

****IMPORTANT** Python Setup**

For all problem sets in the class, we will be using Python 2.7 with three libraries: NumPy 1.11+, SciPy 0.17+ and OpenCV 2.4.13.

Get started on this as soon as possible by looking at our [Windows](#) installation tutorial (for Windows 10, etc.) and [Mac OS](#) installation tutorial (Mac OS X).
For ubuntu users starting from a default 16.04 installation the following command should have you running the ps0.py script:

```
sudo apt-get install python-numpy libopencv-dev python-opencv python-sciPy
```

Start this step early!

Due to the variety of past experiences with Python, and the diversity of computing platforms out there, we expect that this will be a breeze for some, but harder for others. We expect that everyone will help each other set up.

We have set up a simple script that verifies if the required tools are correctly installed in your computer. You should be able to download / clone it from:
<https://github.gatech.edu/omscs6476/ps00.git>

Finally, setting up your environment properly is a requirement to be completed before the end of the first week of class. These documents are simple guides that may not fit all cases. Please make sure to share any tips or alternatives you found to work for you.

#pin

logistics

Updated 1 hour ago by Ivan Dario Jimenez and Pedro Velez

followup discussions for lingering questions and comments

☒ Resolved ☐ Unresolved



Junjie Yang 2 days ago

My Python environment is Anaconda. I tried the homebrew way to install opencv but it is not working for me.
So the way I am using is simply typing "conda install -c menpo opencv" in the terminal.
I think it might be useful for the classmates who are using Anaconda as their python environment.



Caleb McCreary 2 days ago Agreed. You can also use the pip commands with anaconda and it should be nice and easy.



Junjie Yang 2 days ago I also tried the pip install opencv but when I opened the python interpreter and try import cv2. It is still not there.



Ian Chu Te 2 days ago
Hello Junjie,

I'm also using Anaconda.
First, I created a new environment:

```
conda create -n py27 python=2.7 anaconda
```

Activated it,

```
activate py27
```

Then, I went to <http://www.lfd.uci.edu/~gohlke/pythonlibs/#opencv>.
Downloaded and installed the wheel named **opencv_python-2.4.13.2-cp27-cp27m-win_amd64.whl**

```
pip install opencv_python-2.4.13.2-cp27-cp27m-win_amd64.whl
```

After that, ps0.py finished successfully!

(You will need to activate py27 on subsequent sessions)

Hope it works on your end!



Junjie Yang 2 days ago I passed the test using the way I mentioned before.

```
conda install -c menpo opencv
```

But thanks for sharing this method!



Ian Chu Te 2 days ago Oh, I see! Sorry for the redundancy.



Junjie Yang 2 days ago It is always good to try a different method.



Chenxi Yu 2 days ago



Ben Masters 2 days ago Just a follow-up, the menpo version did not work for me since it seems to be an earlier iteration of the recommended opencv version (updating doesn't work either). The version recommended by Ian worked for me though (using Anaconda).



Ran Chen 1 day ago "conda install -c menpo opencv" installs an older version (2.4.11) instead of 2.4.13, and I could not pass the test. Which version did you get?

Correction: it passed the test, but can the instructors confirm that opencv 2.4.11 would be fine as long as it passes the test? ps0.py seems to only verify the the version is 2.4.x. Thanks a lot.



Andres Osorio Plata 1 day ago Instructions from Ian and Junjie worked for me. I had Python 2 and 3 along with an old numpy version, so I had to install and setup Anaconda because brew did not update my paths. ps0.py passed. I'm on a mac.



Ran Chen 1 day ago What's your opencv version number?



Wei Li 1 day ago I use conda and the following command installed opencv 2.4.11 for me

```
conda install -c menpo opencv
```

I assume it's Ok since it passed the test



Jihyun Lee 21 hours ago I installed the same way, and ran 5 tests and failed to load video.

Any thought?

I am using 2.4.11 openCV version



Andres Osorio Plata 15 hours ago I'm using OpenCV version 2.4.11, the default version that gets installed after you run the conda command after you activate the virtual environment



Chris Morris 13 hours ago @Jihyun Lee

I think this is related to ffmpeg. If you find a solution, please advise.



