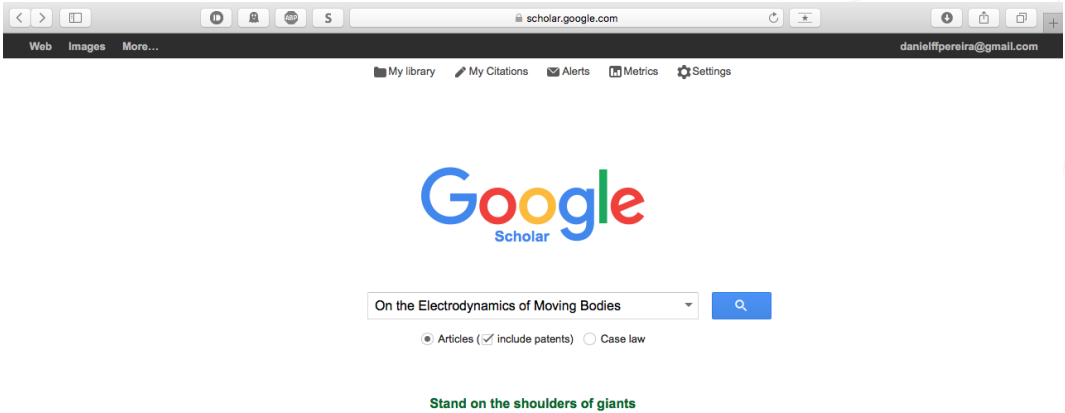
- You then call the reference with the \ref command.

Bibliographies and citations

How to make a bibliography

- Easiest way is to have a .bib file.
- This file can be made by hand or with a reference management software (JabRef, Mendeley, Bibdesk or other).
- I'll show you how to do it by hand.
- Generate a .bib file, somehow, by changing the extension of a .txt created with notepad, for example.
- Go get the reference text and copy it into the .bib file.

Where to get references



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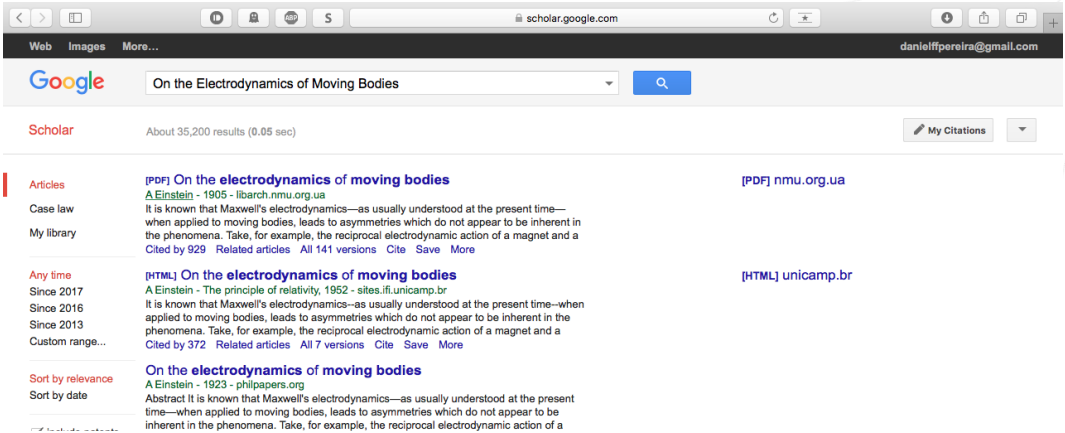

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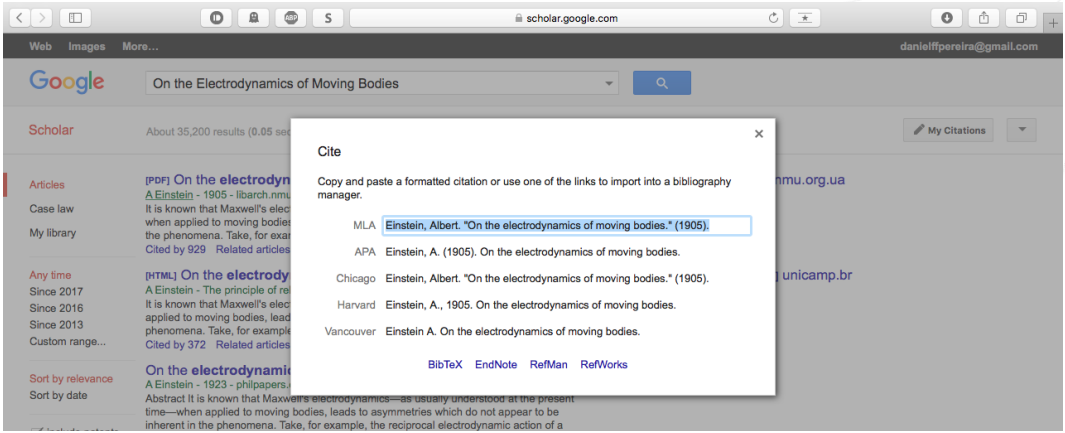

