Installing Required Software for *EYW: ECS* on Macs

(last updated 5/12/20)

This document contains everything that teachers need to know to download, install, and run the software that is required to teach the 2020-21 *Engineer Your World: Engineering Applications of Computer Science* curriculum (ECS, formerly called EYW2) on Macs.

For PCs, please see the document 'ECS_Software_for_PCs_2020-21'. While the curriculum can be run on both PCs and Macs, if you have the choice between the two, we recommend using PCs because they tend to have fewer issues with software installation and OS updates that affect the functionality of the necessary software. Also, many of the lessons show screenshot examples from PCs.

Contents

What software do we need and why do we need it?

- **Python 3** - The programming language that students will use to write programs throughout the year. The Thonny IDE (below) comes with Python 3.7 built in, so Python and Thonny will be installed together.
- **Thonny** - An Integrated Development Environment (IDE) for Python that is designed for beginners. This is where students will compose their Python code throughout the year. Thonny offers both ease of use and consistency across the year, since this is the IDE that students will use to code on the Raspberry Pis in the spring semester.
- **OpenCV** (Open Source Computer Vision) **Library** - A library that contains copious functions for analyzing and manipulating digital images. It is needed for the *Images* and *Motion Capture* units.

- **Numpy Library** - A library that adds support for multidimensional arrays (*e.g.*, digital images) with a collection of mathematical functions to operate on these arrays. NumPy automatically comes installed with the OpenCV library (above). It is needed for the *Images* and *Motion Capture* units.
- **Homebrew** - A software package management system that assists with the installation of software on macOS. It supports the installation of the PortAudio Library (below) and is needed for the *Electronic Music* unit.
- **PortAudio Library** - A library that supports audio input and output. It is required by the Pysine Library (below) and is needed for the *Electronic Music* unit.
- **Pysine Library** - A library that contains useful functions for playing sound through the computer's internal speaker. It is needed in the *Electronic Music* unit.
- **Webcam Setting App** - An app that offers extra functionality for controlling the Logitech C270 webcam that is provided in the course equipment kit. Note that this app will not work if:
    - You have Logitech C170 webcams instead of Logitech C270 webcams; or
    - Your machine is running macOS 10.14 Mojave or 10.15 Catalina.

  Do not worry if you find yourself in this situation. This is not a serious problem. Students can still complete the curriculum, although with slightly increased difficulty in setting filters in the *Motion Capture* unit.

Software Installation

Install the following software on the teacher's computer prior to professional development. Install it on all student computers prior to the beginning of the year.

Installing Python 3.7 and Thonny (combined installation)

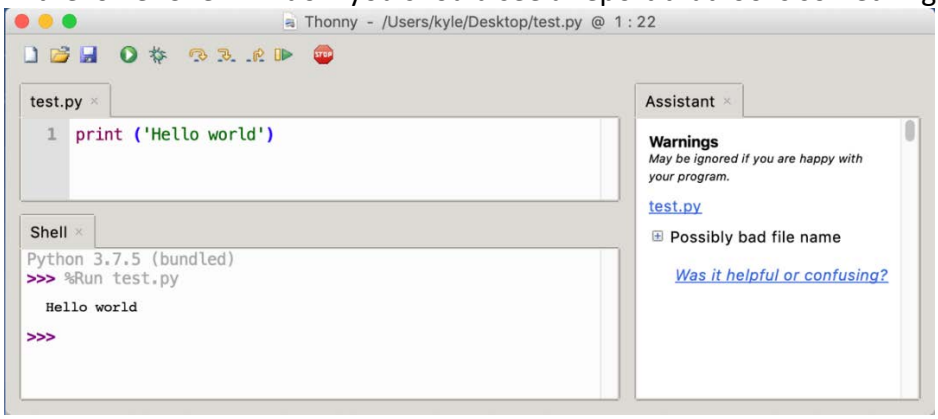
1. Go to https://thonny.org/
2. Click on the download link for the Mac installer. A pop-up window should appear asking what to do with the .dmg file.
3. Choose the Open with DiskImageMounter (default) option. Click OK. After a short wait with a status bar you should eventually see a new finder window with a readme.txt file and the Thonny app icon:

4. You can either drag that Thonny icon onto your desktop (not recommended) or into your Applications folder (recommended). To put it into your Applications folder, right-click on the Finder window icon ,choose 'New Finder Window', navigate into the Applications folder, and drag the Thonny icon from the other window into that folder. (If you want to create a desktop shortcut, wait until Thonny has finished installing in the Application folder and then drag the app icon *from inside the Applications folder* to the desktop.)
5. Eject the disk image by right-clicking on the disk image icon and choosing 'Eject'.

