

How to install Cadnano on Windows

Getting started

This chapter describes how to set up and configure your local **Windows** desktop or laptop so you can begin designing DNA origami nanostructures with **Cadnano**. If you have an Apple computer, please see the **macOS** version of this document. This tutorial matches how we set up our own machines in the Douglas Lab as of September 2018.

When we refer to **Cadnano1**, we mean two separate “legacy” versions of Cadnano. The first is **cadnano v0.2.3** which supports honeycomb-lattice designs, and the second is **cadnanoSQ v0.2.4**, which supports square-lattice designs). **Cadnano1** was written in the ActionScript language (similar to JavaScript) for the **Adobe AIR** platform. **Cadnano2** is the Python port of Cadnano1. It uses **PyQt5**, a library that provides Python bindings for **Qt** (pronounced “cute”), a cross-platform GUI framework, which replace the function of Adobe AIR.

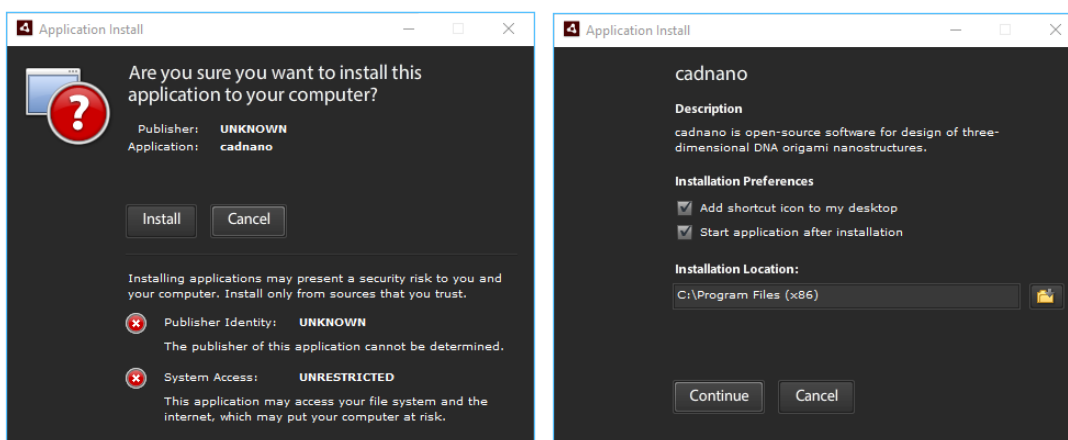
We find that it is useful to have a more than one copy of **Cadnano** available on your system. For example, you might want to open two versions of a design and edit them side-by-side. Also, while an OS update may often cause one version to stop working, it is rare that both will break simultaneously.

~ Notation styles for this document ~

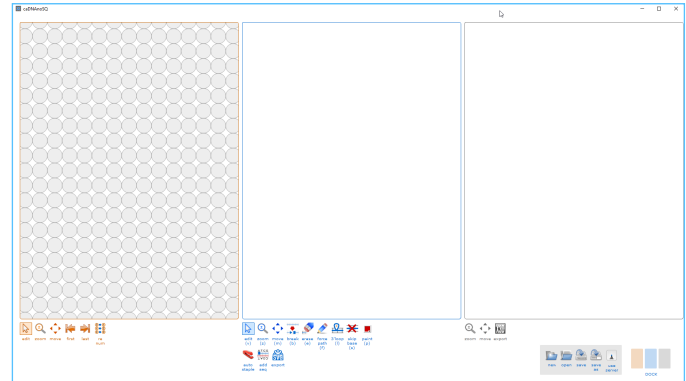
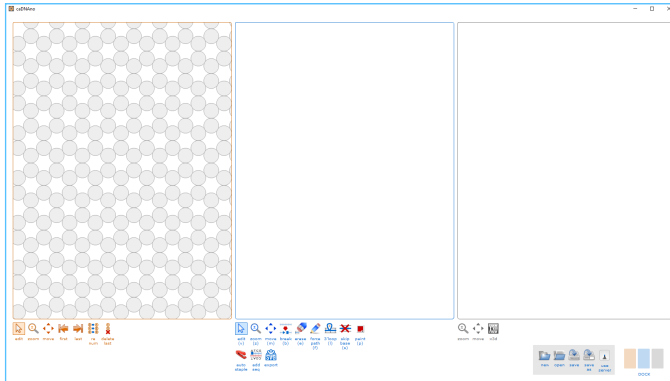
URLs = blue clickable links	http://bionano.ucsf.edu/
Programs and packages = bold	cadnano2
Terminal commands = gray monospace font	<code>python main.py</code>
Button or tab = bold with brackets	[Clone a repository]
Important notes = bold red	Don't forget this

