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	python main.py				
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://get.adobe.com/air/
- 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.

Application Ir	stall – 🗆 X	Application Install - 🗆 🗙
	Are you sure you want to install this application to your computer? Publisher: UNKNOWN Application: cadnano Install Cancel	Cadnano Description cadnano is open-source software for design of three- dimensional DNA origami nanostructures. Installation Preferences M Add shortcut icon to my desktop M Start application after installation
	Installing applications may present a security risk to you and your computer. Install only from sources that you trust. Publisher Identity: UNKNOWN The publisher of this application cannot be determined. System Access: UNRESTRICTED This application may access your file system and the internet, which may put your computer at risk.	Installation Location: C:\Program Files (x86)

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.



- 2. Make sure you check the option Add Python 3.7 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**:

Sae 2	Start Menu (Windows)		C:\Windows\System32\cmd.exe	-	×
			Microsoft Windows [Version 10.0.17134.285] (c) 2018 Microsoft Corporation. All rights reserved.		î
2	Feedback Hub	Documents	C:\Windows\System32>python Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Intel)] on win32		
2		Pictures This PC	Type "help", "copyright", "credits" or "license" for more information. >>> print("aloha cadnano user!") aloha cadnano user!		
R		Recent Items +	>>> exit()		
		Control Panel PC settings	C:\Windows\System32>_		
47	Notepad +	Programs (6)			
4	Snipping Tool	📰 ond 🖬 ondoey			
		😺 cmdi32 🖬 dsregond			
	Calculator	 VaultCrnd Documents (43) 			
Ń		B cmdine B cmdine			
1	Programs +	CMDeviceIntegration ThirdPesor/Controller.cs			
	Apps •	PickupController.cs P See more results			
cmd	×	Search the Internet			~

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 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 douglaslab/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.

File Edit View Repository Branch Help	- 🗆 X	File Edit View Repository	Branch Help	-	Ξ×
Current repository v Current branch cadnano2	- C Fetch origin Last fetched just now	Current repository	P Current branch •	C Fetch origin Last fetched 8 minutes ago	
Changes History Changed files		Changes History	Check for win before calling win.clo	Dise 1 changed file	
	ь	Check for nin before calling win.dose Check for nin before calling win.dose Check for nin before Check by the indexes Check by the indexes Check by the call of the check by 7, 2018 Check by the check by 7, 2018 Check by the check by 2, 2018 Check by the check by the check by 2, 2018 Check by the check by the check by 2, 2018 Check by the check by the check by 2, 2018 Check by the	controllers)documentcontroller.py	00 -ser,	ler():
Summary (required)	No local charges Wood sharges the sequence of the second sharges	Hx crash on when skip to endpoint Shewn Dougles committed Jul 24, 2018 Patched DNAHighlighter Shewn Dougles committed Jul 19, 2018 Fix bug saving SVG export Shawn Dougles committed Jul 15, 2018		Þ	
Description		Fix bug applying custom sequence Shawn Dougles committed Jul 15, 2018 Fix SVG save issue Shawn Dougles committed Jul 12, 2018			
24 Commit to master		Disable Autostaple xovers within 1 base Shawn Douglas committed Jul 3, 2018 Add userion info to reading			

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 \rightarrow Open in Command Prompt.

File Edit View	Repository Branch	Help	– 🗆 🗙	C File Edit View Re	Repository	Branch Help			II X
Current repository	Push	Ctrl+P	▼ Ω ^{Fetch origin}	Current repository					
4° cadnano2	Pull	Ctrl+Shift+P	- Last fetched just now	* cadnano2		° master	 Last fetched a minute ago 		
Changes	Remove			Changes Hi	History				
in o changeo ne	View on GitHub	Ctrl+Shift+G		an o changeo neo					
	Open in Command Pro	ompt Ctrl+1							
	Show in Explorer	Ctrl+Shift+F			_				
	Open in Sublime Text	Ctrl+Shift+A			Unabl	e to locate Git		×	
	Repository settings				A	We were unable to locate Git on yo commands in the command promp To help you get Git installed and co resources available.	our system. This means you won't be able to else st anfigured for your operating system, we have Open without Gil	ecute any Git iome external Install Git	
~			No local changes	-	_		No local changes		
Summary (required)			would you like to open this repository in explorer?	Summary (required)			would you like to open this repository		
Description				Description					
4+				¥+					
Commit to mas	ter			Commit to master	r				

