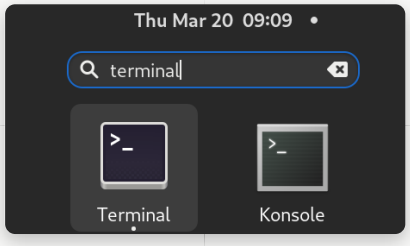
Linux

This quickstart will help you set up your Linux machine to explore the sourcecode of Bonsai or develop and debug your blender scripts in VSCode. This has the benefit of having a complete development environment where you can explore the code, make changes, debug (break-points, watch variable and stack contents, etc.) and see the results in blender

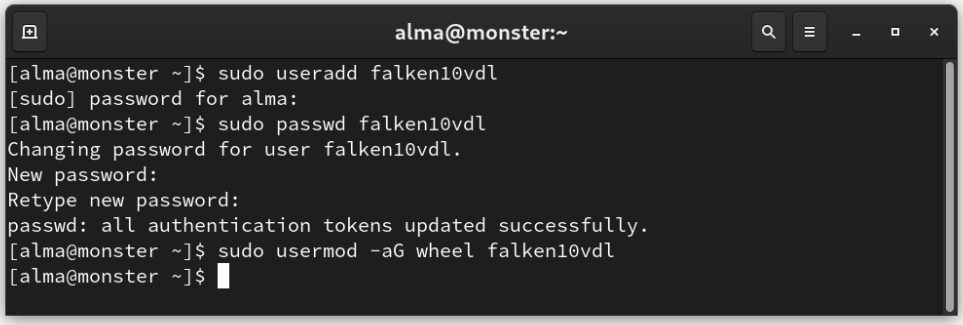
- Steps 1-6 will get you started with VSCode to develop and debug python scripts in Blender.
- Steps 7-14 will allow you to interact with GitHub to make changes to the Bonsai project.

We will be using AlmaLinux 9 as our operating system and Visual Studio Code as our Integrated Development Environment (IDE) and we will create a dedicated user for Development.

1. **Create Development User**: Open up a terminal (typically hitting “Windows” key and writting “terminal” in the search field)




```
sudo useradd falken10vdl
sudo passwd falken10vdl
sudo usermod -aG wheel falken10vdl
```



Tip

If for some reason you need to delete the user, you can use the following command:

```
sudo userdel -r falken10vdl
```

2. **Install Blender for the created user**: We will install blender locally in the users home

directory. We must check that we are following the Systems requirements.

We will download Blender 4.2 from the Blender download page. In particular, we take the 4.2 LTS for Linux.

We will download the Linux 64 bit version:

https://www.blender.org/download/release/Blender4.2/blender-4.2.8-linux-x64.tar.xz

```
wget https://download.blender.org/release/Blender4.2/blender-4.2.8-linux-x64.tar.
tar -xvf blender-4.2.8-linux-x64.tar.xz
mv blender-4.2.8-linux-x64 /home/falken10vdl/.local/share/applications/blender-4.
```

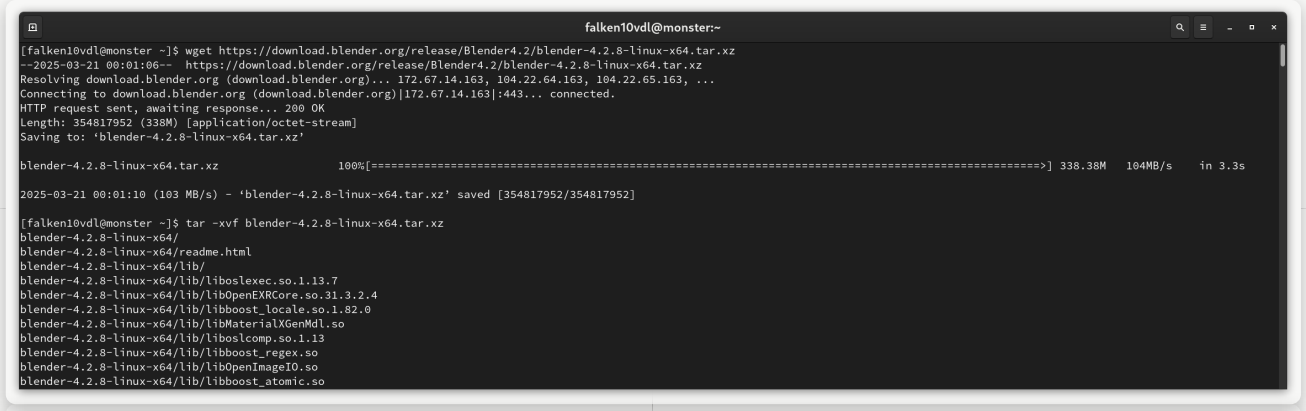
Warning

If the directory */home/falken10vdl/.local/bin/* does not exist, we will create it.

```
mkdir -p /home/falken10vdl/.local/bin/
```

We will create a symbolic link to the blender executable in the bin directory and we will also modify the blender.desktop file to open in a terminal and to have a custom icon.

```
ln -s /home/falken10vdl/.local/share/applications/blender-4.2.8-linux-x64/blender
sed -i 's/^Terminal=.*/Terminal=true/' /home/falken10vdl/.local/share/application
sed -i 's|^Icon=.*|Icon=/home/falken10vdl/.local/share/applications/blender-4.2.8
```

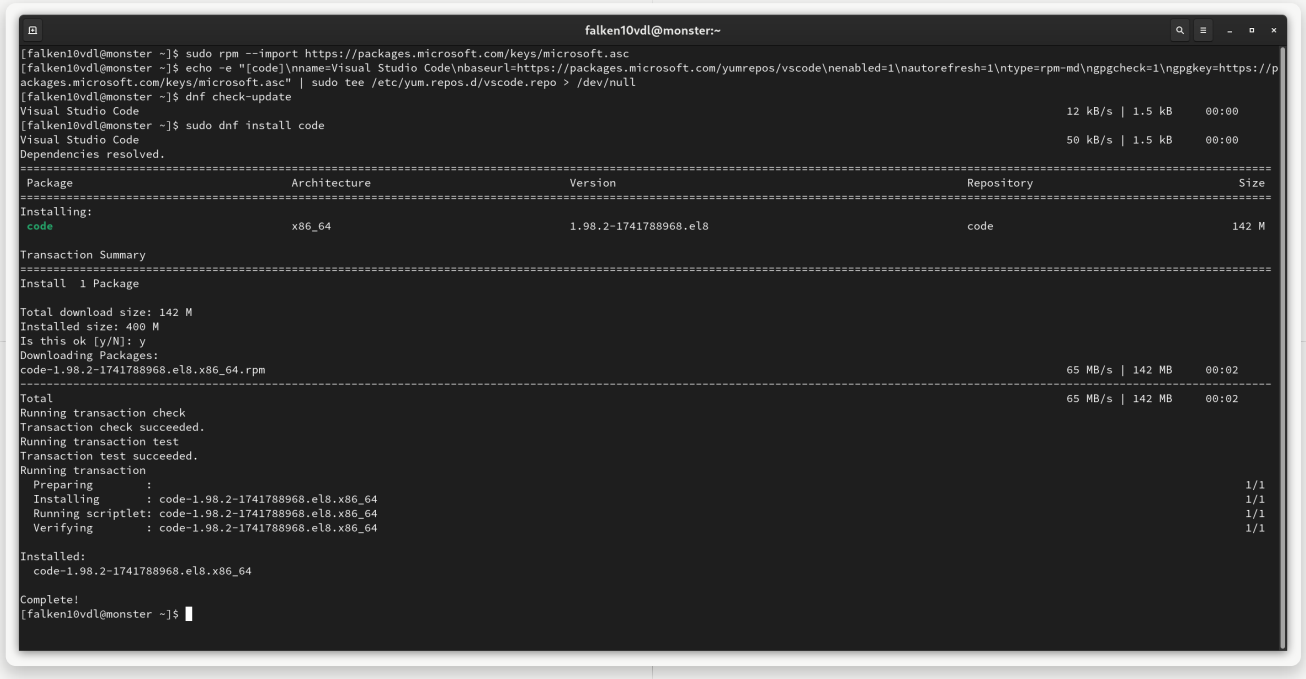


Congratulations! You have now Blender installed in your machine. You can launch it by typing *blender* in the terminal.

Now install the Bonsai Blender extension. Follow the Unstable installation.

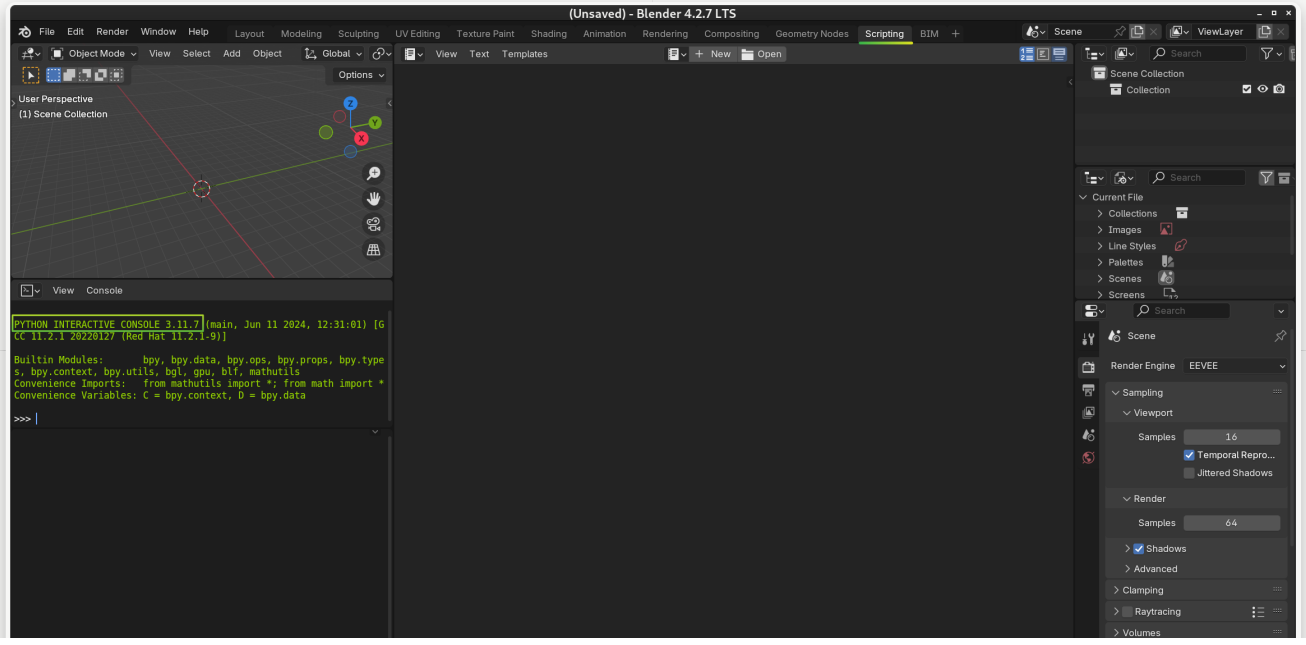
3. **Install VSCode**: Log in as the new created user (*falken10vdl* in this example) and install Visual Studio Code.

```
sudo rpm --import https://packages.microsoft.com/keys/microsoft.asc
echo -e "[code]\nname=Visual Studio Code\nbaseurl=https://packages.microsoft.com/
dnf check-update
sudo dnf install code # or code-insiders
```



4. **Adjust Python version in VSCode as in Blender**: Although not extrictly mandatory, this is a good practice step to ensure that the Python version in VSCode matches the one in Blender.

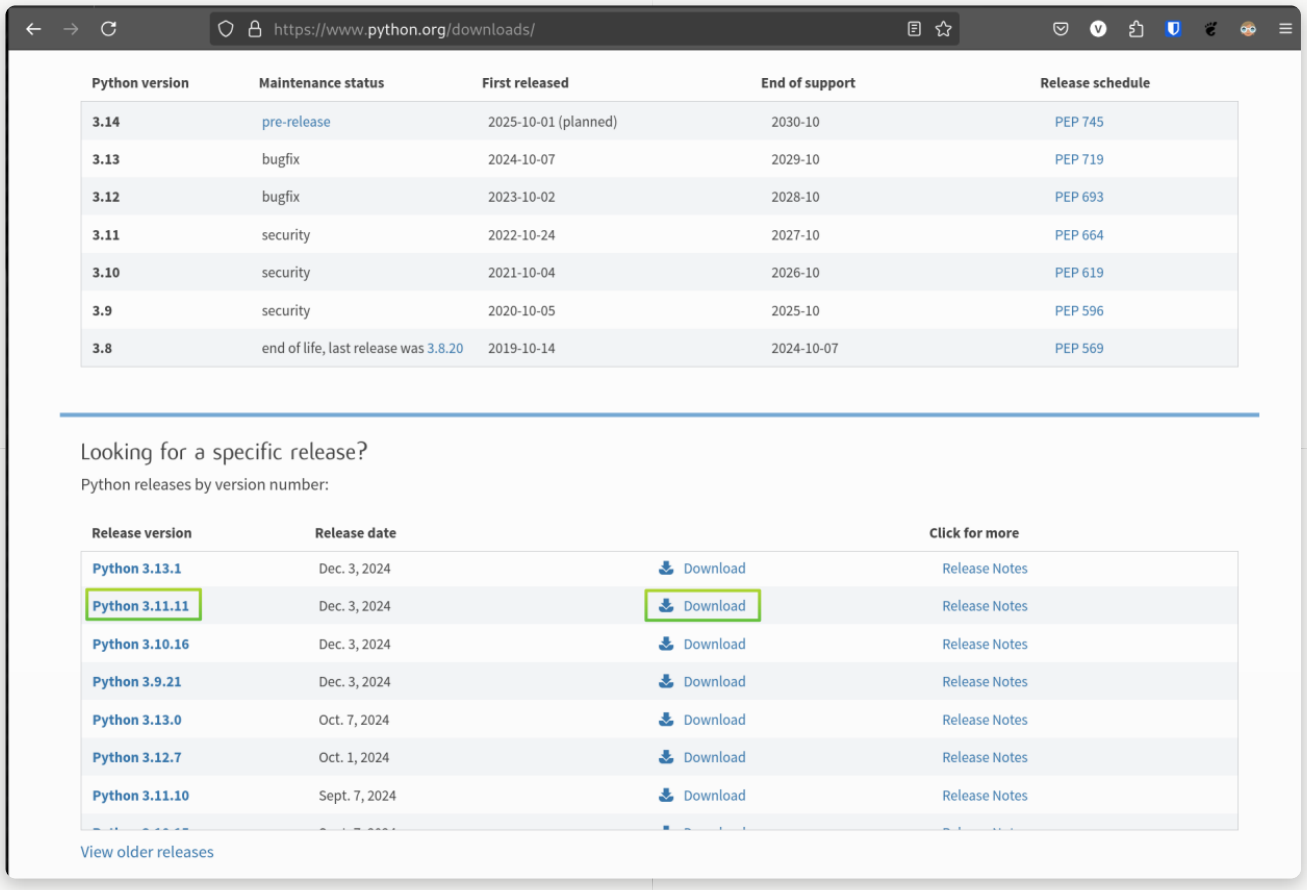
   Check the Python version in Blender by going to Scripting. In the Python Console you can see the version number of the Python interpreter



In our case it is version 3.11.7

We will need to install the closest version in our Linux machine.

We check in Python Downloads.



The closest version is 3.11.11. So we download the Gzipped source tarball and install it.

