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Computer Specifications Required to Run the Application:

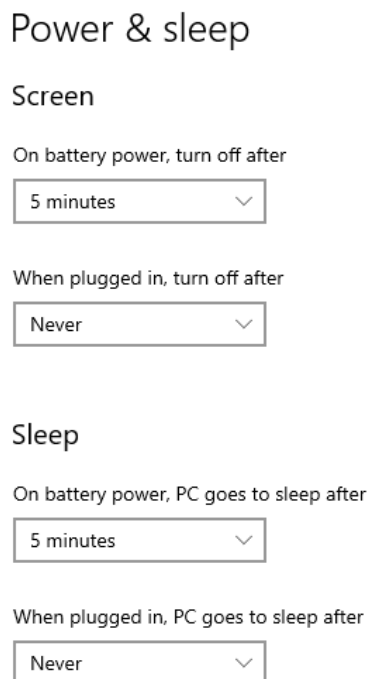
Component	Minimum	Recommended	Best	Purpose
Central Processing Unit (CPU)	Intel i5 (9th generation or above) or AMD Ryzen 5 (5th generation or above)	Intel i7 (9th generation or above) or AMD Ryzen 7 (5th generation or above)	Intel i9 (9th generation or above) or AMD Ryzen 9 (5th generation or above)	This will determine the processing speed of the AI classification portion of the software
Graphics Processing Unit (GPU)	NVIDIA GeForce GTX 750 Ti	NVIDIA GeForce GTX 1070	NVIDIA GeForce RTX 3090	This will determine the processing speed of MegaDetector
Random Access Memory (RAM)	8GB DDR4 or DDR5	16GB DDR4 or DDR5	32GB or more DDR4 or DDR5	This will determine the quantity of images that can be processed at once by the AI

Additional Hardware Guides:

1. <https://www.userbenchmark.com/Software>
 - a. This site can be used for testing the processing power of each component of your computer individually, or your computer as a whole.
2. <https://developer.nvidia.com/cuda-gpus>
 - a. This site gives a full list of GPUs that can run MegaDetector very quickly.

Disabling Sleep Mode:

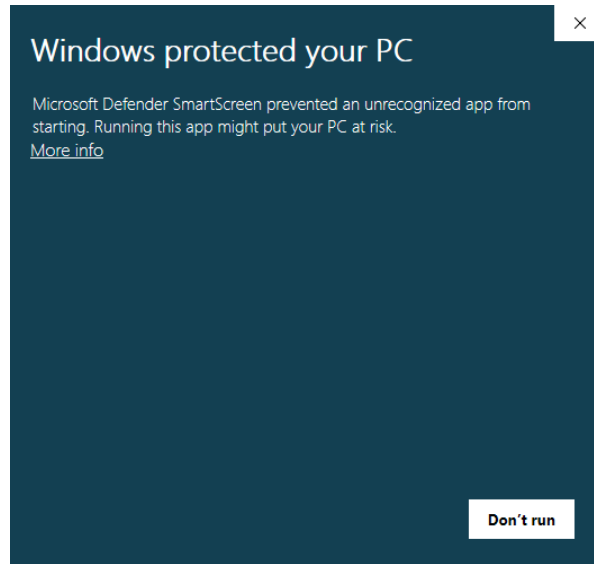
1. Note that if your computer enters "sleep mode," it will pause the process.
 - a. Please ensure that sleep mode is disabled in your system settings if you let this run in the background.
 - b. You can do this by entering "Power & sleep settings" in the Windows search bar then selecting "Never" in the dropdowns as shown below



