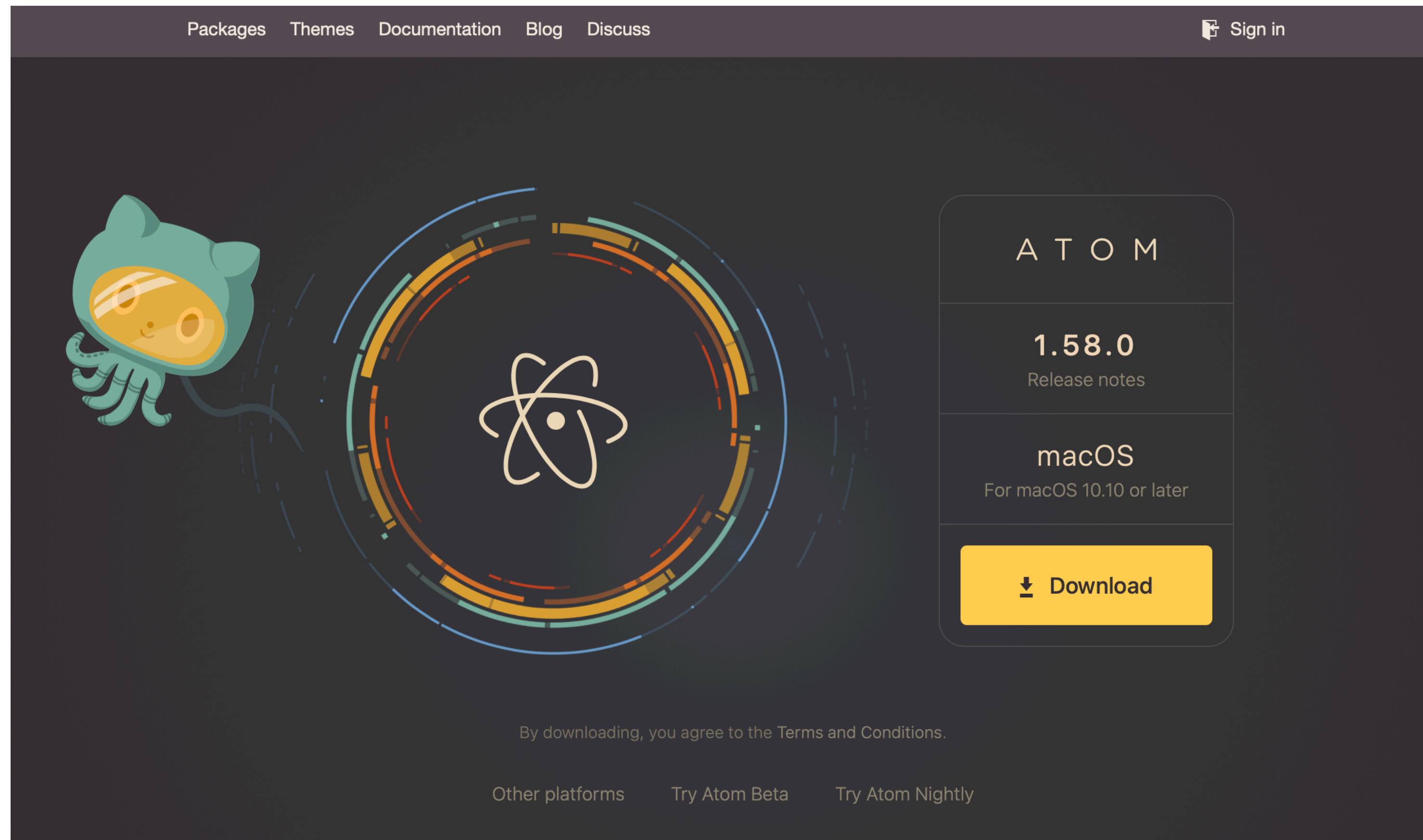

Development Interfaces and Version Control

With examples from Atom, Pycharm, Rstudio, Git

BIO392

2021-09-24

Atom (Atom.lo)



Atom

- Text editor
 - With various customised plug-ins/functions
 - syntax highlight
 - Code completion
 - Sharing/collaboration etc...
 - Similar tools: Sublime, BBEdits
-

Atom (Atom.lo)