Jihyun Lee 5 hours ago @Andres how can I activate the virtual environment?

Sorry, I will follow the below step.

It works now.

Thanks, Ian Chu Te!

But still curious why it only works in 2.4.13(whl ?)...in my case.

☒ Resolved ☐ Unresolved



Ian Chu Te 2 days ago

For Anaconda Users (Windows only)

(DISCLAIMER: This works on my end. But I'm not 100% sure it will work with yours. Ping me for issues - maybe I can help.)

First, I created a new **Python 2.7** environment:

```
conda create -n py27 python=2.7 anaconda
```

Activated it,

```
activate py27
```

Then, I went to <http://www.lfd.uci.edu/~gohlke/pythonlibs/#opencv>.

Downloaded and installed the wheel named **opencv_python-2.4.13.2-cp27-cp27m-win_amd64.whl**

```
pip install opencv_python-2.4.13.2-cp27-cp27m-win_amd64.whl
```

After that, ps0.py finished successfully!

(You will need to activate py27 on subsequent sessions)

Hope it works on your end!



Binshuang Li 2 days ago Hi Ian, thanks for sharing your tips. I tried activate py27
It reported the following error:

Error: activate must be sourced. Run 'source activate envname'
instead of 'activate envname'.

Not sure where went wrong.



Binshuang Li 2 days ago brew tap homebrew/science
brew install opencv@2
worked for me and passed the test.

Thanks, @Elli Magnuson



Ian Chu Te 2 days ago @Binshuang Li

Glad to hear that you made it work. This guide is only for Windows users. Sorry I haven't indicated that. I'll edit it now.



Ran Chen 1 day ago is there a mac version of the wheel?

☒ Resolved ☐ Unresolved



Eric 2 days ago The lectures 1A have sections for Matlab and Octave, but not Python, am I looking at old versions of the Videos or are these just relics of past classes?

I'm already up to speed on python mostly, but I guess there is no video section in 1A on getting up to speed with python?



Parnell White 2 days ago Just relics that have yet to be updated.



Pedro Velez 2 days ago The lecture quizzes are in Matlab. This repository tries to mimic them. I'll try to record some videos soon explaining how these answers work.

<https://github.com/pdvelez/CV-lecture-quizzes-python>

☒ Resolved ☐ Unresolved



Chenxi Yu 2 days ago
I may have a different track. But after I do the follows, it works. Does that mean I am good so far with installing Opencv in python.
import cv2



Junjie Yang 2 days ago Try to download the test file in github and run the python file.



Chenxi Yu 2 days ago Thanks. I got it.

☒ Resolved ☐ Unresolved



richard (rick) suhr 2 days ago
Will we not be using vagrant in this class (as we did in Comp Photo last spring)?



Maxx Lee 2 days ago I second this question. It would be good to have a way to test locally with exact course approved versions.



Liang Xu 2 days ago ye, I would like to use the vagrant. It is easy to keep our local version is the same with the autograder.



richard (rick) suhr 2 days ago @21 is also asking for a vagrant file, I'd check there as well for any response



Xiaohui Han 2 days ago Is there a particular reason why we can't reuse the vagrant image from Computational Photography? I have everything setup already.



richard (rick) suhr 1 day ago No particular reason at all. Just dug my old vagrant file out and the installed modules on the cv 0.17 box fit the version requirements for numpy, scipy, and openCV



Patrick Mulvihill 15 hours ago Could you share this vagrant file as an "unofficial" environment that satisfies CV's requirements in case an official one isn't released?



Paul D Thompson 14 hours ago <https://github.gatech.edu/omscs6475/assignments/blob/master/Vagrantfile>



richard (rick) suhr 13 hours ago There is a link to it from Maxx Lee in @21

☒ Resolved ☐ Unresolved





Liang Xu 2 days ago
using
conda install -c dhaneshr opencv
you can down load the opencv with versuon 2.4.13.



Liang Xu 2 days ago ignore this post, this version opencv does not work.

☒ Resolved ☐ Unresolved



Elli Magnuson 2 days ago
The command provided in the document:

```
brew install homebrew/science/opencv --with-ffmpeg
```

Does not work for me.

