Padaco Instruction Manual

1. Welcome

1.1. Introduction

This instruction manual will lead you through the steps of using Padaco in combination with a tutorial dataset. Padaco is a data visualization and processing toolbox for analyzing data collected from Actigraph's GT3X+ wearable device. The GT3X+ records ambient light and three axis of acceleration, which is useful for assessing context, patterns, and levels of human activity. Padaco has three primary modes of operation: single study viewing; batch processing; and group pattern exploration. The single study view mode is for visualizing the contents of individual GTX3+ output files directly or as derived through Padaco's classification or feature extraction algorithms; which the user can choose from and configure. The batch processing mode is for configuring and then applying specific parameter refined feature extraction and activity classification methods to a collection of GT3X+ output files, which, in turn, can be used by Padaco's pattern exploration mode. This final mode is for visually presenting trends found in the batch processed output sample.

This manual is broken into four sections: 2(1) Installation and setup; (2) System requirements; (3) Single study mode; (4) Batch processing; and (5) Group pattern exploration.

1.2. Licensing and system requirements

Padaco is distributed under a common-creatives attribution license http://www.gnu.org/licenses. Padaco may be run directly from either (1) its source code within MATLAB, which requires a licensed copy of MATLAB, MATLAB version 2009 or later to be installed; or (2) as a standalone application from one of the OS specific binary files available for Windows 7 (or later), Mac OS X (10.6 or later), and CentOS (5.4 or later). The binary applications rely on installation of the MATLAB compiled runtime (mcr) to be installed as part of the setup process.

2. Installation and setup

2.1. Stand-alone application

This section covers installation and setup of Padaco as a standalone application; which does not require a MATLAB license.

1. Download the Padaco program and tutorial dataset from http://www.stanford.edu/~hyatt4/software/padaco.
2. Unzip the Padaco archive and double-click the ***MyAppInstaller_web*** file.

   Note: The following steps may vary by operating system (Mac OS X shown here) and if a MATLAB complier runtime (MCR) environment has previously been installed on

your computer.

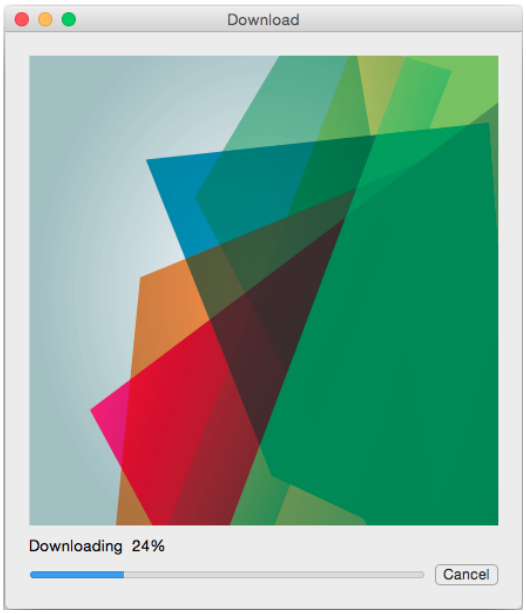


Figure 1: Installer downloading the MATLAB compiler runtime from the web. An internet connection is required.

3. The installer begins downloading additional installation files. (Figure 1)

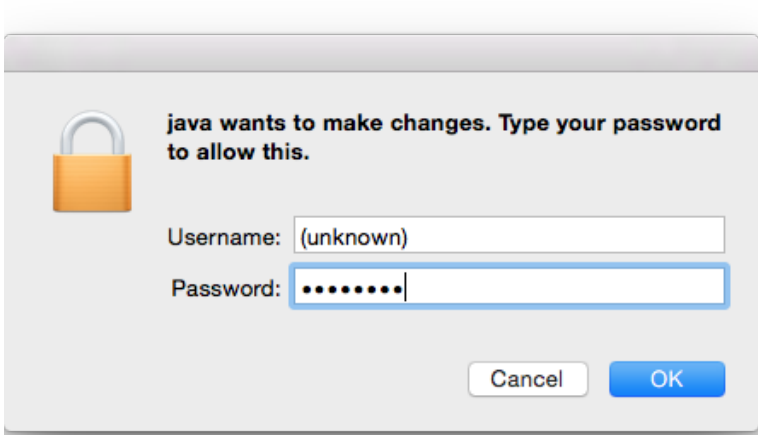


Figure 2: Installation may request administrative privileges during the process.

4. Enter your administrative credentials as applicable. (Figure 2)
5. Configure your network connection settings as necessary. Note: an internet connection is required to download the MCR files necessary to run Padaco independently of MATLAB. (Figure 3)
6. Choose and confirm the installation directory for Padaco; this is where the application (*.exe* or *.app*) will be placed. (Figure 4a and 4b).