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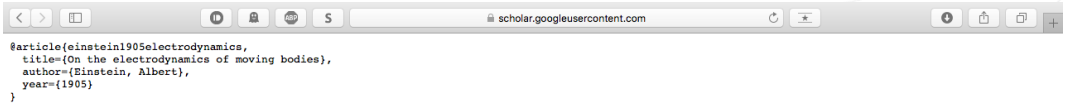


Understanding the citation text

```
@article{einstein1905electrodynamics,
  title={On the electrodynamics of moving bodies},
  author={Einstein, Albert},
  year={1905}
}
```

- Different publications want different formats.

```
@typeofsource{citetext,
  title={Source title},
  author={Authors},
  year={Publication year}
}
```

How to insert the bibliography in the document

- After preparing a .bib file, you need to feed it to LaTeX.

```
\bibliography{bibliography}
```

- There are different styles of bibliographies, they change the way things are presented.

```
\bibliographystyle{plain}
```

- By default, LaTeXonly includes cited sources in the bibliography, if you want uncited sources to be included, use the code:

```
\nocite{*}
```

How to cite a source

- After having included the bibliography in the document, this is cited with the \cite{citetext} command.
- If you wish to cite multiple sources at the same time, do:

\cite{citetext1,citetext2,citetext3,...}

- For more, see en.wikibooks.org/wiki/LaTeX/Bibliography_Management

This concludes the LaTeX mini-workshop

Introduction to Git

Intro

Initial notions

- What is it?
  - A database control and sharing system.
- GitHub is a very popular option, it's free and open. Create an account on GitHub.
- You need to install the git distribution.
  - Windows: `gitforwindows.org`
  - Mac: `sourceforge.net/projects/git-osx-installer/files/`
  - Linux: run the following code in the console (this should work for most distros)

```
sudo apt-get update
sudo apt-get install git
```

- You should use a Git client:
  - GitKraken: `www.gitkraken.com/git-client`
  - GitHub Desktop: `desktop.github.com`

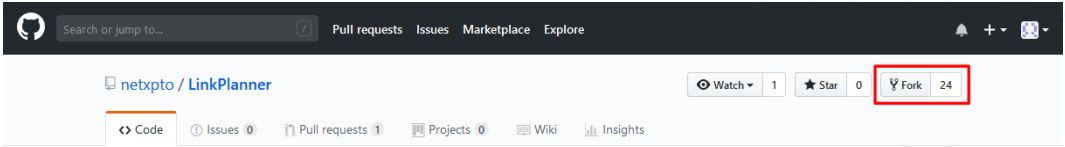
What is a repository

- A repository is a data structure that:
  - Stores a set of files and/or a directory structure.
  - A historical record of the changes to those files.
- The main repository lives somewhere in a server.
- You can **clone** a copy of the repository to your PC.
- Changes are made locally to the cloned repository can be made permanent by **committing** to it.
- Changes can then be **pushed** to the external repository.
- If you are working on another computer, you can then **pull** the changes from the external repository.

Forking repositories

What the fork?

- A fork is a copy of another repository.
- In the GitHub website, navigate to the repository you want to fork.