These commands do work:

```
brew tap homebrew/science  
brew install opencv
```

However this installs version 3.3.0_2. Is OpenCv2 required or will version 3 be fine?



Lars John 2 days ago
I'd recommend sticking with the exact versions outlined, otherwise you might run into issues with the autograder, I presume?

"Python 2.7 with three libraries: NumPy 1.11+, SciPy 0.17+ and OpenCV 2.4.13"



Elli Magnuson 2 days ago In this case for anyone who wants to know how to install 2.4.13 instead of the native version brew installs use the following:

```
brew tap homebrew/science  
brew install opencv@2
```

This is what worked for me.



Sid Wiesner 2 days ago Thanks @Elli Magnuson - that worked for me too.

For anyone else, don't forget to read the output of homebrew there and run those commands to get import cv2 to work.



Sid Wiesner 2 days ago Also that command worked with the flag:

```
brew tap homebrew/science  
brew install opencv@2 --with-ffmpeg
```

☒ Resolved ☐ Unresolved



Brian 2 days ago
how do we get a GitHub enterprise account? I have a GitHub account I can log in and out of, but can't use that user name password with the link provided above.



Lars John 2 days ago I was able to log into the GitHub linked to in the original post with my Georgia Tech credentials (note that it says "Log in via LDAP").



Brian 2 days ago Thank you Lars

☒ Resolved ☐ Unresolved



Brian 2 days ago
Am I doing something wrong? All other steps worked flawlessly. I downloaded the repository, and I am getting the below error. Thanks!

```
C:\Users\newbs\Downloads\ps00-master>python ps0.py  
python: can't open file 'ps0.py': [Errno 2] No such file or directory
```



Brian 2 days ago I figured it out myself. I had to cd to ps00-master again. Rock-n-roll!!

☒ Resolved ☐ Unresolved



Brian 2 days ago

Now that I am all setup, do I need to download an environment from which to run Python? Graphing etc....
Thank you!



Maxx Lee 2 days ago Do you mean development environment? If so, I recommend [PyCharm](#), with the professional one being free for students. I've used it for all of my OMSCS courses that use Python.

In terms of graphing, I'm not sure what you mean. If you want to generate graphs within Python, there's [matplotlib](#).



Brian 2 days ago Maxx, thanks. Do I just go to PyCharm and download it? Will it automatically find NumPy, openCV, and the SciPy that I just downloaded?

I assume we don't do Python from the Command Prompt, that is what I meant by environment etc.



Brian 2 days ago Okay, I just downloaded PyCharm...is that it? Do I need to adjust any settings, set the environment etc.? Or am I off to the races?



Maxx Lee 2 days ago When you create a project you'll need to specify which python interpreter to use. You should point it to the one you just set up. It will use the packages that you installed.

<https://www.jetbrains.com/help/pycharm/configuring-python-interpreter.html#local-interpreter>



Brian 2 days ago Thank you!



Christian Cortner 2 days ago Additionally PyCharm lets you use an Anaconda environment for your interpreter. This is especially useful as different classes will likely have different python install requirements. You can create the environment directly from within PyCharm or point it at one you already created i.e. Ian Chu Te's post above). Instructions for configuring at the link Maxx Lee posted.

☒ Resolved ☐ Unresolved



Damien Benveniste 2 days ago

Related to Brian's question, what IDE is advised to run computer vision stuff? Is Jupyter a viable option for that field?



Scott Lilleboe 2 days ago For previous classes, I have really like Pycharm and we get a free version that you just need to renew the license for once a year as long as you are a student: <https://www.jetbrains.com/student/>



Caleb McCreary 2 days ago Damien,

Scott has set you on the right track. I do really like Jupyter myself, and frequently use Jupyter notebooks for computer vision applications here at work. Ultimately, I assume it will depend on what is required and further instruction may be given. Hope this helps.



Damien Benveniste 2 days ago Yeah I quite like pycharm but I wonder if it is optimal for CV. If there no known problems in using opencv in Jupyter or if the homework are not too object oriented, I think I will mainly go with Jupyter. I guess everything will depend on how the homework are set up. By the way the community version of pycharm is completely free with no need for a license.

☒ Resolved ☐ Unresolved



Yi Sun 2 days ago

Here is a guide to an alternative OpenCV installation method, if it helps. It also has a section to get FFMPEG codec working.