We use the “altinstall” option to avoid overwriting the default Python version which could cause conflicts with the default installed version of the linux operating system.

```
wget https://www.python.org/ftp/python/3.11.11/Python-3.11.11.tgz
tar -xvf Python-3.11.11.tgz
cd Python-3.11.11
sudo dnf install gcc openssl-devel bzip2-devel libffi-devel
./configure --enable-optimizations
nproc
make -j 4 #adjust the value to the one provided by nproc
sudo make altinstall
```

```
Python-3.11.11/.mailmap
Python-3.11.11/.pre-commit-config.yaml
Python-3.11.11/.readthedocs.yml
Python-3.11.11/Doc/
Python-3.11.11/Doc/Makefile
Python-3.11.11/Doc/README.rst
Python-3.11.11/Doc/_static/
```

```
falken10vdl@monster:~/python/Python-3.11.11
Python-3.11.11/configure.ac
Python-3.11.11/install-sh
Python-3.11.11/pyconfig.h.in
Python-3.11.11/setup.py
[falken10vdl@monster python]$ cd Python-3.11.11/
[falken10vdl@monster Python-3.11.11]$ sudo dnf install gcc openssl-devel bzip2-devel libffi-devel
[sudo] password for falken10vdl:
github_git-lfs                                                                                                  352  B/s | 833  B     00:02
github_git-lfs-source                                                                                           329  B/s | 833  B     00:02
Package gcc-11.5.0-5.el9_5.alma.1.x86_64 is already installed.
Package openssl-devel-1:3.2.2-6.el9_5.1.x86_64 is already installed.
Package bzip2-devel-1.0.8-10.el9_5.x86_64 is already installed.
Package libffi-devel-3.4.2-8.el9.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[falken10vdl@monster Python-3.11.11]$ ./configure --enable-optimizations
checking build system type... x86_64-pc-linux-gnu
checking host system type... x86_64-pc-linux-gnu
checking for Python interpreter freezing... ./_bootstrap_python
checking for python3.11... python3.11
checking Python for regen version... Python 3.11.11
checking for pkg-config... /usr/bin/pkg-config
checking pkg-config is at least version 0.9.0... yes
```

```
falken10vdl@monster:~/python/Python-3.11.11
config.status: creating Makefile.pre
config.status: creating Misc/python.pc
config.status: creating Misc/python-embed.pc
config.status: creating Misc/python-config.sh
config.status: creating Modules/Setup.bootstrap
config.status: creating Modules/Setup.stdlib
config.status: creating Modules/ld_so_aix
config.status: creating pyconfig.h
configure: creating Modules/Setup.local
configure: creating Makefile
[falken10vdl@monster Python-3.11.11]$ nproc
16
[falken10vdl@monster Python-3.11.11]$ make -j 16
Running code to generate profile data (this can take a while):
# First, we need to create a clean build with profile generation
# enabled.
make profile-gen-stamp
make[1]: Entering directory '/home/falken10vdl/python/Python-3.11.11'
make clean
make[2]: Entering directory '/home/falken10vdl/python/Python-3.11.11'
find . -depth -name '__pycache__' -exec rm -rf {} ';'
find . -name '*.py[co]' -exec rm -f {} ';'
find . -name '*.[oa]' -exec rm -f {} ';'
```

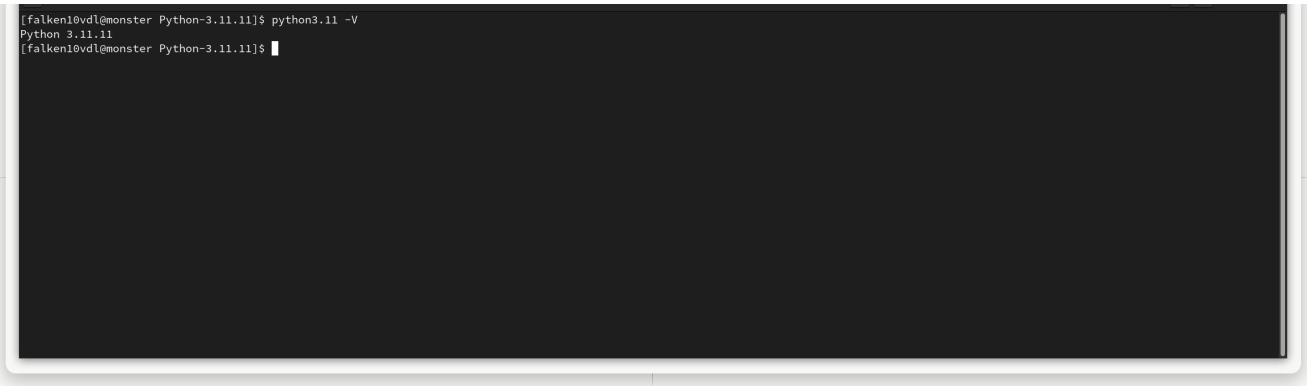
```
falken10vdl@monster:~/python/Python-3.11.11
renaming build/scripts-3.11/pydoc3 to build/scripts-3.11/pydoc3.11
renaming build/scripts-3.11/idle3 to build/scripts-3.11/idle3.11
renaming build/scripts-3.11/2to3 to build/scripts-3.11/2to3-3.11
make[1]: Leaving directory '/home/falken10vdl/python/Python-3.11.11'
[falken10vdl@monster Python-3.11.11]$ sudo make altinstall
if test "no-framework" = "no-framework" ; then \
        /usr/bin/install -c python /usr/local/bin/python3.11; \
else \
        /usr/bin/install -c -s Mac/pythonw /usr/local/bin/python3.11; \
fi
if test "3.11" != "3.11"; then \
        if test -f /usr/local/bin/python3.11 -o -h /usr/local/bin/python3.11; \
        then rm -f /usr/local/bin/python3.11; \
        fi; \
        (cd /usr/local/bin; ln python3.11 python3.11); \
fi
if test "x" != "x" ; then \
        rm -f /usr/local/bin/python3.11-32; \
        lipo  \
                -output /usr/local/bin/python3.11-32 \
                /usr/local/bin/python3.11; \
fi
if test "x" != "x" ; then \
        rm -f /usr/local/bin/python3.11-intel64; \
```

```
falken10vdl@monster:~/python/Python-3.11.11
copying build/scripts-3.11/pydoc3.11 -> /usr/local/bin
copying build/scripts-3.11/idle3.11 -> /usr/local/bin
copying build/scripts-3.11/2to3-3.11 -> /usr/local/bin
changing mode of /usr/local/bin/pydoc3.11 to 755
changing mode of /usr/local/bin/idle3.11 to 755
changing mode of /usr/local/bin/2to3-3.11 to 755
rm /usr/local/lib/python3.11/lib-dynload/_sysconfigdata__linux_x86_64-linux-gnu.py
rm -r /usr/local/lib/python3.11/lib-dynload/__pycache__
/usr/bin/install -c -m 644 ./Misc/python.man \
        /usr/local/share/man/man1/python3.11.1
if test "xupgrade" != "xno"  ; then \
        case upgrade in \
                upgrade) ensurepip="--altinstall --upgrade" ;; \
                install|*) ensurepip="--altinstall" ;; \
        esac; \
         ./python -E -m ensurepip \
                $ensurepip --root=/ ; \
fi
Looking in links: /tmp/tmpisfl8hch
Requirement already satisfied: setuptools in /usr/local/lib/python3.11/site-packages (65.5.0)
Requirement already satisfied: pip in /usr/local/lib/python3.11/site-packages (24.0)
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager. It is recommended to use a virtual environment instead: ht
tps://pip.pypa.io/warnings/venv
[falken10vdl@monster Python-3.11.11]$
```

After this, we have the 3.11 python version installed in our machine. It is reachable by typing *python3.11* in the terminal.

```
python3.11 -V
```

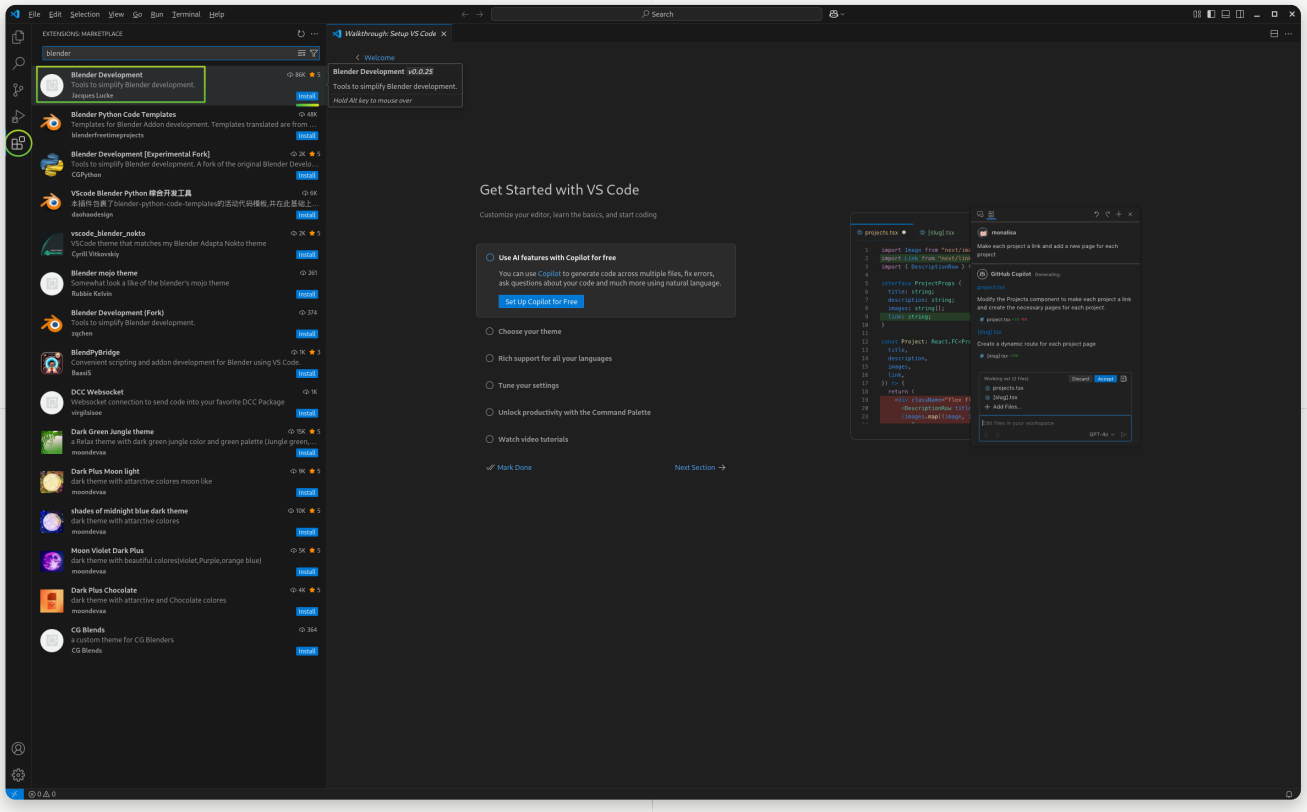
```
falken10vdl@monster:~/python/Python-3.11.11
```



Congratulations! You have now a Python version in VSCode similar to the one run by Blender.

5. **Connect VSCode to Blender by means of VSCode's extension: "Blender Development"**: This steps is crucial to be able to develop and debug scripts in VSCode ans interactivwely see the results in Blender.

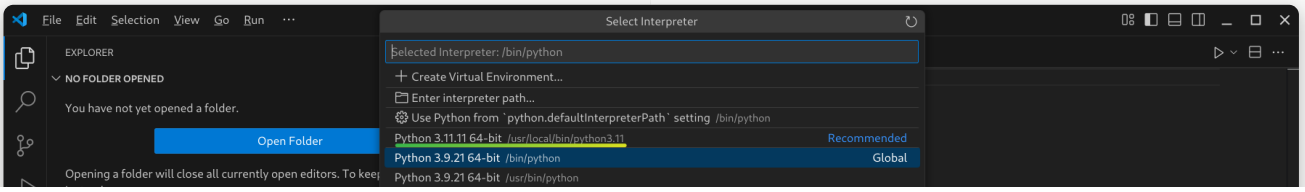
   Launch VSCode and go to the Extensions tab, search for Blender Development and install it.

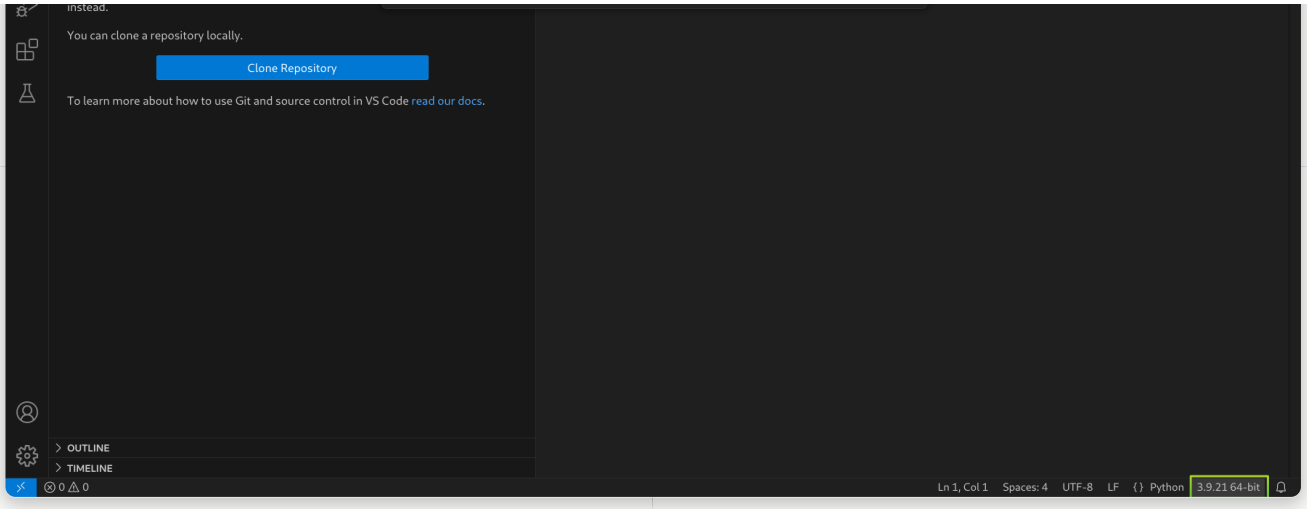


This will also install some Python related extensions.

Finally create a sample python file and check the Python interpreter version in the bottom left corner.

File ▸ New File... ▸ Python File





6. **Test that you can develop python scripts in VSCode for Belnder**: Create a sample blender python file. you can use whatever blender python script you want. We will use this one from the blender documentation: Example Panel

```
import bpy

class HelloWorldPanel(bpy.types.Panel):
    """Creates a Panel in the Object properties window"""
    bl_label = "Hello World Panel"
    bl_idname = "OBJECT_PT_hello"
    bl_space_type = 'PROPERTIES'
    bl_region_type = 'WINDOW'
    bl_context = "object"

    def draw(self, context):
        layout = self.layout

        obj = context.object

        row = layout.row()
        row.label(text="Hello world!", icon='WORLD_DATA')

        row = layout.row()
        row.label(text="Active object is: " + obj.name)
        row = layout.row()
        row.prop(obj, "name")

        row = layout.row()
        row.operator("mesh.primitive_cube_add")


def register():
    bpy.utils.register_class(HelloWorldPanel)


def unregister():
    bpy.utils.unregister_class(HelloWorldPanel)
```

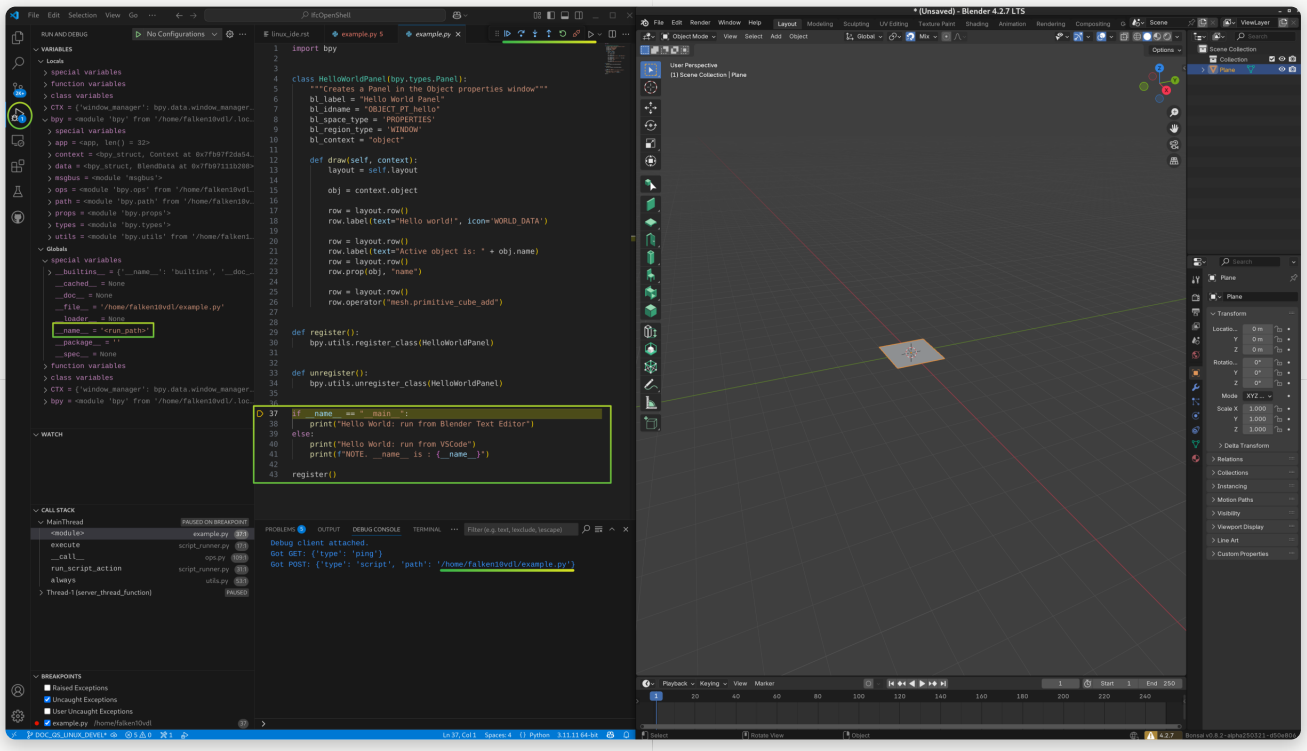
```
if __name__ == "__main__":
    print("Hello World: run from Blender Text Editor")
else:
    print("Hello World: run from VSCode")
    print(f"NOTE. __name__ is : {__name__}")

register()
```

We have changed the last part of the script since running from VSCode has some subtle diferences compared to running from the Blender Text Editor. In particular the special variable *__name__* is different.

