



Interactive
Mathematics
Education
Resources for
All

User Manual

Fowler • Obbels • Nowell • Snapp

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Source: <https://github.com/ximeraProject/ximeraManuals>



developed in XIMERA

To lovers of mathematics everywhere.

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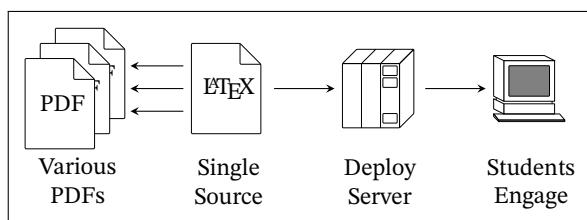
1 Introduction and setup

1.1 About Ximera

What is Ximera? What is it supposed to do? Who is it for?

Ximera, pronounced “chimera,” (**Ximera: Interactive, Mathematics, Education, Resources, for All**) is an open-source platform that provides tools for authoring and publishing (PDF and Online), open-source, interactive educational content, such as textbooks, assessments, and online courses.

Authors write and store their content on their own machines and GitHub repositories. Authors own their content and decide how to license their content. From a single source written in **LATEX**, Ximera generates various output: PDF worksheets, PDF textbooks, and PDF solution manuals, and so on. Of most interest, Ximera can also create online interactive activities:



The source code used to produce PDFs can also create interactive online activities when deployed to a Ximera server. Students access this content via a URL or an assignment in their LMS.

Students interact with the *content* produced within Ximera, hence their experience is highly dependent on the *quality* of this content. Research shows that

students find Ximera materials to be more readable than traditional course materials and perform equivalently to those using proprietary textbooks and online homework systems. While students typically encounter Ximera through their courses, many discover it via web-search and use the platform as independent learners. In 2023, Ximera has over one million unique visitors. Since Ximera materials are free, they are accessible to anyone, regardless of enrollment in official courses.

Get involved by contributing as an instructor, author, or developer. To get started with Ximera, visit our *First Steps in Ximera* GitHub repository:

<https://go.osu.edu/xfs>

This document assumes you have completed the instructions there, and have successively deployed Ximera content online.

Funding for the Ximera Project is provided by a U.S. Department of Education Open Textbooks Pilot Program grant in the amount of \$2,125,000, from 2024–2026, with no external funding. In the past, the Ximera Project has also received support from NSF Grant DUE-1245433, the Shuttleworth Foundation, the Ohio State University Department of Mathematics, and the Affordable Learning Exchange at Ohio State.

As a token of our appreciation, **consider applying for a Ximera Flash-Grant Stipend:**

<https://go.osu.edu/ximera-flash-grant>

Thank you for your interest in Ximera. We encourage you to contact the team with any questions you may have.

The authors listed on the cover are the current Ximera lead developers. In reality, this document has many authors as it is part of an evolution of Ximera documentation. Rodney Austin, Oscar Levin, Matt Thomas, and Hans Parshall authored parts of either the document class or original documentation.

Email: ximera@math.osu.edu

Website: <https://github.com/ximeraProject/>

1.2 First steps in Ximera

Try out Ximera!