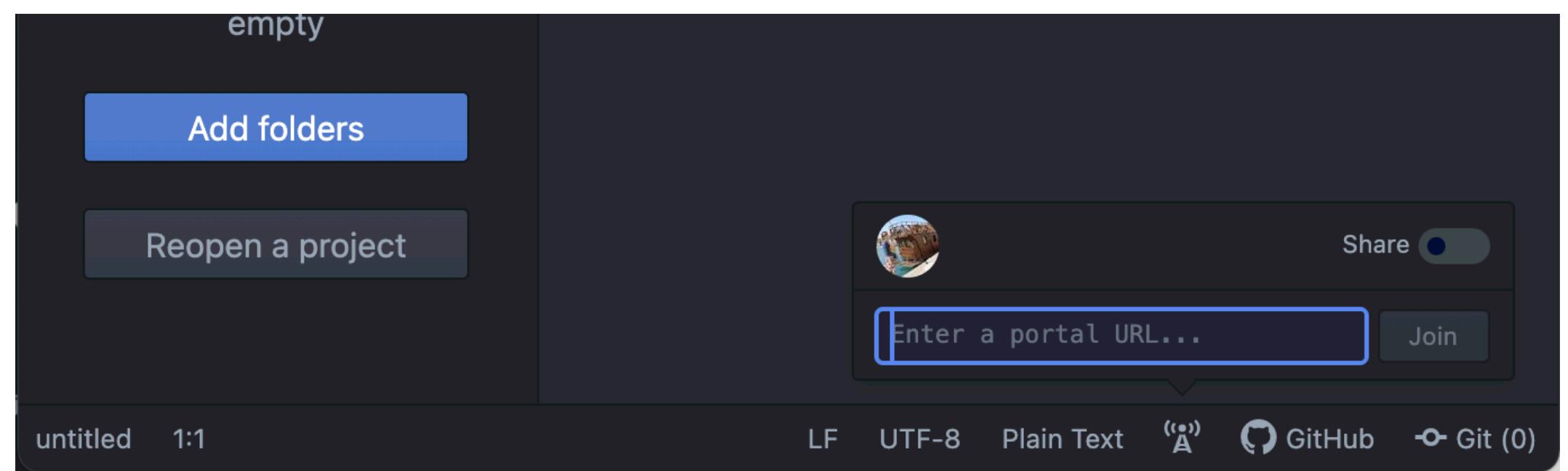
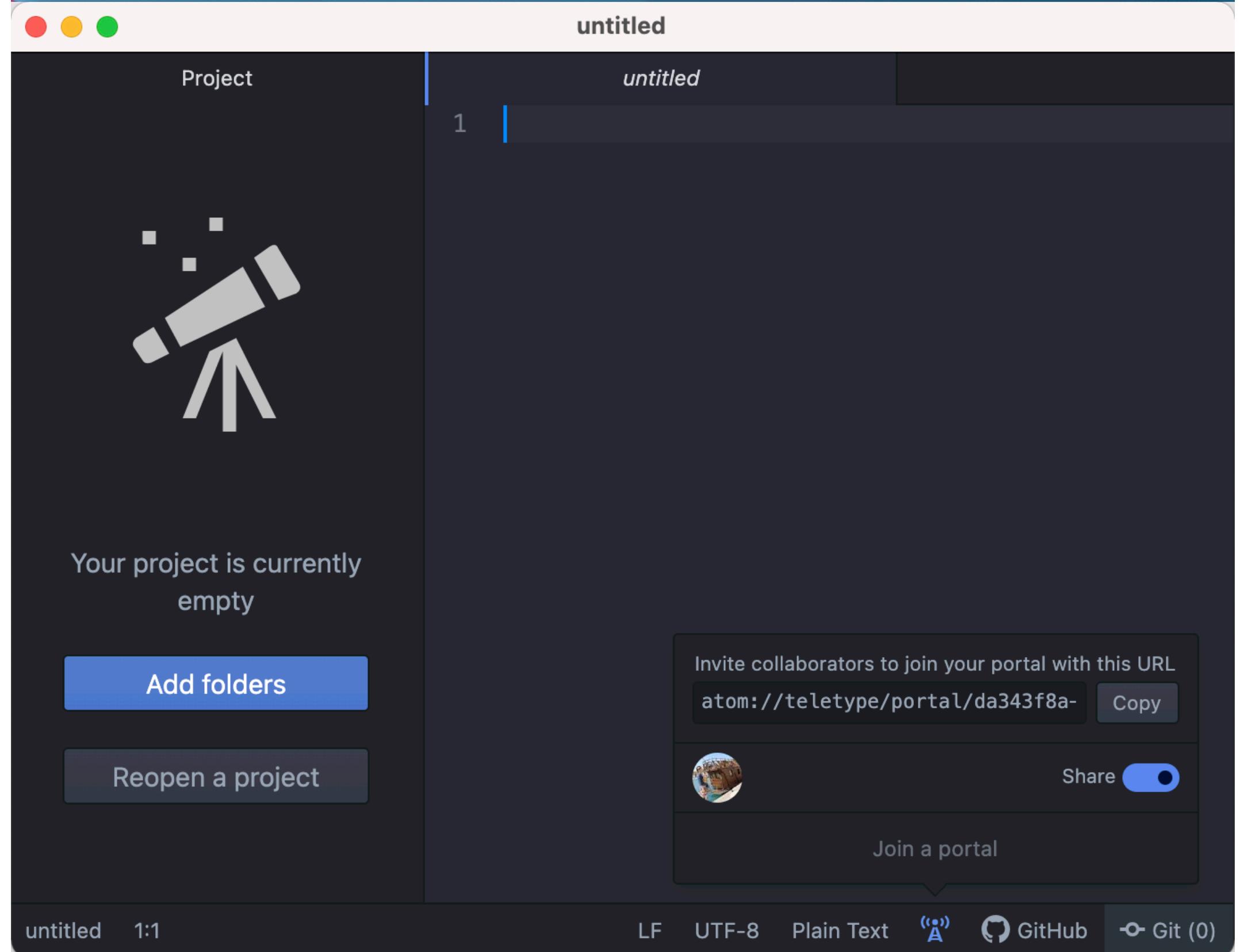
The screenshot shows the Atom code editor interface. The top menu bar includes File, Edit, View, Selection, Find, Packages, and Help. The left sidebar is titled "Project" and lists the directory structure of a "wordpress-5.2.4" project. The "index.php" file is selected in the sidebar and is also the active tab in the main editor area. The code in the editor is as follows:

```
1 <?php
2 /**
3  * Front to the WordPress application. This file doesn't do anything, but loads
4  * wp-blog-header.php which does and tells WordPress to load the theme.
5  *
6  * @package WordPress
7  */
8 /**
9  * Tells WordPress to load the WordPress theme and output it.
10 *
11 * @var bool
12 */
13 define( 'WP_USE_THEMES', true );
14 /**
15 * Loads the WordPress Environment and Template
16 */
17 require( dirname( __FILE__ ) . '/wp-blog-header.php' );
18 |
```

The status bar at the bottom shows "wordpress\index.php 18:1" on the left and "LF UTF-8 PHP GitHub Git (0)" on the right.