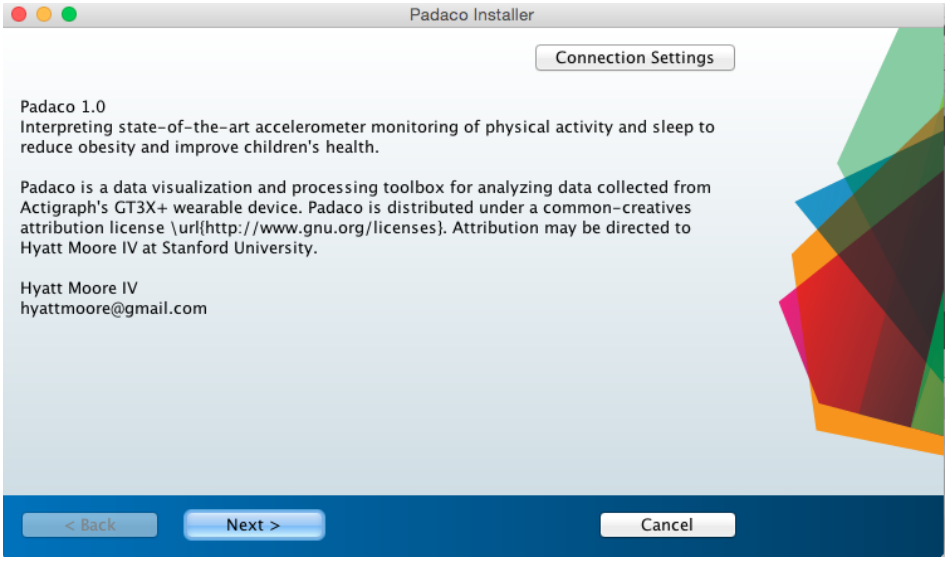
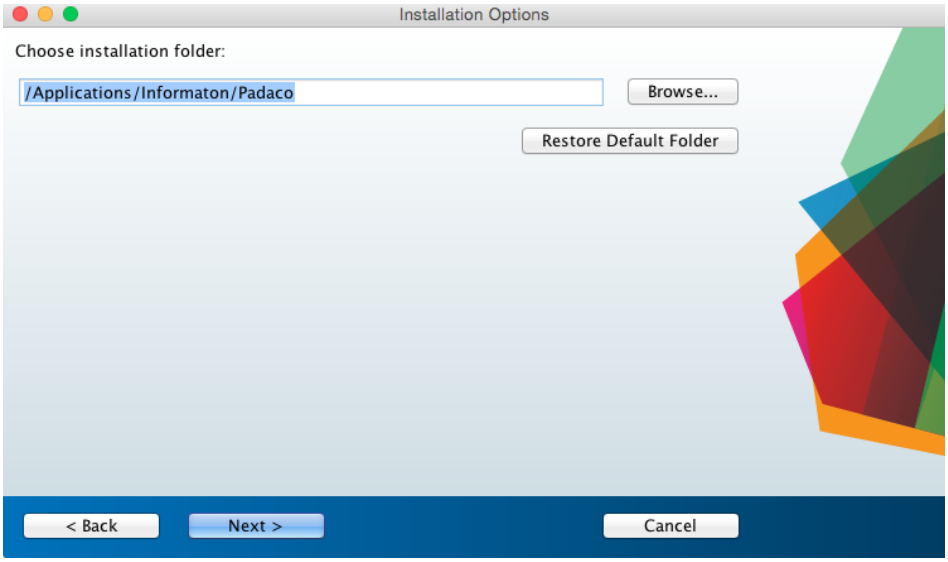
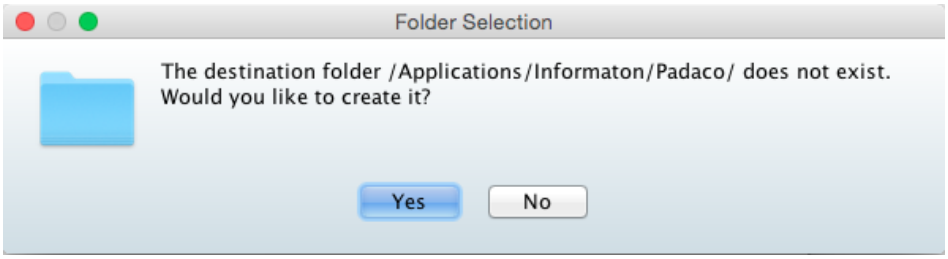