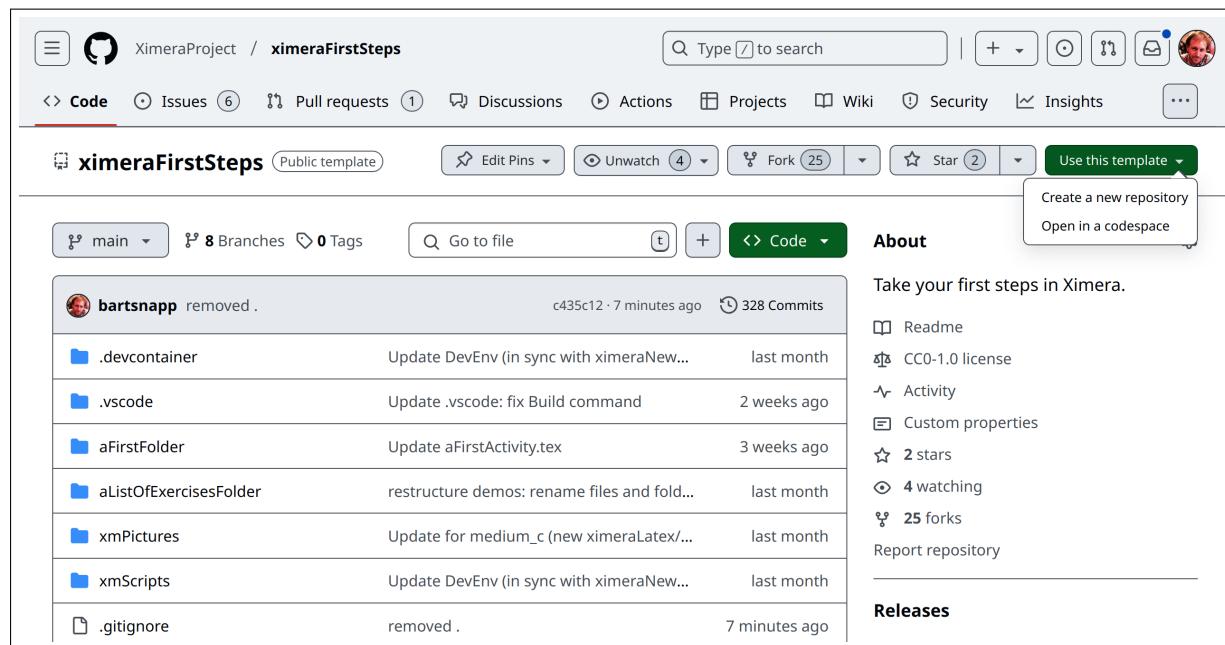
To use Ximera, you must have a GitHub¹ account. GitHub is a web platform where developers can store, share, and manage their code. It uses git, popular software for version control, to help teams work together simultaneously without overwriting each other's changes. GitHub has issue tracking, pull requests for proposing

changes, and other project management tools. It's like a shared folder for coding, designed to help teams work smarter and track progress. Go to <https://github.com> and either sign-up or log-in. Note, you must know your **username** and **password**, so store them in a safe place; like in a safe, or under your bed.

After you have a GitHub account, log-in and go to:

<https://github.com/ximeraProject/ximeraFirstSteps>

You will see something like this:



¹See GitHub at <https://github.com>

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Website: <https://github.com/ximeraProject/>

Start your repository with a template repository's contents.

Include all branches
Copy all branches from XimeraProject/ximeraFirstSteps and not just the default branch.

Owner * bartsnapp / **Repository name *** bartXimeraTest
bartXimeraTest is available.

Great repository names are short and memorable. Need inspiration? How about [curly-octo-broccoli](#) ?

Description (optional)

Public
Anyone on the internet can see this repository. You choose who can commit.

Private
You choose who can see and commit to this repository.