Install Your Atom

- Choose your color scheme
- Try syntax highlighting
- Try auto-completion (e.g. python)
- Try teletype with your peers



Integrated Development Environment (IDE)

- (Syntax highlighting)
 - (Code completion)
 - Run code by line
 - Browse variables
 - Debugger
-

IDE Examples

- Python (Pycharm, Jupyter)
 - R (Rstudio)
 - Java (IntelliJ)
-

PyCharm ([jetbrains.Com/Pycharm/](https://www.jetbrains.com/pycharm/))

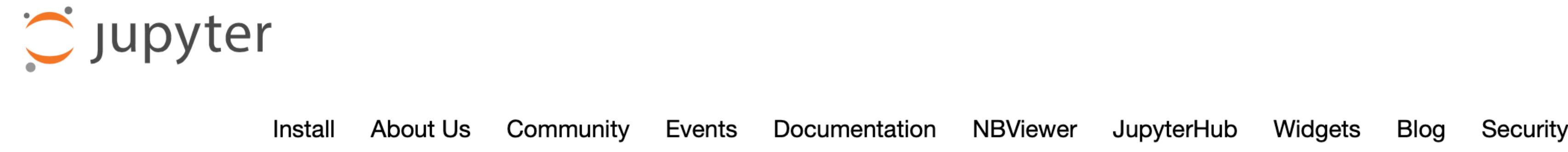


PyCharm ([jetbrains.Com/Pycharm/](https://jetbrains.com/pycharm/))

The screenshot shows the PyCharm IDE interface with the following details:

- Title Bar:** django_tutorial – models.py
- Toolbar:** Test: (dropdown), Run, Stop, Refresh, Git: (dropdown), Undo, Redo, Search.
- Project Structure:** Shows the project structure under "django_tutorial". The "polls" app is expanded, showing "migrations", "static", and "polls" subfolders. Inside "polls", there are "style.css", "templates", "__init__.py", "admin.py", "apps.py", "models.py" (selected), "tests.py", "urls.py", and "views.py".
- Code Editor:** The "models.py" file is open. The code defines two classes: "Question" and "Choice". The "Question" class has a "question_text" field (CharField) and a "pub_date" field (DateTimeField). The "Choice" class has a foreign key "question" (models.ForeignKey) and a "choice_text" field (CharField). Both classes have a "__str__" method returning their respective fields.
- Tooltips:** A tooltip for the "Question" class is visible, listing its methods: __init__, __str__, was_published_recently, unique_error_message, validate_unique, _check_unique_together, _get_unique_checks, and _perform_unique_checks.
- Django Console:** Shows a Python console with the Django 3.0.6 environment. It includes tabs for "Python Console" and "Django 3.0.6".
- Bottom Status Bar:** Displays "Tests passed: 10 (35 minutes ago)", "12:23 LF UTF-8 4 spaces Python 3.8 (django_tutorial) master", and "Event Log".

Jupyter Notebook ([Jupyter.Org/](https://jupyter.org/))



The screenshot shows the official Jupyter website at jupyter.org/. The page features a large, central, stylized orange and white logo with the word "jupyter" in lowercase. Surrounding the logo are numerous small, semi-transparent icons representing various programming languages and tools, including Python, JavaScript, R, and others. Above the logo is a navigation bar with links: Install, About Us, Community, Events, Documentation, NBViewer, JupyterHub, Widgets, Blog, and Security.

Install About Us Community Events Documentation NBViewer JupyterHub Widgets Blog Security



Project Jupyter exists to develop open-source software, open-standards, and services for interactive computing across dozens of programming languages.



Jupyter Notebook (jupyter.org/)

Screenshot of a Jupyter Notebook interface showing a contents sidebar and a main notebook area.

Contents:

- 1 Optical Coherence Tomography
 - 1.1 Imports, preliminaries, defir
 - 1.2 Imaging system - overview
 - 1.3 OCT Theory - overview
 - 1.3.1 Comments and calcula
 - 1.3.1.1 Resolution "back-of
 - 1.3.1.2 Scan depth "back-
 - 1.3.1.3 Scaling of coheren
 - 1.3.2 Time Domain OCT (TD)
 - 1.3.2.1 Detection-bandwid
 - 1.3.2.2 TDOCT: SNR and
 - 1.3.3 Fourier Domain OCT
 - 1.3.3.1 Impact of finite spe
 - 1.3.3.2 Interlude: Finite sa
 - 1.3.3.3 Impact of finite nur
 - 1.3.3.4 FDOCT: SNR and
 - 1.3.4 Spectral domain/swept
 - 1.3.4.1 SSOCT: SNR and I
 - 1.4 Simulation
 - 1.5 Potential laser sources

1.3.3 Fourier Domain OCT (FDOCT)

In FDOCT, the different wavelengths are collected on a spectrometer, with N_{pix} pixels, and spectral resolution δ_r .

Returning again to Eq. (8) (see, e.g., Izatt and Choma (Izatt J.A., Choma M.A. (2008) Theory of Optical Coherence Tomography. In: Drexler W., Fujimoto J.G. (eds) Optical Coherence Tomography. Biological and Medical Physics, Biomedical Engineering. Springer, Berlin, Heidelberg; doi: https://doi.org/10.1007/978-3-540-77550-8_2; alternate link: https://www.researchgate.net/publication/226178102_Theory_of_Optical_Coherence_Tomography/download):

$$I_D(k) = \frac{Q}{4} S(k) \left[R_R + \sum_{n=1}^N R_n \right] \quad \text{" DC terms "}$$
$$+ \frac{Q}{2} S(k) \left[\sum_{n=1}^N \sqrt{R_R R_n} \cos [2k(z_R - z_n)] \right] \quad \text{" Cross - correlation terms "}$$
$$+ \frac{Q}{2} S(k) \left[\sum_{n \neq m=1}^N \sqrt{R_n R_m} \cos [2k(z_n - z_m)] \right]. \quad \text{" Autocorrelation terms "}$$

In the FDOCT configuration, z_R is held fixed.