Step 1. Install both honeycomb and square-lattice versions of Cadnano1

1. Install **Adobe AIR** from: <https://airsdk.harman.com/runtime>
2. Download **cadnano** and **cadnanoSQ** from <http://cadnano.org/legacy>
3. Double-click each installers and follow the instructions. You should see an Application Install dialog window. Don't worry about the warning, it just means that we didn't pay a tax to become a known publisher. When you proceed, you can choose to add a desktop shortcut, or install in a different location.

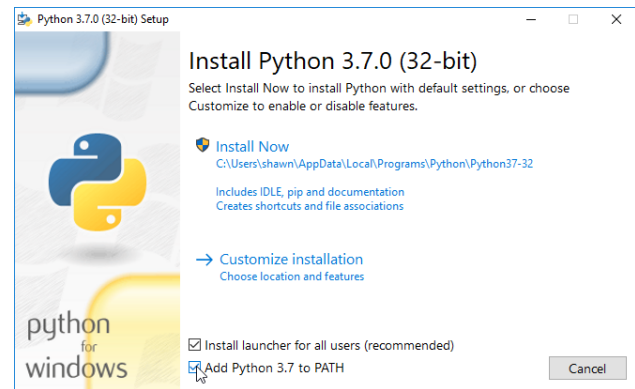
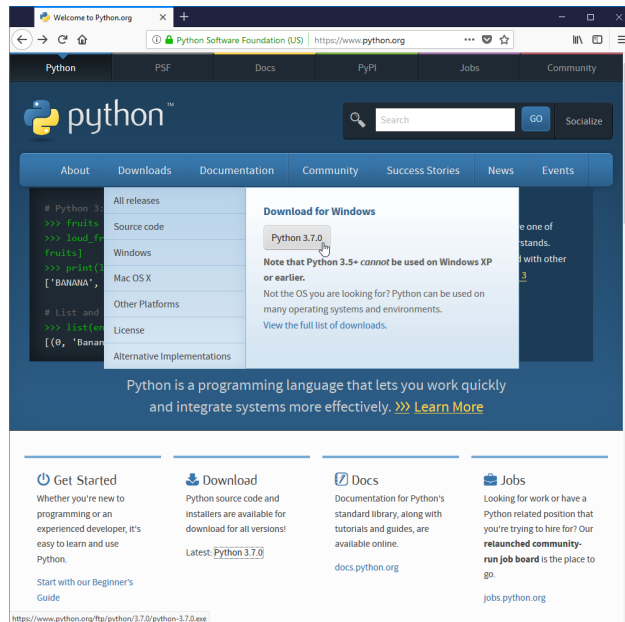


4. You should see these windows when you successfully install and launch **cadnano** and **cadnanoSQ**, respectively.

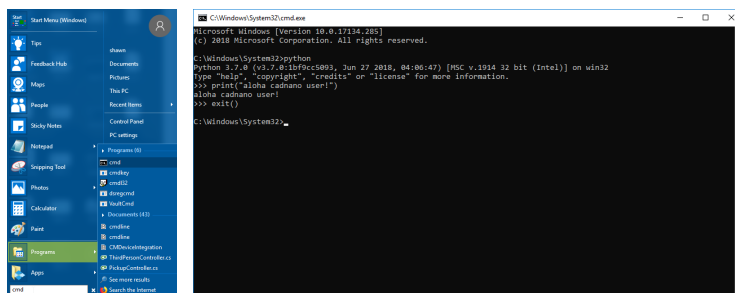


Step 2. Install Python3

1. Visit <https://www.python.org/> and mouse over the **[Downloads]** tab, and download and run the installer. The screenshots below were created for Python 3.7, but the latest version (Python 3.9) should work.