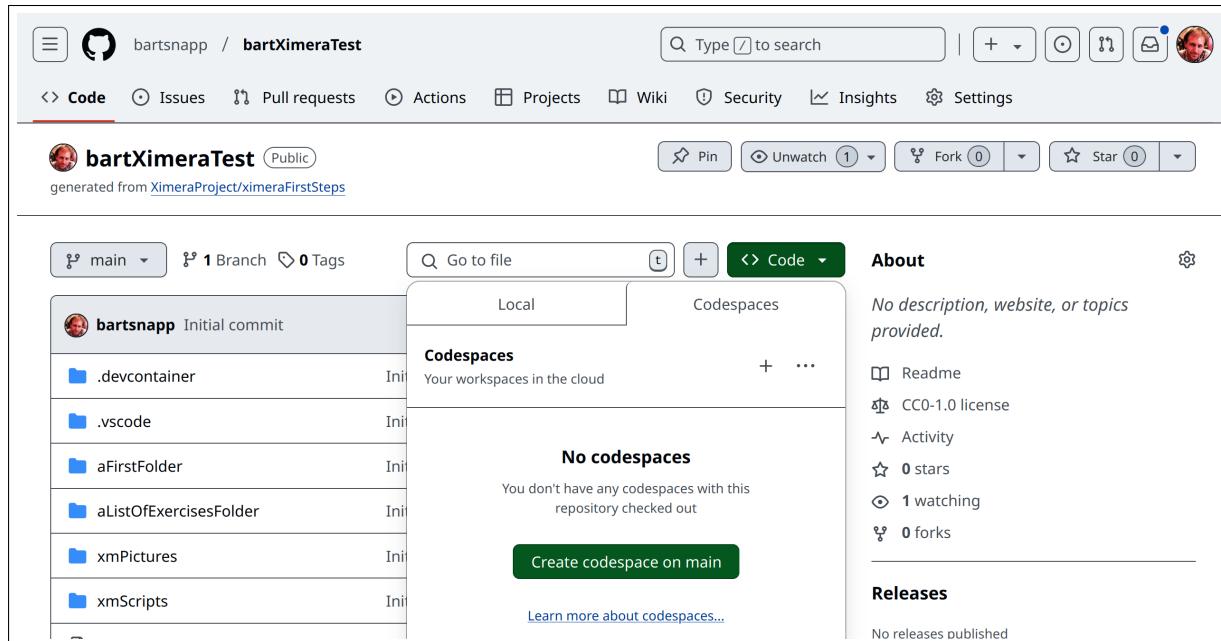
(i) You are creating a public repository in your personal account.

Create repository

Click on the green “Use this template” button and select “Create a new repository.” Give it a fun repository name, and push the button “Create repository.” At this point you have your own personal copy of our repository XimeraFirstSteps. In fact, after you create it, GitHub will take you to it. This copy can always be found at

<https://github.com/YOUR-GIT-USER-NAME/YOUR-REPO-NAME>

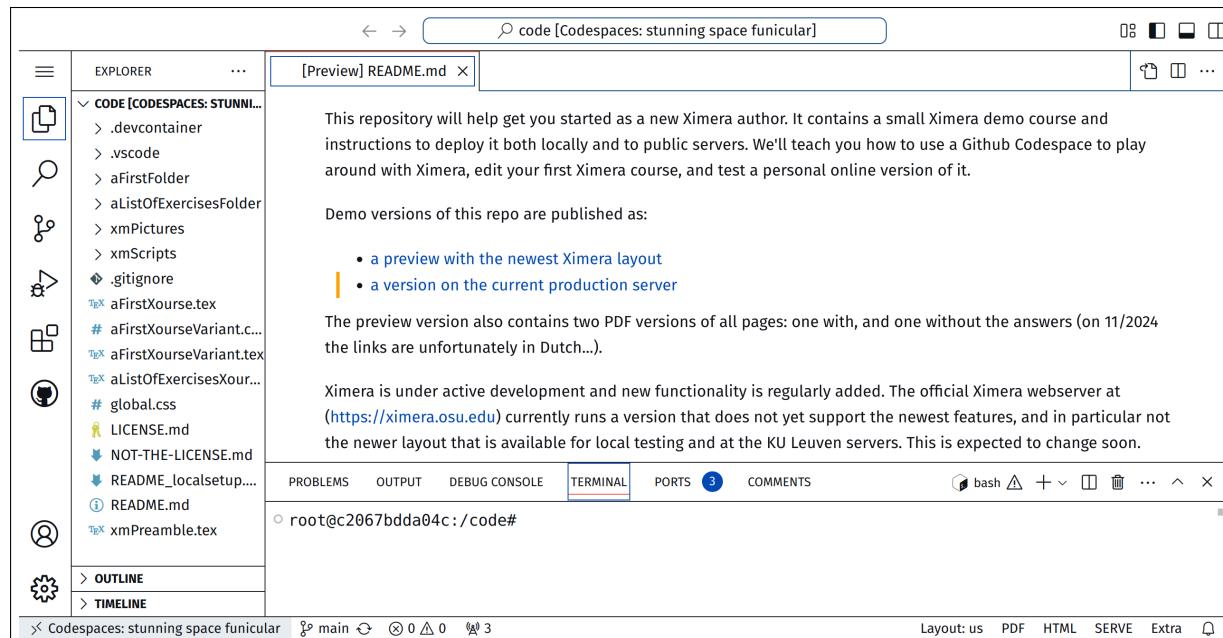
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Website: <https://github.com/ximeraProject/>

