User Guide BatCount v. 1.24

Important notes:

- BatCount should be installed and then the application executable that is generated should be in a folder where the user has write permissions (for example on the Desktop or Documents folder. Similarly, the output folder location should also be to your Desktop or Documents folder. Leaving the executable in the install folder and using the wrong output folder can cause the program to crash if the folder permissions are not set to allow files to be written.
- To view settings descriptions on any buttons or numerical input boxes, toggle cursor over the setting of interest and a textbox with a brief description will appear.
- If a video needs to be run through BatCount software again after an initial run, it is important that the either original video file or the output folder is renamed. Otherwise, the original output file will be rewritten.
- If the program crashes, do not delete the output folder. It will generate an error report which will give insight into why the program crashed.

BatCount installation:

1. Visit http://sites.saintmarys.edu/~ibentley/imageanalysis/pages/BatCount.html and click the installation link (BatCount Install File for Windows Devices) (Image 1). Note: This file may not be trusted for download by web browsers and may require manual override to download.

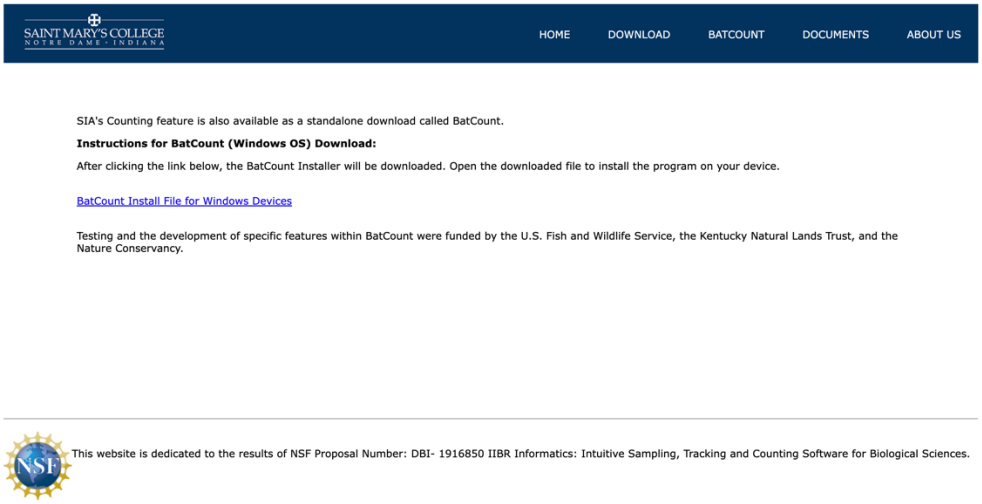

Image 1. Webpage containing BatCount installation link.

2. The installation file should appear in the computers downloads folder. Double click the installation file to begin installation. A pop up titled “Windows protected your PC” may appear. Simply click “More info” and “Run anyway” to continue the installation process (Images 2 & 3).

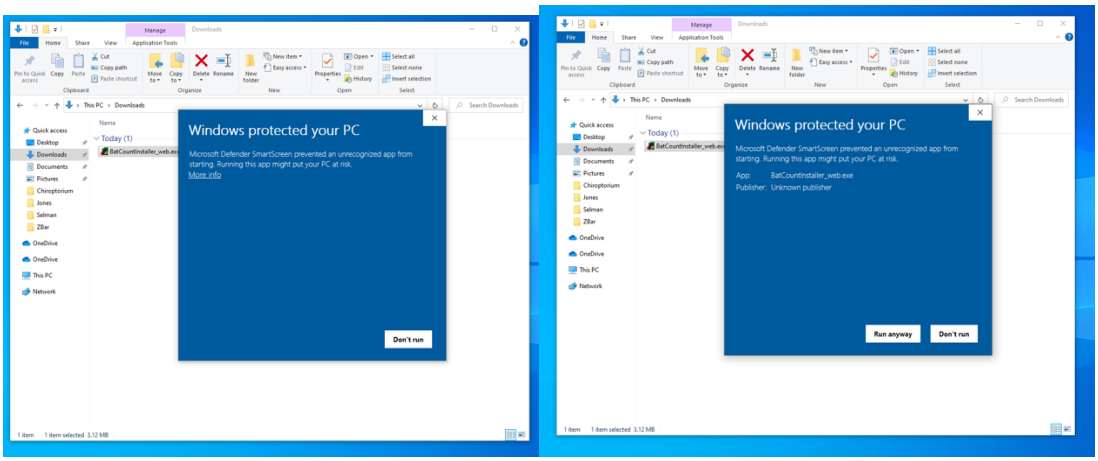

Image 2 & 3. “Windows protected your PC” pop up and override.

3. Another pop up will appear asking if you want to allow this application to make changes to your device, select “yes”
4. The window for the BatCount installer will appear now. Click “Next >”. This will take you to a screen where you can select a location for the installation folder (Image 4). To select the installation location, select “Browse”, select the desired installation location and click “Select”. The window will now return to the previous screen. Click “Next >”
    a. Note: For easiest use, it is suggested to install BatCount on the desktop of the computer. However, if installed elsewhere (ex: Applications), there is an option to add a shortcut to the desktop.