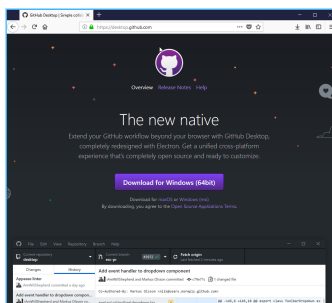
2. Make sure you check the option **Add Python 3.9 to PATH** before continuing the installation. If you forget to do this, you can rerun the installer with the correct setting. Then click the **[Install Now]** button.
3. Confirm that Python3 is successfully installed by running it from a Command terminal. You can launch the terminal by opening the Start menu and searching for **cmd.exe**:



4. From the terminal, type `python` and hit enter. You should see the Python version and a `>>>` prompt. Quit python with the command `exit()`.

Step 3. Install GitHub Desktop

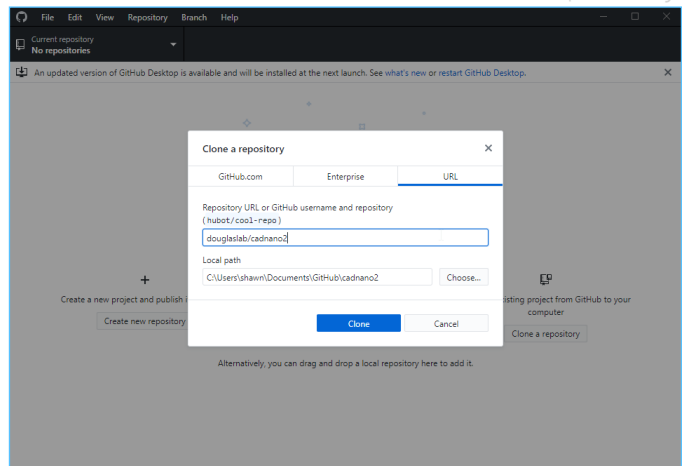
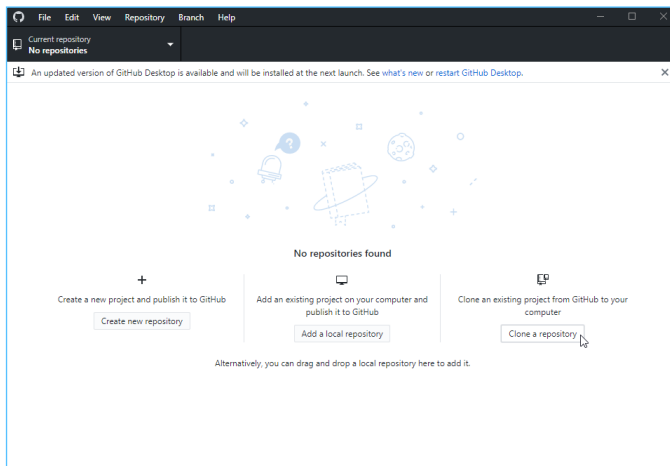
1. Visit <https://desktop.github.com/> and download the **Windows** installer. Install with the default settings.
2. If you do not yet have a [GitHub.com](https://github.com/) account, now is a good time to create one. Otherwise, enter your existing credentials. (This account will be necessary if you wish to report any issues or bugs with **Cadnano2** at <https://github.com/douglaslab/cadnano2/issues>)



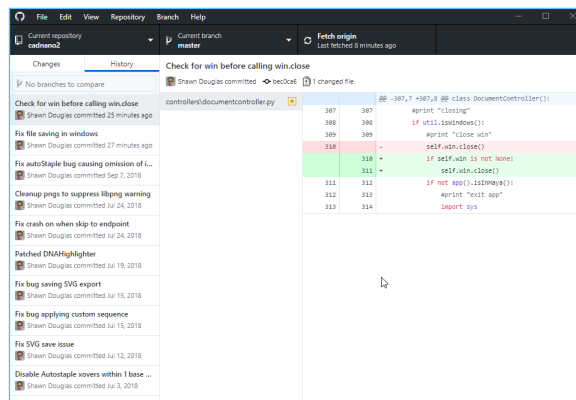
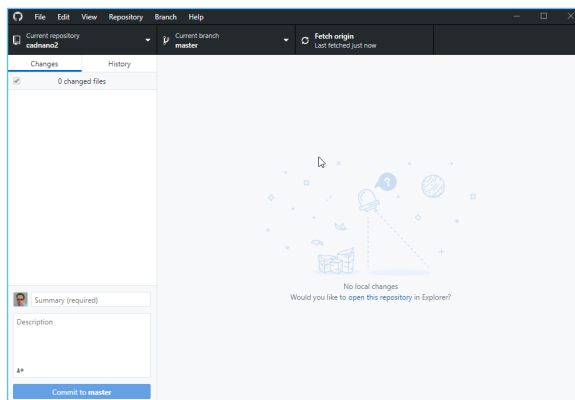
Step 4. Install Cadnano2 by cloning the source git repository