In [23]:

```
lambda_0 = 1.5500
k_0 = 2.0*np.pi/lambda_0
Dlambda_0 = 0.100
Dk = 2.0*np.pi*Dlambda_0/lambda_0**2.0

k_range = np.linspace(-3.0*Dk+k_0, +3.0*Dk+k_0, 10000)

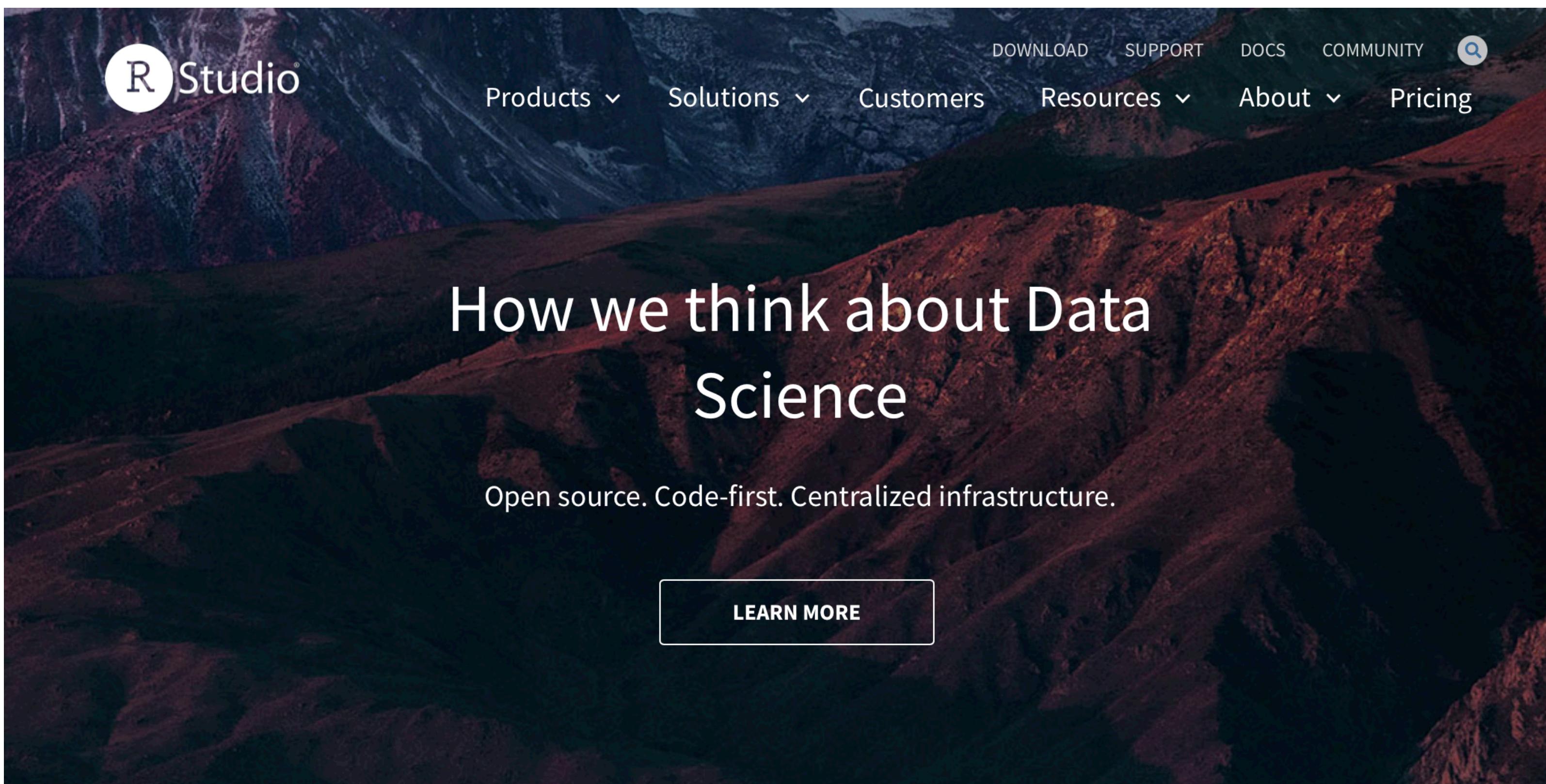
TD_OCT_signal = 0.25*0.5*(np.exp(-((k_range - k_0)/Dk)**2.0)) \
+ 0.5*np.sqrt(0.5*2.0E-4)*(np.exp(-((k_range - k_0)/Dk)**2.0)) \
*np.cos(2.0*k_range*(50.0)) \
+ 0.5*np.sqrt(0.5*1.5E-4)*(np.exp(-((k_range - k_0)/Dk)**2.0)) \
*np.cos(2.0*k_range*(200.0))
```