Once there, click the green “code” button, select the “Codespaces” tab, and click “Create codespace on main.” A GitHub codespace is like a remote computer set up specifically for coding. It’s a cloud-based environment where you can write, test, and run your code, just like on your own computer, but everything happens on remote servers. It comes preconfigured with all the tools, libraries, and settings you need for

your project. You connect to it through your browser or favorite editor, and because it’s tied to your GitHub projects, you can instantly start working without worrying about setting up software on your local machine. It’s like having a ready-to-use, fully equipped coding computer that you can access from anywhere. **It will take around 5 minutes for your codespace to be created.**

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Once the codespace is created, you will see something like this:

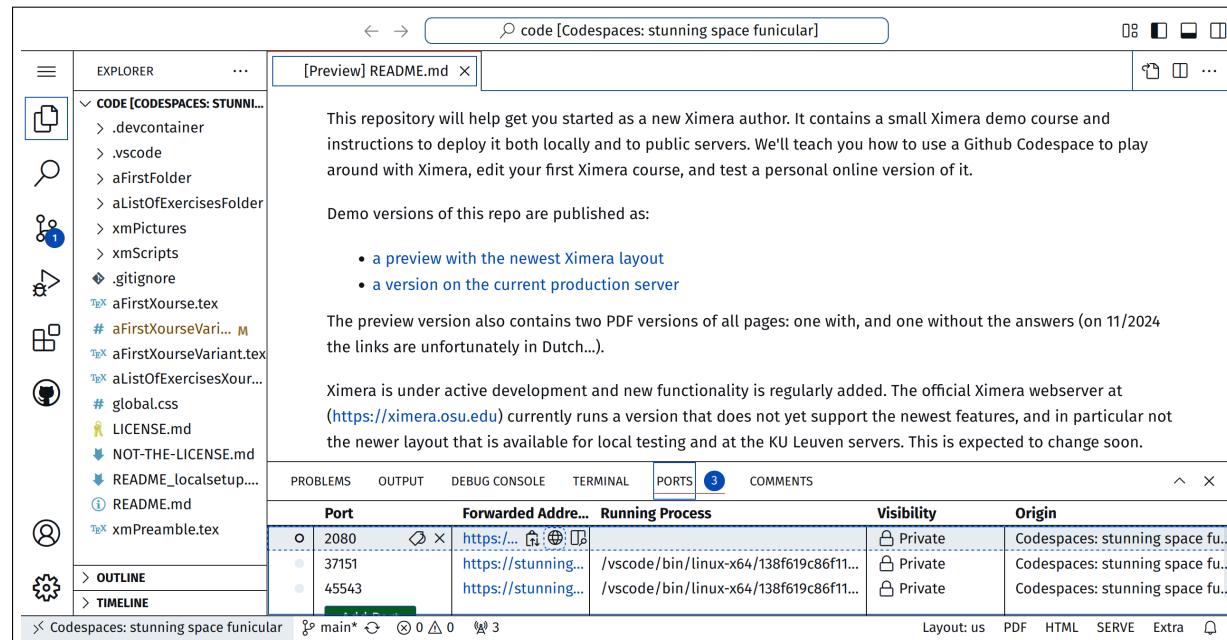
At the bottom right-hand corner of the screen you will see a button that says

“SERVE.” Press the “SERVE” button to compile Ximera content to HTML and JavaScript. This will take a few minutes.