We will use **GitHub Desktop** to install **Cadnano2**. If you have not previously used the application, when you first open it you will not have any custom repositories. Some versions of Desktop have a tutorial repository. You can view the tutorial if you wish, and then delete it.

1. Click on the **[Clone a repository]** button on the bottom right, or navigate to the same command via the **File** menu. You will see the “Clone a repository” dialog shown in the right panel below:

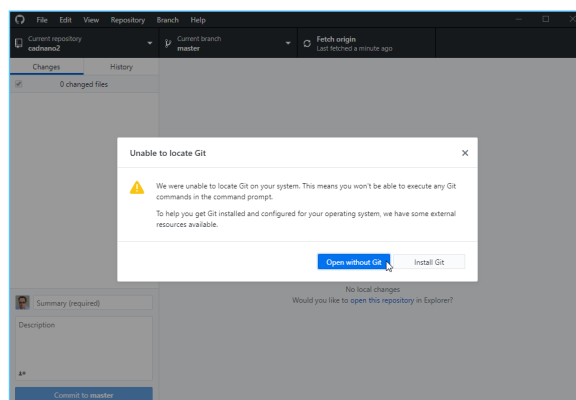
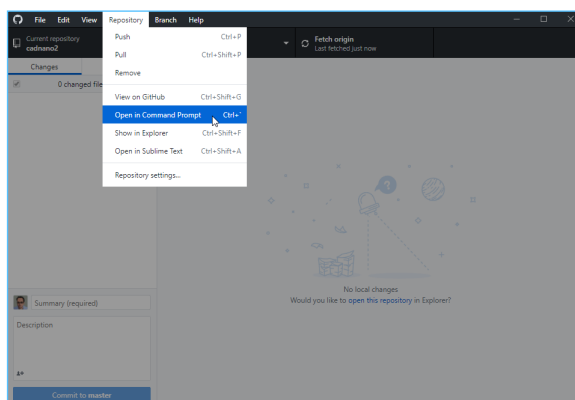


2. Choose the **[URL]** tab and enter `doughlab/cadnano2` then click the **[Clone]** button. It should download.
3. Confirm that you successfully downloaded **cadnano2**. It should be selected under the “Current repository” button at the top, and the “Changes” window layout will appear. We have not made any source changes, so it should be empty. Select the **History** tab to see some recent commits.



We are almost ready to run Cadnano2, but first we need to install a two more dependencies. We will do so from the terminal window. Conveniently, GitHub Desktop provides a command that opens a terminal in the directory of the current repository, which will be useful in a moment.

4. Use the mouse to navigate in the menu bar to Repository → Open in Command Prompt.



We won't be using git commands at the moment, so you can just click **[Open without Git]** to proceed. You should now have a command terminal open, similar to launching **cmd.exe** from the Start menu, but the prompt and current working directory should match the **cadnano2** git repository path. If you wish to suppress the "Unable to locate Git" warning in the future, you can go ahead and click the **[Install Git]** button and follow the instructions.

Step 5. Install Cadnano2 dependencies: PyQt5 and networkx

PyQt5 is required to run **Cadnano2**, similar to Adobe AIR for **Cadnano1**. The **networkx** package is used to handle some of the graph algorithms for the original version of the Autobreak plugin. We won't be using that feature, but it's easier to just install the dependency for now. We will be using **pip**, a command-line python package installer.