In [26]: fig_disp

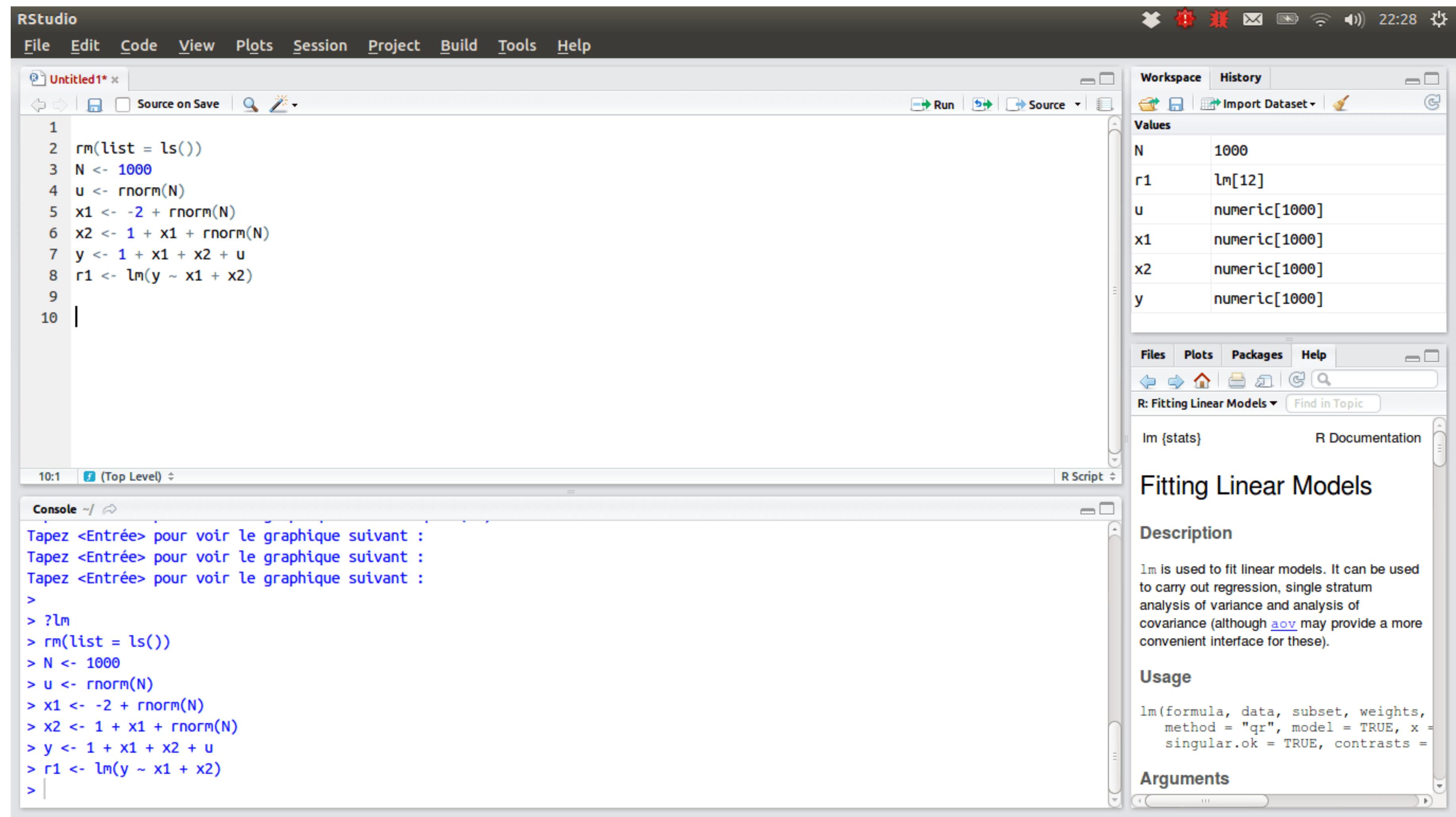
Out[26]:

A line graph showing the intensity signal I_0 [arb.] versus wavenumber k [μm^{-1}]. The x-axis ranges from 3.2 to 4.8, and the y-axis ranges from 0.00 to 0.12. The signal is a red line that starts at zero, rises to a peak around $k = 4.05$, and then decays back towards zero.

RStudio(Rstudio.Com)

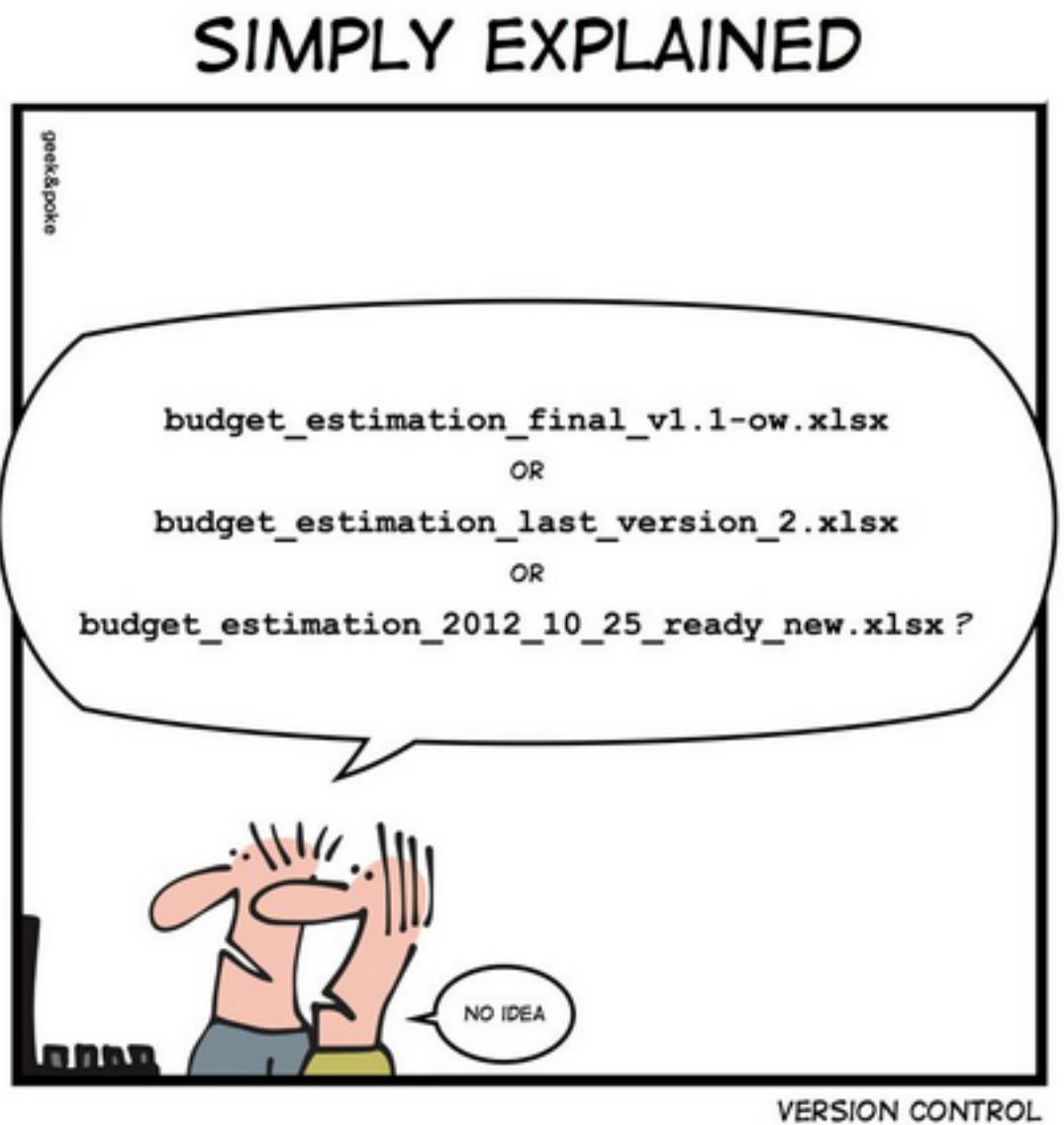


RStudio(Rstudio.Com)