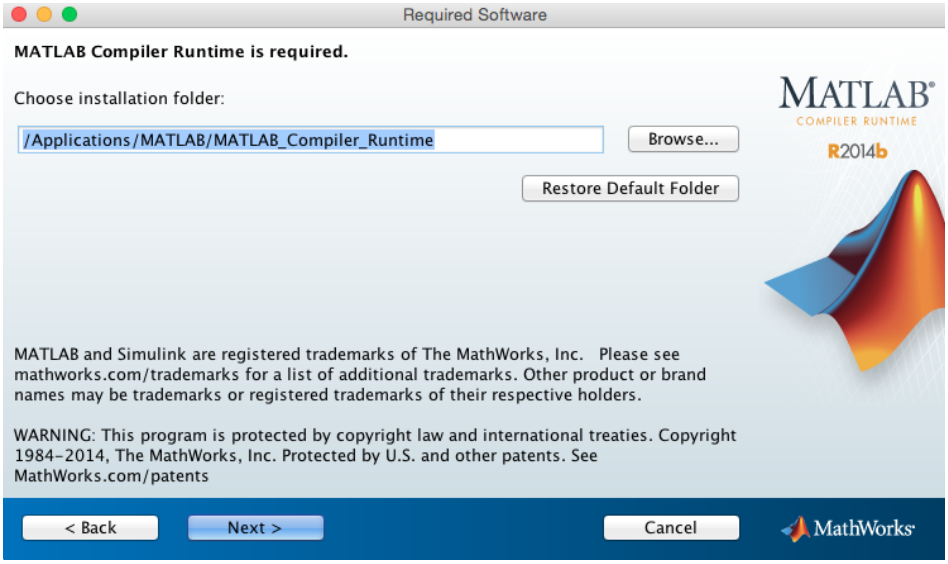
Figure 3: Click ***Connection Settings*** to configure internet connection settings for MCR download (if necessary) and click ***Next*** to continue with the installation.



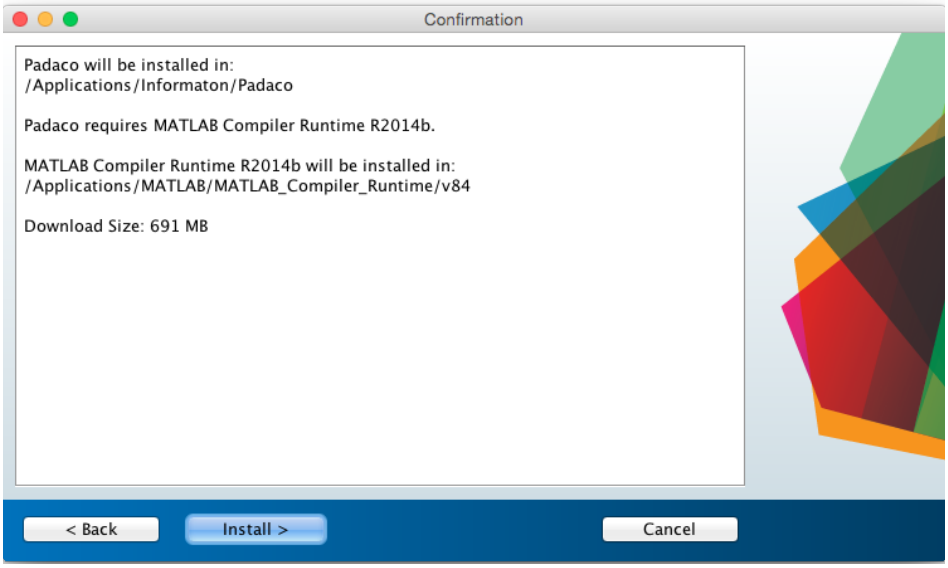
(a) Select the installation directory for Padaco (defaults shown).



(b) Confirm creation of the installation director (as necessary).



(a) Select the installation directory for the MCR (defaults shown).



(b) Confirm installation details (as necessary).

7. Choose your installation directory for the MCR and install.

8. Confirm installation details.

9. Read The Mathworks' EULA and, if you agree and want to continue the installation, select *Yes* and then click *Next*.

10. Wait for the MCR files to completely download and install. Download times will vary based on internet connection and operating system performance.