6. Start Thonny by clicking on the app icon. Click 'Open' if you get a pop-up message about it being downloaded from the internet.
7. Choose the standard initial settings and click 'Let's go!'
   You should see the Thonny app window appear; it will likely have two inset windows, <untitled> and Shell, as shown below.
8. Test to see if everything works by writing a short program:
   a. In the upper <untitled> window type the following:

      ```
      print ('Hello world')
      ```

   b. Click the Run icon  or press the F5 key.
   c. It will prompt you to name the file and choose its location. Choose anything you like (such as test.py on the Desktop) and click Enter. Note that python code is saved with the extension .py. If you do not add this extension to your file name, Thonny will do it automatically for you.
   d. In the lower Shell window you should see a report that looks something like this:



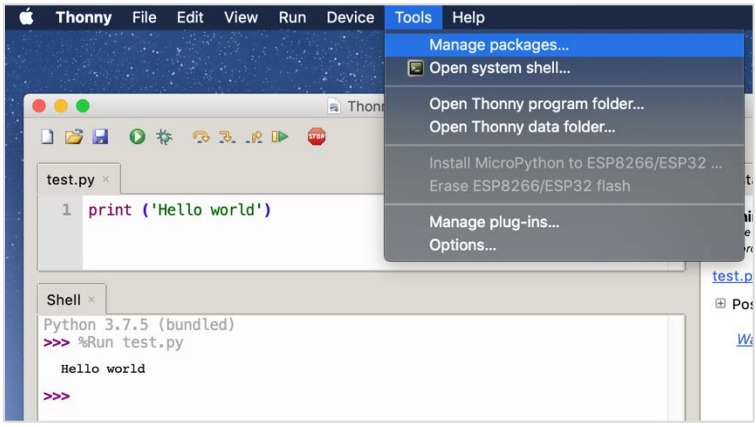
   (Don't worry about the warning in the Assistant window; it can be ignored.)

   You just used Thonny to program in Python 3.7!

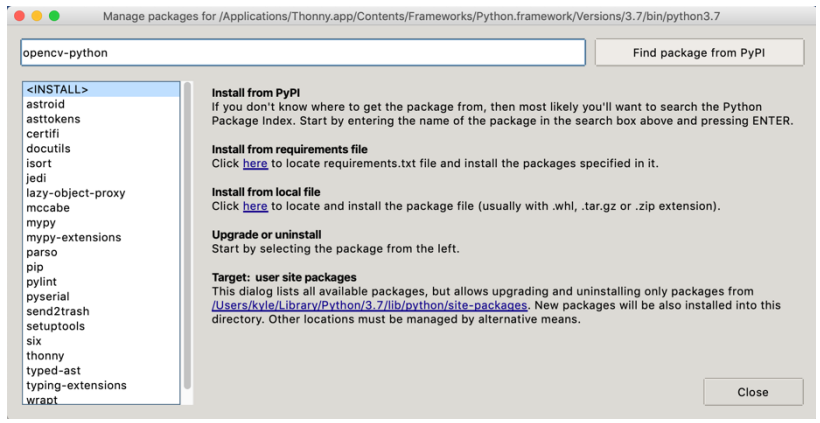
Installing the OpenCV and NumPy libraries (combined installation)

1. In the Thonny app navigate to Tools > Manage Packages

   This will open up a new window titled 'Manage packages for……'