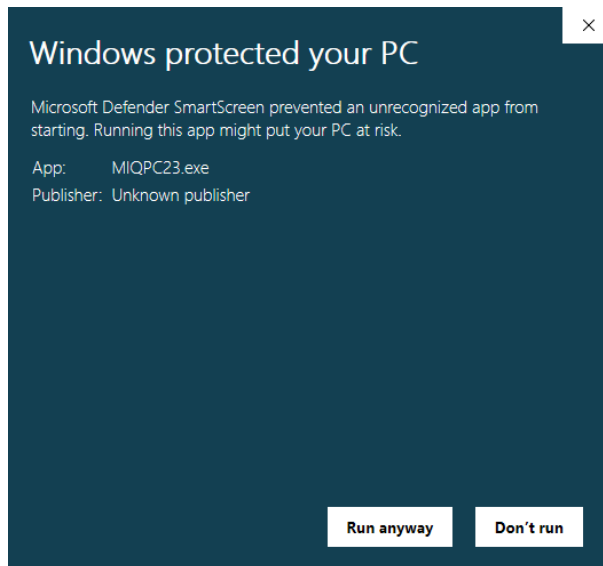
2. If your system powers down, the process will be canceled and you will need to start over.
 - a. Please make sure your device is connected to a power source, and that it will not shut down during the process.
3. During this time, you can use your computer for other tasks.
 - a. Please be aware that doing so may increase the processing time, and that you may experience lag in your other applications.

Addressing Windows Defender:

1. You will get a pop-up message when running certain applications like the one below:



2. Click on the underlined "More info" button



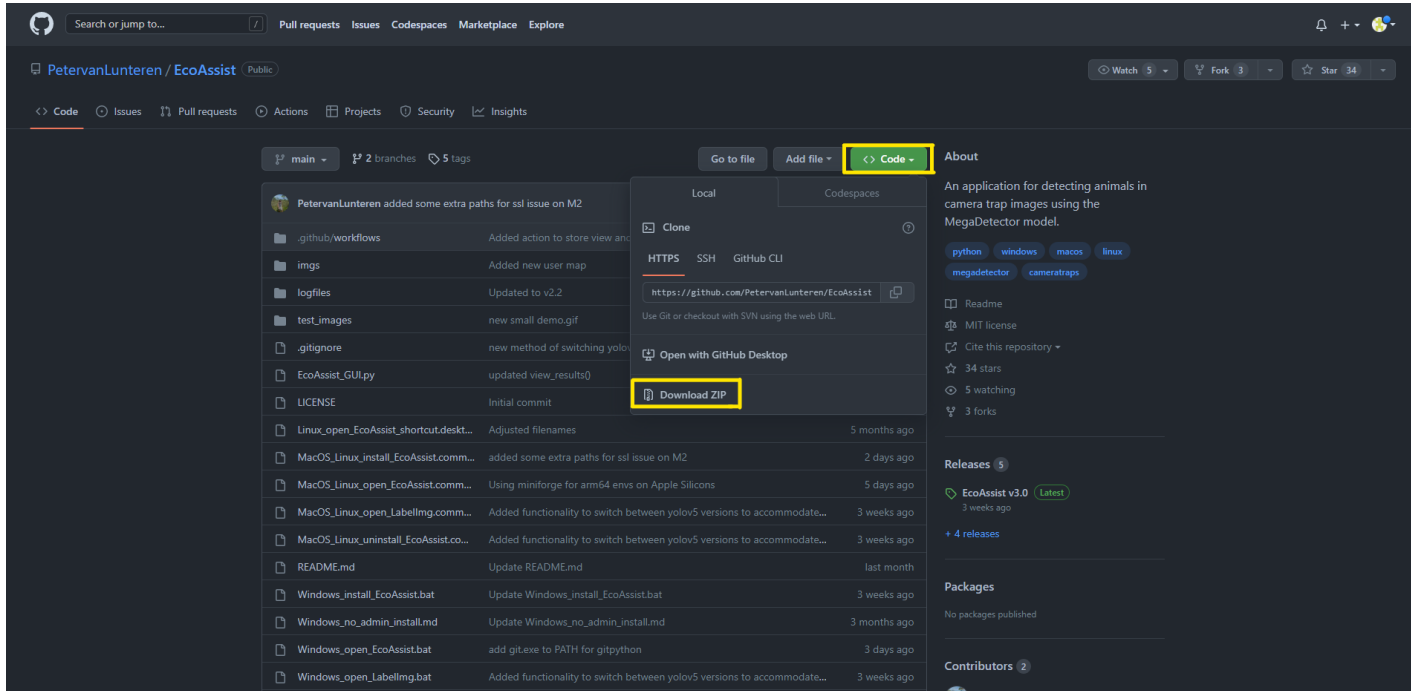
3. Click on the "Run anyway" button to run the program

Installing EcoAssist and its Dependencies:

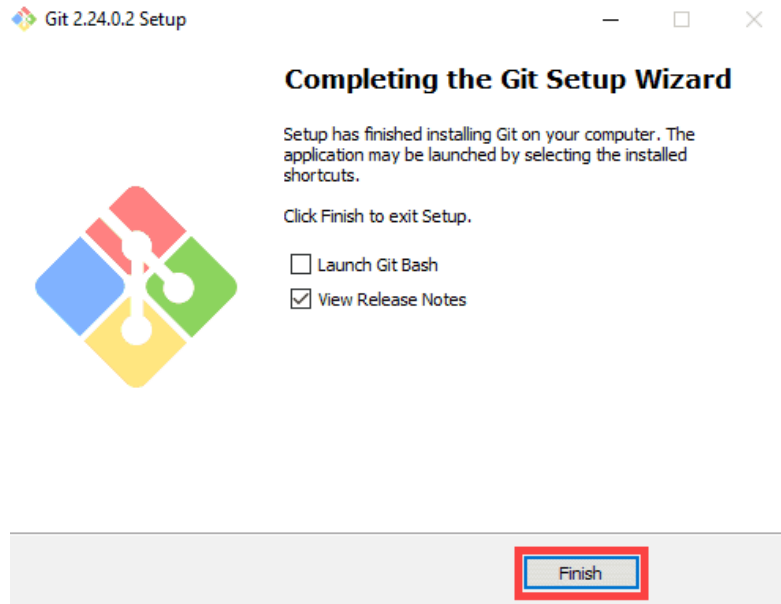
1. EcoAssist: <https://github.com/PetervanLunteren/EcoAssist>

READ FIRST:

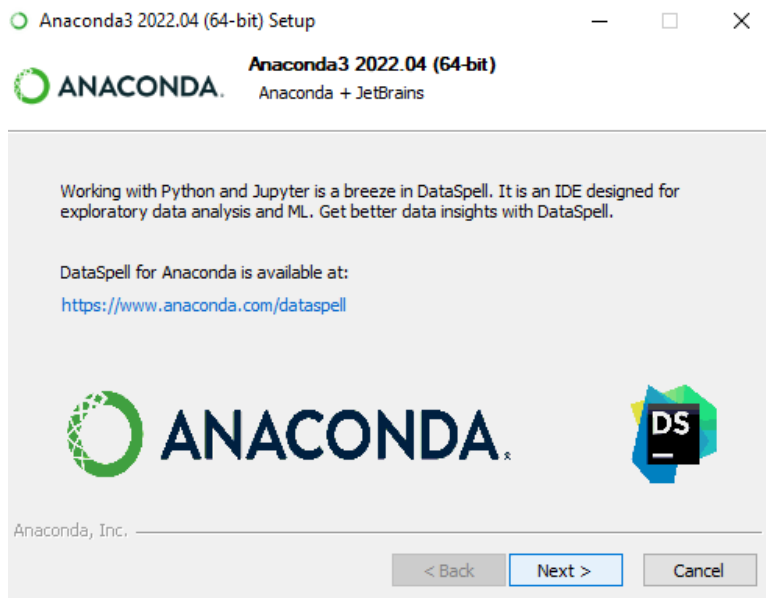
- a. **Note: This installation will take 15-30 minutes depending on Wifi connection**
- b. On the GitHub page click “Code”
- c. “Download ZIP”



- d. Once the zip file has finished downloading, right click and select “Extract All”
 - i. Once it finishes extracting the files, you can delete the downloaded ZIP file.
- e. Click Windows_install_EcoAssist.bat
- f. EcoAssist will download multiple applications
 - i. Git: this is required to download MegaDetector
 1. Git will have its own popup window for installation
 2. You can use default/recommended settings for all sections of the installation
 3. Before finishing the installation uncheck “view release notes”



- ii. MegaDetector: This is Microsoft's image recognition software that EcoAssist uses
 1. MegaDetector will install automatically, no further action is required
- iii. Anaconda3: This is used for multiple Python packages in order for the code to run properly
 1. Anaconda will have its own popup window for installation
 2. You can use default/recommended settings for all sections of the installation