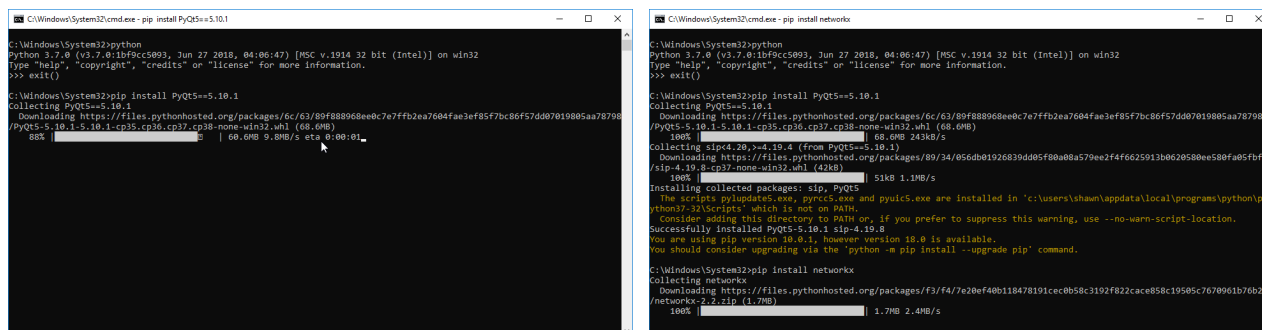
1. Install **PyQt5** using the following command:

```
pip install PyQt5
```

2. Install **networkx** using the following command:

```
pip install networkx
```

The above commands should output messages about downloading and installing the corresponding packages. If you see warnings about upgrading **pip** to the newest version, you can ignore them. Or, follow the instructions if you wish.

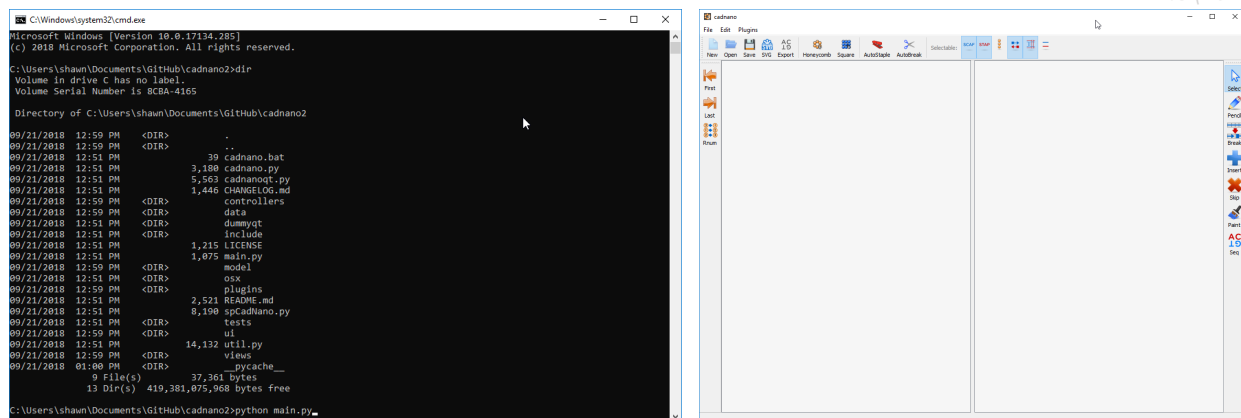


Step 6: Running Cadnano2

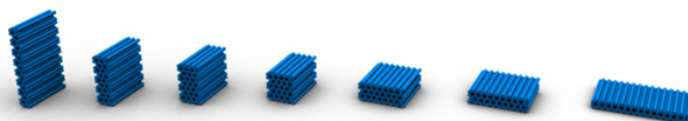
We should be ready to run **cadnano2**. If you still have your terminal window open from [Step 5](#) with the **cadnano2** repository path as your working directory, you can skip to step 2.