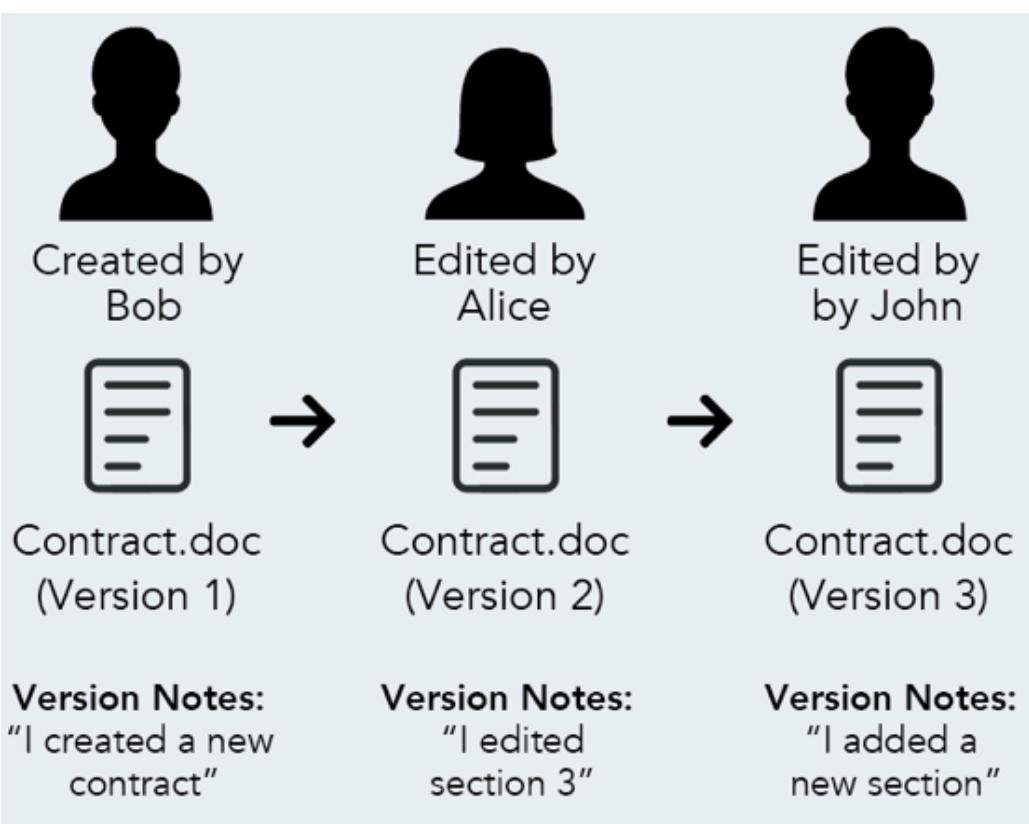
Why Version Control?