- iv. EcoAssist
 - g. Purpose: Graphical User Interface for MegaDetector
- 2. Timelapse: <https://saul.cpsc.ucalgary.ca/timelapse/pmwiki.php?n=Main.Download2>
 - a. Follow the installation instructions on the site
 - b. Purpose: Image analysis once classification is complete
- 3. Once the files have finished downloading, you can move them to wherever you'd like. ***Do not open anything just yet!***

Installing MIQPC23:

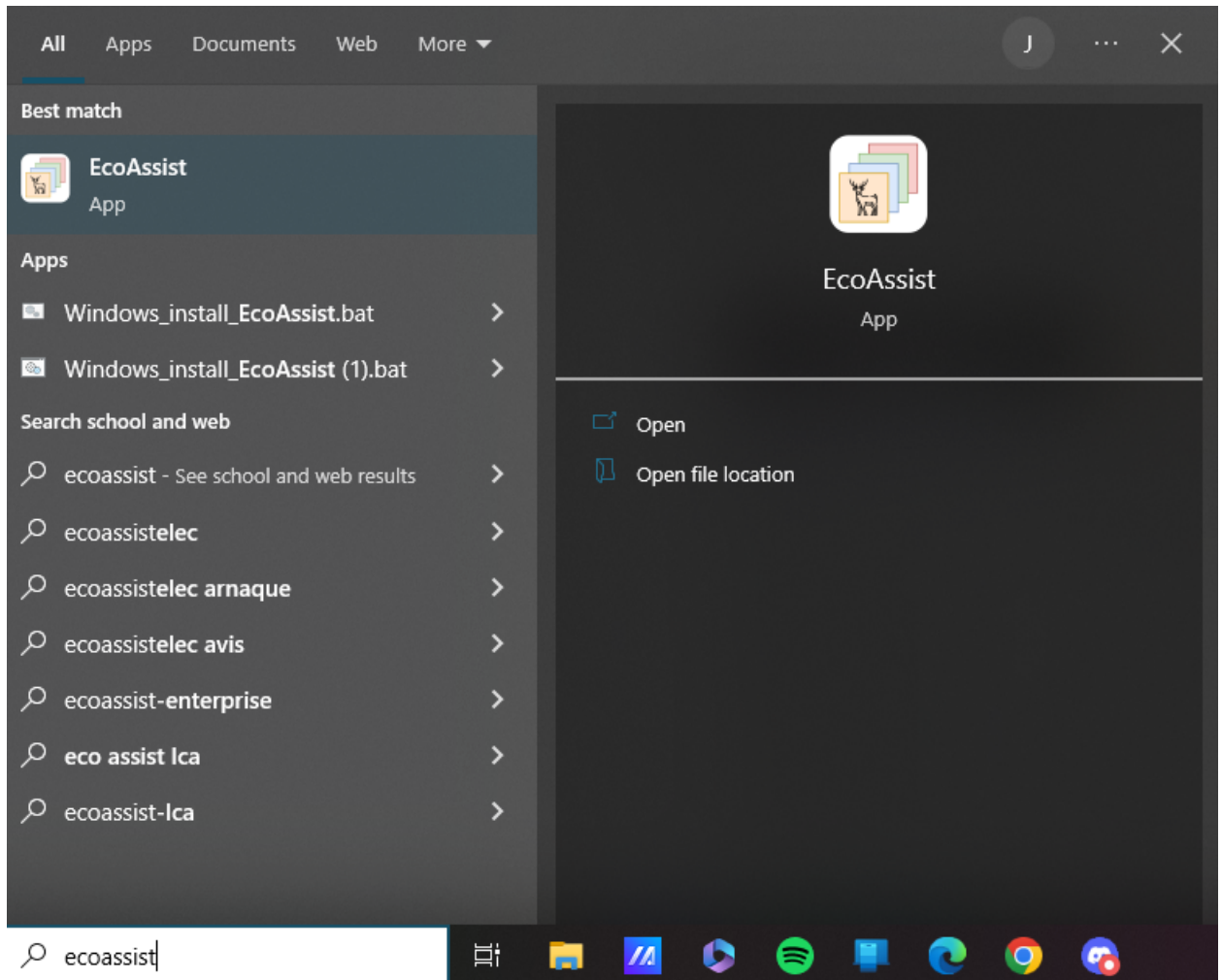
1. In your browser, navigate to
https://drive.google.com/file/d/1_268Vz3qBl5RnWT34-XOswnfCkU1gdkn/view?usp=share_link
2. Download the file, named “MIQPC23.zip,” to your computer
3. It will give a warning that the file cannot be scanned for viruses, download anyway
4. Once you have downloaded “MIQPC23.zip,” move the file from your downloads to a location of your choice.
5. Right click on MIQPC23.zip, and click “extract all”
6. Once it finishes extracting all the files, navigate to MIQPC23 > MIQPC23.exe
 - a. You can now delete MIQPC23.zip. It is no longer needed
7. Right click on MIQPC23.exe, and click “Create Shortcut”
8. You can move this shortcut to wherever you like. **DO NOT MOVE THE ORIGINAL MIQPC23.exe FILE OUT OF THIS FOLDER- IT WILL NOT RUN. *Do not open anything just yet!***

