Image processing in Python – Practical 2

I. Find the folder containing respiration data, it should be called “breathing_data” and contain 18 csv files
II. Load the required modules. These include, but are not limited to `numpy`, `matplotlib.pyplot` and `find_peaks` from `scipy.signal`
III. Use `numpy.loadtxt` to load the first csv file. Check the documentation for this function to figure out how to load a csv. What is the shape of the resulting array? What does the shape mean?
IV. Try plotting the data using a few different options (e.g. `plot`, `scatter`). What does each axis in the array refer to?
V. The data is probably quite noisy. To remove the noise, convolve the signal with a filter function by using `numpy.convolve`. There are some example filter functions in the PythonBasics.ipynb notebook, or you could try writing something of your own.
VI. Identify the peaks in the signal. You can use `find_peaks` from `scipy`, or implement something of your own. There is a broken implementation in the PythonBasics.ipynb notebook, see if you can figure out what is wrong and fix it.
VII. Now, plot the original signal, the smoothed signal and some markers identifying the location of peaks. Make sure that:
- Your axes are labelled
- There is a legend
- You can see all the plot lines

VIII. Save the figure in .png format
IX. Now you have this working for one csv file, try to apply it to the other 17 files. Produce a png showing the original signal, smoothed signal and detected peaks for each one. Try to automate this process, for example by using the functions in the `os` module to list files in a folder
X. By looking at the peak-to-peak interval, you should be able to work out the respiration rate for each csv file. Which one has the highest? Are there any that are weird, can you figure out how to exclude sections of the data to improve the respiration rate estimation?