<http://mathalope.co.uk/2015/05/07/opencv-python-how-to-install-opencv-python-package-to-anaconda-windows/>

☒ Resolved ☐ Unresolved



Matthew Martz 2 days ago

The mac instructions don't work verbatim. It's trying to install more recent versions of everything.



Elli Magnuson 2 days ago The only one that I faced a slight difficulty with was OpenCV and this is the process I followed instead of the tutorial:

<https://sites.google.com/site/yonasstephenfyp2013/updates/tutorialinstallingopencvonmacosxmountainlion>

I can try to answer any questions you have if you choose to do it the way I did.



Matthew Martz 2 days ago Thanks for the tip. I pulled the tar for 2.4.13 from here: <https://github.com/opencv/opencv/releases>. then followed the directions in the link you posted but ran into two errors. One related to QtKit and the other "ignoring return value of function declared with 'warn_unused_result' attribute [-Wunused-result]"

The good news is I have numpy version 1.11.0 and scipy 0.17.0 installed (via pip), but python version 2.7.13... so I'm probably 25%



Matthew Martz 2 days ago @Elli I saw above you used brew install [opencv@2](#)

Did you have to do anything special to link it. I can't seem to import it via python (import cv2)



Marc Mahanna 2 days ago @Matthew, the following fixed the import cv2 error for me:

```
echo /usr/local/opt/opencv@2/lib/python2.7/site-packages >> /usr/local/lib/python2.7/site-packages/opencv@2.pth
```

Was at the end of output from `brew install opencv@2`



Matthew Martz 2 days ago Thanks @Marc Mahanna...

For me it was:

```
echo /usr/local/opt/opencv@2/lib/python2.7/site-packages >> /usr/local/lib/python2.7/site-packages/opencv@2.pth
mkdir -p /Users/mattmartz/Library/Python/2.7/lib/python/site-packages
echo 'import site; site.addsitedir("/usr/local/lib/python2.7/site-packages")' >> /Users/mattmartz/Library/Python/2.7/lib/python/site-packages/homebrew.pth
```

Based on how my terminal wrapped it I missed part

Thanks!



Sid Wiesner 2 days ago



Matthew Martz 2 days ago [DELETED]



Sid Wiesner 2 days ago The ps00 tests are working for me. The opencv-python examples needed some tweaking to work for me on a mac. Here are the snippets that eventually worked for me:

Shows camera feed, and press q to quit.

```
import numpy as np
import cv2

cap = cv2.VideoCapture(0)

while(True):
    ret, frame = cap.read()
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    cv2.imshow('frame',gray)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break

cap.release()
cv2.destroyAllWindows()
```

Shows video in grayscale.

```
import numpy as np
import cv2

cap = cv2.VideoCapture('test.avi')

while(cap.isOpened()):
    ret, frame = cap.read()
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    cv2.imshow('frame',gray)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break

cap.release()
cv2.destroyAllWindows()
```



Sid Wiesner 2 days ago And here is output of ps0.py:

```
sid@[~/Desktop/ps00-master]: python ps0.py
.....
-----
Ran 5 tests in 0.135s

OK
```

☒ Resolved ☐ Unresolved



Nathaniel Rabold 2 days ago

Has anyone run into this error when importing opencv?

```
>>> import numpy as np
>>> import scipy
>>> import cv2
```

RuntimeError: module compiled against API version 0xb but this version of numpy is 0xa

Traceback (most recent call last):

File "<stdin>", line 1, in <module>

ImportError: numpy.core.multiarray failed to import

```
>>> np.__version__
```

```
'1.11.0'
```

```
>>> scipy.__version__
```

```
'0.17.0'
```



Nathaniel Rabold 1 day ago I was able to get the ps00 tests to run using numpy-1.13.1.



Lin Shao 1 day ago I met the same error with numpy 1.12.1. No problem with 1.13.1.

☒ Resolved ☐ Unresolved



Hamza Surti 1 day ago

I pass the tests but my python version on mac is still 2.7.13. Is that okay? When I try

```
brew install python
```

it says that python is already installed



Sarah Byers 1 day ago The instructions for Mac state that 2.7.13 is what is used for grading:

"You should note that this class requires Python 2.7 (and is graded using 2.7.13)."