Making predictions on a set of images:

In order to make predictions on a set of images, you need to run two separate programs that connect with each other. The following subsections explain how to complete this process.

Running EcoAssist:

1. Open EcoAssist by searching for it in the Windows Search Bar



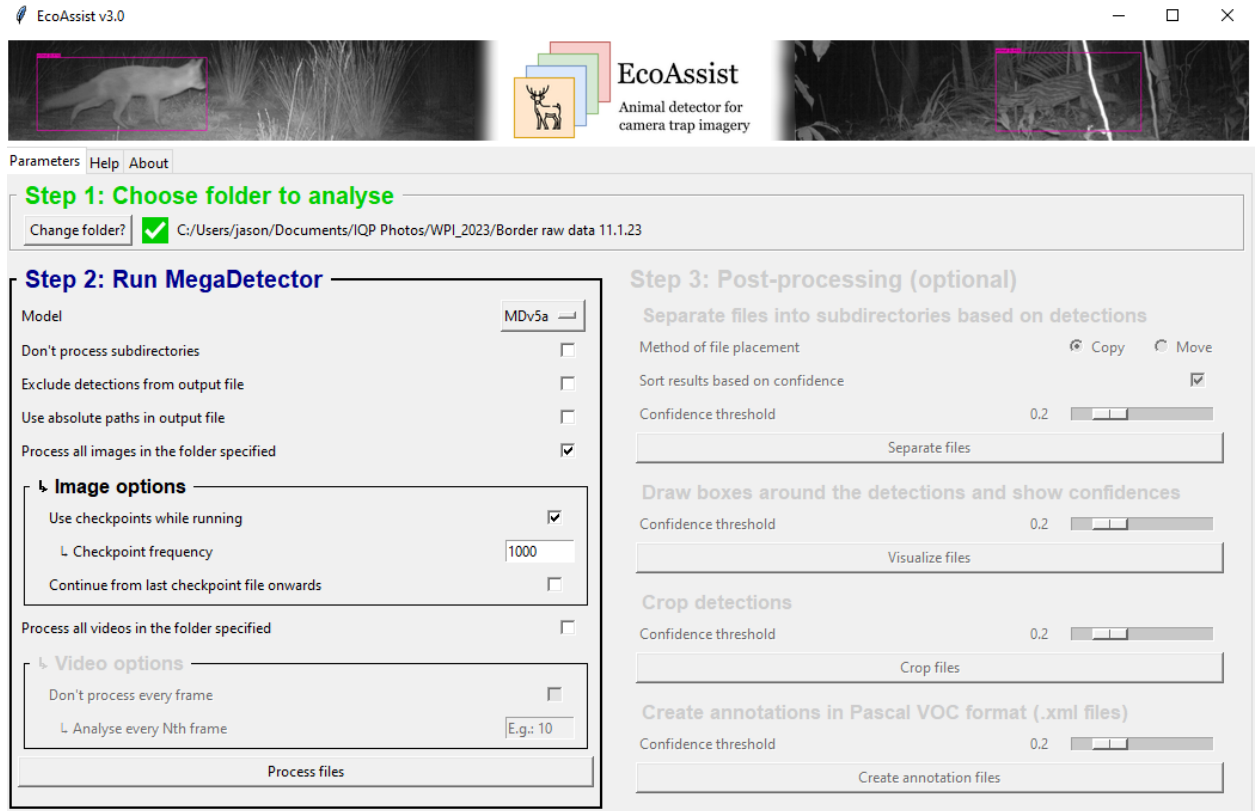
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2. Select a folder to process images using MegaDetector