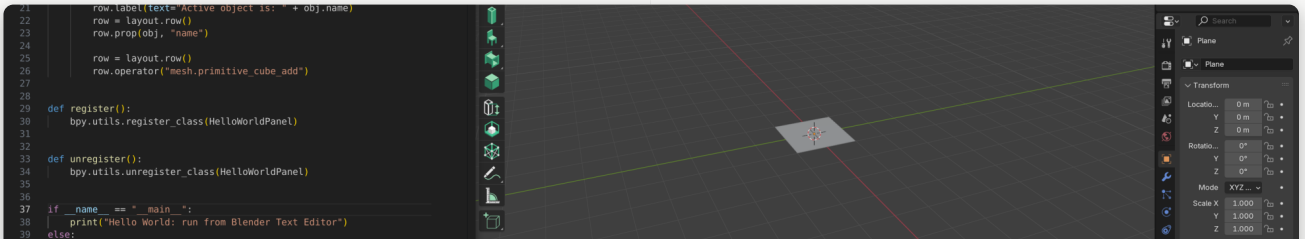
Press CTRL-SHIFT-P and type “Blender: Start”. Blender will start.

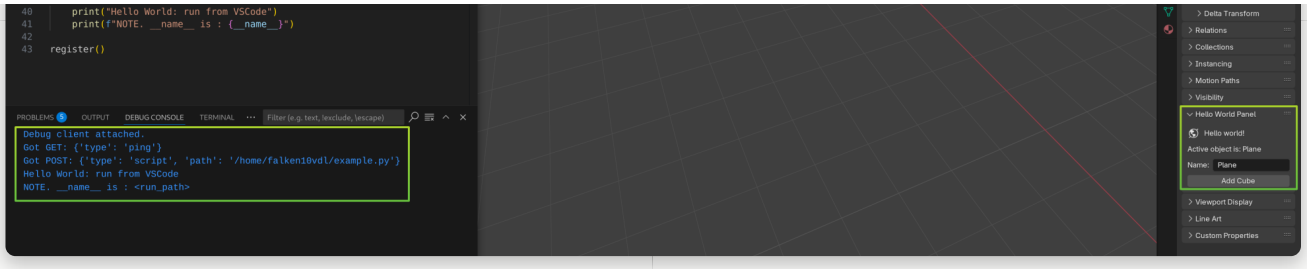
Press CTRL-SHIFT-P and type “Blender: Run Script”. The script will run and the output will be seen in Blender!

As you can see below. We have set a break-point in line 37 (see point 13 below for another example of setting a break-point). We can inspect in the left side the local variables, global variables, add watches, check the stack, etc. For example we can see that __name__ has a valuer of “<run_path>” Instead of “__main__”.



Once we continue execution we can check in the VSCode Terminal the output and in Blender the panel created by the script.



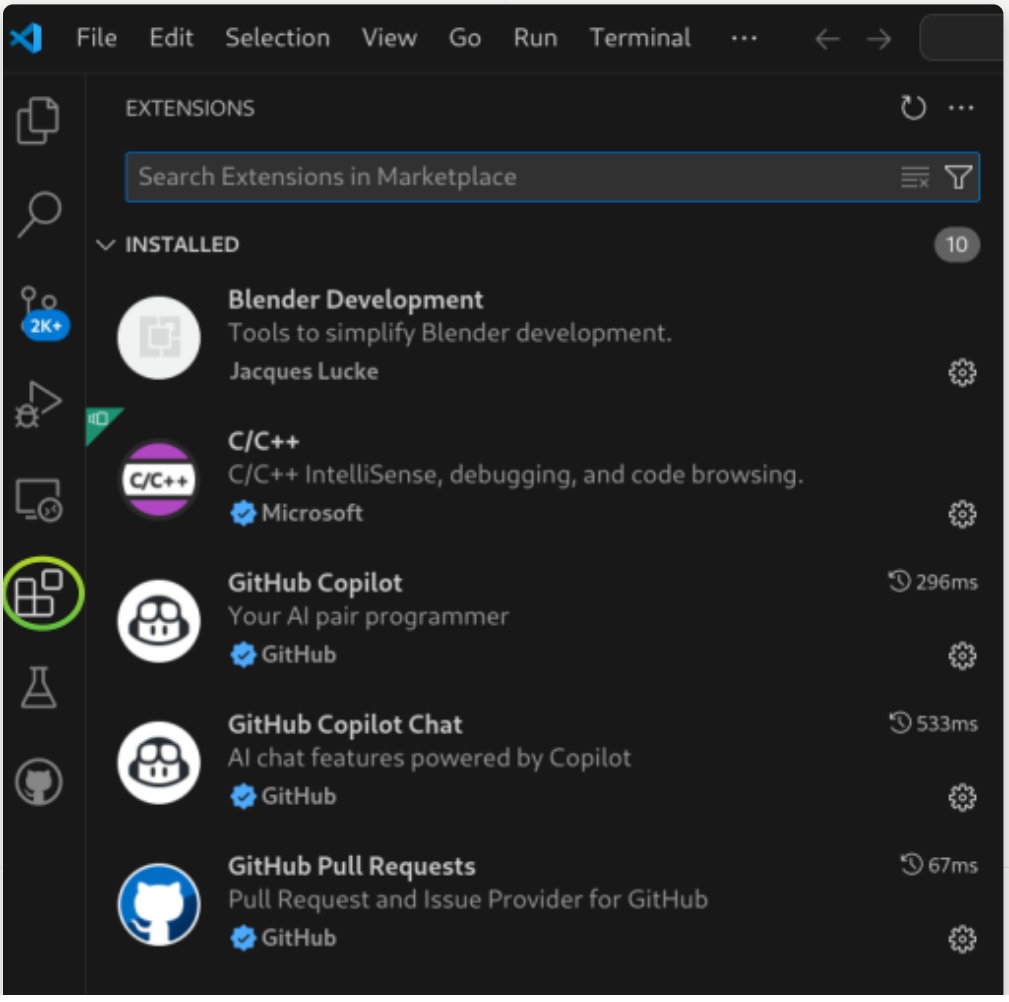


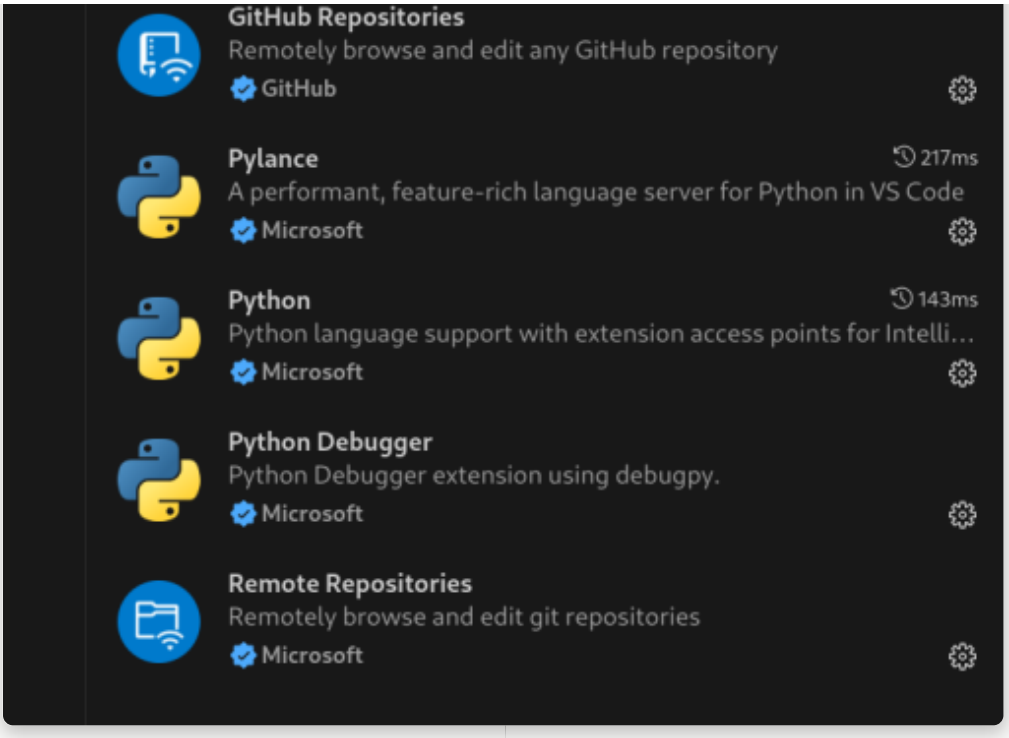
CONGRATULATIONS! You have now a development environment ready to speedup your python scripting in Blender.

Now let's find out how to interact with GitHub in order to make changes to the Bonsai project.

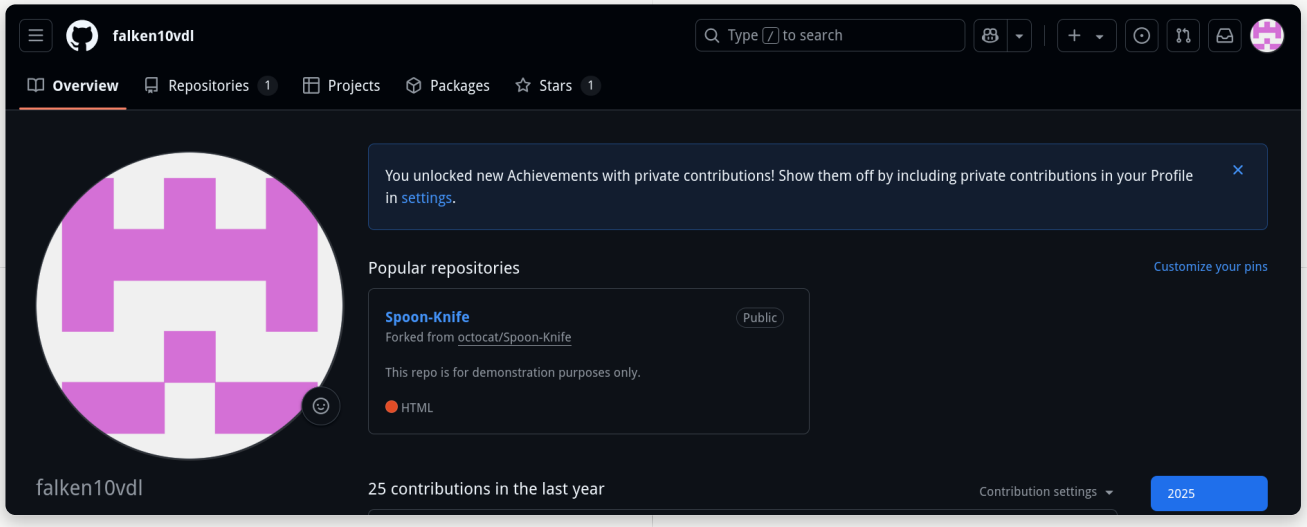
7. **Install GitHub related VSCode extensions**: To facilitate the use of git commands and pulling and pushing files from a local repository towards github, please install as well the following VSCode extensions:
   - GitHub Pull Requests
   - GitHub Repositories
   - Remote Repositories

   Optionaly you can also install Copilot extensions
   - GitHub Copilot
   - GitHub Copilot Chat

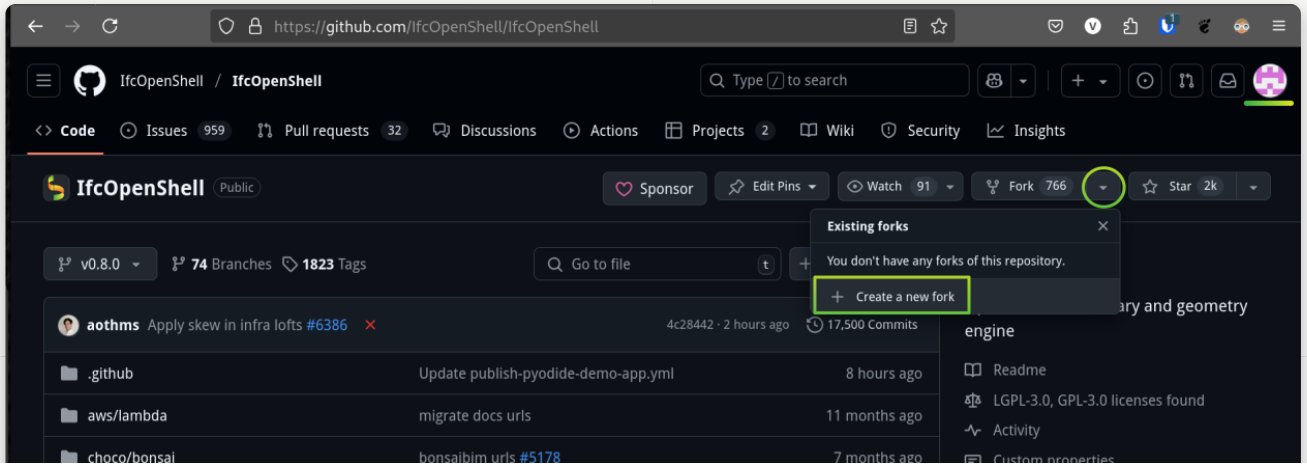


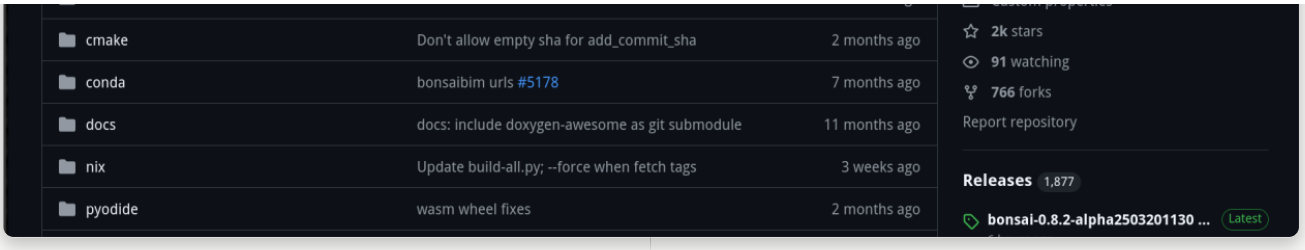


8. **Fork IfcOpenShell project from GitHub**: For this step you will need an account on GitHub. Once you have a registered account you can find it under https://github.com/YOURGITHUBUSERID In the example for *falken10vdl* the link is https://github.com/falken10vdl

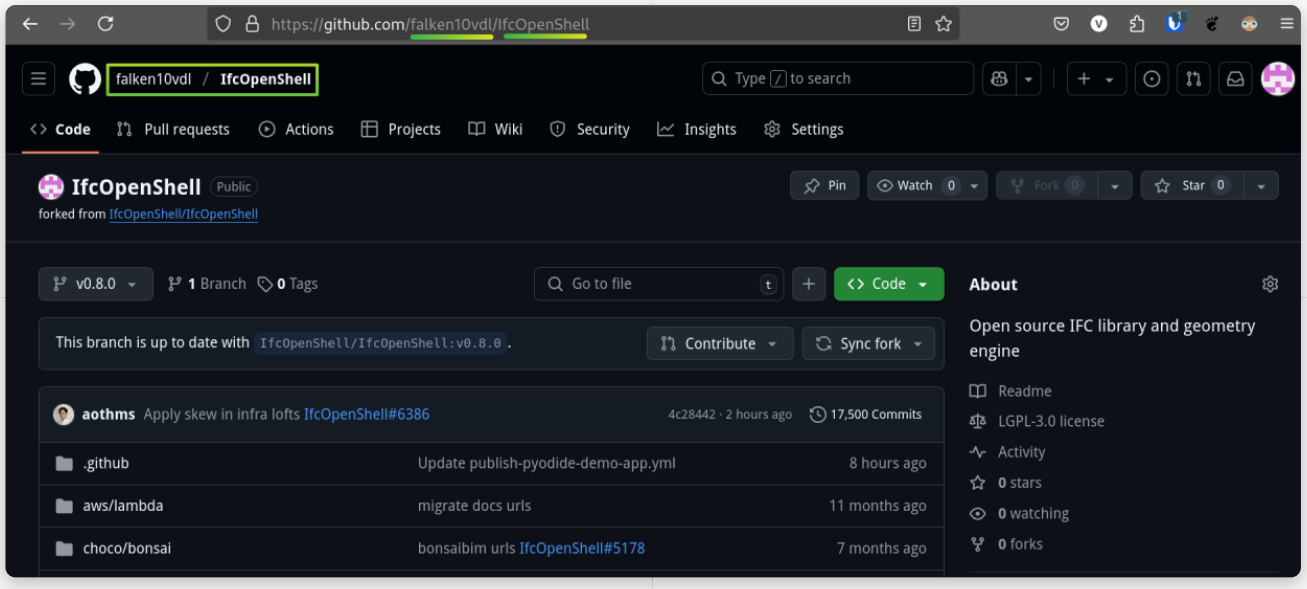


Go to the IfcOpenShell GitHub page. And click on the Fork button. Please make sure that you are logged with your GitHub account as shown in the top right corner of the page.