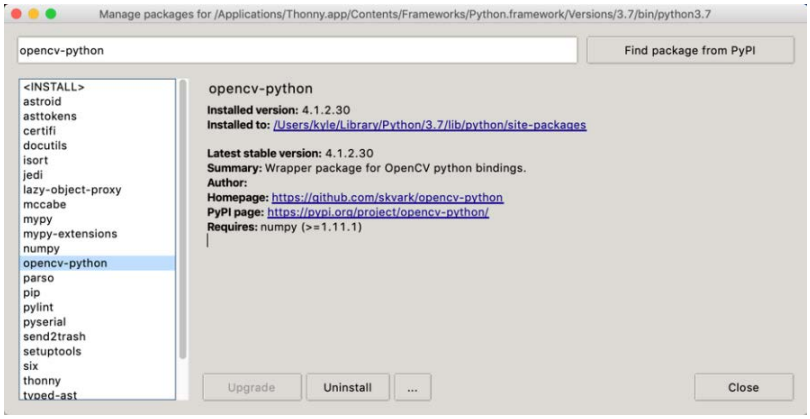


2. In the search bar at the top of the new window enter “opencv-python” and click the button ‘Find package from PyPI’.



3. It will find the latest stable version of OpenCV for Python. On the next screen (not shown here) click ‘Install’.

4. Another window will pop up showing a very small font log of the installation process. This pop-up window will close when it is finished. You’ll then see the new buttons ‘Upgrade’ and ‘Uninstall’ in the other window.



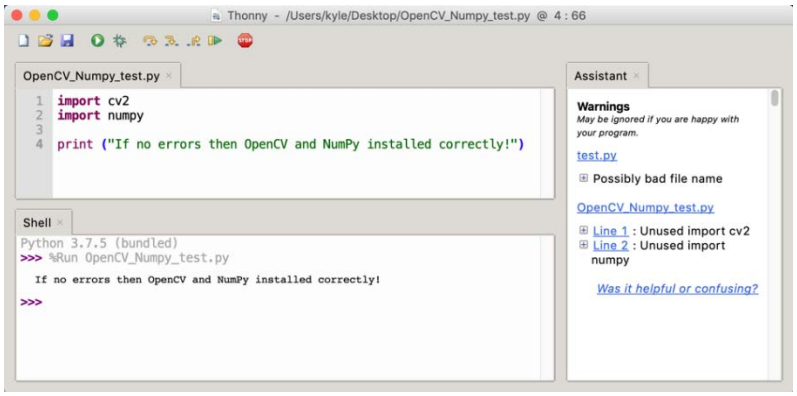
5. You’ve just installed OpenCV, which comes with NumPy included. Note that OpenCV needs to be imported as “cv2” in your python programs, as in the example below. Now let’s test to make sure they’re working properly.

   a. Open a new file in Thonny with the  icon.
   b. Type the following in the upper window:

```
import cv2
import numpy
print ("If no errors then OpenCV and NumPy installed correctly!")
```

   c. Click Run and save the file with whatever name you want (such as OpenCV_Numpy_test.py).

You should see something like this. Again, ignore the warnings in the Assistant window for now. If no other errors occurred and you see the print statement, then everything is installed correctly.

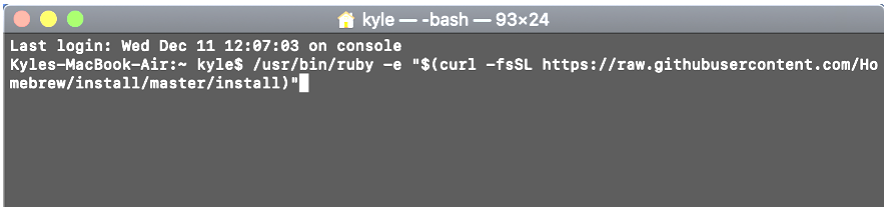


Installing Homebrew and PortAudio

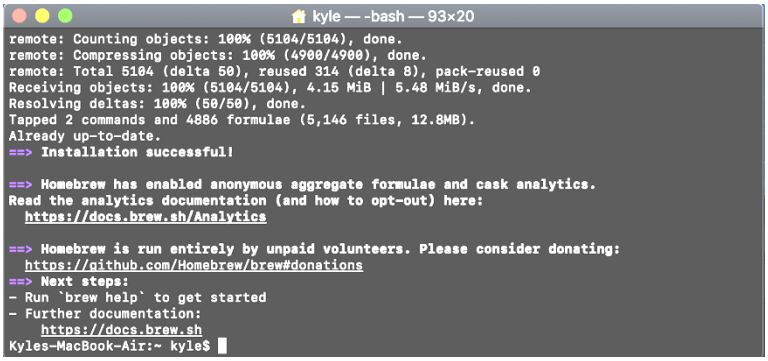
1. Open the Terminal app. You can do this by searching in a finder window for "terminal app" (search 'This Mac'). The app will look like this:

2. In the terminal, copy/paste the following line of code (taken directly from the Homebrew website) and press enter:

```
/usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
```

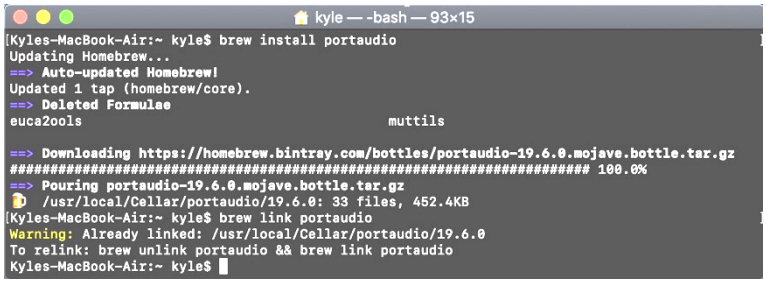


3. The script will execute and prompt you to press Return and enter your admin password. Accept any default prompts that may come up (by pressing Enter). The entire process will likely take a few minutes. It might also need to install Xcode Command Line Tools on your computer; allow it to do so. Once it has finished it will return to the original prompt, which typically shows the name of your computer and your username followed by $.



4. Next enter the following line into the terminal and press enter:

```
brew install portaudio
```



5. Then enter this line:

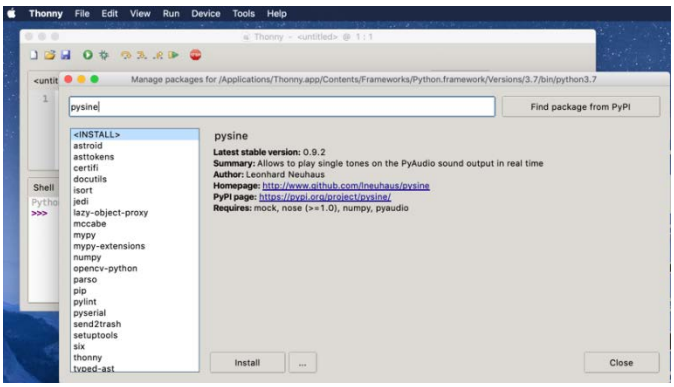
```
brew link portaudio
```

Ignore any warning about it already being linked.

You now have Homebrew and PortAudio installed and are ready to install Pysine. You can close the terminal window.

Installing the Pysine library

This process will be very similar to how you previously installed OpenCV. It can only be done after installing Homebrew and PortAudio.



1. In the Thonny app navigate to Tools > Manage Packages

   This will open up a new window titled 'Manage packages for……'

2. In the search bar at the top of the new window enter "pysine" and click the button 'Find package from PyPI'.

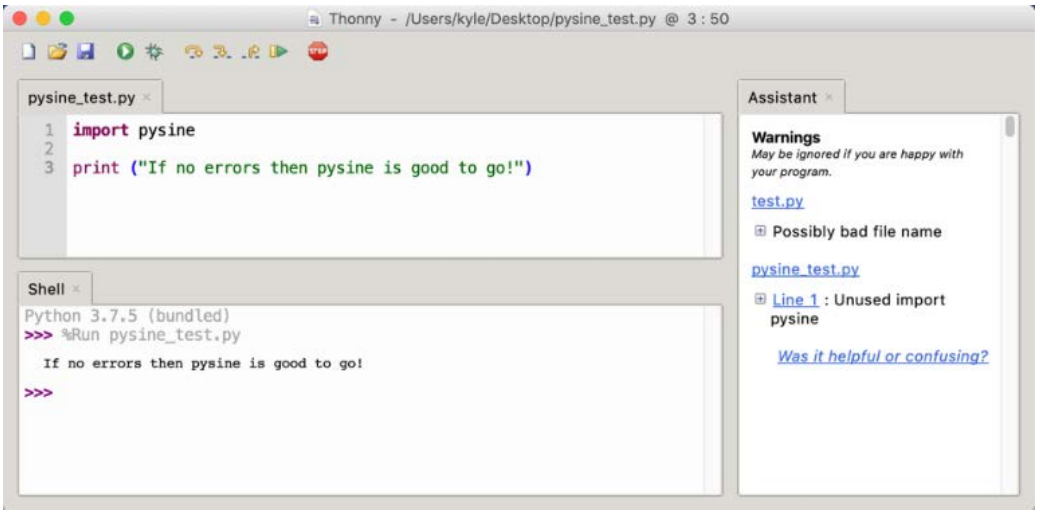
3. It will find the latest stable version of Pysine. Click 'Install'.