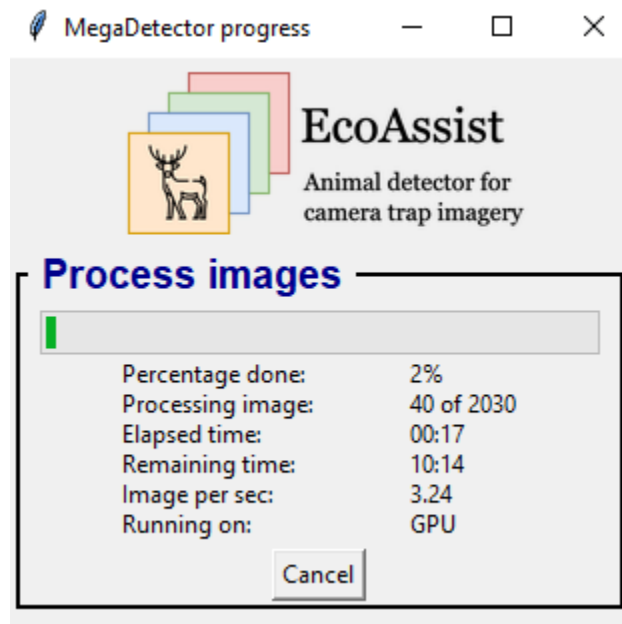


- a. Select “process all images”, “process all videos”, or both
 - i. You can use checkpoints to save your progress in case the program fails to complete processing. The checkpoint frequency is how many images are processed before a checkpoint is created
 - ii. You can also specify how many frames per second each video will have to take
- b. Click the “Process files” button at the bottom once you have inputted your desired settings

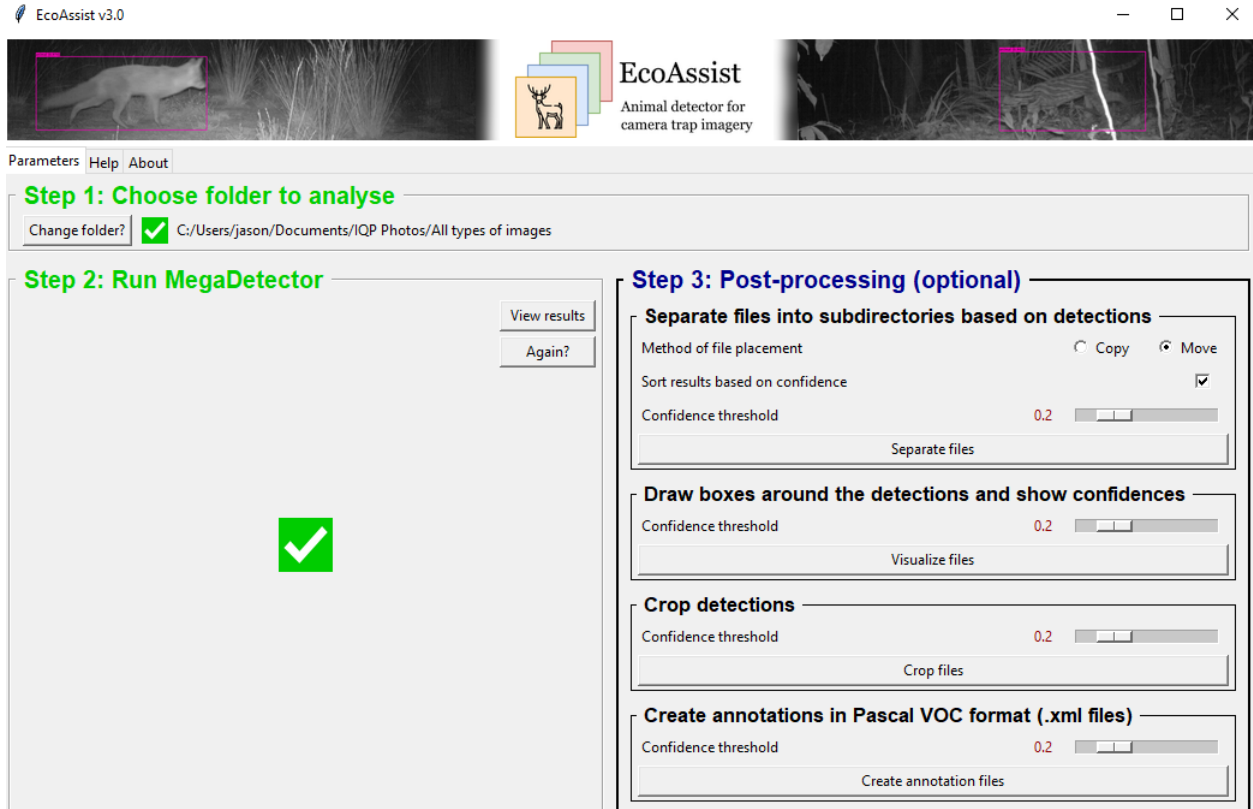
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- c. Wait for the progress bar to finish. Depending on your computer specifications, this may take up to 12 hours.
 - i. Your computer entering sleep mode could interfere with this process. See the [Disabling Sleep Mode](#) section to learn how to disable sleep mode.