How to fork a repository

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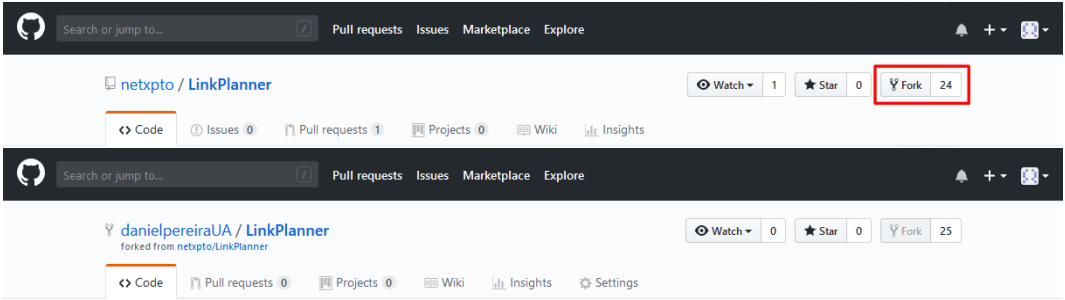
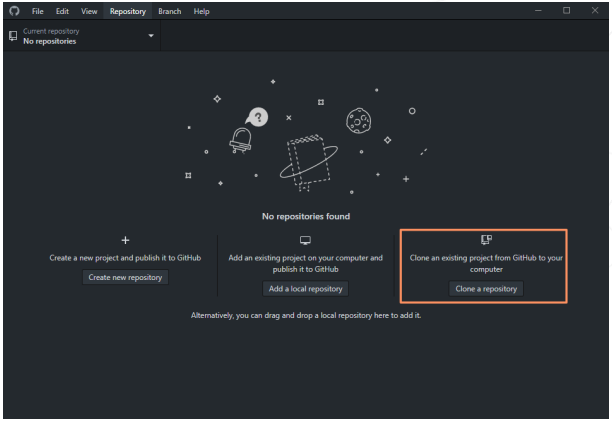


How to clone your fork

- This is not the only way to do it, but it is the easiest.
- In the GitHub Desktop app, choose to *clone a repository*.



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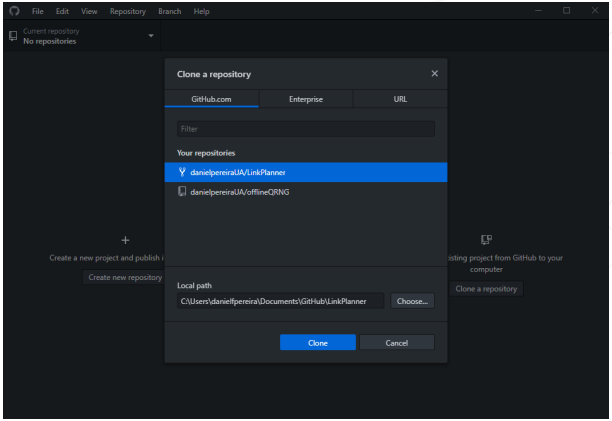
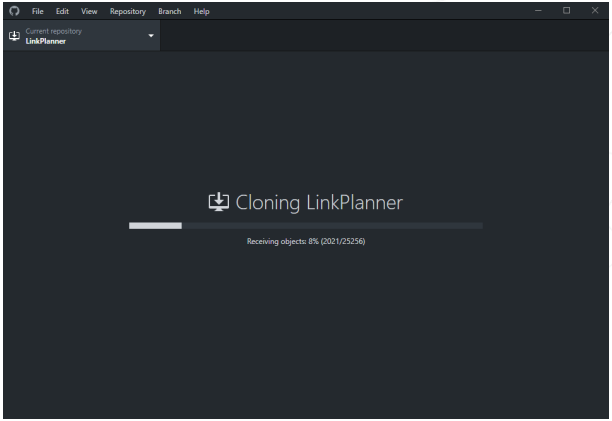


How to clone your fork

- This is not the only way to do it, but it is the easiest.
- In the GitHub Desktop app, choose to *clone a repository*.
- Then you just have wait while it downloads, may take a while.