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==5.10.1
```

The "==5.10.1" part forces the installation of a specific version of PyQt5. We have found that the latest version of PyQt5 (version 5.11.2, as of September 2018) causes some runtime errors, but this one should work fine.

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.

C:\Windows\System32\cmd.exe - pip install PyQt5==5.10.1 - 🗆 🗙	🖬 CriWindows)System32\cmd.exe - pip install networks — 🗆 🗙
:WindowsSystem32)python ython 37.0 (v3.7.8/1bF9c58983, Jun 27 2018, 04:80:47) [MSC v.1914 32 bit (Intel)] on win32 ype "help", "copyright", "credits" on "license" for more information. >> wilt()	C:\Windows\System32python Python 3.7.8 (v3.7.4e:lbf9c:5893, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Intel)] on win32 Type "help", "copyright", "credits" or "license" for more information. >> exit()
יעורסופייגעריאראריגעריגעריגעריגעריגעריגעריגעריגעריגעריגע	C: Windows:System2:PipE install PyQEs-5.10.1 Collecting PyQEs-5.10.1 Downloading https://file.pythonNoted.org/packages/6/6/80/888086eeQc?affb2ea7604fa2ef85f7bc80f57bc80f57bd80f80805a78708 PyQEs-5.10.1.205, PyQEs-5.10.1 Downloading https://file.pythonNoted.org/packages/80/A065081026830d085f8ue88570e2f4f6c25013b62088eeS80fa8fb Sub Collecting sige:2,0,2,4,10,4 (from PyQEs-5.10.1) Downloading https://file.pythonNoted.org/packages/80/A065081026830d085f8ue88570e2f4f6c25013b62088eeS80fa8fb /sip 4.10 #cg17-nne-win12.441 (428) Installing collected packages is0, PyQEs The scripts pilodists.ee, pyrcG:see and pyuEs ee are installed in 'clusers\shawnlapdatallocal\programs\python'p /hear2.510.100.1, hearey events in 18.0 fe available. You are using pip version 18.0.1, hearey events in 18.0 fe available. You are using pip version 18.0.1, hearey events in 18.0 fe available. You are using pip version 18.0.1, hearey events in 18.0 fe available. You are using pip version 18.0.1, hearey events in 18.0 fe available. You are using pip version 18.0.1, hearey events in 18.0 fe available. You are using this infile.pythonhosted.org/packages/19/1/r220ef40b118478191cee058C3192f622cace858C19505c7670961b76b2 /https://bile.pythonhosted.org/packages/19/1/r220ef40b118478191cee058C3192f622cace858C19505c7670961b76b2 /https://bile.pythonhosted.org/packages/19/1/r220ef40b118478191cee058C3192f622cace858C19505c7670961b76b2 /https://bile.pythonhosted.org/packages/19/1/r220ef40b118478191cee058C3192f622cace858C19505c7670961b76b2 /https://doi.pyte.pythonhosted.org/packages/19/1/r220ef40b118478191cee058C3192f622cace858C19505c7670961b76b2 /https://https://https://https://https://https

Step 6: Running Cadnano2

We should be ready to run **cadnano2**. If you still have your terminal window open from <u>Step 5</u> 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:

🗘 File Edit	View Repository I	Branch Help					
Current repository	-	Current branch	C Fetc	h origin fetched 8 minu	ites ago		
Changes	History	Check for win before calling win.close					
P No branches to co	ompare	Shawn Douglas committed 🗢 bec0ca6 🗈 1 changed file					
Check for win before calling win.close		controllers\documentcontroller.py			@@ -307,7 +307,8	3 @@ class	
			36	307	#print	"closing"	
					2.5	1	

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.