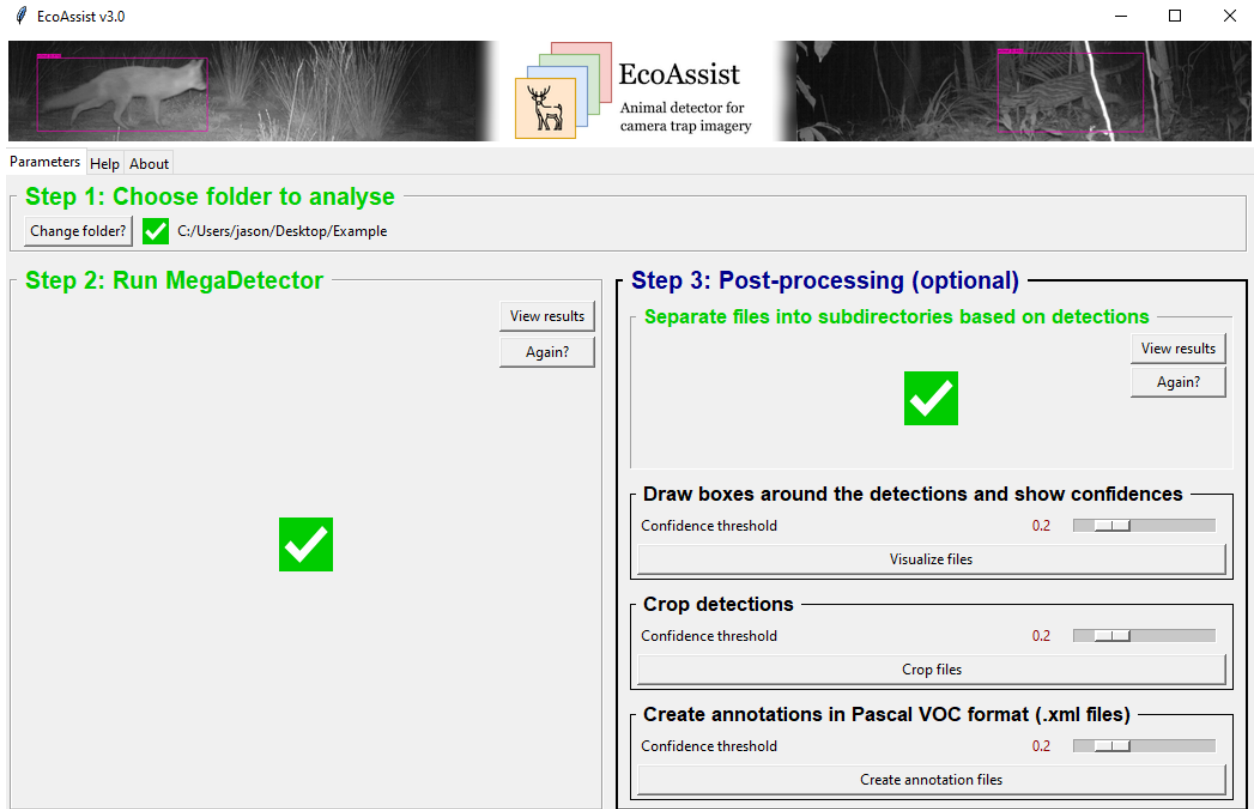
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- d. Note: MegaDetector will sort the images into 4 subfolders after the processing has completed:
 - Empty
 - Animal
 - Vehicle
 - Human
 - e. Select the “Move” option
 - f. You can also separate files based on the confidence value and set a confidence threshold
 - g. Select the “Separate Files” button to sort the images into a folder called “separated_files” with the previously mentioned subfolders.
 - i. Do not copy the images- this will interfere with the process
 - h. You do not need to continue with the “Visualize”, “Crop”, and “Annotation” steps, these will be handled by Timelapse.
3. Once “Separate files” has a checkmark, you can close EcoAssist and continue to the next section.