- Track history



→ Easier to maintain

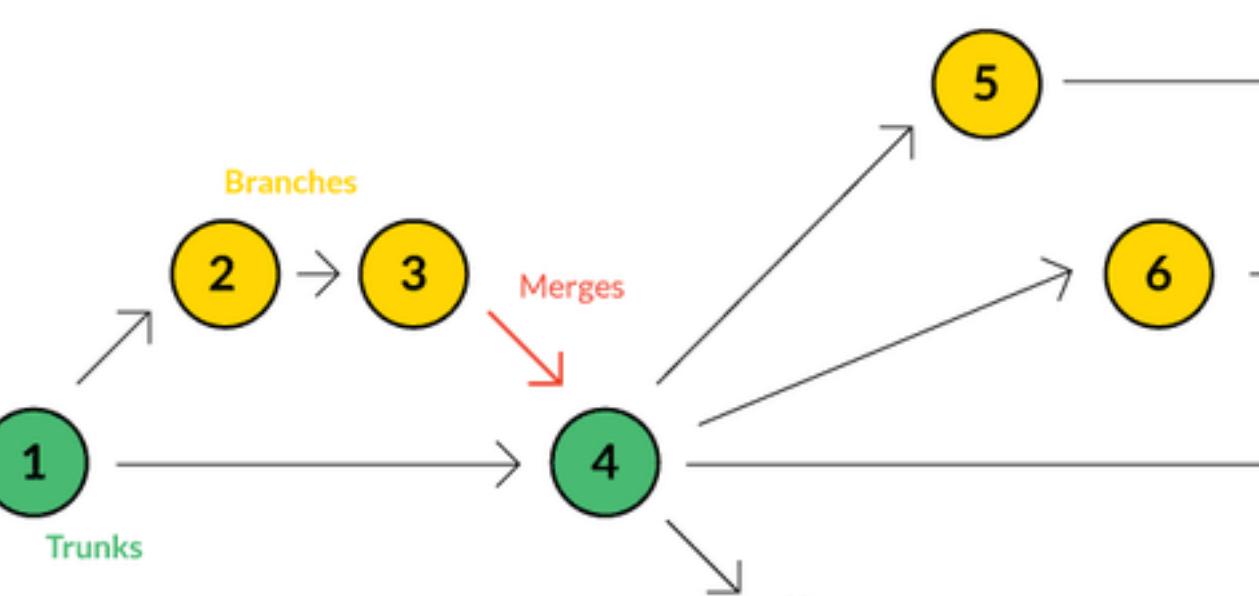
- Collaboration

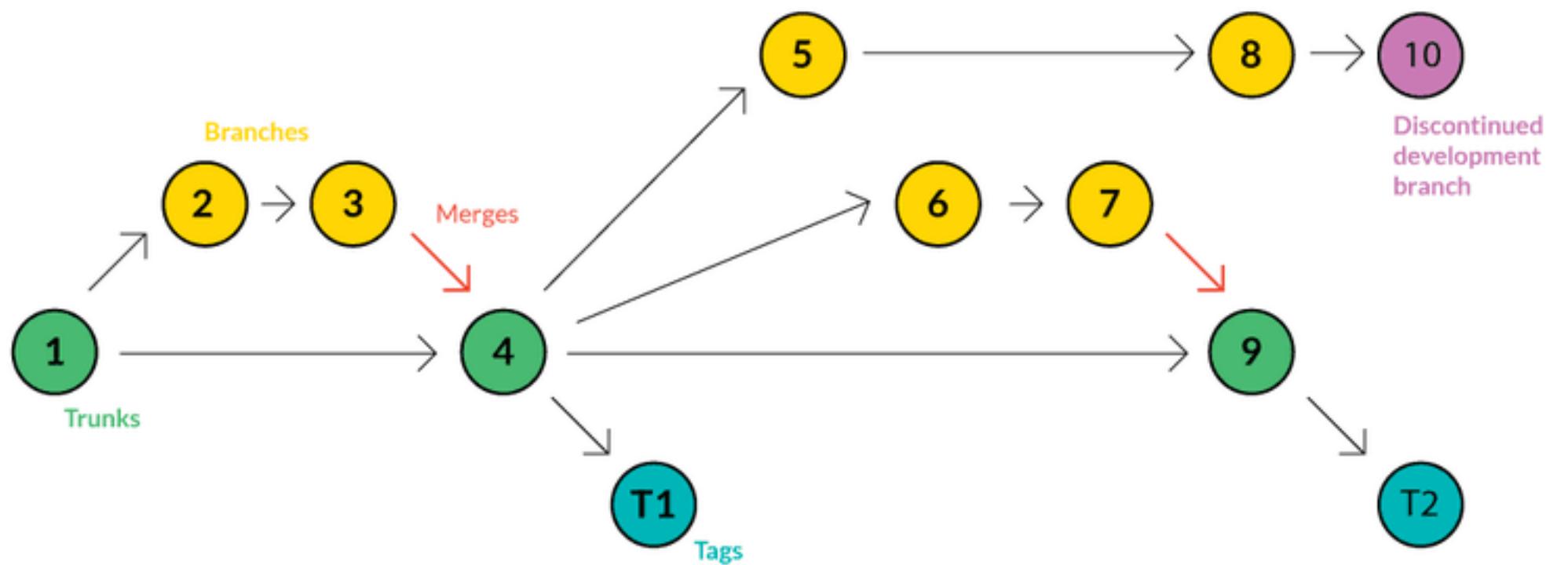


→ Work on same project at the same time

Git



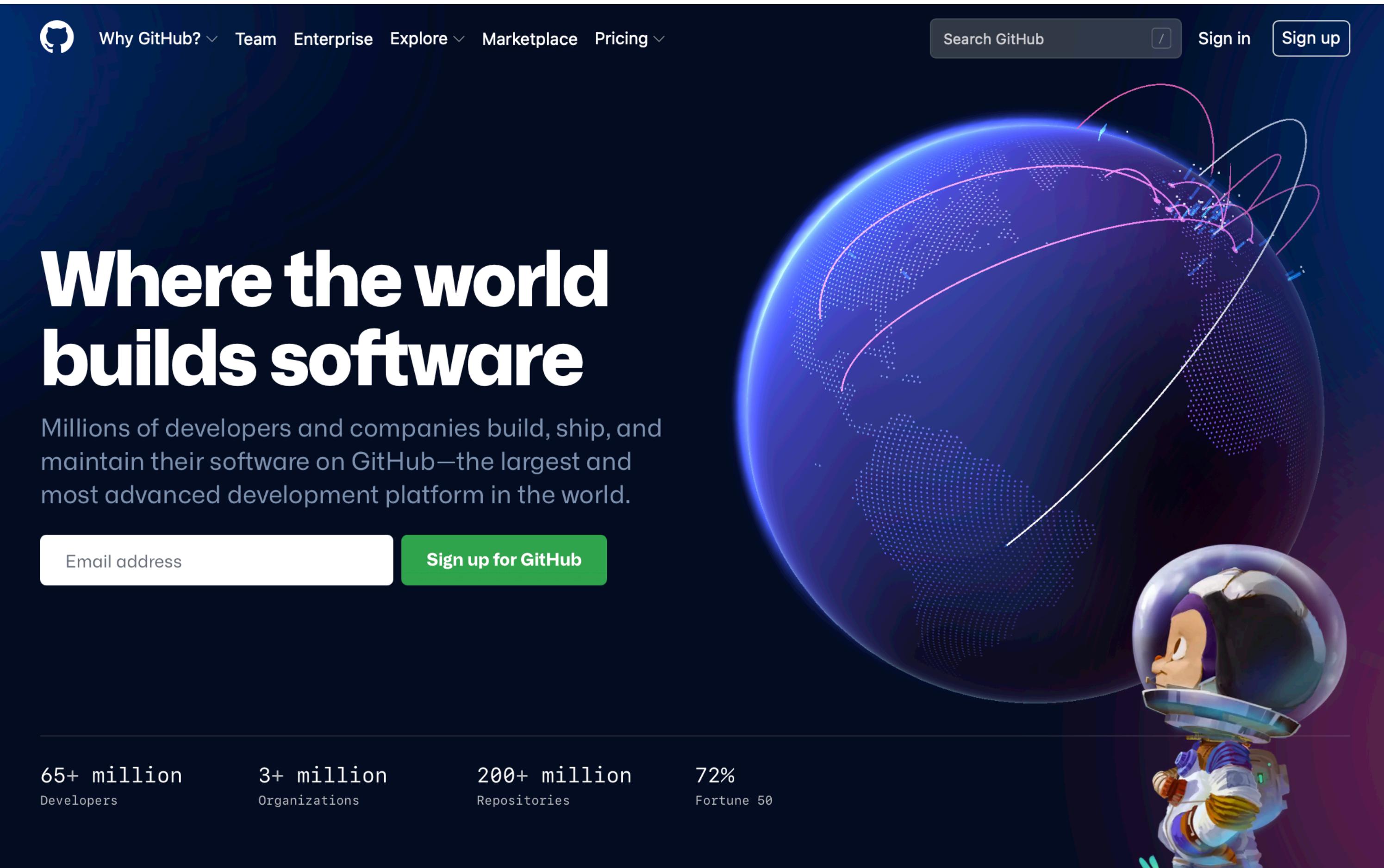
- Locally,
 - Keeps entire repository
 - Keeps all history changes (commits with comments)
 - History can be reverted.
 - Cloud platform
 - GitHub