11. Click **Finish** and wait for the MCR installation and download to complete. (Figure 5)

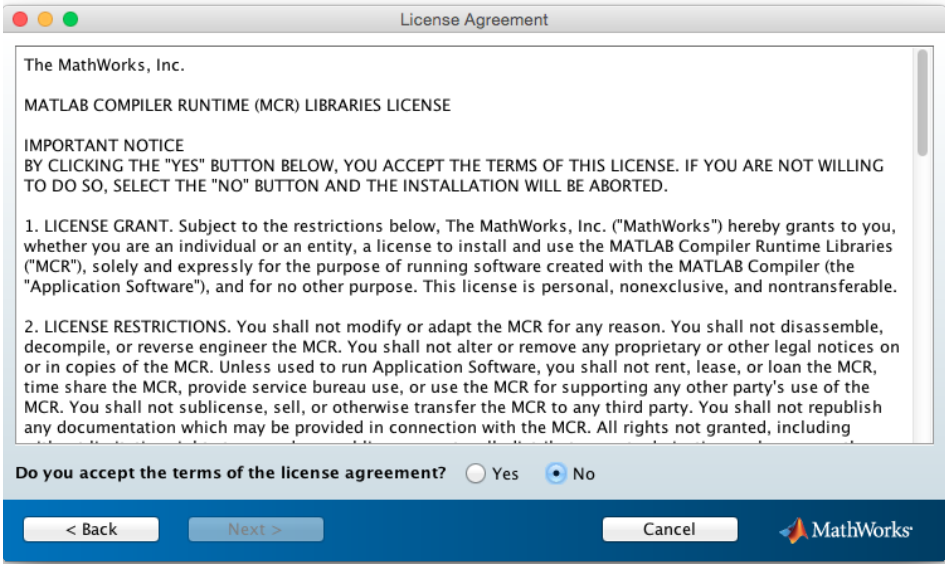


Figure 4: Read and confirm MATLAB's End User License Agreement if you agree with it. You must confirm if you wish to continue with the installation.

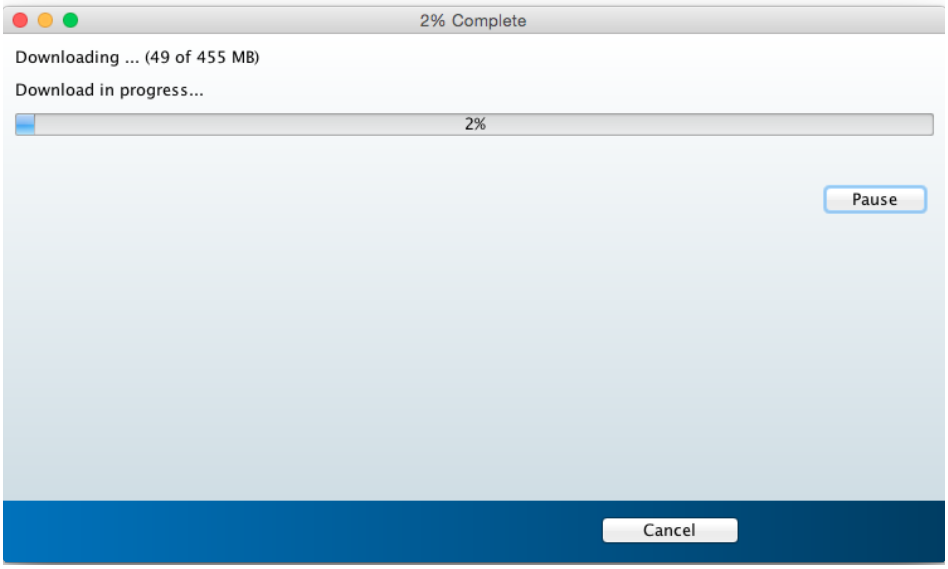


Figure 5: Progress display for MCR download.

12. Once the installation is complete, you may run the Padaco program by clicking on its application file; which is located in the install directory set previously (see Figure 4a). The MCR required to run Padaco will load first, in the background, and can take up to 30-seconds on some machines.

2.2. Source code installation and setup

The following outline will guide you through the steps necessary to run Padaco directly from its source code. A licensed version of MATLAB is required to run Padaco directly from its source code.