4. You can test to see if pysine is working properly by writing a short program like you did for OpenCV:

   a. Open a new file in Thonny with the icon.
   b. Type the following in the upper window:

```
import pysine
print ("If no errors then pysine is good to go!")
```

   c. Click Run and save the file with whatever name you want (such as pysine_test.py).



Installing the Webcam Setting App

Note that this app (nor any other app with the desired functionality) will work on macOS 10.14 Mojave or 10.15 Catalina. This is not a serious problem as the students can still complete the curriculum without it, although with slightly increased difficulty in setting filters in the Motion Capture unit.

1. Go to this link:
   https://utexas.box.com/s/7b47z775n2v5luq3b0bwwrdf7pu2tad2
   *(**Why is this file on UTBox?** Originally the Webcam Settings application was provided by Stopmotion Explosion, but their download link is no longer active. Engineer Your World is part of the University of Texas so we now provide a working link to the file via UTBox. No other webcam application (including the one provided by Logitech) has been proven to work in the way that the curriculum requires on Macs using the Logitech c270 webcams that are provided in the supply kit from Studica, so this is the only option available at this time.)*
2. Click the 'Download' button and save the file to your Desktop.
3. Go to your Desktop and open the file. You should see the icon for the appear: 

4. Click on that app icon. You'll likely get a pop-up warning about the app being downloaded from the internet, click open.
5. The app should open. Test to see if it's working by choosing a camera in the bottom pulldown menu and make sure that you see an image from the camera.

Addendum for Online Professional Development in Summer 2020

Teachers must have two additional pieces of software on their computers in order to participate in the virtual PD session in July 2020: Zoom and Slack. These are not needed on the student computers. Although both Zoom and Slack are usable through a web browser, we highly recommended downloading and installing the desktop clients for both. This will improve both functionality and ease of use.

We will also be using Canvas and Google Docs to deliver the curriculum; however, these do not require any special software other than a web browser (e.g., Firefox, Chrome, Safari).

Installing Zoom

We will be using Zoom to videoconference during PD. In light of concerns about Zoom's security and privacy, we will be following the University of Texas's recommended guidelines for Zoom security and privacy. This includes hosting all meetings using UT Zoom Pro accounts which have added security features.

1. Download and install the desktop client for Zoom here: https://zoom.us/support/download or update your current desktop client by clicking on your profile picture (or the icon with your initial at the top right of the window).

2. Create a Zoom account and/or make sure that your account profile includes your first and last name.

   That is all for now. We will send you a meeting invite in mid- to late-June to test your Zoom settings, webcam, and microphone.

Installing Slack

We will be using Slack to hold group discussions, share new information, and distribute examples of working code during PD. Additionally, our teacher community uses Slack throughout the entire school year to stay in touch with EYW and each other.

1. Download and install the Slack desktop app following the instructions here: https://slack.com/help/articles/207677868-Download-Slack-for-Mac

2. Create a Slack account and/or make sure that your account profile includes your first and last name.

   Again, that is all you need to do for now. When we connect in mid- to late-June, we will invite you to the eyw2 workspace and help you get acquainted with our Slack channels.

End of software installation

At this point your Mac computer has everything it needs to complete the *Engineer Your World: Engineering Applications of Computer Science* curriculum as well as participate in the summer 2020 Virtual Professional Development Institute. You do not need to install anything else.