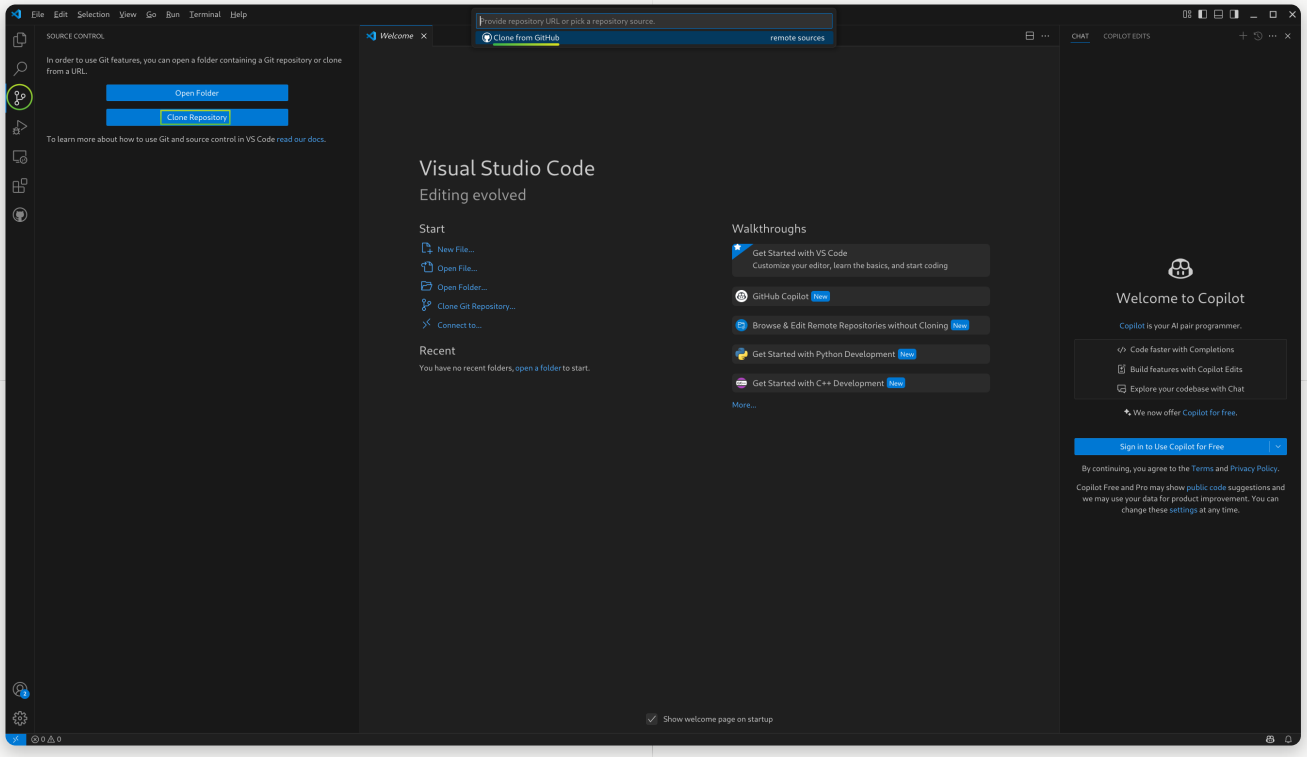


Once the fork is generated you will be redirected to your own fork of the IfcOpenShell project.



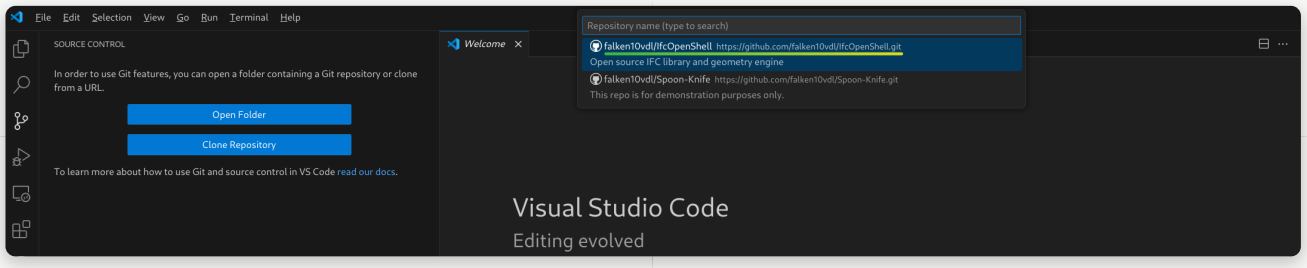
Now we will clone the forked repository to our local machine.

9. **Clone bonsai to our development environment**: Launch VSCode Select the Source Control tool. Then Clone repository and then select “Clone from GitHub”.



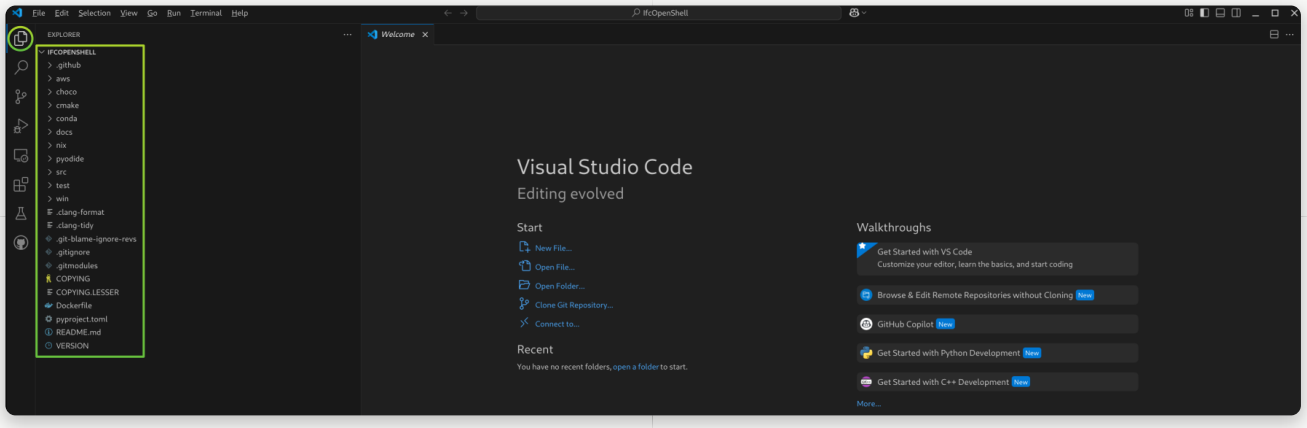
A series of steps will be required to authenticate with GitHub. You will need to provide your GitHub credentials. Once VSCode has authenticated yourself in GitHub, you will be able to select the repository you want to clone. In this case we will clone the IfcOpenShell

repository.



VSCode will ask you to select a folder where the repository will be cloned. and it will start the cloning process.

Once finished, you will see the repository in the Explorer tool.



10. **Link the Bonsai addon to the local cloned repository**: We will now edit the following script that establishes links from the unstable-installation to the cloned repository so we can easily see the changes done in the cloned repository taken effect when we load blender locally.

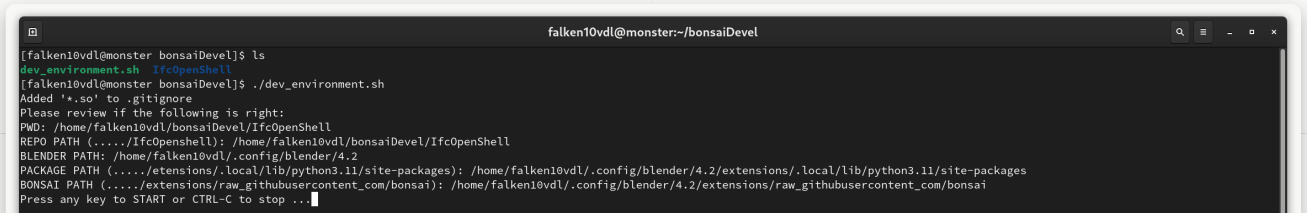
Download dev_environment.sh

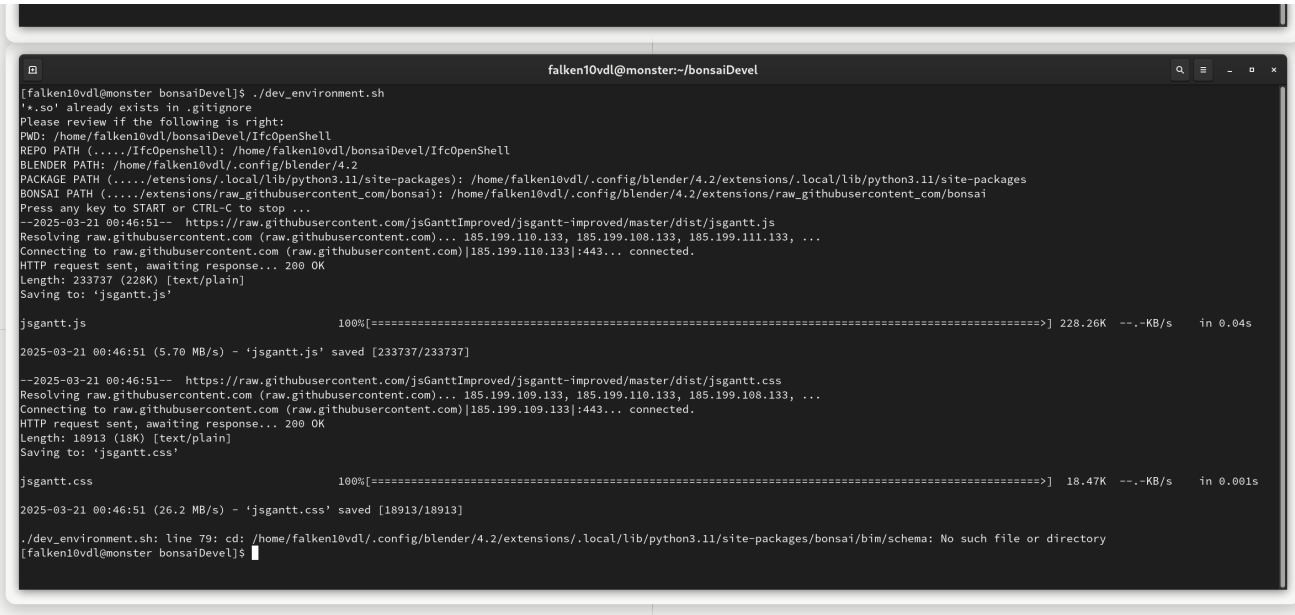
Edit the file to match the paths in your system. In our case we will edit the following lines:

- REPO_PATH="$HOME/bonsaiDevel/IfcOpenShell"
- BLENDER_PATH="$HOME/.config/blender/4.2"
- PACKAGE_PATH="${BLENDER_PATH}/extensions/.local/lib/python3.11/site-packages"
- BONSAI_PATH="${BLENDER_PATH}/extensions/raw_githubusercontent_com/bonsai"

We execute the script in the terminal. Confirm the data and the script will create the necessary links.

```
./dev_environment.sh
```





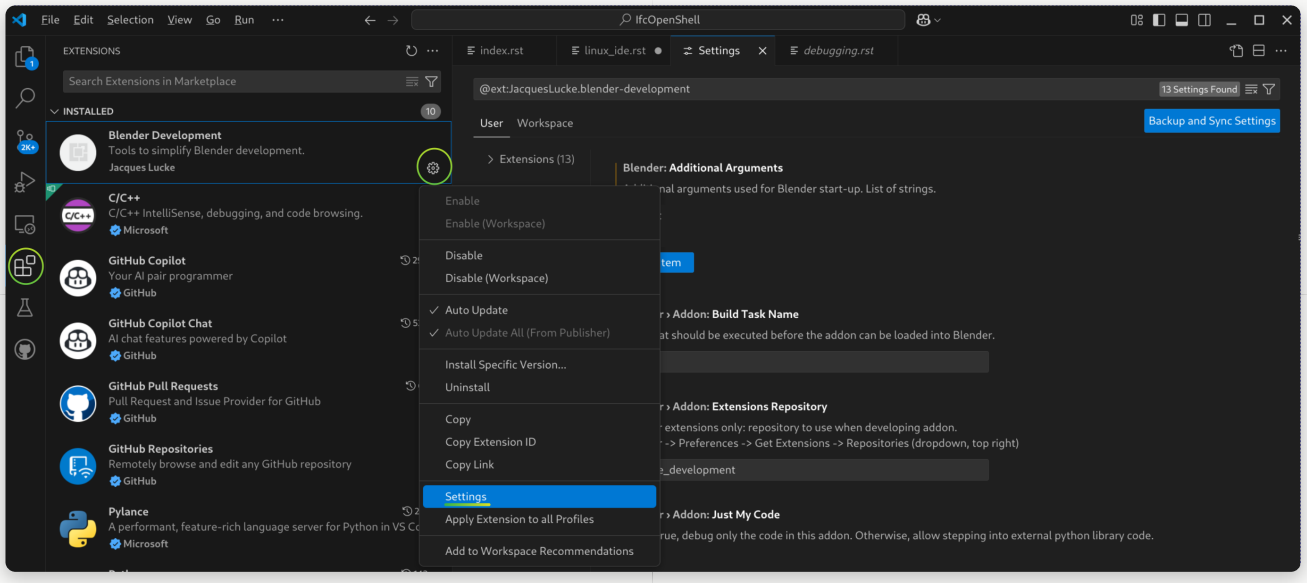
Warning

If you receive an error like this:

```
cp: cannot stat '/home/falken10vdl/.config/blender/4.2/extensions/.local/lib/python3.11/site-pack
```

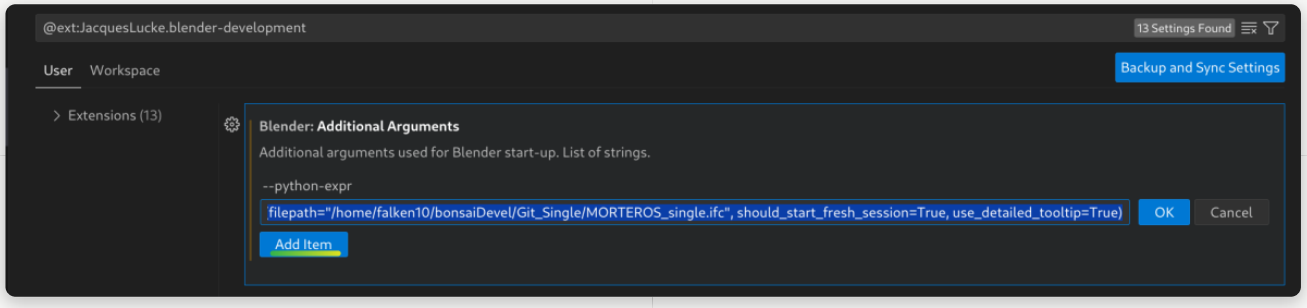
It means that you have not installed the Bonsai Blender extension. Please refer to tha last part of point 2. above and follow the Unstable installation.