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When the compilation is finished, note the line that says: “PROBLEMS,” “OUTPUT,” “DEBUG CONSOLE,” “TERMINAL,” “PORTS.” You want to click on “PORTS.” The “PORTS” tab may be hidden within . . .



After you click on “PORTS,” click on the globe, and a webpage will open. Your content will be under the link “Content.” You should be able to see the content in your browser. Demo versions of this repo are published as:

- a preview with the newest Ximera layout²
- a version on the current production server³

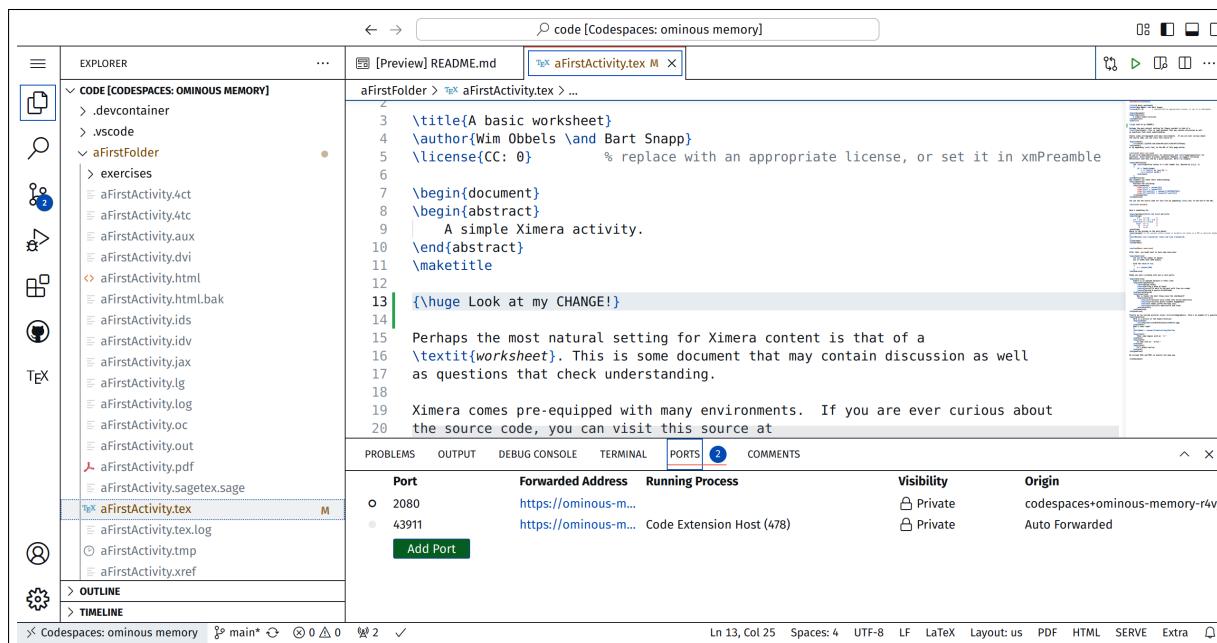
²See a preview with the newest Ximera layout at <https://set.kuleuven.be/voorkennis/firststeps24/aFirstCourseVariant/aFirstFolder/aFirstActivityVariant>

³See a version on the current production server at <https://ximera.osu.edu/firststeps24/aFirstCourse/aFirstFolder/aFirstActivity>

1.3 Working with git

We introduce you to *git*, and help you make changes on your own.

Once you've deployed our content in a GitHub codespace, you'll surely want to change it and make it your own.