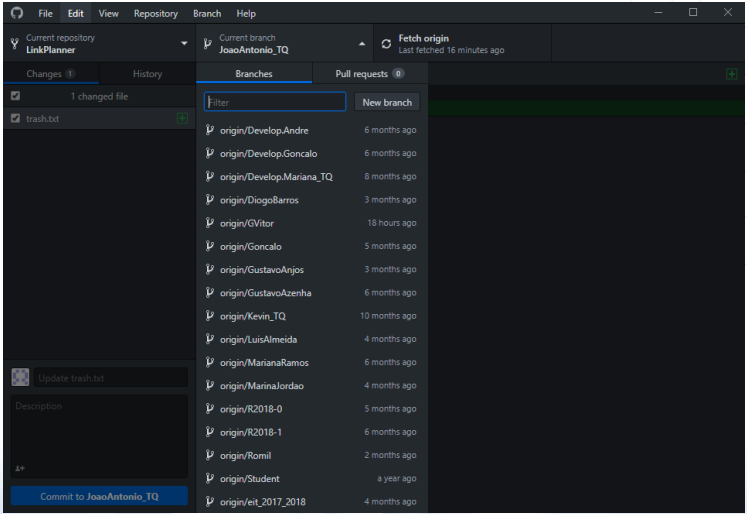


Working inside your fork

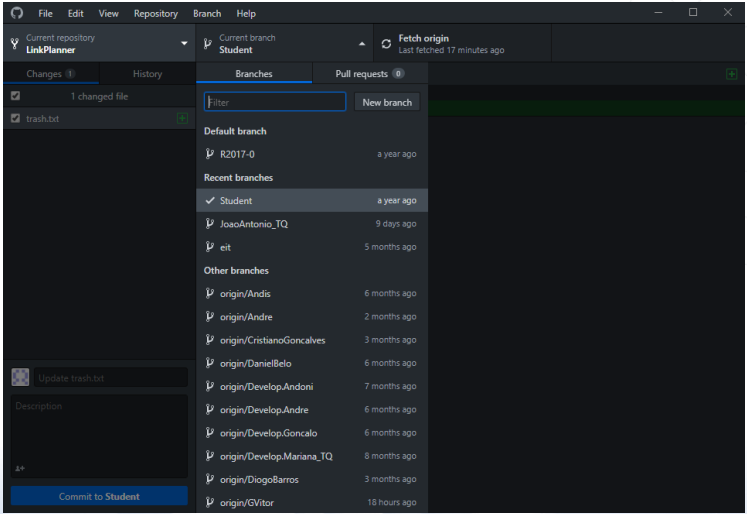
Branches

- What is a branch?
  - You can see it as a split of a repository inside it.
  - While a fork is to another account, a branch remains in the same account.
  - Allows code to be tested before it is included in the main branch.
- You won't have to worry about branches much in this class, only that you work on the branch allotted to you.

Branches

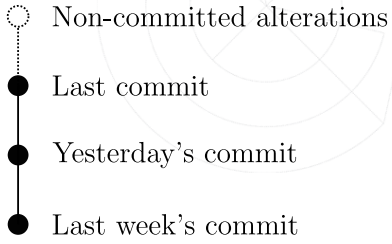


Branches



Committing, pushing and pulling

- Alterations made on your **clone** (that lives on your computer) can be made "official" by *committing* to them.
- You can discard changes by *checking out* the version of the latest commit. You can even **check out** a version of a file from any previous commit.
- The alterations you make this way are local to your machine, you need to **push** them to your "cloud" repository.
- If you wish to work on your repository on another machine, you will need to **pull** the latest version from the "cloud" repository.



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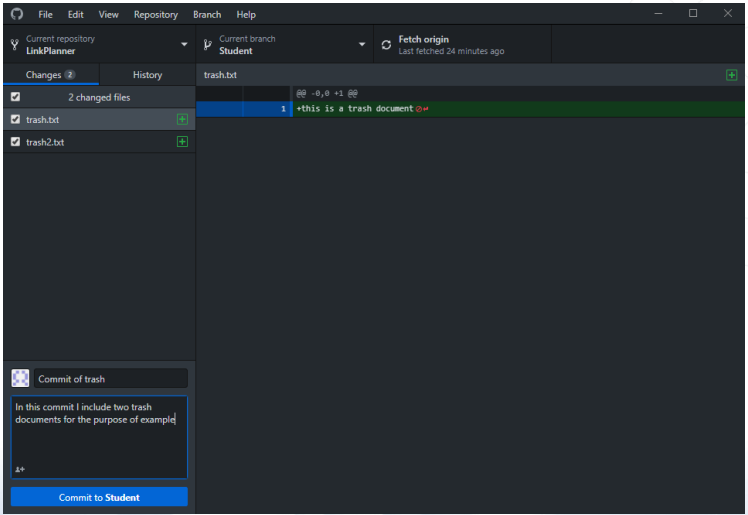

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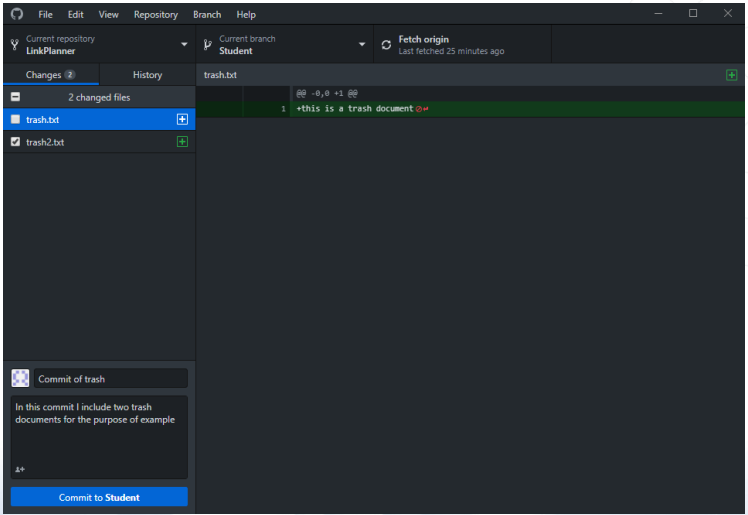