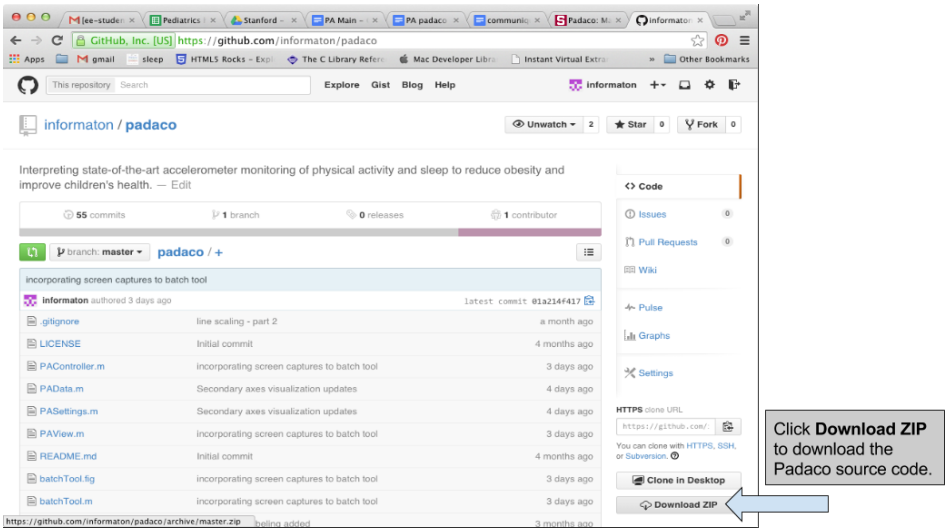


Figure 6: Padaco's source code is available at http://www.github.com/informaton/padaco. Click on the **Download ZIP** button in the lower-right corner to download a compressed archive (.zip) of the source code.

1. Download the Padaco source code from www.github.com/informaton/padaco. Users can do this via *git* or by clicking the **Download ZIP** button found on the repository's webpage (see Figure 6).

2. Unzip the downloaded file into a convenient directory or own computer (e.g. the *Documents* folder)

Figure 7: Padaco's source code is available at http://www.github.com/informaton/padaco. Click on the **Download ZIP** button in the lower-right corner to download a compressed archive (.zip) of the source code.

3. Open MATLAB and continue with the following steps from within MATLAB, once it is running.

4. Add the folder where you unzipped the Padaco files to your MATLAB path.

5. To start Padaco from the from the MATLAB editor prompt, type *padaco* into the editor window followed by the *Return* (or *Enter*) key (Figure 7).

6. Use the following steps to launch Padaco from MATLAB's home menubar.

   (a) From MATLAB's home menu bar, select *File* and then *Open*. The Open File dialog will appear. Locate the path containing the Padaco source code (e.g where source code was downloaded from or copied to; e.g. C:\Padaco\). Select the file ***padaco.m*** and press the *return* key or click *Open*.

   (b) The Padaco.m file will open in an editor window.

   (c) Select *Debug* and then *Run* from the MATLAB toolbar bar

   (d) If prompted to *Add Folder to Path* or *Change Directory*, either choice will allow use of the program. Selecting *Add Folder to Path* makes it possible to run the program by typing *padaco* into the MATLAB command terminal and pressing the **Enter** key.

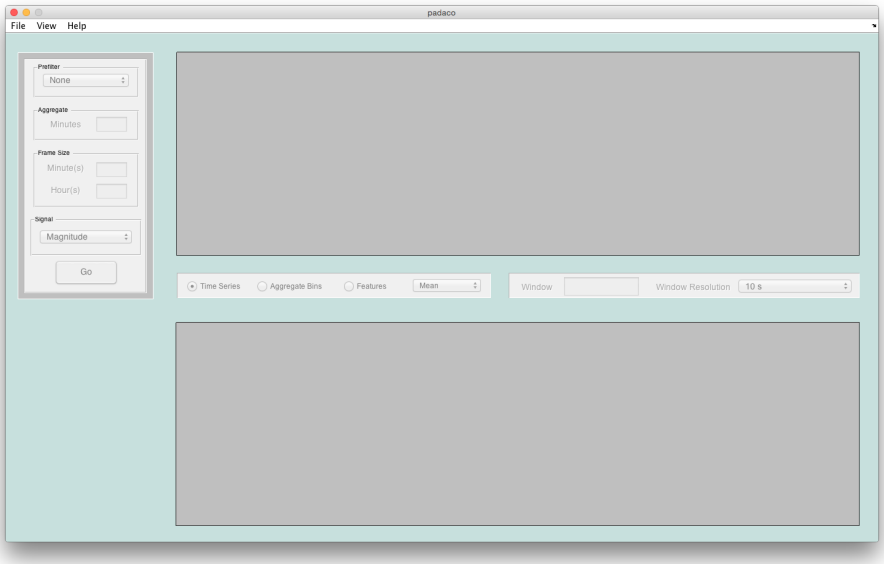


Figure 8: Padaco's initial launch screen.

Padaco starts in the *Single study view mode* the first time it is launched (Figure 8). See Section 8 for troubleshooting, if this not the case.

3. Tutorial data

A week of triaxial-accelerometer data was collected continuously at 40 Hz from the Actigraph GT3X+ from a male subject between 25 and 35 years of age. This dataset companion is

provided for use with Padaco and is referenced through the instruction manual. It consists of two files, which have been compressed into a 55 MB .zip archive that can be downloaded at http://www.stanford.edu/~hyatt4/software/padaco/sampleData.zip.