11. **Adjust the VSCode Blender extensionst**: We will now make some adjustments to the VSCode Blender extension to ease the reload of the addon. Select the Extensions tool. Then Blender Development and then select Settings.

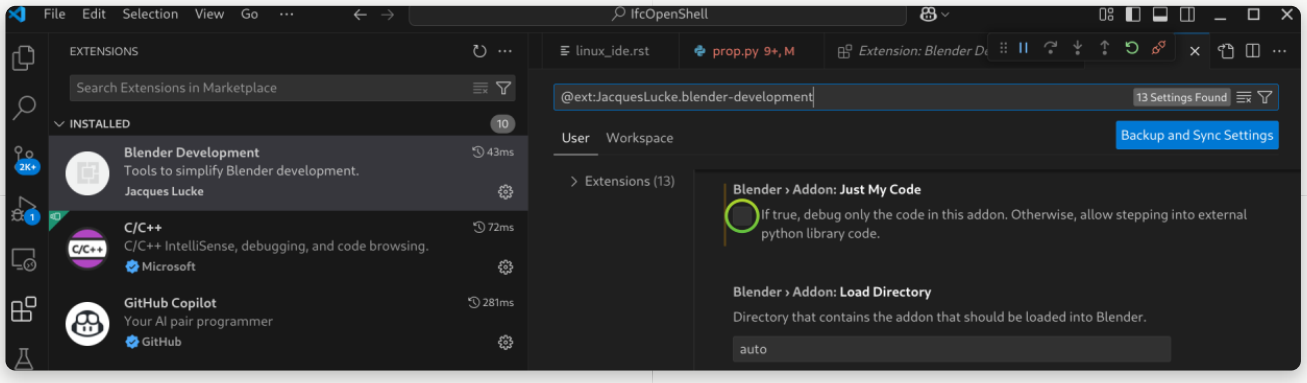


Click twice in “Add Item” within the *Blender: Additonal Arguments* section and add the following two items (adapt *Testing.ifc* to the name of the IFC file you want to test during Bonsai development):

- –python-expr
- import bpy; bpy.ops.bim.load_project(filepath=”/home/falken10vdl/bonsaiDevel/Testing.ifc”, should_start_fresh_session=True, use_detailed_tooltip=True)

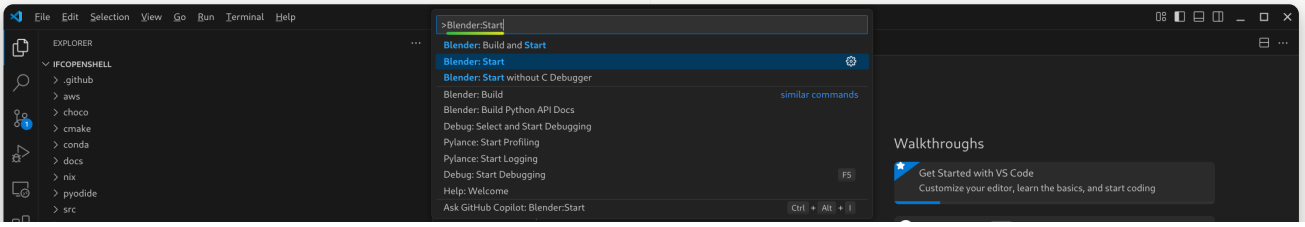


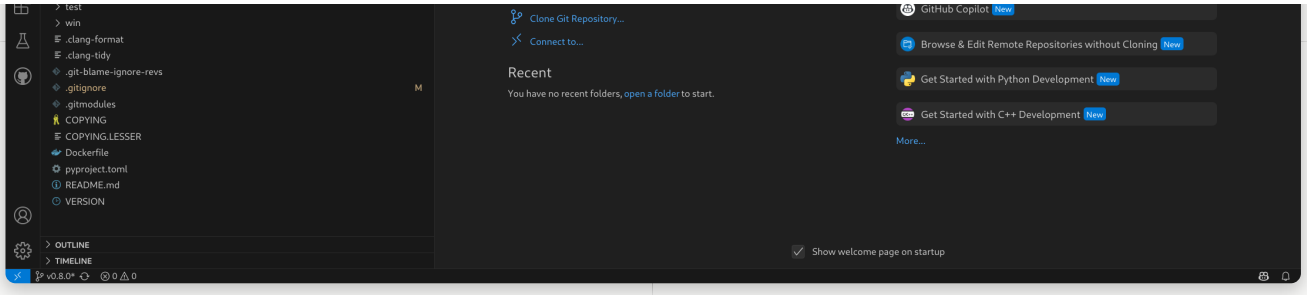
Make sure that Blender > Addon: Just My code is not selected (This allows to set the breakpoints anywhere in the source code).



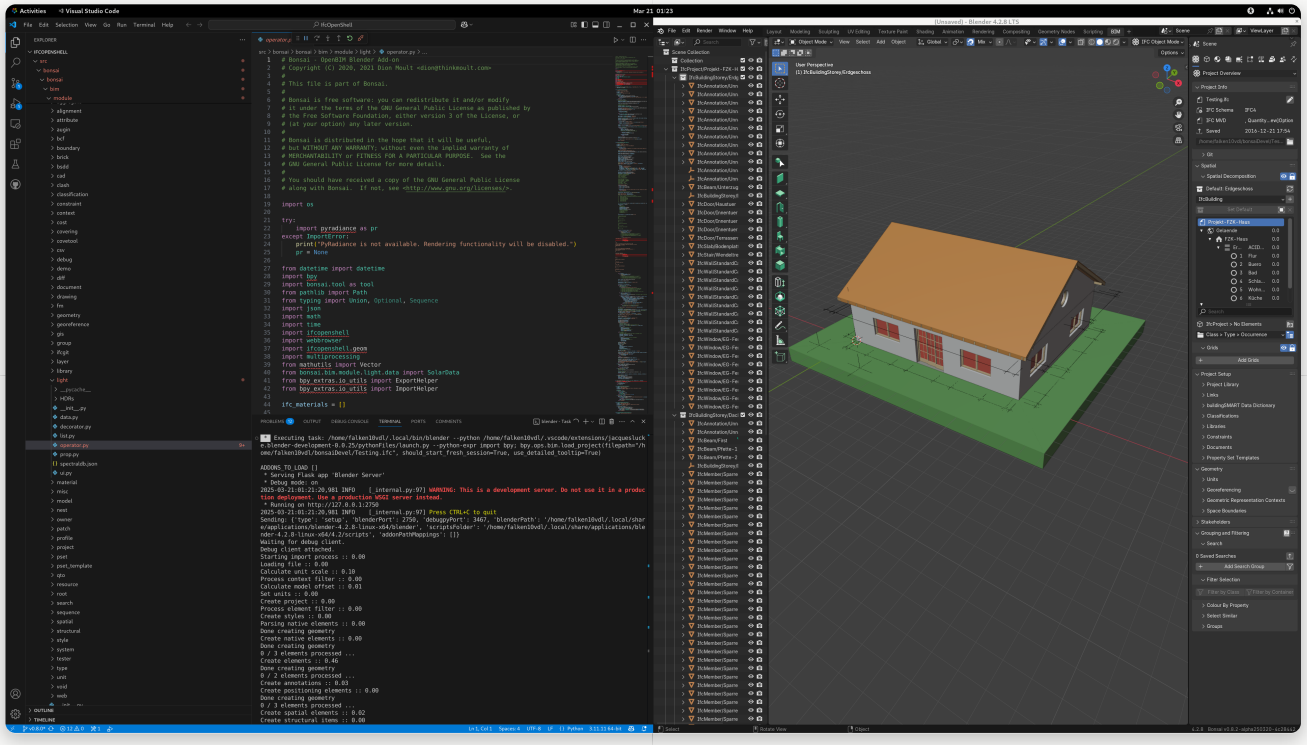
> **Warning**
>
> This way to use the VSCode Blender extension is not the standard one. Refer to the VSCode Blender extension documentation for the standard way to use it. The reasond behind is that this allows us to start VSCode in the top of the cloned repository so all the Git related funtionality in VSCode works properly and we have a complete view from VSCode Explorer tool of the whole repository.
>
> Bonsai is a big project with a lot of dependencies so reloading it it is not an easy task (see discussion in https://community.osarch.org/discussion/1650/vscode-and-jacquesluckes-blender-vscode/p1). We have taken the pragmatic approach to start blender with a specific file (*Testing.ifc*) and then we can reload the addon from the Blender UI which also upload automatically the changes in the addon and the testing file To summarize:
>
> - We need *Blender > Addon: Just My code* to get the breakpoint functionality even if the addon is not "registered/loaded" to the extension (due to the root folder we use)
> - We need *Blender: Additonal Arguments* to automatically load the Testing.ifc file when we start Blender from VSCode (We do not use *Blender:Reload Addons* since it does not work in our case)
>
> Instead of restarting Blender from VSCode, we use the Blender UI that, as explainedin the next step, it provides a simple way to get the addon and the Testing file reloaded.

12. **Launch blender from VSCode**: We are now ready to launch Blender from VSCode. Open VSCode. Open the cloned repository if not already open. Press CTRL-SHIFT-P and type "Blender: Start".

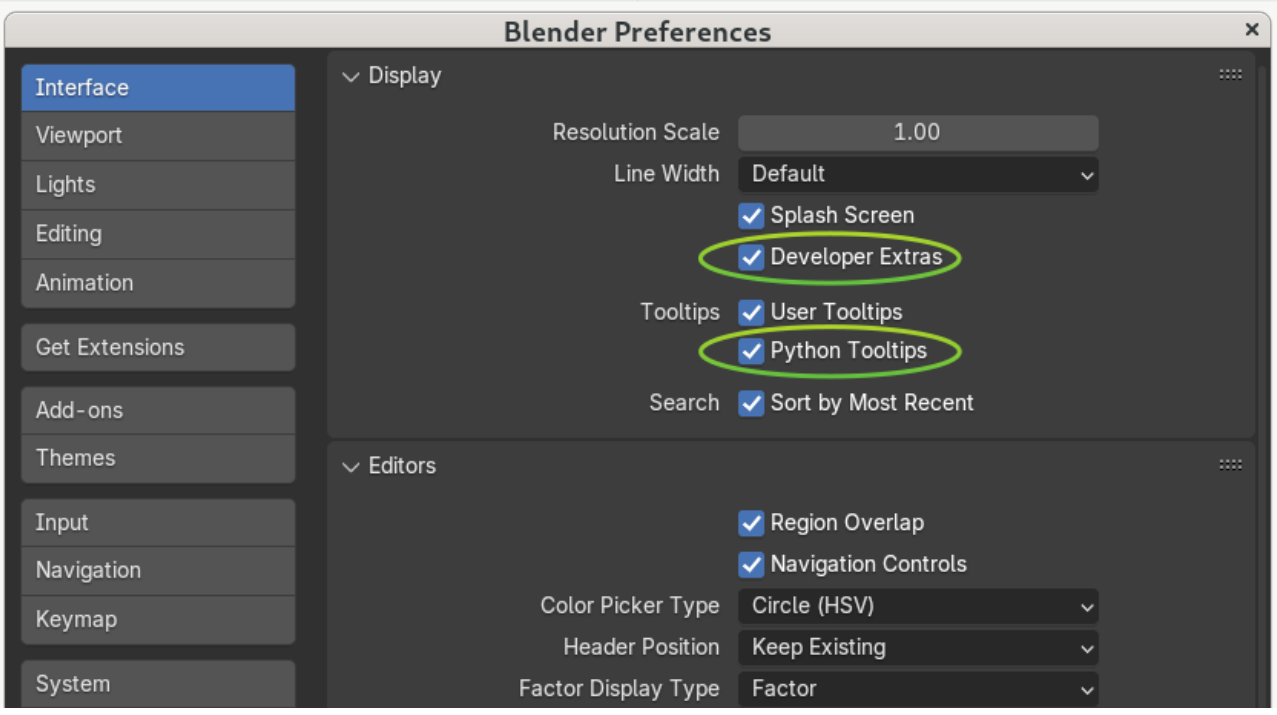


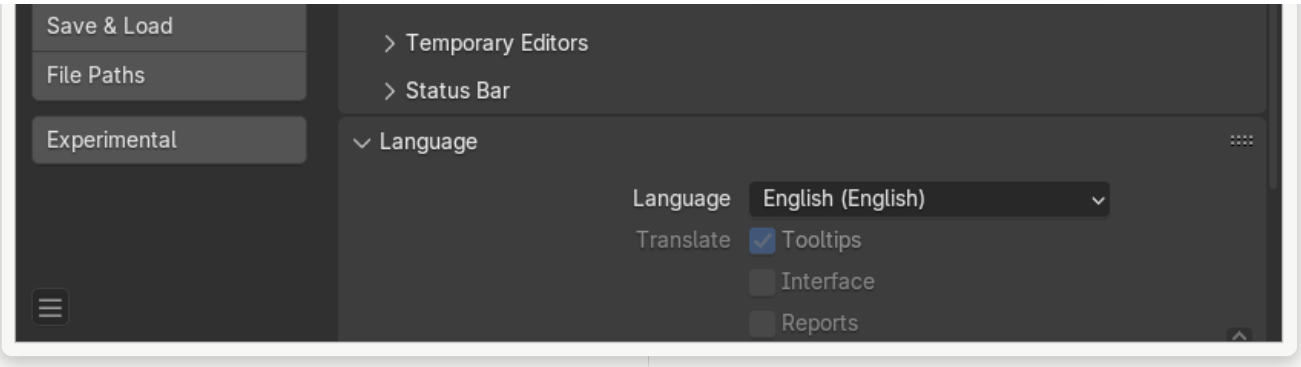


Blender will start loading the Testing.ifc file. You can now start exploring the code and make changes to the addon!

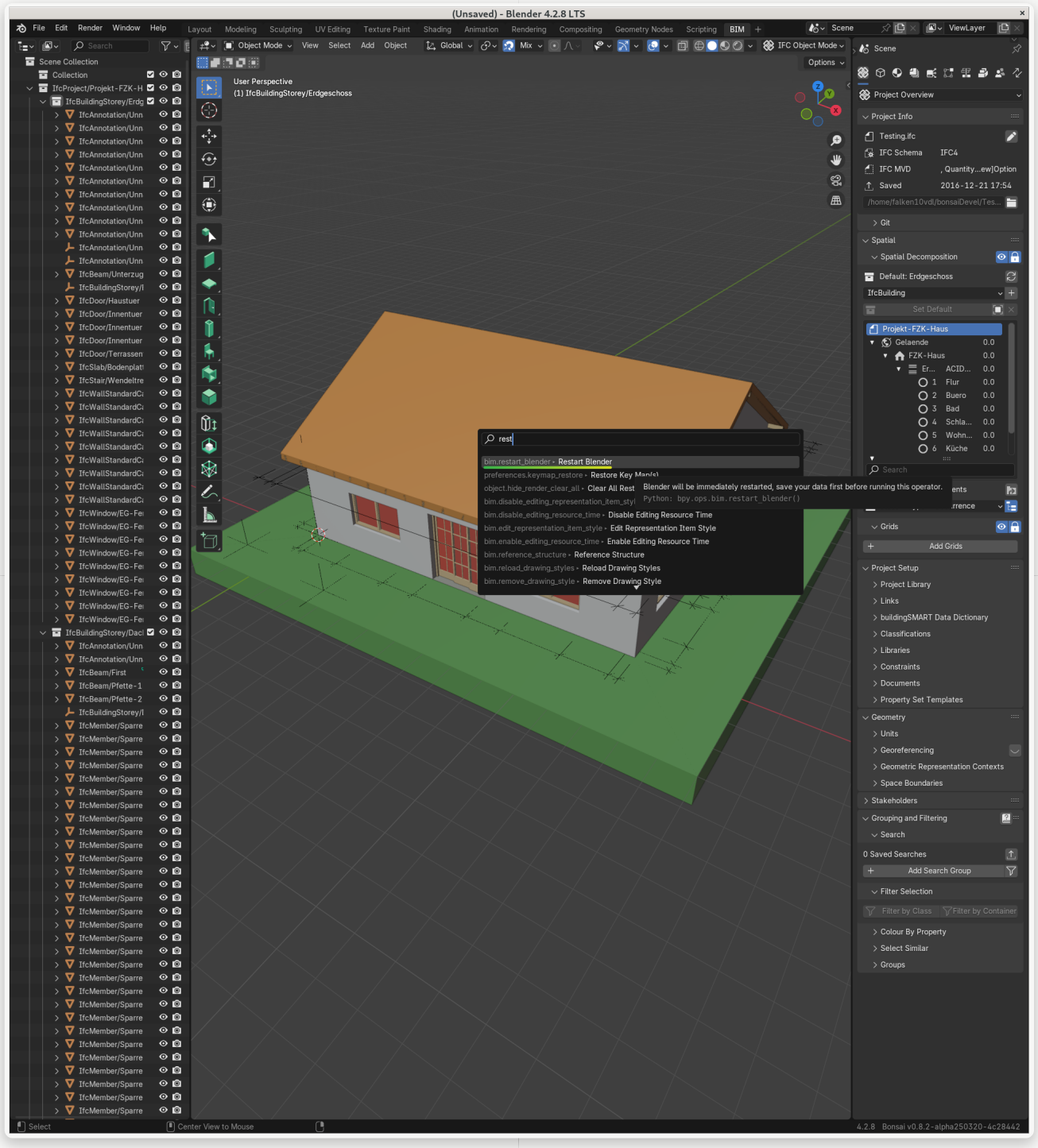


In order to be able to restart blender (and reload the addons + reload teh Testing file) we need to enable “Developer Extras” and also a good practice is to enable “Python Tooltips” in Edit ▸ Preferences ▸ Interface.