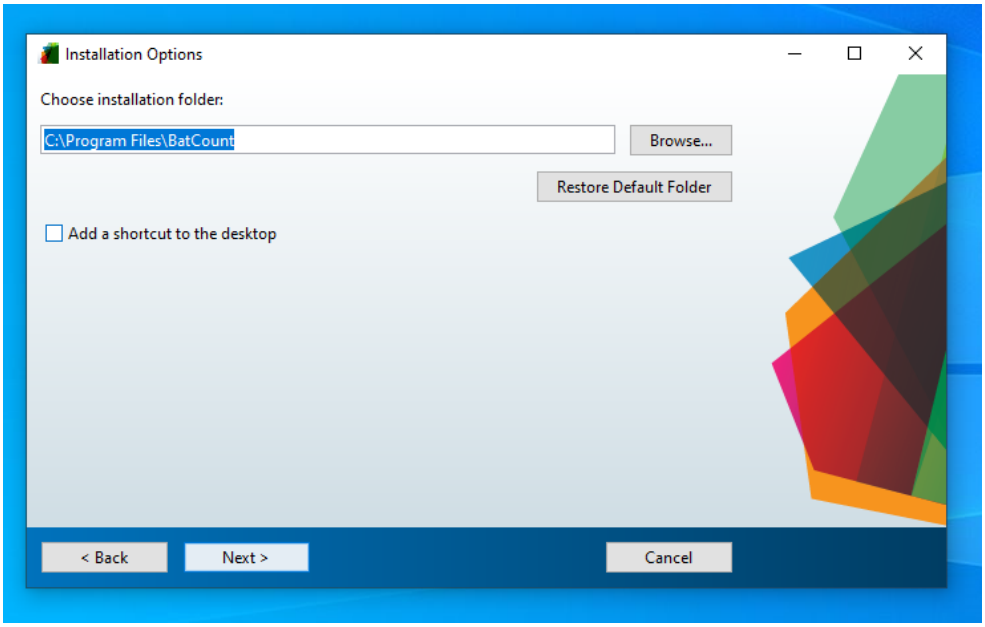

Image 4. Installation folder location selection window.

5. The window to select an installation location for MATLAB Runtime will appear next (Image 5). The default location is fine. Click “Next >”

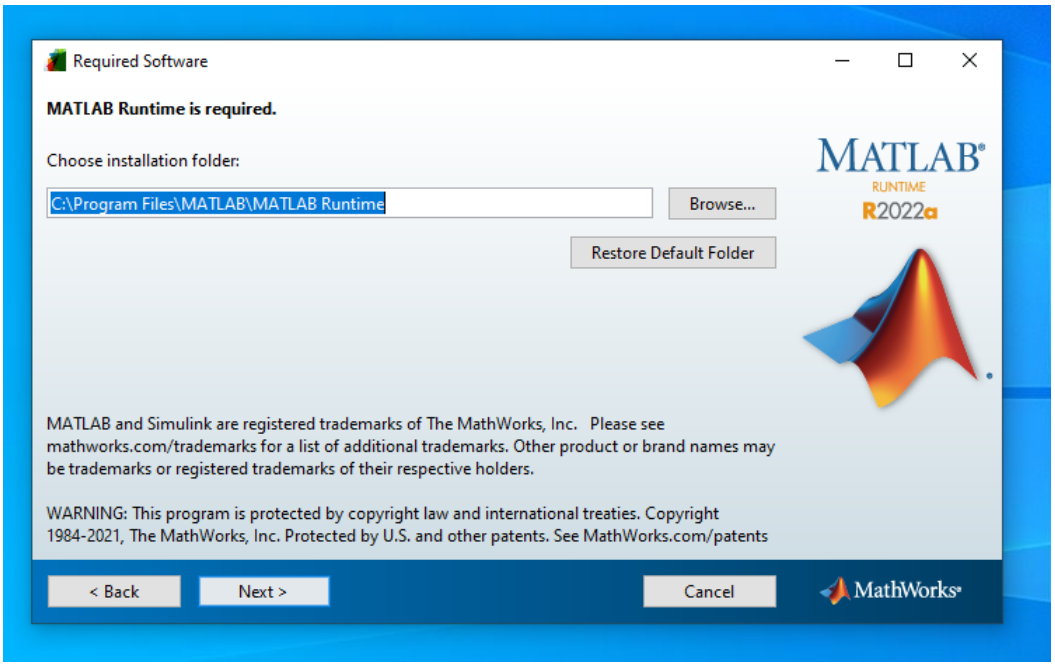

Image 5. MATLAB Runtime installation folder selection window.

a. Note: If you already have MATLAB Runtime installed, the computer should recognize and indicate this on this window similar to as seen below (Image 6). Simply click “Next >”