☒ Resolved ☐ Unresolved



Steven Larrivee 1 day ago

This is going to sound stupid.... but when I went to get the test run at github it asks for an Ldap sign in, I tried using my github sign in and it rejected it. So how do I sign in?



richard (rick) suhr 1 day ago If you're asking what I think you are, you need to use your gatech sign in.



Steven Larrivee 1 day ago I tried that and it gives me an invalid credentials error



Trenton Faris 1 day ago Have you first logged in at github.gatech.edu?



Steven Larrivee 1 day ago tried, still get invalid error



Steven Larrivee 1 day ago Got it! FYI for anyone else having trouble logging in do not use gatech.edu at the end of your log in name! (wow do I feel dumb!!!)

☒ Resolved ☐ Unresolved



Cassie Wright Jr. 1 day ago

FYI. I'm using virtualenv on a Mac; it was NOT EASY but I eventually got everything set up.

If anyone needs advice let me know and I'll do the best I can to assist.



Andrew Kapocsi 1 day ago Can you please share the steps you followed?



Cassie Wright Jr. 2 hours ago

1) Install virtualenv and virtualenvwrapper ([tutorial here](#)).

2) Install Brew: At command line as admin, execute:

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

3) Install OpenCV; use the [PyImageSearch tutorial](#). **Remember to use the 2.4.13 version.**

Also, you'll have to tweak the 'make' file for your environment. Here's a sample of mine:

```
cmake -D CMAKE_BUILD_TYPE=RELEASE \
-D CMAKE_INSTALL_PREFIX=/usr/local/Cellar \
-D PYTHON2_PACKAGES_PATH=/CLW/Dev/Python/Envs/cv01/lib/python2.7/site-packages \
-D PYTHON2_LIBRARY=/Library/Frameworks/Python.framework/Versions/2.7/bin/python \
-D PYTHON2_INCLUDE_DIR=/Library/Frameworks/Python.framework/Versions/2.7/Headers \
-D INSTALL_C_EXAMPLES=ON \
-D INSTALL_PYTHON_EXAMPLES=ON \
-D BUILD_EXAMPLES=ON ..
```

4) Copy cv2.so and cv.py files to local virtualenv directory

5) Copy OPENCV libs to correct directory. Here's the command I used, but may be different for your environment:

```
sudo ln -s /usr/local/Cellar/lib/*.dylib /usr/Local/Lib
```

I hope this helps.

—Cass

☒ Resolved ☐ Unresolved



Ashish Ahuja 1 day ago

I am using Windows 7 and facing error while installing numpy as outlined in the document. Please suggest some solutions. Tried upgrading pip but got message system is up-to-date

```
ca: C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\ahujaxia>python
Python 2.7.13 <v2.7.13:a06454b1afa1, Dec 17 2016, 20:53:40> [MSC v.1500 64 bit <
AMD64>] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> quit()

C:\Users\ahujaxia>python -m pip install --upgrade pip
Requirement already up-to-date: pip in c:\python27\lib\site-packages

C:\Users\ahujaxia>cd downloads

C:\Users\ahujaxia\Downloads>pip install "numpy-1.11.3+mkl-cp27-cp27m-win_amd64.w
hl"
numpy-1.11.3+mkl-cp27-cp27m-win_amd64.whl is not a supported wheel on this platf
orm.
You are using pip version 8.1.1, however version 9.0.1 is available.
You should consider upgrading via the 'python -m pip install --upgrade pip' comm
and.
```



Ashish Ahuja 1 day ago It finally worked. Just had to restart the machine.

☒ Resolved ☐ Unresolved



Paul D Thompson 1 day ago

Pleased to say both my native Mac installation and my vagrant machine from Computational Photography passed the ps0.py tests.

☐ Resolved ☒ Unresolved



Graham Arthur Mackenzie 1 day ago

Following the instructions for Mac here...

When I ran `brew install python` I got an error, saying that 2.7.13 was already installed (and have caused myself further headache by upgrading to 2.17.13_1)

When I restarted the terminal, it still said my Python version was 3.5.2.

Any idea where I'm going wrong here?