The two files include (1) the raw accelerometer values collected at 40Hz, and (2) their corresponding *count* values, based on a 1-second epoch, as assigned by the Actilife® software.

1. **sample1_sec.csv** This is the 1-second *count* data as output by the ActiLife software.
2. **sample.gt3x** This is the raw, binary data collected from the GT3X+ device.

The data archive should be placed in a convenient location on your computer and unzipped for readers wanting to follow along with the same data used in this guide. In this guide, the sample dataset is assumed to be saved in the folder */home/user/padaco*.

4. Single study view mode

5. Batch processing

Instructions for batch processing the tutorial dataset are provided first, followed by a second example showing the batch processing tool applied two a larger dataset that is not included with the tutorial.

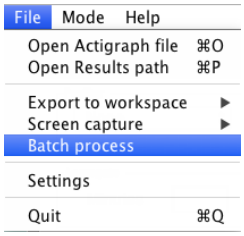


Figure 9: Start the batch processing toolbox from Padaco's file menubar

Use Padaco's menubar to switch to the Batch Processing tool; Figure 9. Default settings for the Batch Processing tool are shown in Figure 10.

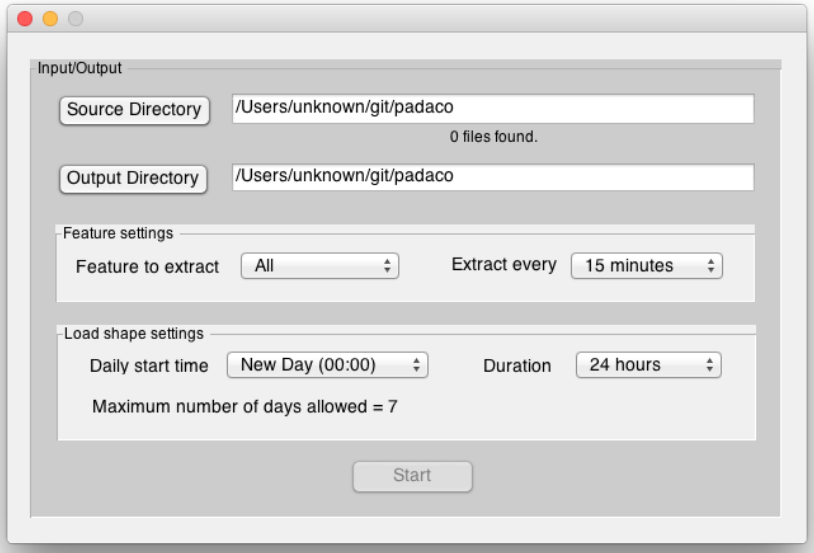
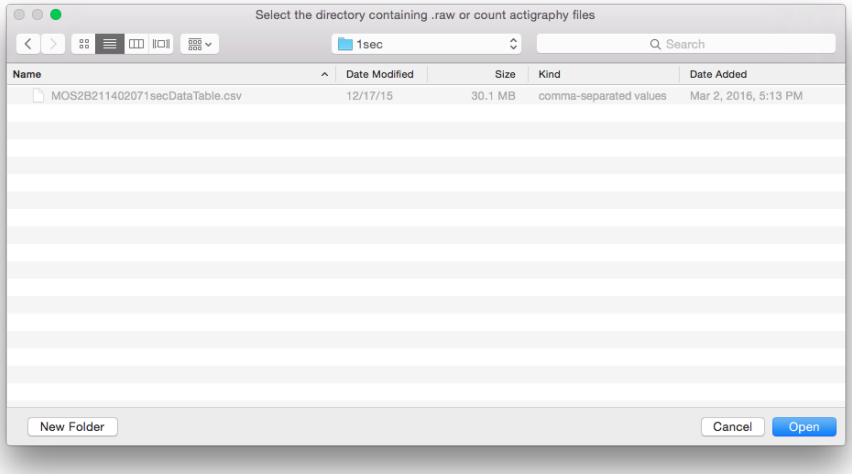


Figure 10: Initial settings for Batch Processing.

5.1. Tutorial dataset

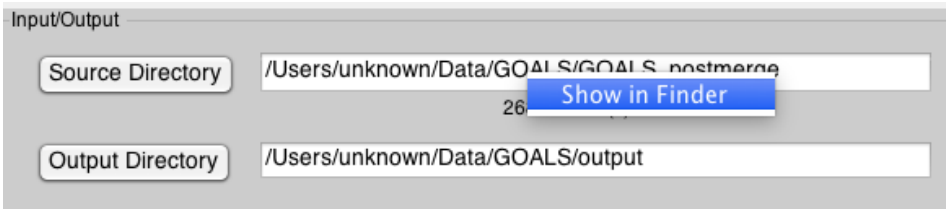
Adjust the initial batch settings with the following steps:



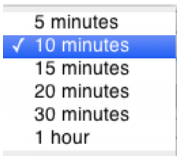
(a) Open the path containing the .csv Actigraph file(s) to be processed; the directory containing the sample data.