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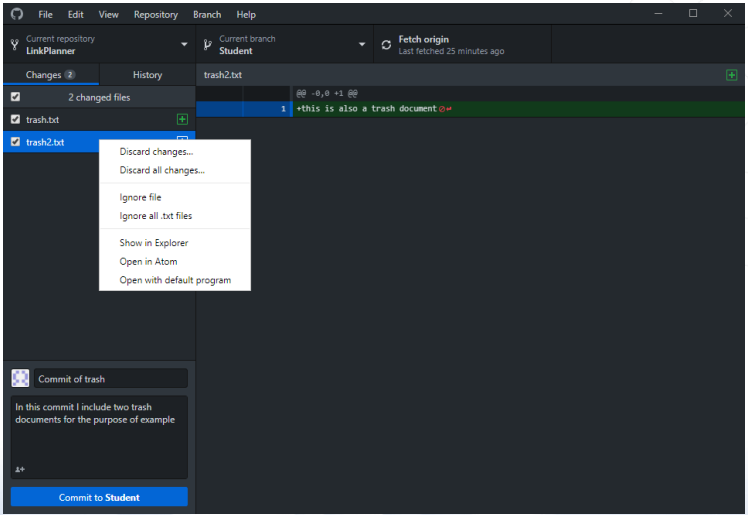

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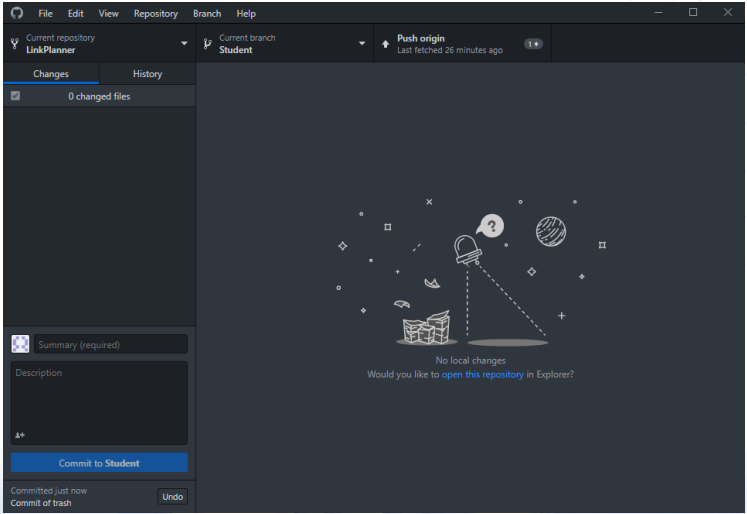

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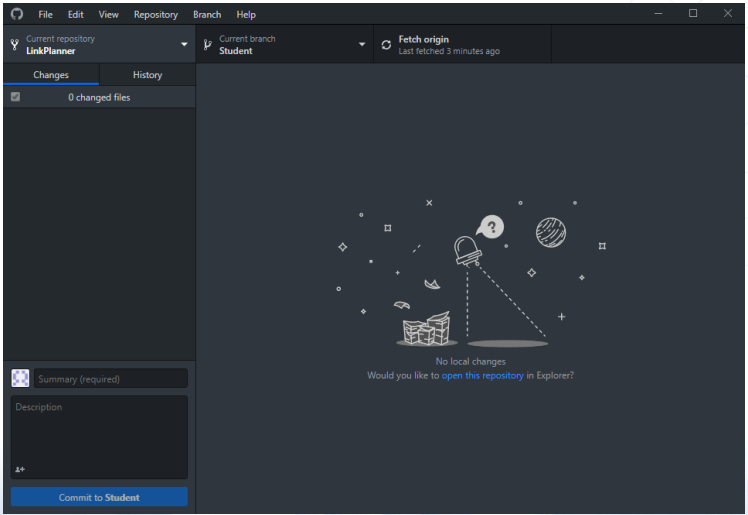