The screenshot shows a GitHub Codespace interface. On the left is the Explorer sidebar with a tree view of files in the 'CODE [CODESPACES: OMNIOUS MEMORY]' folder. The 'aFirstActivity.tex' file is selected and open in the main editor area. The code editor shows the following LaTeX code:

```

\title{A basic worksheet}
\author{Wim Obbels \and Bart Snapp}
\license{CC: 0} % replace with an appropriate license, or set it in xmPreamble
\begin{document}
\begin{abstract}
A simple Ximera activity.
\end{abstract}
\maketitle
{\huge Look at my CHANGE!}
Perhaps the most natural setting for Ximera content is that of a
\textrit{worksheet}. This is some document that may contain discussion as well
as questions that check understanding.
Ximera comes pre-equipped with many environments. If you are ever curious about
the source code, you can visit this source at

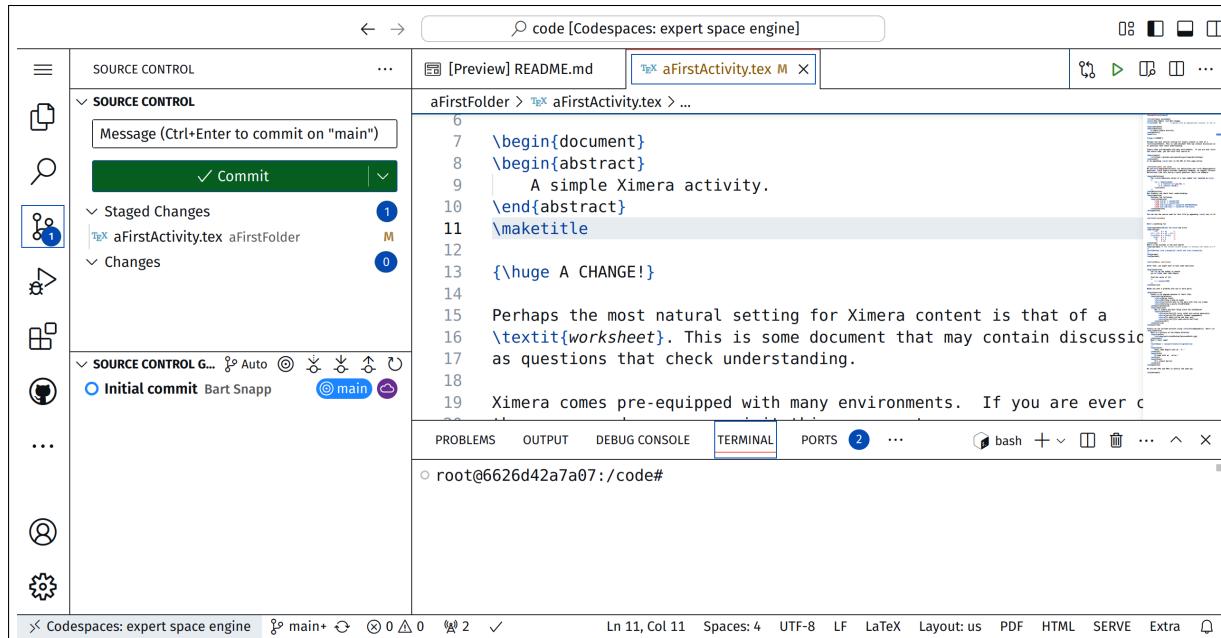
```

Below the code editor are tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL, PORTS, and COMMENTS. The PORTS tab is active, showing two ports: 2080 (Forwarded Address: https://ominous-m... Running Process: https://ominous-m...) and 43911 (Forwarded Address: https://ominous-m... Running Process: Code Extension Host (478)). A green 'Add Port' button is visible. At the bottom of the interface are status bars for Ln 13, Col 25, Spaces: 4, UTF-8, LF, LaTeX, Layout: us, PDF, HTML, SERVE, Extra, and a small preview icon.

Within codespace, you are running VS Code, a full-fledged text editor. You can make changes directly there. Our files are on the left, and are revealed by the “pages” icon. Here, I’ve opened the folder `aFirstFolder`, and then the document `aFirstActivity.tex`. I made a change in the middle of the screen.

At this point, you may push “SERVE” and see the results of your change; however, **these changes were made only in your temporary codespace**, a virtual computer, lost in the cloud. To make these changes to your actual GitHub repository, you need to “sync” them back.

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Remember Git is like a magical notebook that remembers every change you make to your project. It helps you go back in time if something breaks and lets you share your work with others. For this reason, it makes you do a little “dance” to ensure good code hygiene.