(b) Results of selecting the folder with the sample data.

(c) Select the path where the processed data should be stored in a similar manner.



(d) Right-clicking on either path brings up a context window with the option to open the path with your operating system's file exploring tool (Mac's *Finder* shown here).



(e) Change the feature calculation interval, the amount of time consecutive given to calculate consecutive features to 10 minutes.

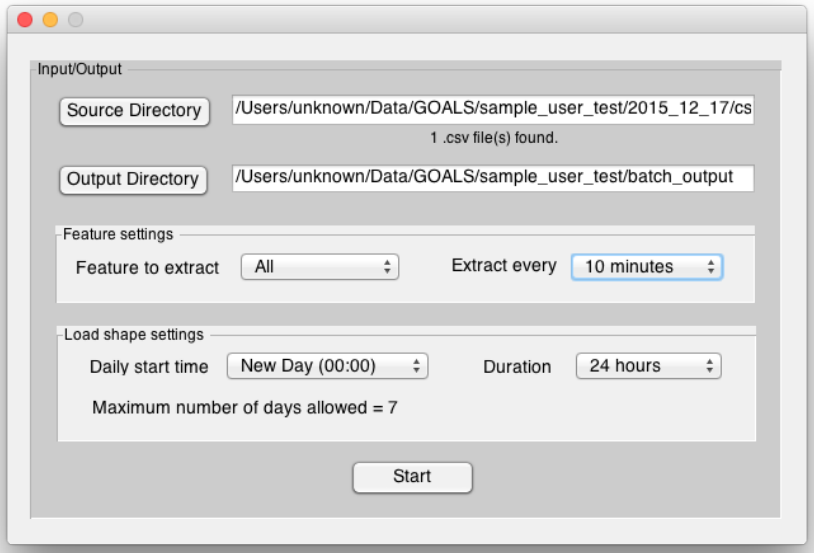


Figure 11: Final batch processing settings for the tutorial example.

Press ***Start*** to begin processing the sample data file.

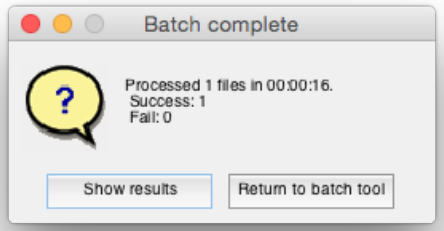
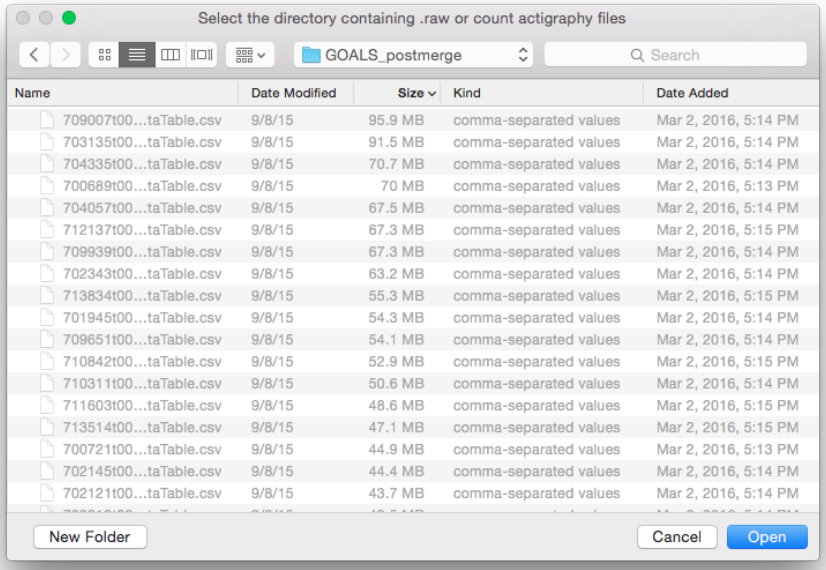