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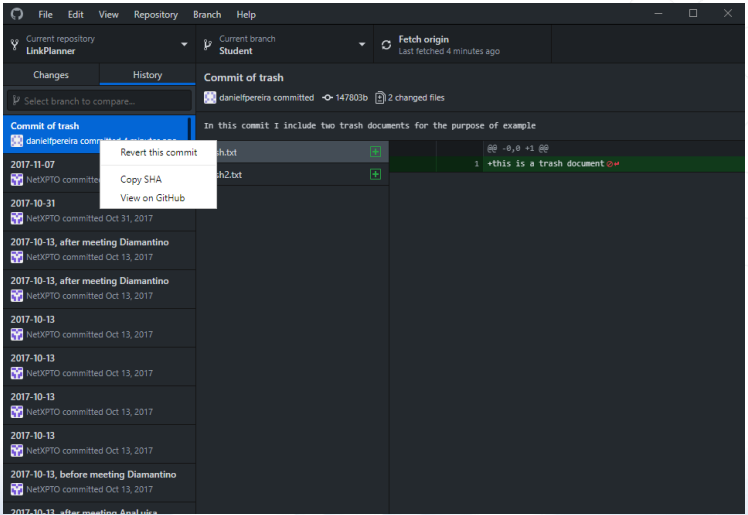
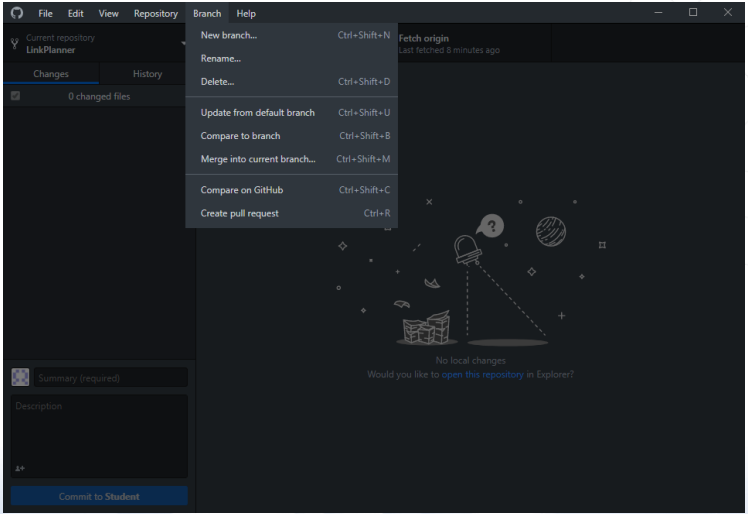


Communicating between forks

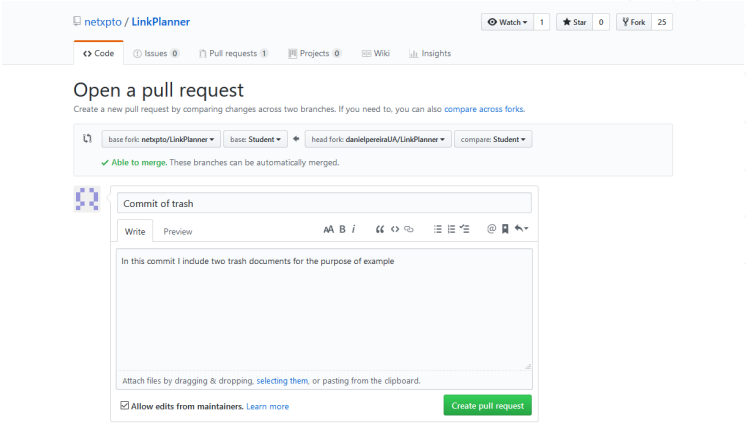
Pull requests

- The alterations you made and pushed to your account only live in your fork.
- If you want to share them with someone else (for example the owner of the original repository) you need to open a pull request.