Once these are enabled, you can press F3 and write restart to restart Blender.

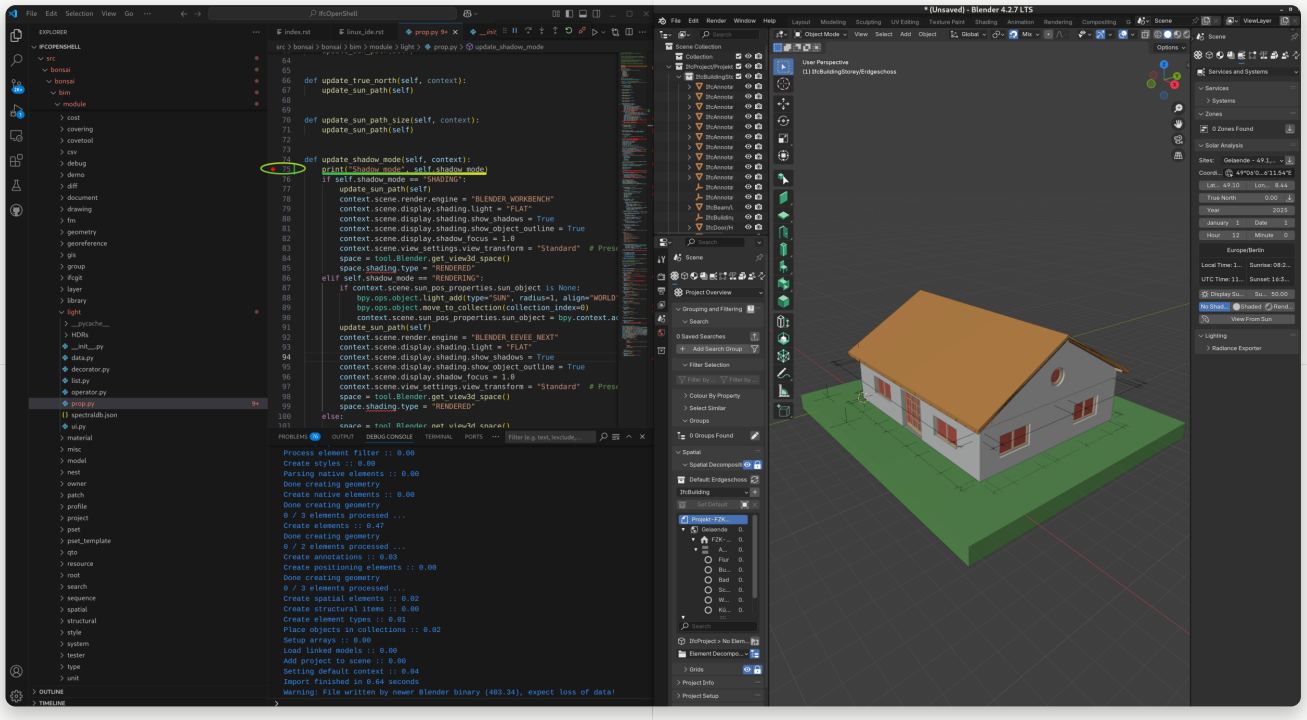


13. **Add a break-point**: Let's add a break-point in the code to see how it works. Press CTRL_SHIFT_P and type "Blender: Start". Blender will start. Open the cloned folder and go to *src > bonsai > bonsai > bim > module > ligth > prop.py* and go to line 75. Add a line

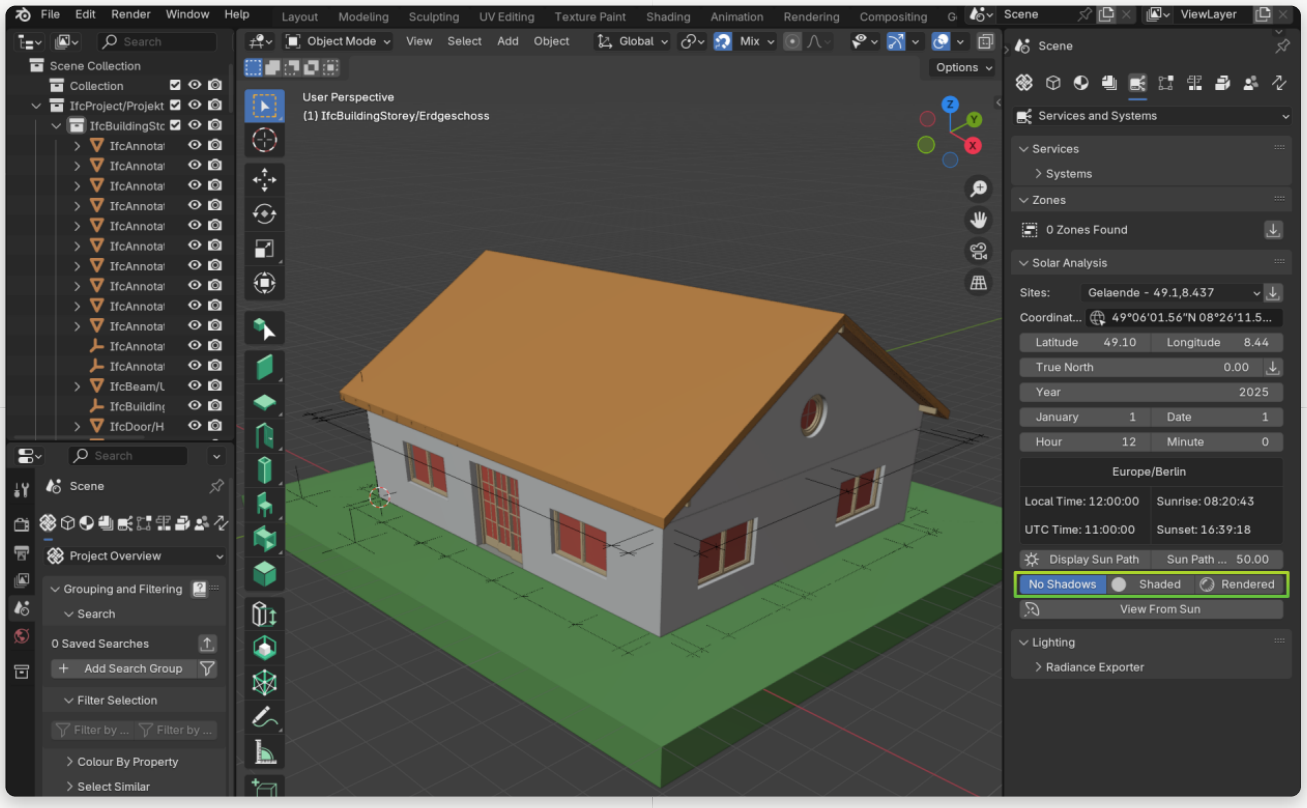
for a print statemente and click on the left side of the line number to add a break-point.

```
74    def update_shadow_mode(self, context):
75        print("Shadow mode", self.shadow_mode)
76        if self.shadow_mode == "SHADING":
```

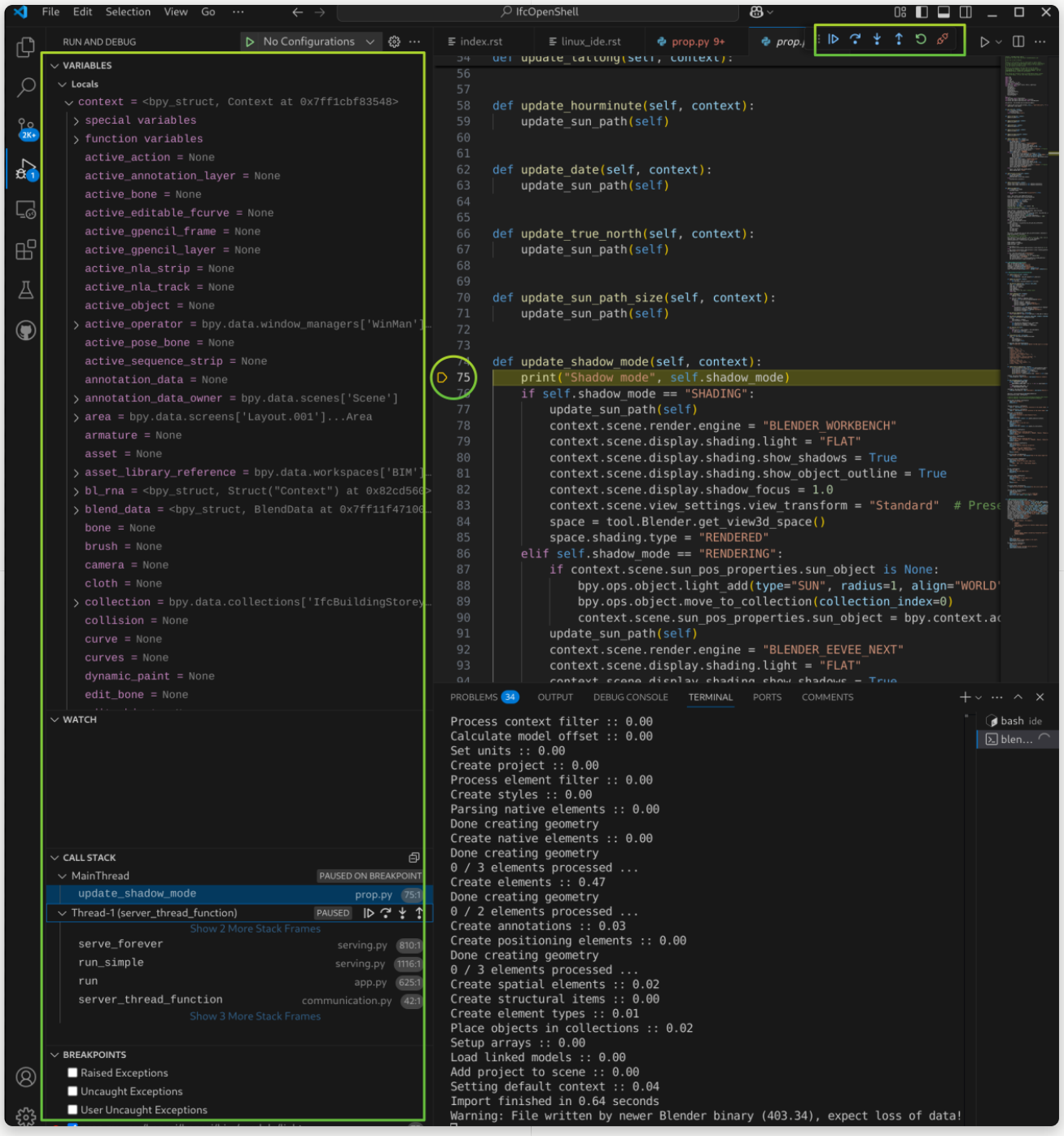
Set a break-point in line 75.



In Blender. Go To SOLAR ANALYSYS Tool in Bonsai and Click in “No Shadow”, “Shaded” or “Rendered”



This will trigger the break-point. See how the execution is stopped at the break-point.



From here you can watch the local variables, global variables, add watches, check the stack, etc. Resume execution or move step by step to see how the code is executed.

CONGRATULATIONS! You have now a development environment ready to explore the Bonsai code and contribute to the project.

14. **Make changes and do a Pull Request to the project**: In the previous steps we got a complete IDE to explore and make changes to the Bonsai sourcecode. In this step we will provide a simple workflow of using Git commands within VSCode to make changes and do a Pull Request to the project. Bonsai changes very fast so our cloned repository will be outdated very soon. We propose to do the following:

    a. Check in our GitHub page if our project fork (https://github.com/falken10vdl/IfcOpenShell) is outdated compared to the IfcOpenShell main branch (https://github.com/IfcOpenShell/IfcOpenShell).

b. Sync our fork with the upstream branch (if needed).

c. Pull the changes in our porject fork to our local repository (/home/falken10vdl/bonsaiDevel).

d. Create a new branch in our local repository (example: *DOC_QS_IDE*)

e. Publish the branch to our project fork in GitHub.

f. Make changes in the code.

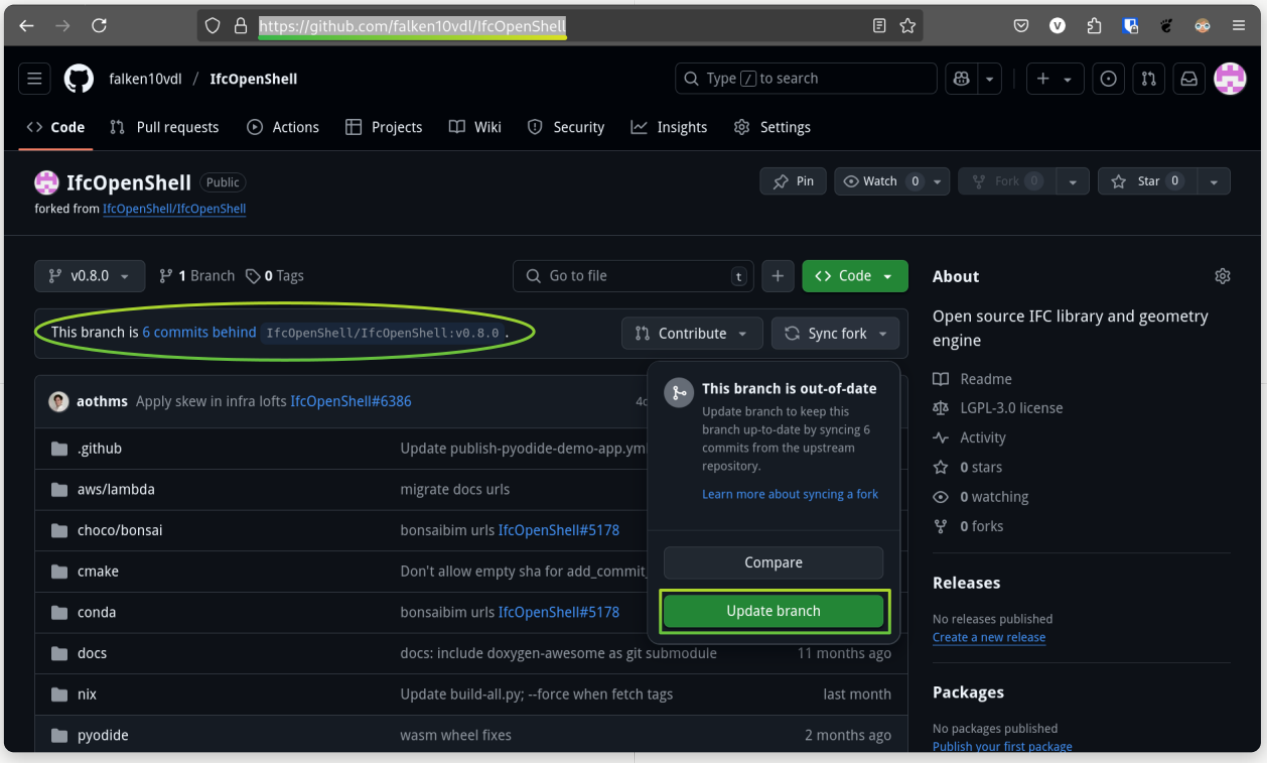
g. Commit the changes.

h. Push the changes to our project fork.