1. Open **GitHub Desktop**. Use the mouse to navigate in the menu bar to Repository → Open in Command Prompt and choose **[Open without Git]** if you have not installed Git.
2. Use the Terminal window to launch Cadnano2 using the following command:

```
python main.py
```

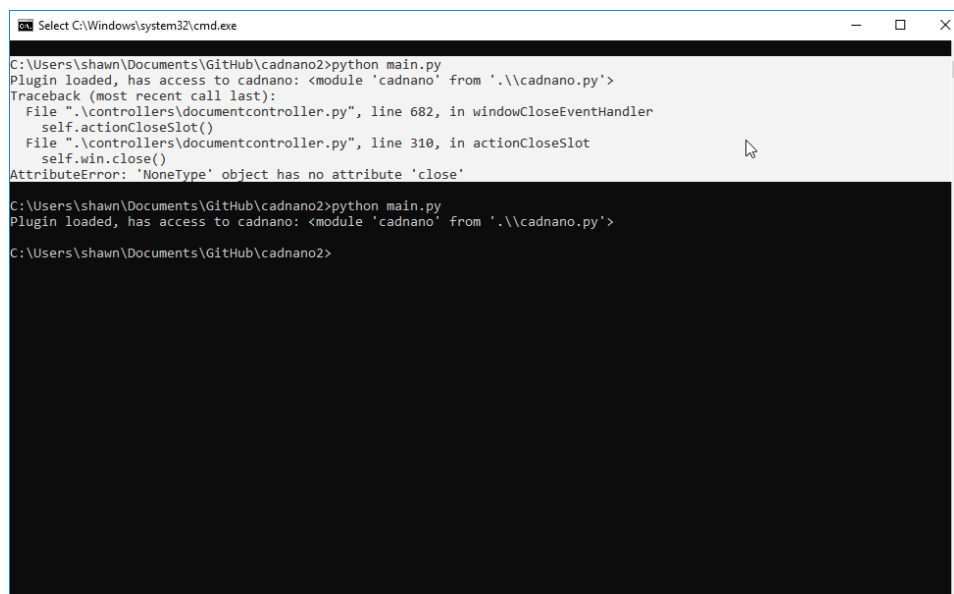


Both honeycomb and square lattice designs are handled by the same version of **cadnano2**, so we are all done! You can click on the **[Honeycomb]** or **[Square]** button in the interface to get started, or visit <http://cadnano.org/gallery.html> to download some published DNA origami designs to open and play with.



Step 7: Reporting Bugs

The **douglaslab/cadnano2** application is not bug free. You should get in the habit of saving your designs frequently, and reporting bugs when it crashes so we can make it more stable over time. As you may have noticed from the commit history, some bugs were even revealed in the process of building this tutorial. Typically, you will get a Traceback with some information about the code that was executing when an exception was thrown:

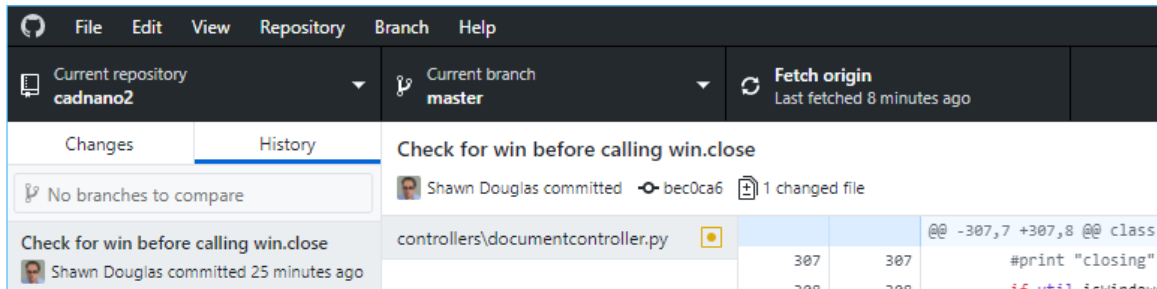


If you encounter this situation, please copy the full traceback and paste it into new “Issue” along with detailed steps to reproduce at <https://github.com/douglaslab/cadnano2/issues>. If you have any example files that will be useful in reproducing the bug, please upload them too. If you poke around in the source code and think that you’ve fixed the

bug, please submit a pull request along with your Issue. If we incorporate your fix, you will be added to the list of contributors.

Step 8: Updating Cadnano2 when it's been patched

If you submit any bugs, hopefully, we will be able to patch the source code quickly. Once that is done, you'll need to synchronize your local copy of cadnano2 with the latest commit. You can do so by clicking the **[Fetch origin]** button at the top right of the **Github Desktop** interface:



Assuming you haven't made any local changes to the source code in the master branch, it should synchronize and the **[History]** tab should reveal any new commits since the last time you fetched.