Version Control Practicals I (Git)

- Create a local git repository.
 - Add a file to it.
 - Make the first commit with comment "my first commit".
-

Github



The image shows the GitHub homepage. At the top, there is a navigation bar with links for "Why GitHub?", "Team", "Enterprise", "Explore", "Marketplace", and "Pricing". On the right side of the header are "Search GitHub", "Sign in", and "Sign up" buttons. The main visual is a large, glowing blue globe with white latitude and longitude lines. A small, stylized cartoon astronaut in a space suit is floating near the bottom right of the globe. The text "Where the world builds software" is prominently displayed in large white letters on the left side of the globe. Below this, a subtitle reads: "Millions of developers and companies build, ship, and maintain their software on GitHub—the largest and most advanced development platform in the world." There is a form field for "Email address" and a green "Sign up for GitHub" button. At the bottom, there are four statistics: "65+ million Developers", "3+ million Organizations", "200+ million Repositories", and "72% Fortune 50".

Why GitHub? ▾ Team Enterprise Explore ▾ Marketplace Pricing ▾

Search GitHub / Sign in Sign up

Where the world builds software

Millions of developers and companies build, ship, and maintain their software on GitHub—the largest and most advanced development platform in the world.

Email address [Sign up for GitHub](#)

65+ million Developers

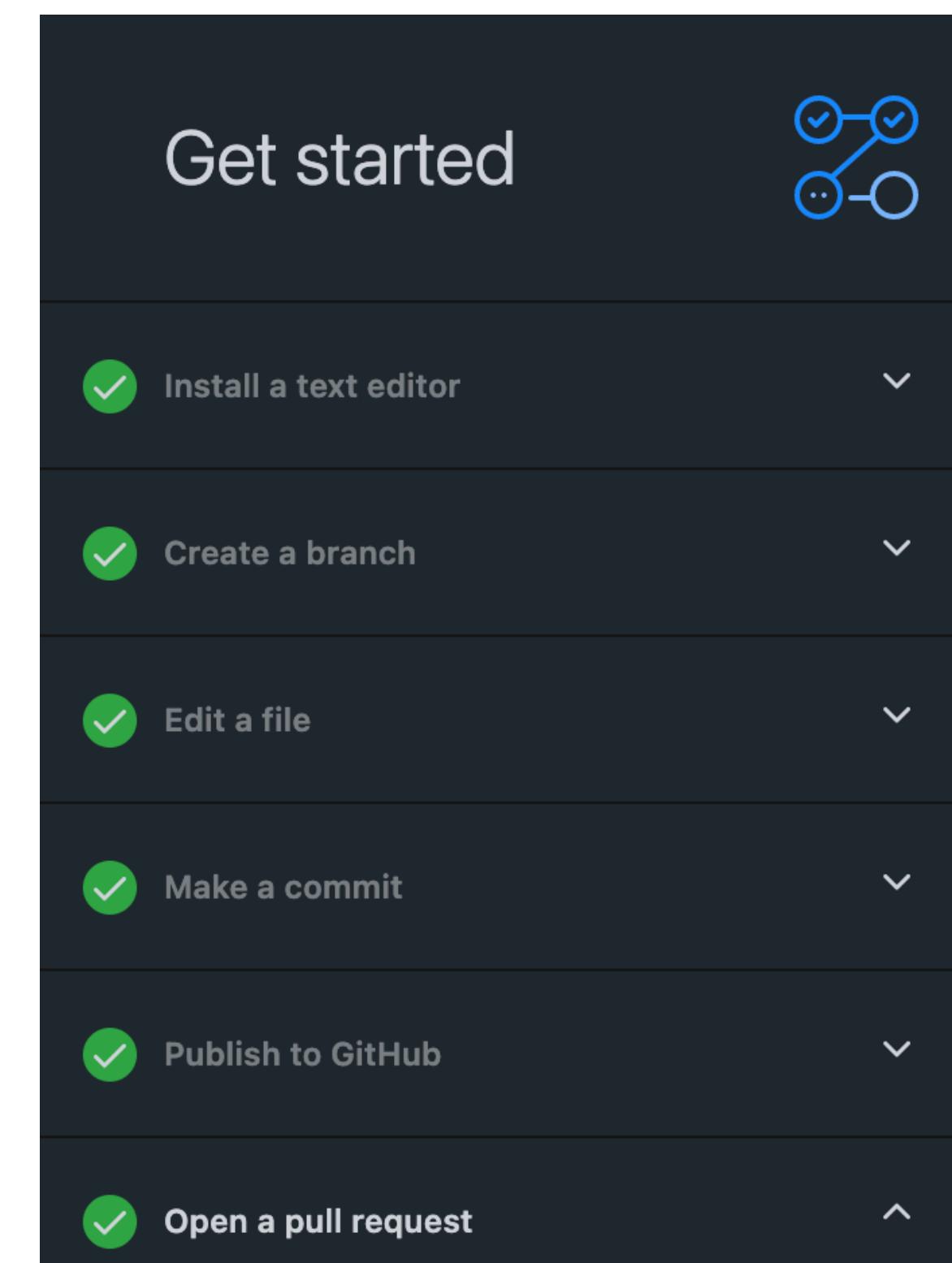
3+ million Organizations

200+ million Repositories

72% Fortune 50

Version Control Practicals II (Github Desktop)

- Install Github Desktop (desktop.github.com)
- Complete the tutorial



Version Control Practicals III (Github)

- Try to do the same tasks in your terminal
-