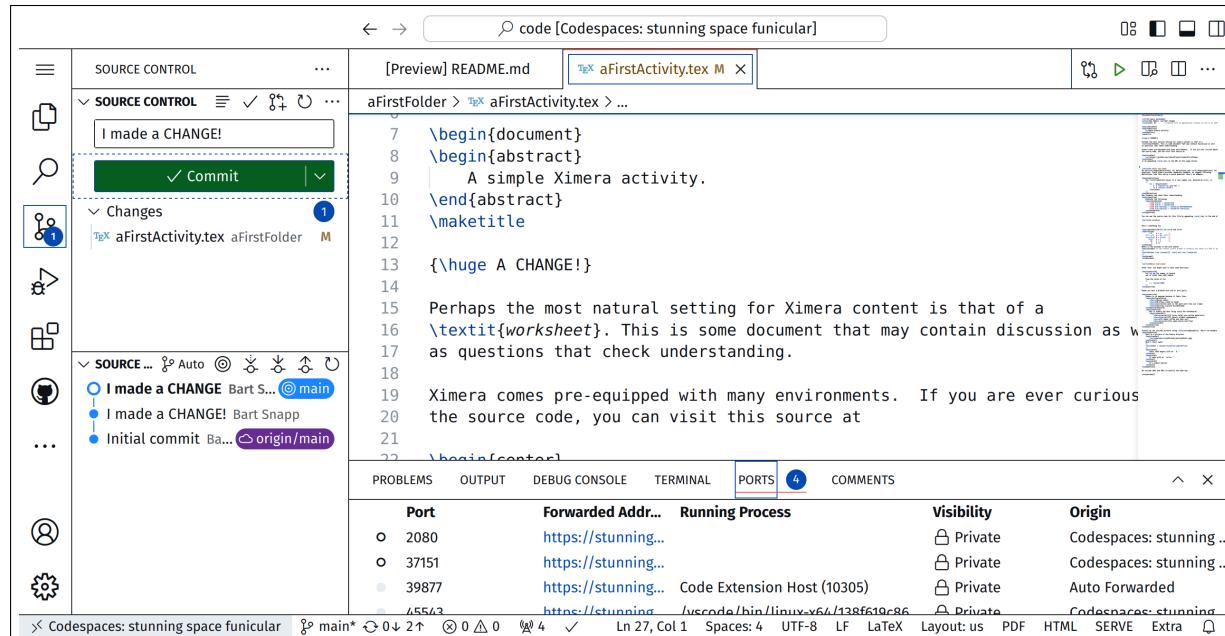
Step 1: Staging Files (The “+” Button) You start by clicking on the icon that looks like a poorly drawn “Y” with lines and circles on the left. Then you click on a +

for every file you want to send to your repository. When you click the little “+” next to a file, you’re saying,

“Hey Git, this file is ready to be saved!”

This adds the file to a special list called the **staging area**. Only files in this list will be saved in the next step.

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Step 2: Committing Changes (Saving Your Work) After staging your files, you