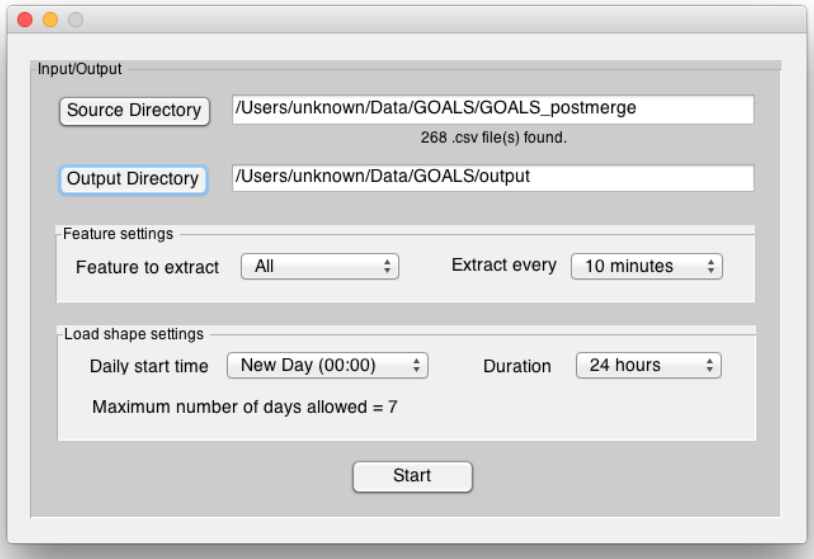
Figure 12: Summary results of the batch processing job are provided upon completion.

5.2. Larger dataset

A larger dataset, containing 268 Actigraph recordings is shown in this section. This data is not included with the software, however the screenshots provided additional reference for those using their own datasets.



(a) Example of selecting a much larger collection of Actigraph studies.



(b) Final batch processing settings for a larger dataset containing 268 input files.

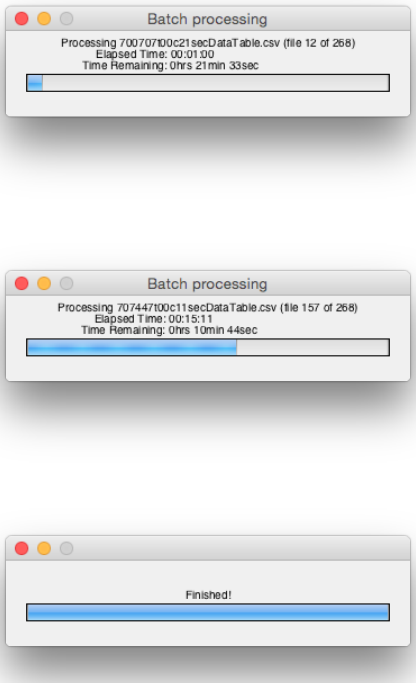
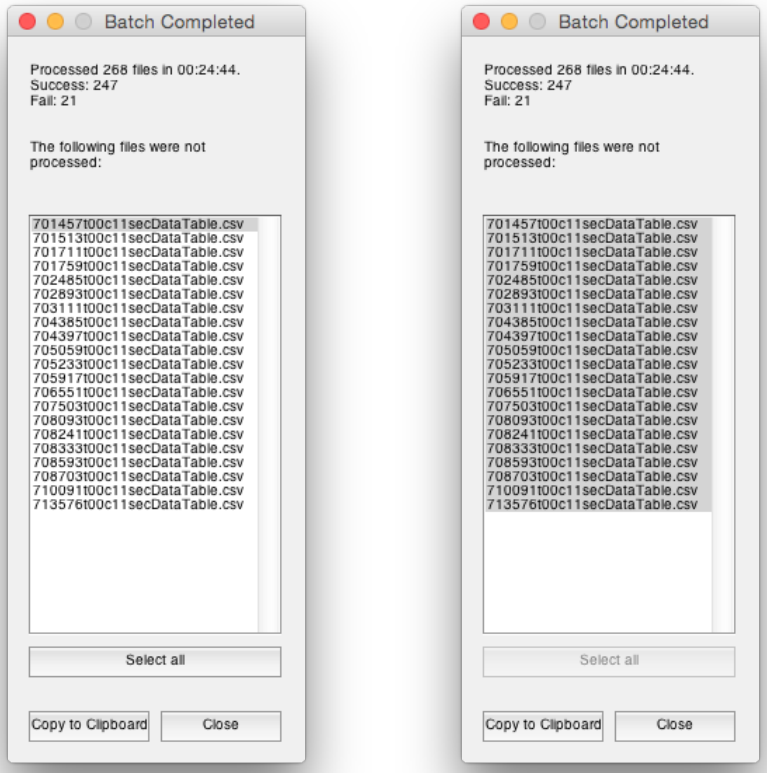


Figure 13: A waitbar shows the current batch processing job progress.



(a) (b)

Figure 14: Problematic files found during batch processing are displayed upon completion. A user can select these files and copy them to the clipboard using the output dialog.

6. Batch analysis

7. Troubleshooting