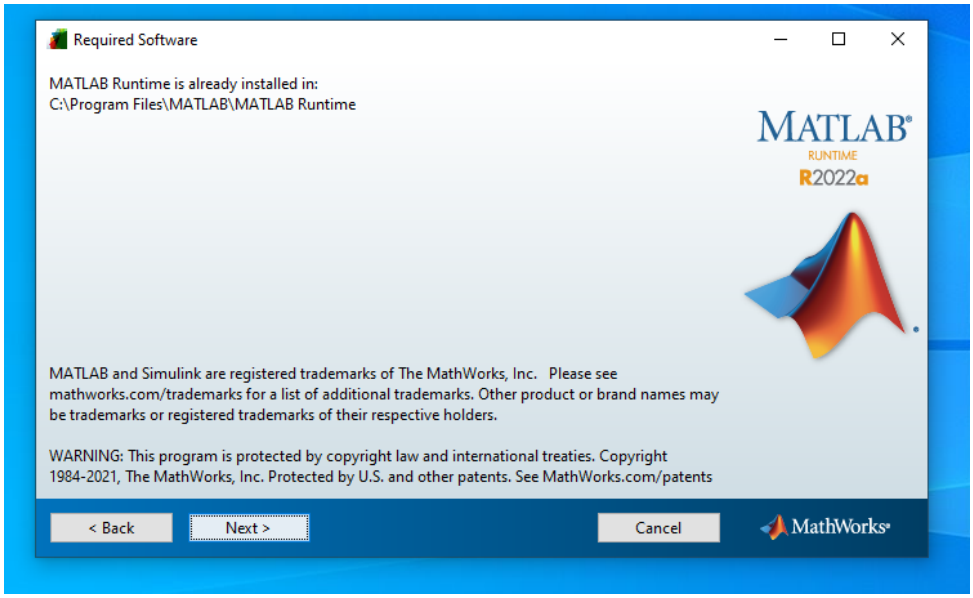

Image 6. MATLAB Runtime already installed window.

6. The next window is the terms of the license agreement (Image 7). Select “Yes” to agree to the terms and continue.

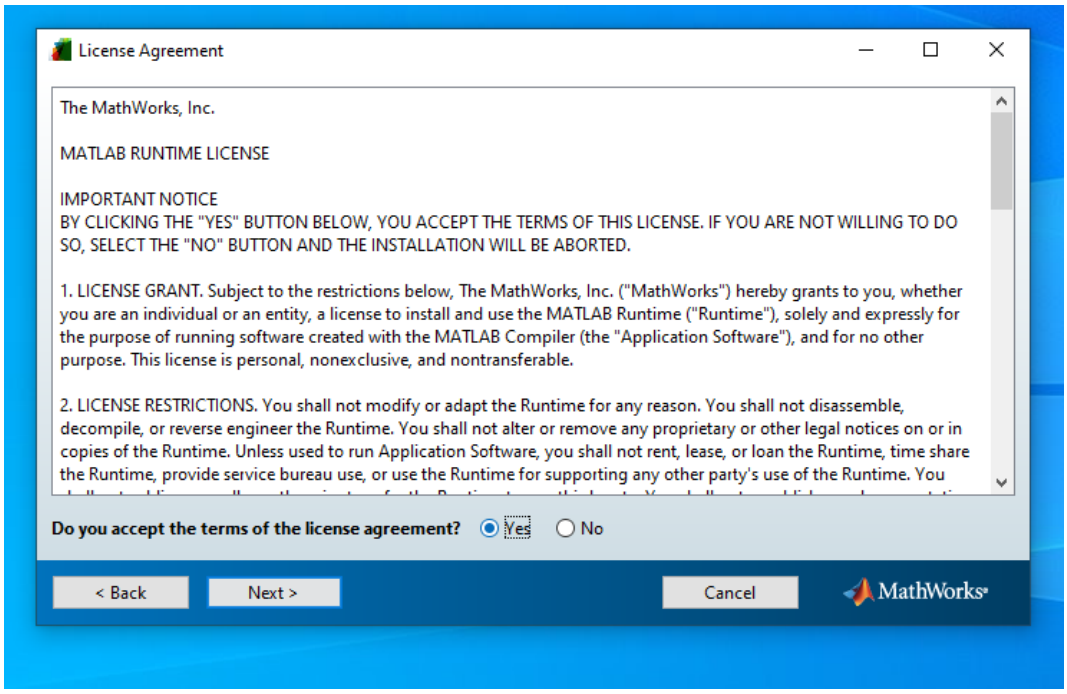

Image 7. Terms of license agreement window.

7. The next window is a confirmation window for installation of BatCount. Select “Install >” to install BatCount (Image 8). A window showing the progress of the download and installation should appear now (Image 9). This will take a few minutes.