Pull requests



Pull requests

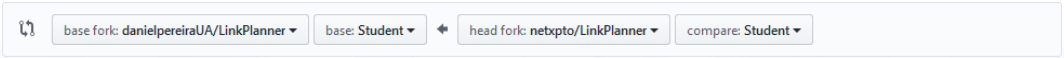


Pull requests

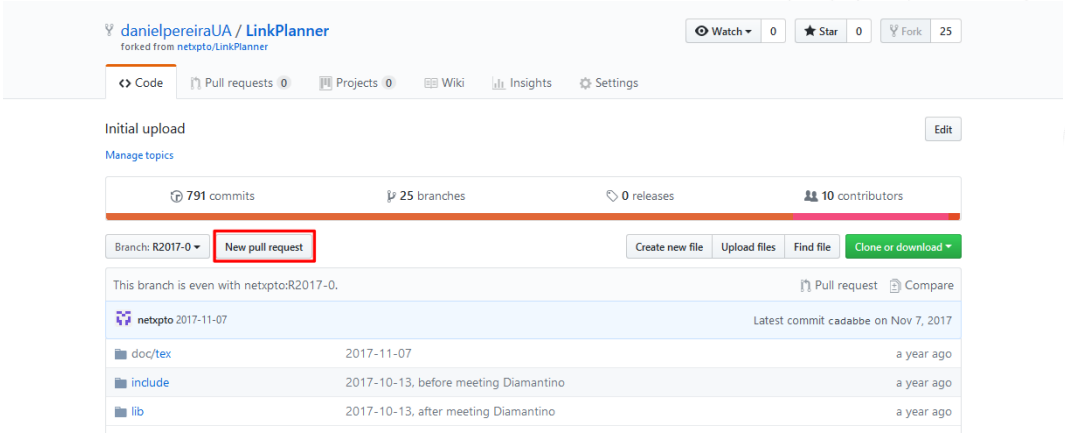
- The alterations you made and pushed to your account only live in your fork.
- If you want to share them with someone else (for example the owner of the original repository) you need to open a pull request.
- The owner of the repository you are requesting the pull to needs to approve it before it actually happens.

Pull requests

- The alterations you made and pushed to your account only live in your fork.
- If you want to share them with another fork of the same repository (for example original repository) you need to open a pull request.
- The owner of the repository you are requesting the pull to needs to approve it before it actually happens.
- Now say you want to update your fork from another fork of the same repository (for example, from the original repository).
- You do the reverse of what you did previously.
- Create a pull request from the fork you want to pull from into your fork.



Pull requests

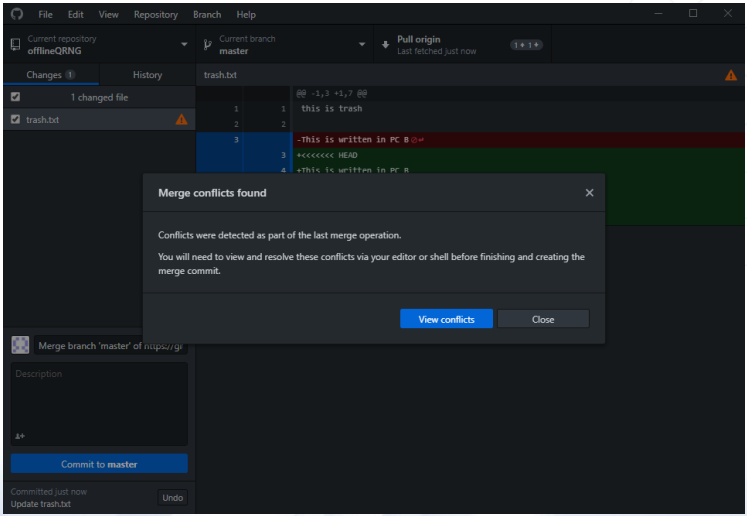


What if things go wrong?

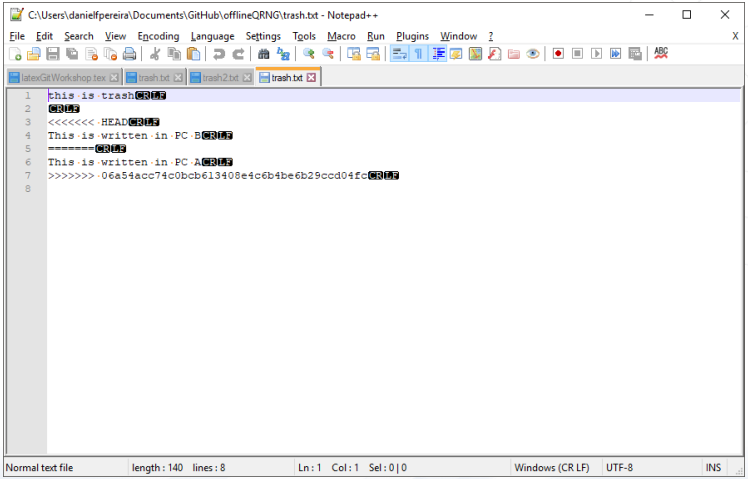
Conflicts

- A conflict arises when:
  - Change a file on PC A, push it to the cloud.
  - Change the same file on PC B before pulling the changes made on PC A.
  - When you then try to pull/push the changes made on PC A/B, you will have a conflict.
- Git knows you made changes on both machines, it evens know what changes you made in which.
- It needs you to tell it what changes to accept and what changes to discard.
- This is called merging.