Secondly, why do the instructions talk about running Python 2.7.11? Aren't we supposed to be running 2.7.13?

Please forgive any newbie gaffs here. I have always found installing things via Terminal interface to be rather bewildering, and the problems that come with installing multiple versions of Python to be especially so.

Thanks for any and all help!



kamal kamalaldin 1 day ago If Python is already installed using brew, try running

```
brew list --versions
```

Then you should see python with the version installed under brew.

In terms of 2.7.11 vs 2.7.13, I agree with you. I was a bit confused as to how the guide said we needed 2.7.13 but seemed to guide us to install 2.7.11.



kamal kamalaldin 1 day ago And if you want to run python 2.7.13, then you might have to run

```
python2
```

instead of just

```
python
```

It depends on which python you have as default.

Also, Mac comes with an installation of python, so you might have to "ignore" this prepackaged python installation by running

```
brew link --overwrite python
```

if you install other brew libraries (e.g. numpy, scipy, opencv) but can't seem to import them. Though don't link if you don't need to.



Paul D Thompson 15 hours ago Also try `which python` to see where it is running from. Your brew installed python should live in /usr/local/bin.

☒ Resolved ☐ Unresolved



Thomas Kimbrell 22 hours ago
Using the Mac instructions...

When I try to install openCV I am getting the following error. I tried opening up the repo but it doesn't seem to be downloadable from there. Any ideas how to get openCV installed from here?

```
Thomass-MacBook-Pro:~ thomaskimbrell$ brew install homebrew/science/opencv --with-ffmpeg
Error: No available formula with the name "homebrew/science/opencv"
=> Searching for a previously deleted formula...
homebrew/science/opencv was deleted from homebrew/science in commit 6c38af15:
  opencv, opencv3: migrate to homebrew/core (https://github.com/Homebrew/homebrew-science/issues/6126)

To show the formula before removal run:
  git -C "$(brew --repo homebrew/science)" show 6c38af15:opencv.rb

If you still use this formula consider creating your own tap:
  https://docs.brew.sh/How-to-Create-and-Maintain-a-Tap.html
Thomass-MacBook-Pro:~ thomaskimbrell$
```



Lin Shao 22 hours ago I met the same error. You can try the following:

```
brew tap homebrew/science
brew install opencv@2
```



Thomas Kimbrell 13 hours ago Thanks Lin!

☐ Resolved ☒ Unresolved



Jihyun Lee 20 hours ago
I am using Anaconda2(based on py27), and installed 2.4.11 openCV version
And, it ran 5 tests and failed 1 to load video.

Even though cv2.VideoCapture("turtle.mp4") does not make any compile error, it looks like not working.
okay, frame = video.read() => (False, None)

Any thought?



Paul D Thompson 14 hours ago Just a guess, but it sounds like the ffmpeg codec isn't installed. Did you install with --with-ffmpeg?



Sunil Arwari 10 hours ago hey, maybe a dumb suggestion, but are you sure that the turtle.mp4 file is in the same directory where you are running the script from? I had this problem the first time - I had just downloaded the script and didn't think about the video file.



Ran Chen 10 hours ago @Sunil Not dumb at all hahaha, I did that without even realizing the script was trying to import something :)



Jihyun Lee 5 hours ago Hi Paul, I used anaconda and it is installed, version 2.7.0.
@ Sunil, and Ran, yeah file is in running directory.

It's very weird.

ffmpeg	2.7.0	0	menpo
opencv	2.4.11	py27_1	menpo

Any idea on these?
These are conda list.

☐ Resolved ☒ Unresolved



Christian Stober 15 seconds ago
I'm going to use an Ubuntu 16.04 VM for this course. I ran the apt-get command as suggested, and the unit tests in ps0.py pass. When I manually check the OpenCV version, I discover it's 2.4.9.1, which seems to be a release from Sep 2, 2014. However, this post states 2.4.13 is required, even though the provided unit test seems to just check for 2.4.x.

Could an instructor clarify, please clarify: will 2.4.9.1 be adequate? If not, is there a recommended method to acquire 2.4.13 in Ubuntu? I found some guidance online, but wanted to confirm before I go mucking things up if passing the ps0.py tests is sufficient.