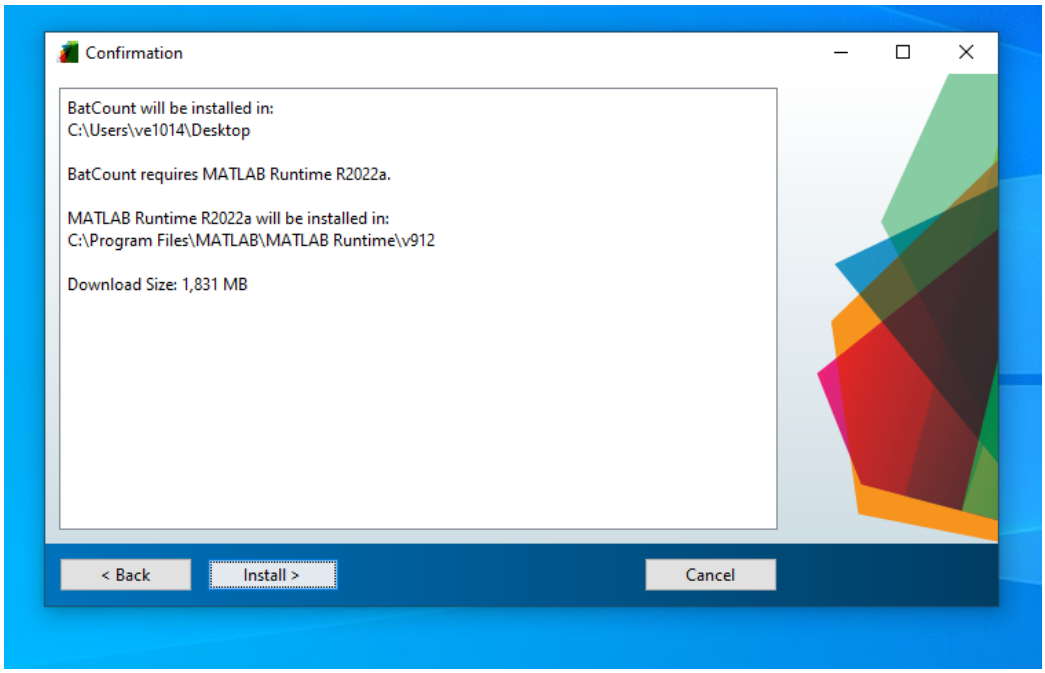

Image 8. Installation confirmation window.

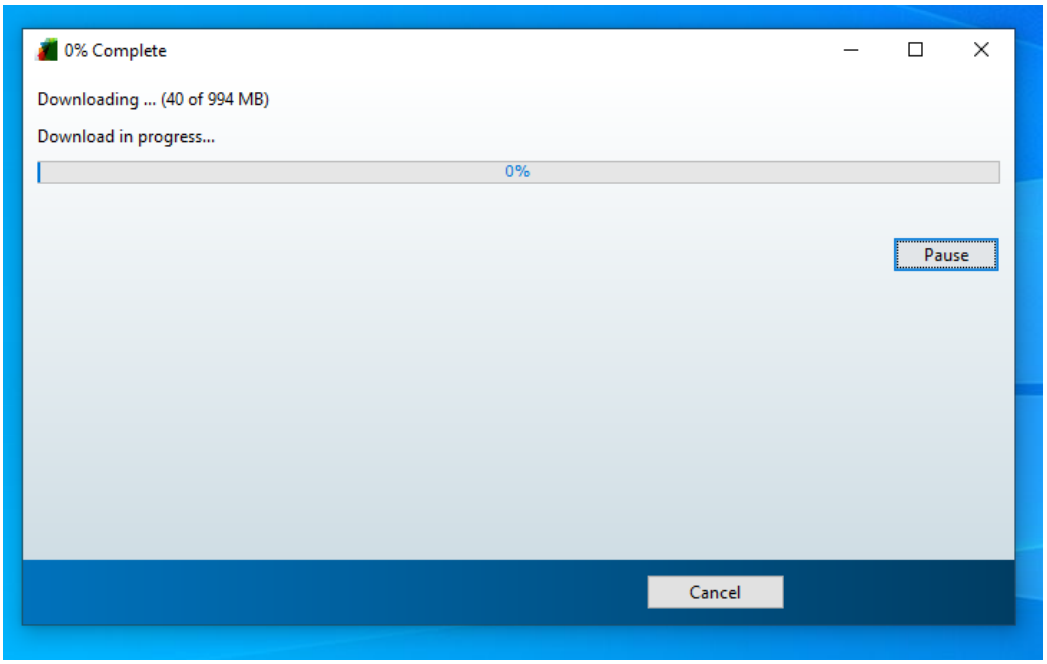

Image 9. Download and installation progress window.