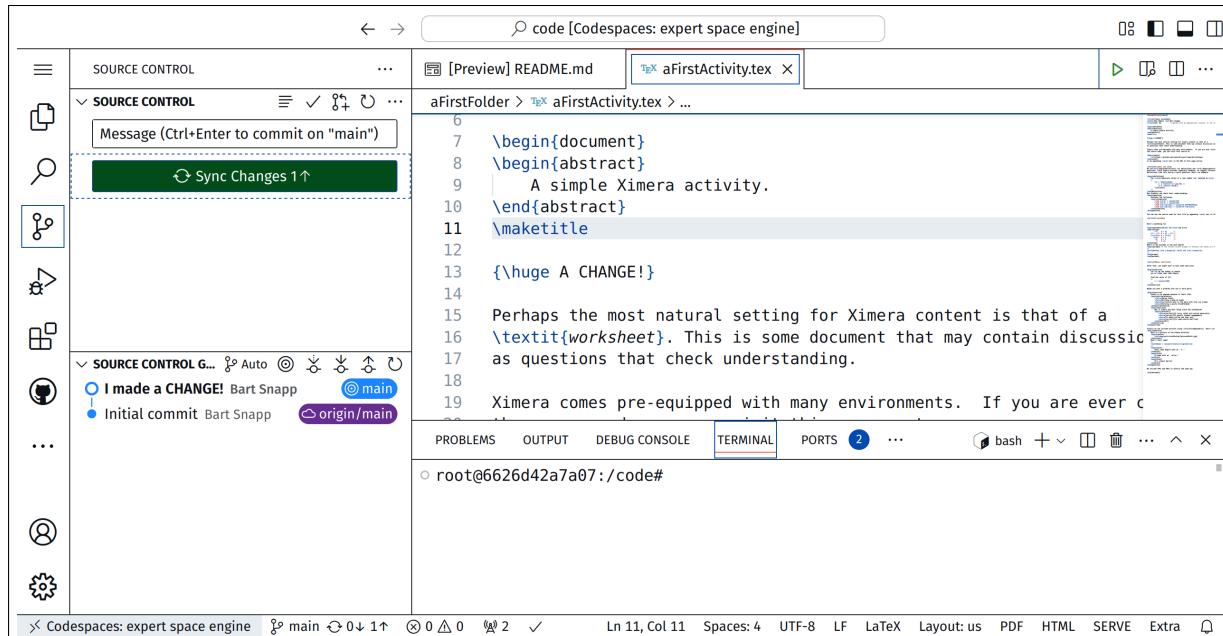
- (a) **type a message** directly above the green “Commit” button.
- (b) Click “Commit.”

This tells Git:

“Save these changes forever, and here’s a note about what I did.”

Git takes a snapshot of the staged files and saves them with your message. If you would ever need to undo your work from this point, this message will help guide your future-self.

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Step 3: Syncing with GitHub (Sending Your Work Online) When you click “Commit and Sync”, you’re telling Git:

“Send my saved changes to the big Git notebook on GitHub.”

Git takes your saved changes and sends them to your **remote repository** (the one on GitHub). At the same time, it checks if there are any new changes from your teammates and brings them back to you. At this point, VS Code in your codespace will ask you if you periodically want to sync. You can click “Yes.”

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The screenshot shows a GitHub repository named 'bartXimeraTest'. The repository was generated from 'XimeraProject/ximeraFirstSteps'. It contains 4 commits:

- main · cf99512 · 2 minutes ago · 4 Commits
- .devcontainer · Initial commit · 2 hours ago
- .vscode · Initial commit · 2 hours ago
- aFirstFolder · I made a CHANGE! · 2 minutes ago
- aListOfExercisesFolder · Initial commit · 2 hours ago
- xmPictures · Initial commit · 2 hours ago
- xmScripts · Initial commit · 2 hours ago

The repository has 1 branch and 0 tags. The 'About' section indicates no description, website, or topics provided. The 'Releases' section shows no releases published.

To check that everything worked correctly, go to

<https://github.com/YOUR-GIT-USER-NAME/YOUR-REPO-NAME>

Above we see my repository, and we see that my change was indeed made.

The Git Workflow For a new author, this can be overwhelming. Here are the steps once again.

(a) **Stage:** Use the "+" button to pick what you want to stage for commit (save).

```
git add FILE-NAME-1 FILE-NAME-2 # You can list multiple files or
git add -u # Add all modified files
```

(b) **Commit:** Write a message and click "commit" to save your changes.

```
git commit -m 'A GOOD MESSAGE'
```

(c) **Sync:** Send your changes to GitHub and get updates from your team.

```
git pull && git push
```

Email: ximera@math.osu.eduWebsite: <https://github.com/ximeraProject/>**Checking Your Work** After syncing, go to:<https://github.com/YOUR-GIT-USER-NAME/YOUR-REPO-NAME>

You should see your changes there!