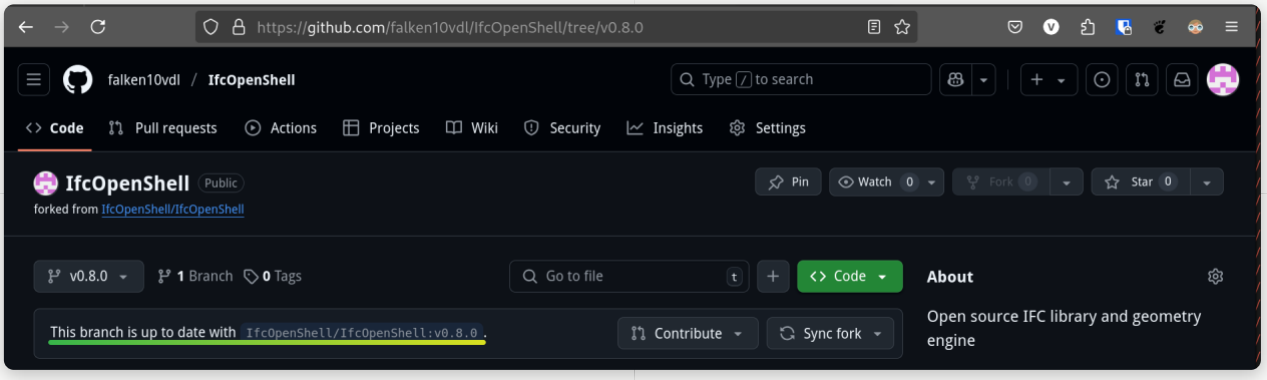
i. Create a Pull Request to the upstream main branch of the IfcOpenShell project.

Letis see below the steps with an example of changing the documentation of the Quickstart guide for the IDE in Linux.

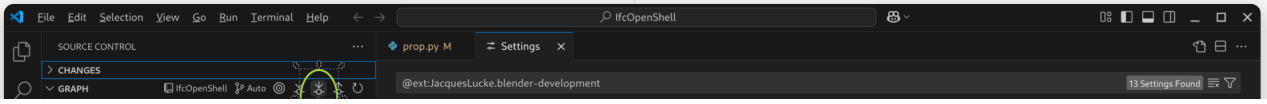
a. Check in our GitHub page if our project fork is outdated. Click *Update branch*

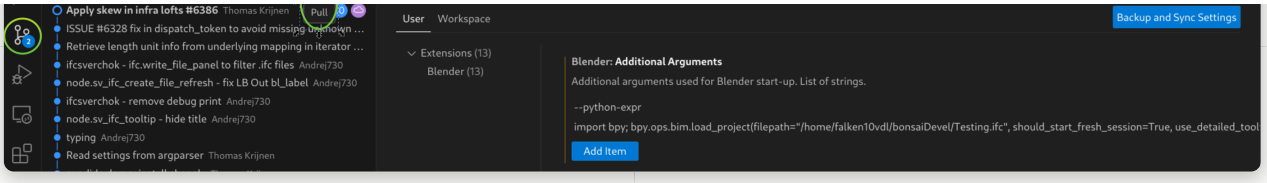


b. After clicking *Update brnach* our fork is up to date with the upstream main branch.

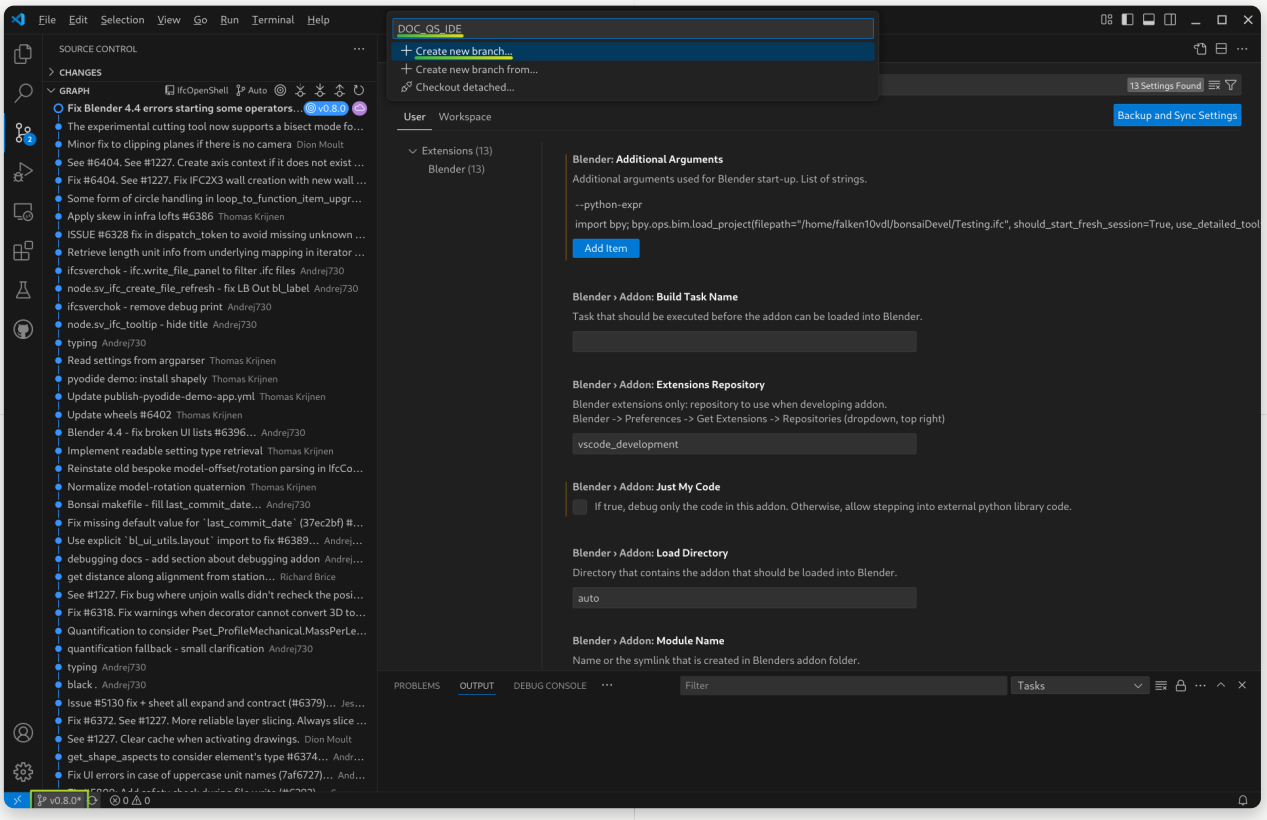


c. Pull the changes in our porject fork to our local repository

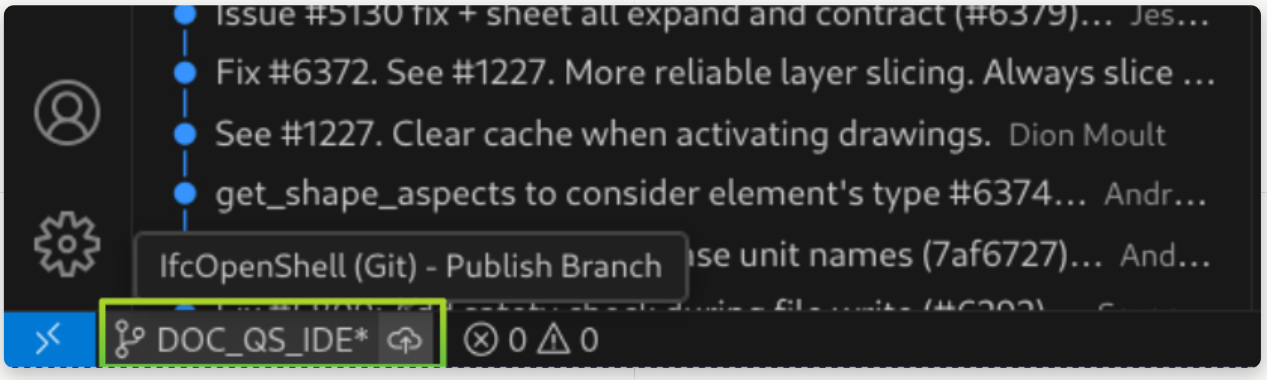




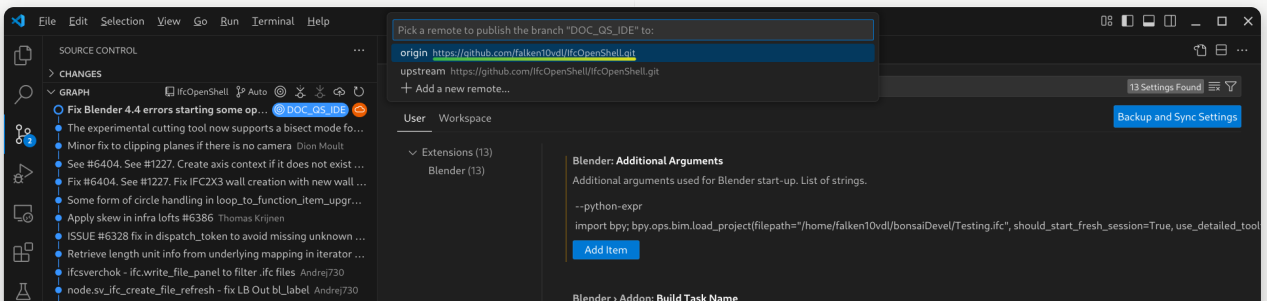
d. Create a new branch in our local repository by clicking in the current branch name in the bottom left corner of the VSCode window. Give a name to the branch and press Enter.

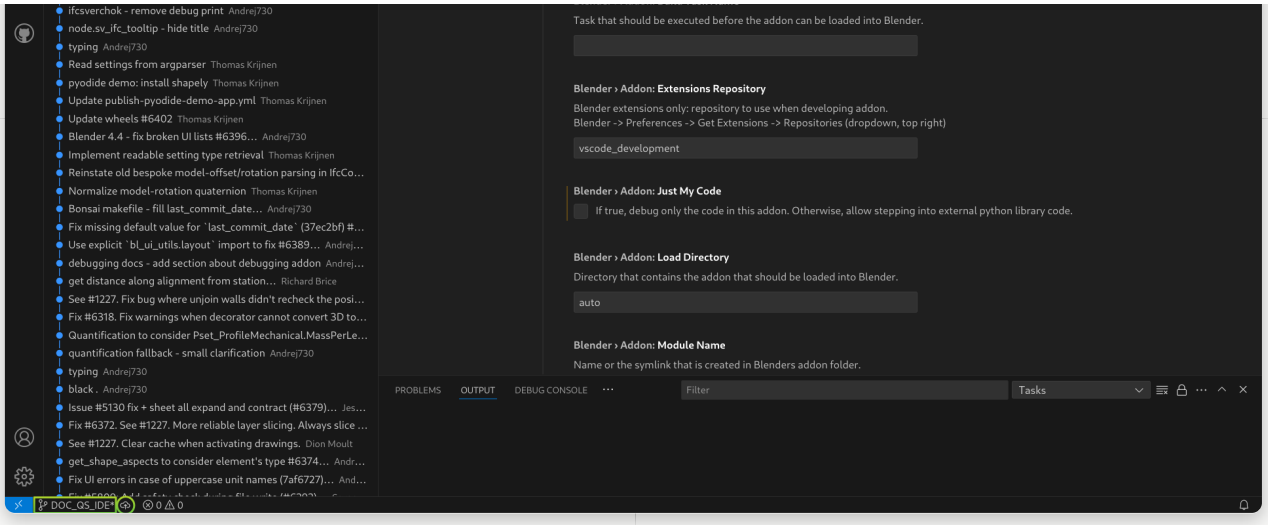


The new branch is created and we can see it in the bottom left corner of the VSCode window.

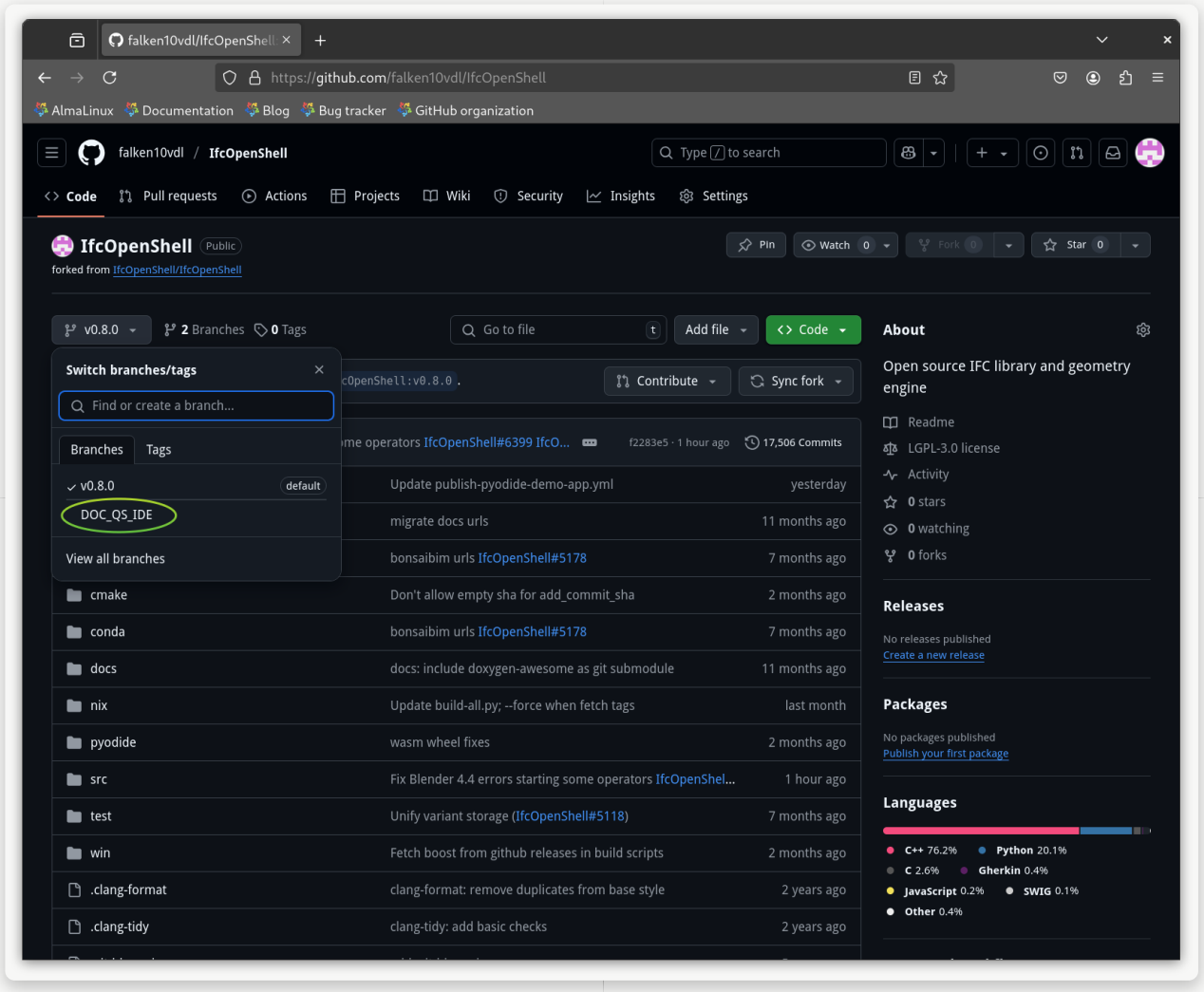


e. Publish the branch to our project fork in GitHub by clicking in the publish button (*little cloud with up arrow*) in the bottom left corner of the VSCode window. Select as origin the project fork.

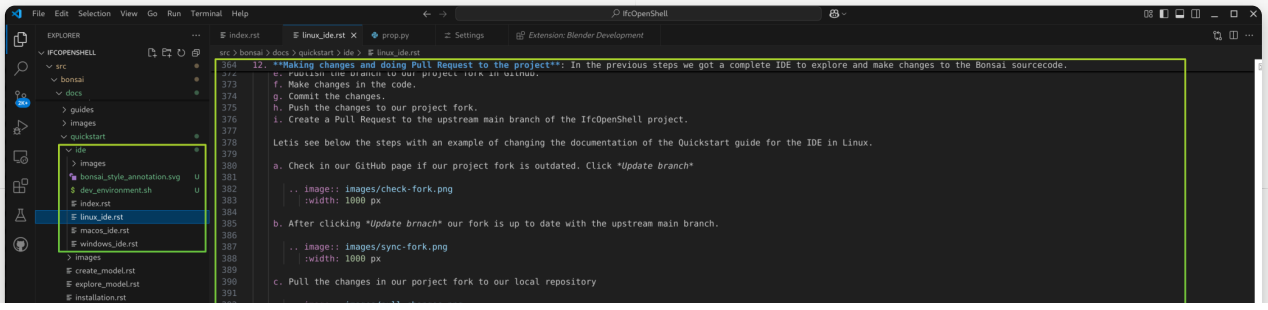


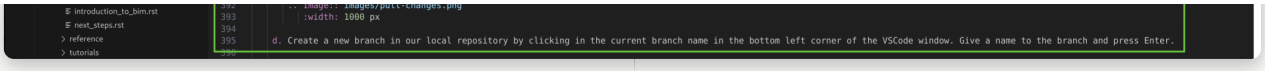


Check that the branch is now in our project fork in GitHub.