8. Once installation is complete, a new window will pop up. Select “Finish” to close the installation window (Image 10).

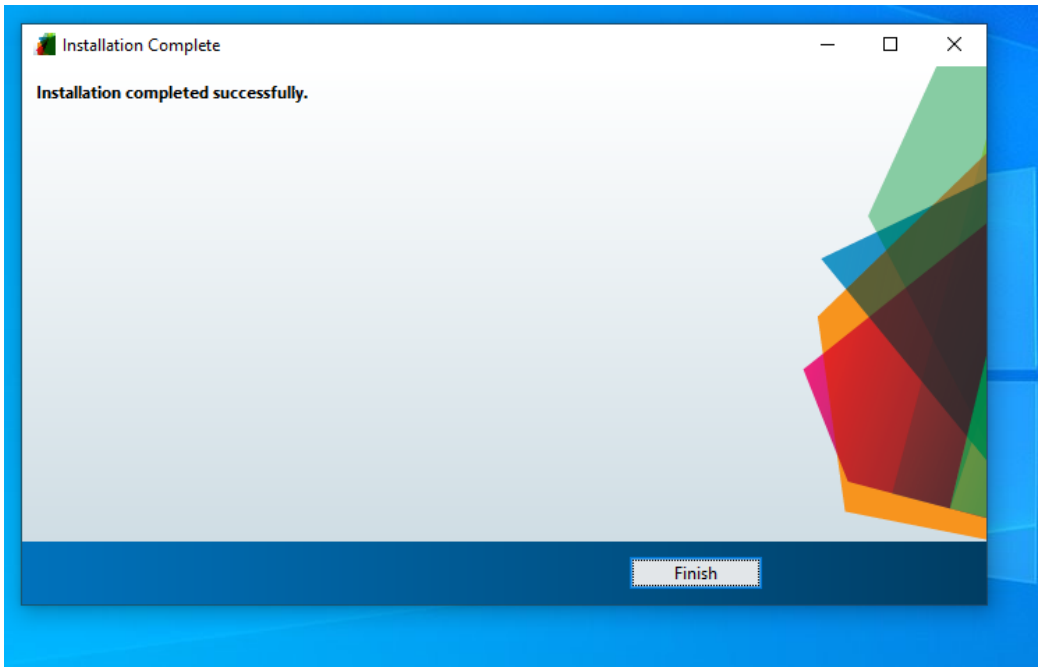

Image 10. Successful installation window.

9. An application folder can be found in the installation location now. To access the application, open the folder. The application can now be moved from the folder to the desktop or other desired location.

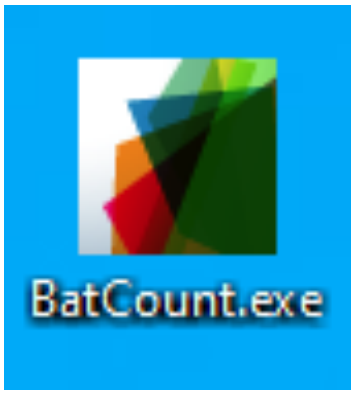

Image 11. Installed application icon.

Using BatCount:

1. Open BatCount by double clicking on the application file. Please note that it can take a minute for the code to begin. After opening the program the app will begun the interface will open (Image 12). If you'd like to change the output directory click on "Change Folder" and choose a folder path for the output files. When the selected output folder is suitable then click on "Select File" and choose desired file for analysis and select "open". Once desired file has been selected for analysis. The software will display text at the top of the window indicating the number of frames converted to temporary video files. Once all files have been converted, the window will update and take you to the settings window (Image 13).

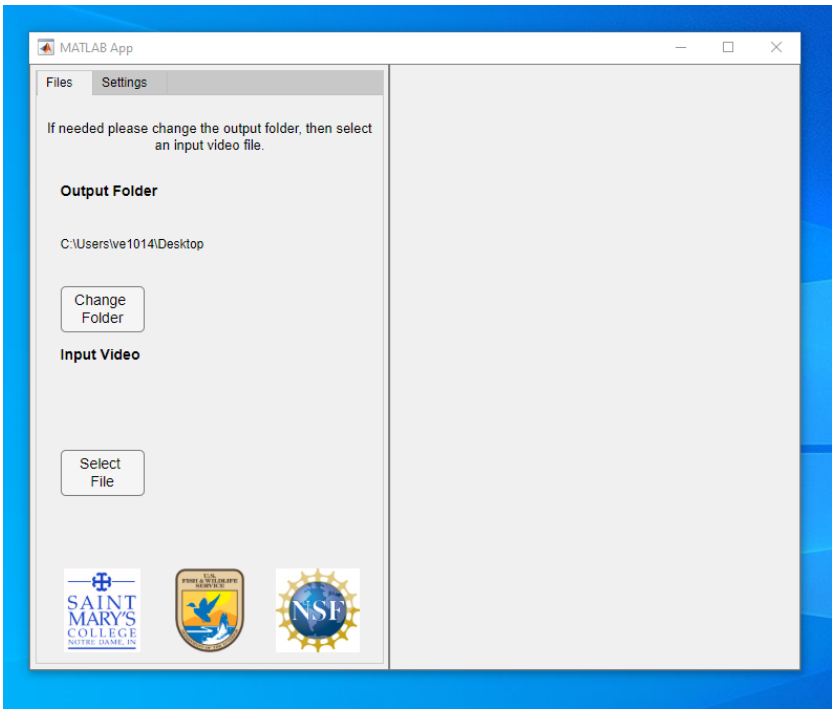

Image 12. Output folder and input video selection window.