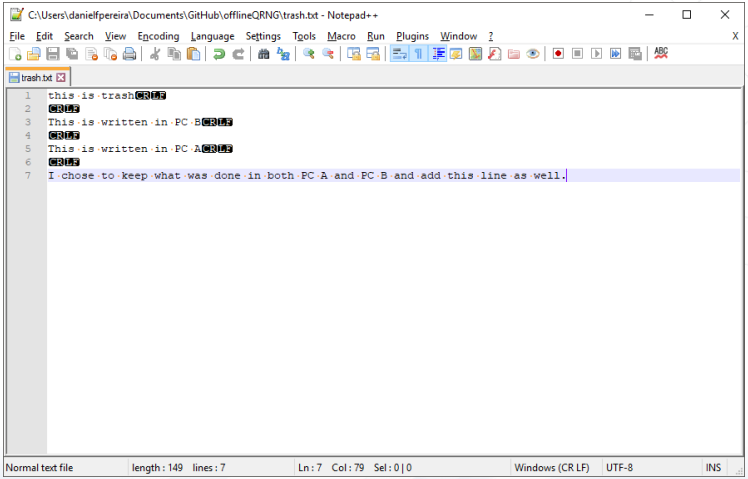
Conflicts



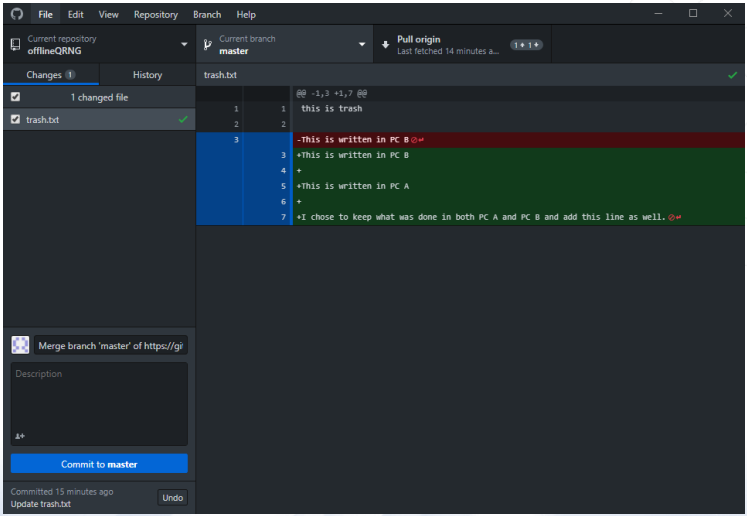
Conflicts



Conflicts

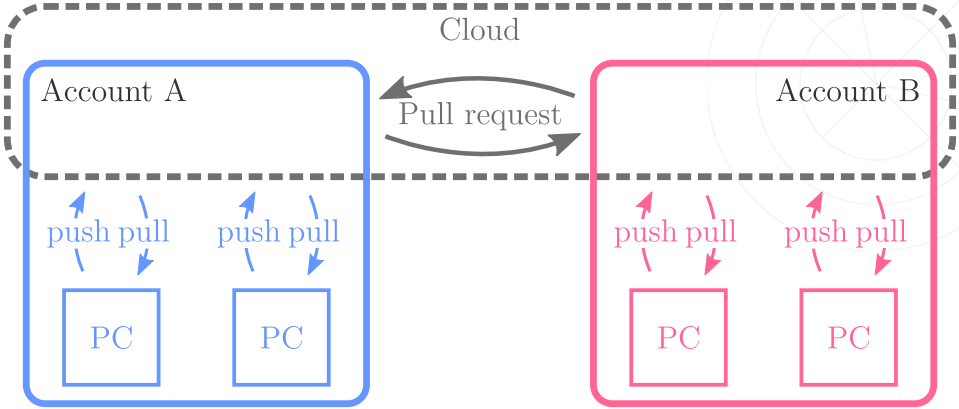


Conflicts



Summary

Topology of communications



This concludes the Git mini-workshop

The end!