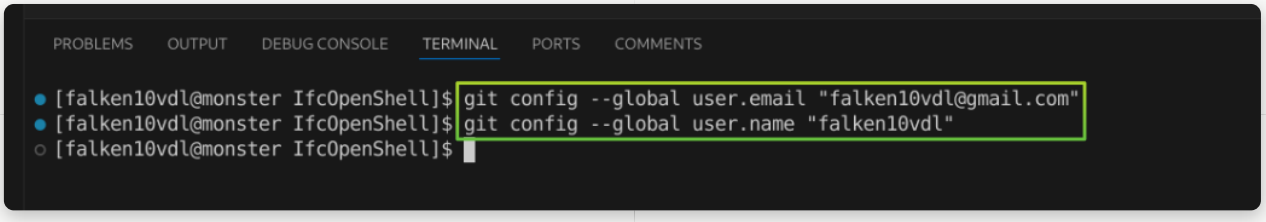


f. Make changes in the code. In this case we will change documentation by adding a Quickstart for the IDE in Linux. :)

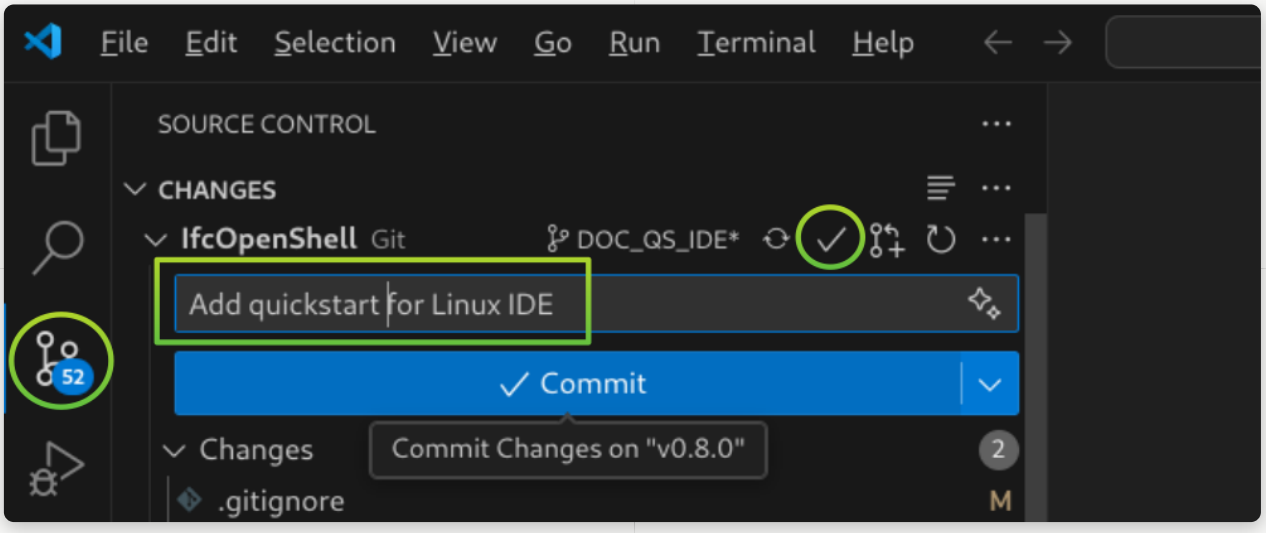




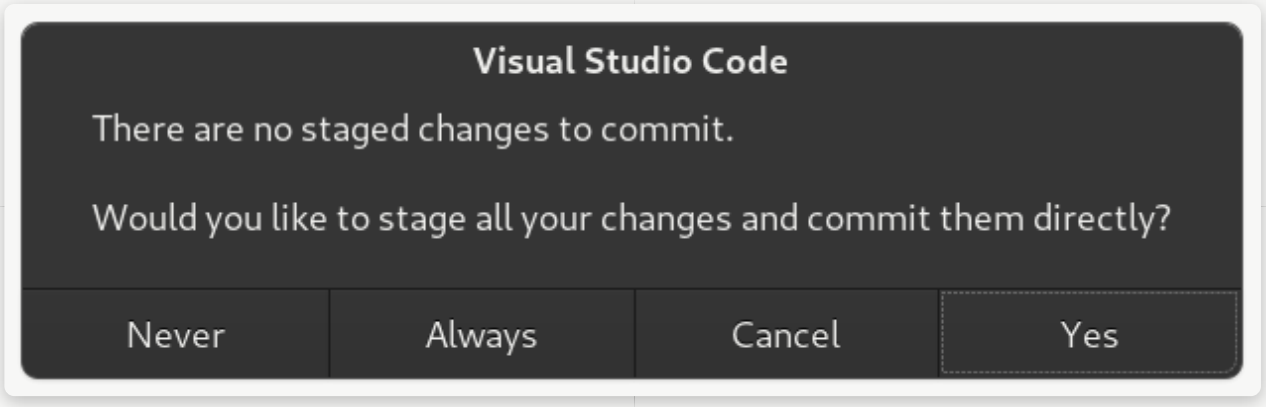
g. Commit the changes. First provide your user name and email to Git.



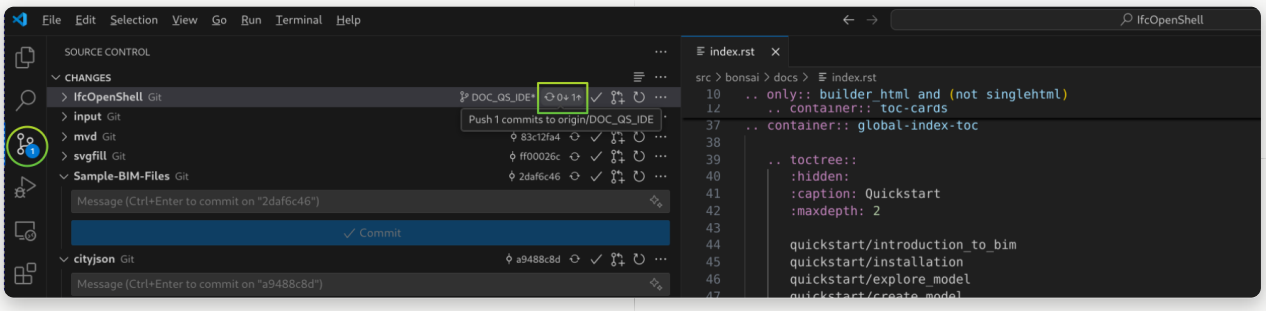
Then commit the changes by clicking in the check mark in the Source Control tool.



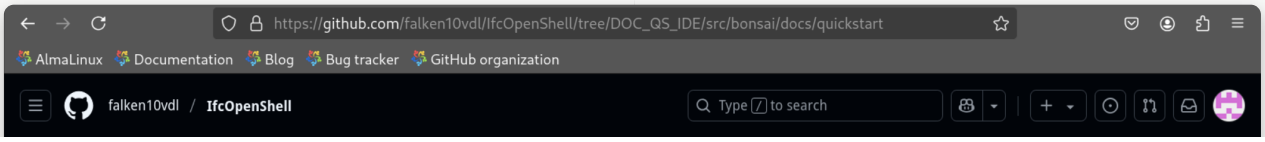
Accept the staging of the changes prior to commit.

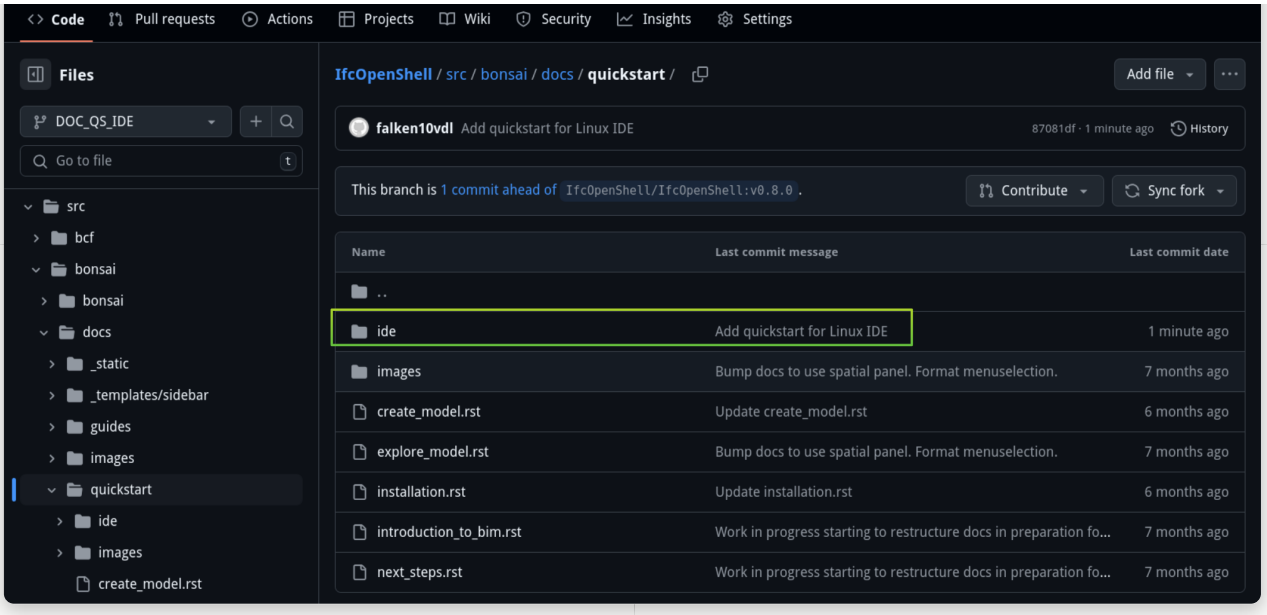


h. Push the changes to our new brnach in the github project fork.

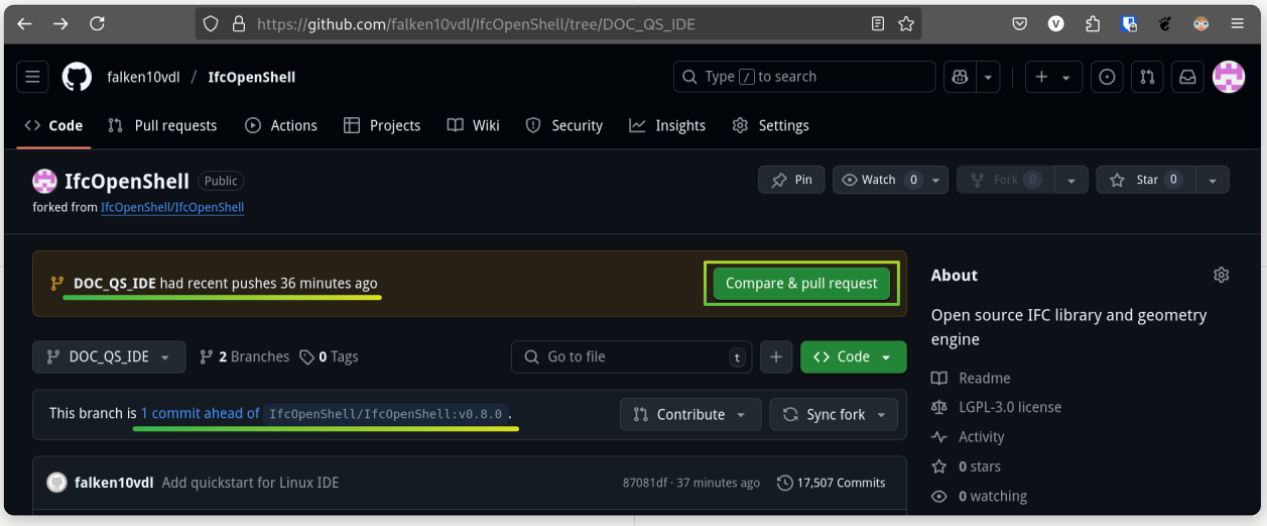


Check that the changes are in the project fork in GitHub. You can see that the directory *ide* has been added, for example.

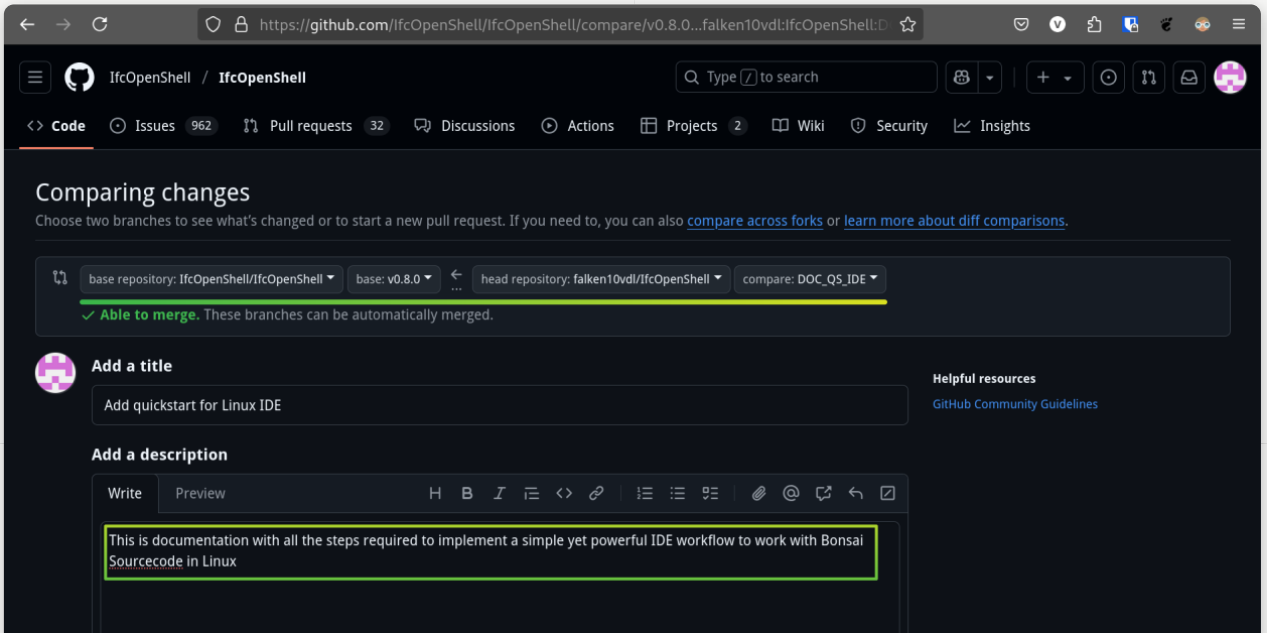


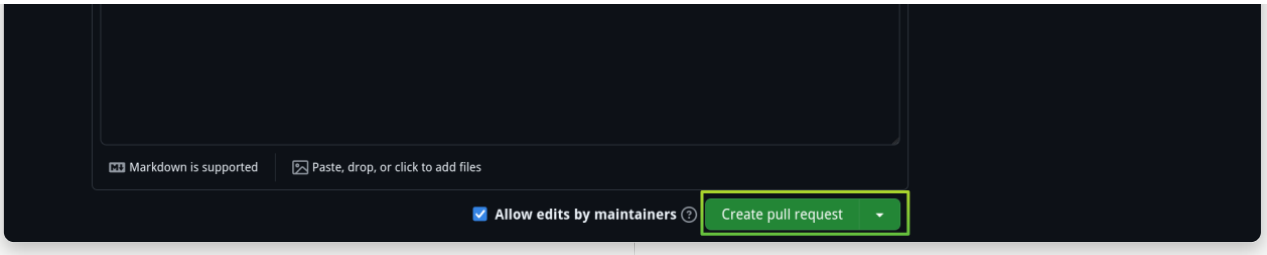


i. Create a Pull Request to the upstream main branch of the IfcOpenShell project. Go to your GitHub page and you will see that the new branch has 1 commit ahead of the upstream main branch. Click in the *Compare & pull request* button.



Verify that the changes are correct, add a description and click in the *Create pull request* button.





CONGRATULATIONS! You have now made a change in the Bonsai project and created a Pull Request to the main branch of the project. Happy coding and documenting!