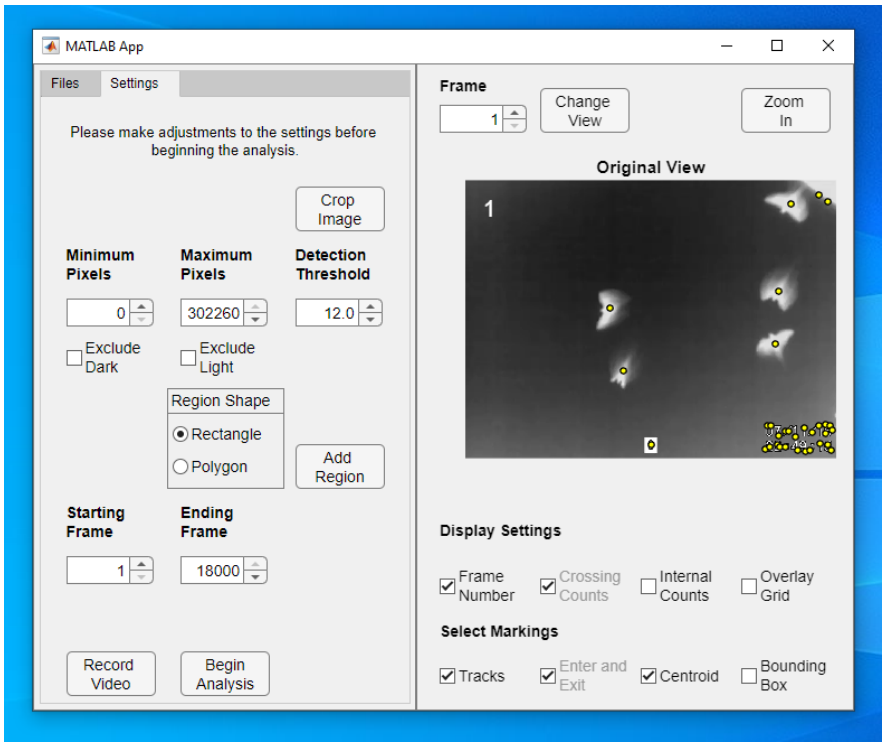

Image 13. Default settings window view.

2. BatCount settings:
    a. Minimum and maximum pixels:
        i. Minimum and maximum pixel size can be adjusted to exclude objects passing through the counting region that are not of interest. To refresh the view, go up or down a frame to see changes in selected objects.
    b. Detection threshold:
        i. The default detection threshold (12) is generally a good detection threshold for thermal videos. For videos with unusual lighting or poor contrast, the threshold may need to be adjusted to ensure bats are being accurately detected. Decreasing the detection threshold will increase the size of the object recognized by the software. Increasing the threshold will decrease the size of the object recognized by the software.
        ii. To determine threshold accuracy, toggle the “change view” button above the video frame on and off (Image 14). Adjust detection threshold until all bats in the standard video view appear in the black and white view. The threshold should be kept at a minimum to ensure bats are not being grouped together if possible.

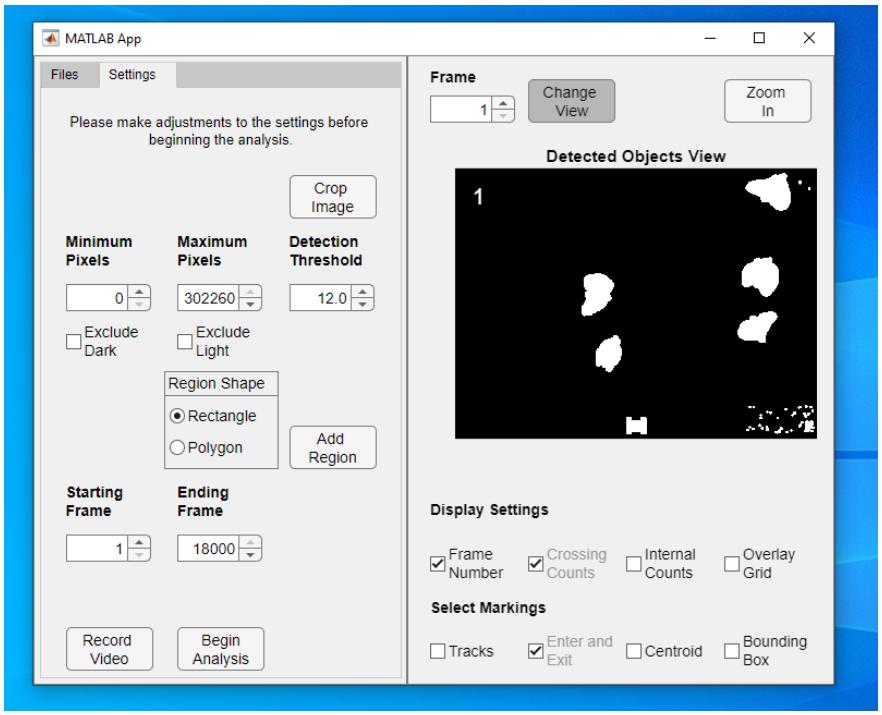

Image 14. Black and white view with default detection threshold.

c. Region shape placement:
    i. Place region in an area that overlaps with the main flow of the emergence of the bats. Please avoid regions that are near the edge of the video frame. Regions too close to the edge can cause the program to crash.
    ii. Add regions by selecting ‘Add region’ and dragging the cursor across the video view window to create the region. Regions can be rectangles (Image 15) or polygons (Image 16); this can be selected prior to region placement by selecting your preferred shape in the ‘Region Shape’ submenu in the settings window. Size and placement of regions can be adjusted after initial creation until the analysis is started.

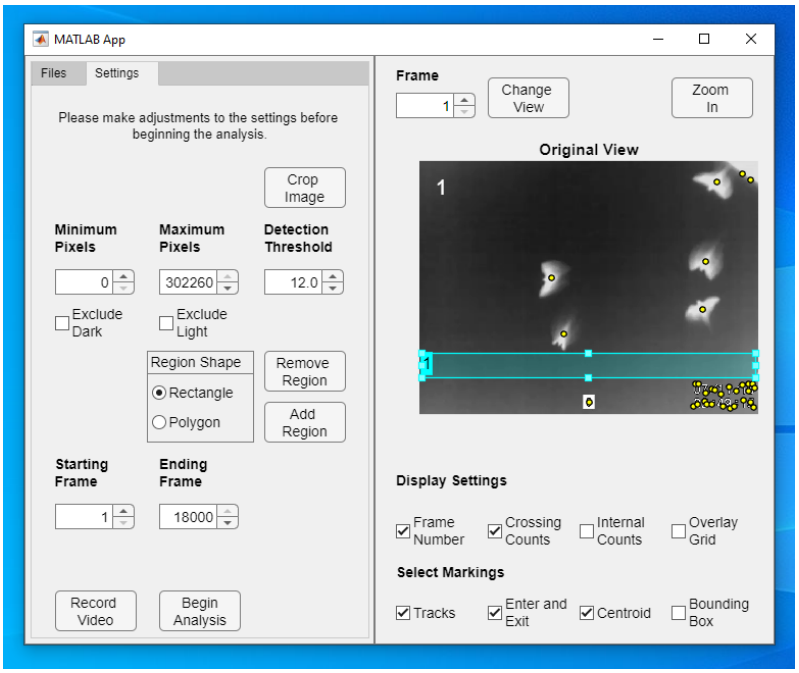

Image 15. Example of rectangle placement.

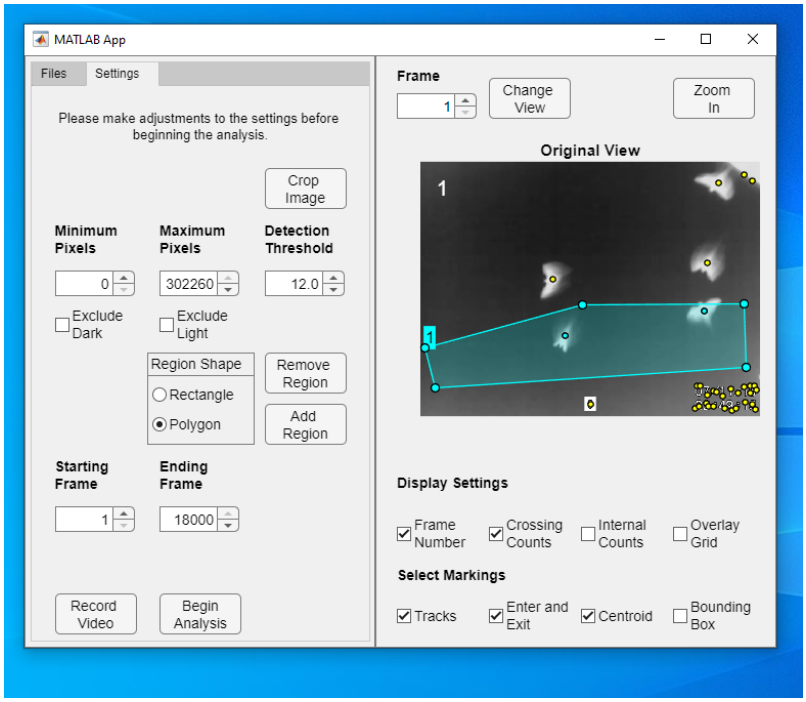

Image 16. Example of polygon placement.

iii. If bats are emerging in multiple directions, multiple regions can be placed that account for each stream of bats (Image 17). Regions can be added by selecting ‘Add Region’. Similarly, regions can be removed by selecting ‘Remove Region’.

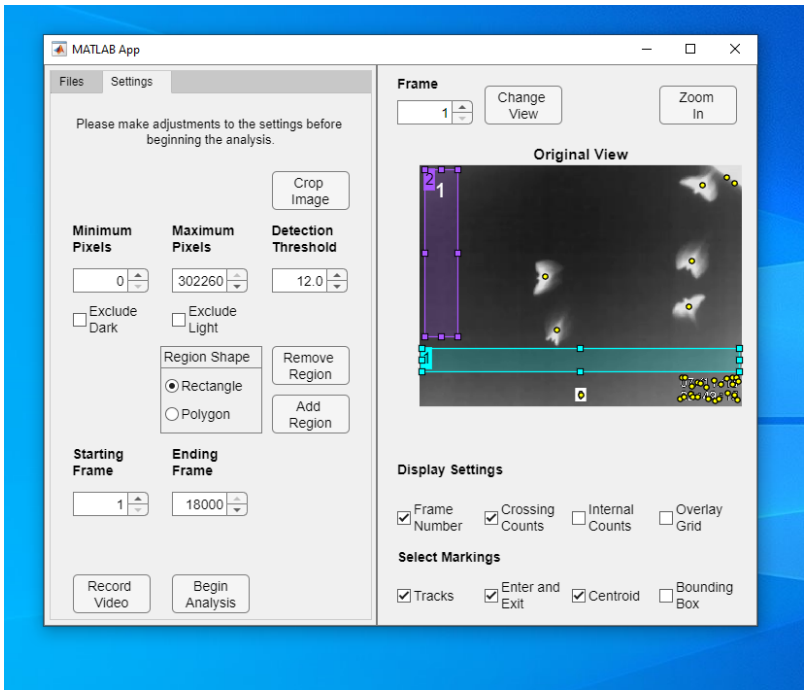

Image 17. Example of multiple regions.

d. Starting and ending frame:
    i. This option allows for a subset of frames within a larger video to be analyzed. To adjust the frames to be analyzed, type the frame you'd like the analysis to begin with into 'Starting Frame' and the frame you'd like analysis to end with into 'Ending Frame'
e. Frame: This option in the top, middle of the window allows for the frame that is being viewed in the video view screen to be adjusted. Frames can be toggled up or down using the arrow buttons or by typing the desired frame number into the box.
f. Display settings:
    i. Frame number: Allows users the option to toggle on/off the frame number in the top, left corner of the window.
    ii. Crossing counts: This check box allows users to display counts for the sum of all objects that have entered (green) and exited (red) each side of each specified region boundary. This will also display the cumulative count from exiting and entering for all prior frames on for each specified region. This will be displayed on the left of the frame.
    iii. Internal counts: This check box allows users to display the count totals for each frame and all specified regions on that frame.
    iv. Overlay grid: This check box allows users to display the coordinate points and grid markings.
g. Select markings:
    i. Enter and exit: This check box allows users to display all tracks for detected objects that are entering (green) and exiting (red) regions of

interest. This option will update crossing counts for each vertices frame by frame as the video is analyzed.

ii. Tracks: This check box will create a vertical line for each bat as they move through the viewing screen. This provides a visual for how the program is tracking the bats movement across the screen and through the counting region.

iii. Centroid: This check box will place a 'centroid' in the center of each detected object in the viewing screen that will move with the bat frame by frame.

iv. Bounding box: This check box allows users to display the bounding boxes for all detected objects. This is especially useful for determining what objects will be counted by the software. If bounding boxes are toggled on, objects with a bounding box around them will be counted by the software when the video is run. If an object does not have a bounding box when toggled on, it will not be counted. Adjusting detection threshold and minimum/maximum pixels will change which objects are being detected and counted.

3. If you'd like to record a video of each frame as it was analyzed press "Record Video". Otherwise, to run program hit "Begin Analysis"

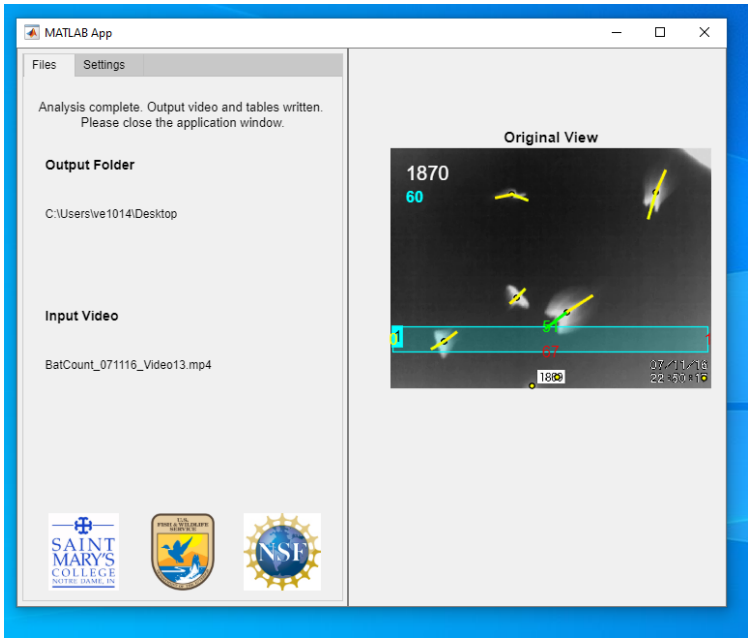

Image 18. Example of the window after a video file has successfully been processed

Note: BatCount 1.24 is still in beta mode. If the software freezes or crashes or you think is malfunctioning, please send an error report email with as much information as possible about the issue to batcountsoftware@gmail.com.