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4. **Note: all folders generate the JSON file with the name image_recognition_file.json.**
Consider renaming some of these files

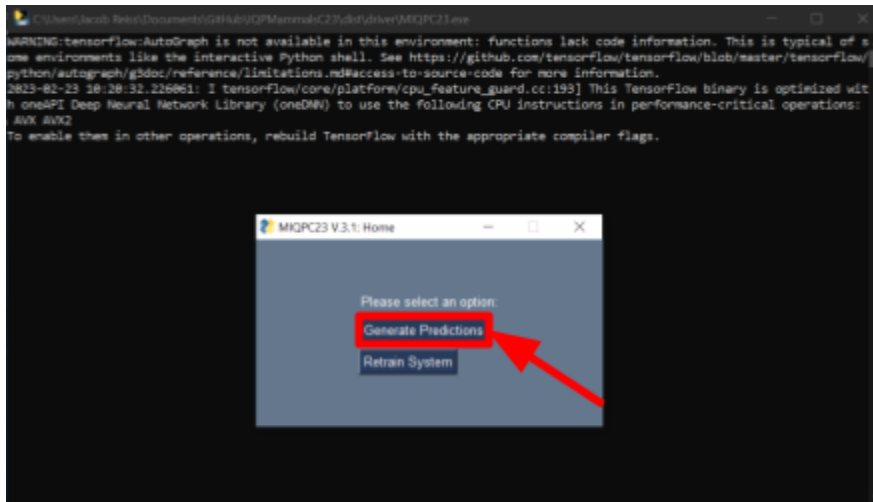


Running MIQPC23:

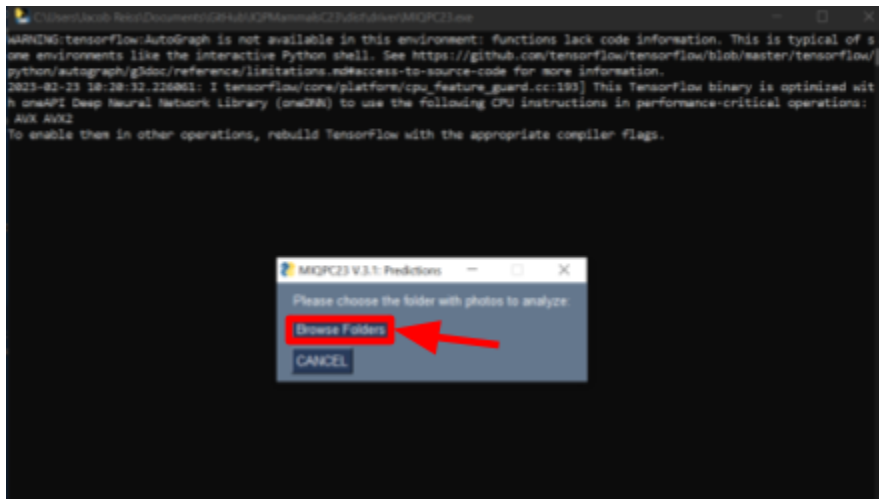
5. Navigate to where you made the "MIQPC23.exe Shortcut", and open it
 - a. If this is the first time you are opening it, Windows Defender will display a warning. This is because Windows does not recognize the publisher of the file. To address this, please see [Addressing Windows Defender](#).
 - b. A command line terminal will open up. You do not need to do anything with this window. **Do not close it**- it will automatically close when the program is done.

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6. Wait until the “MIQPC23” window opens, and then click “Generate Predictions”



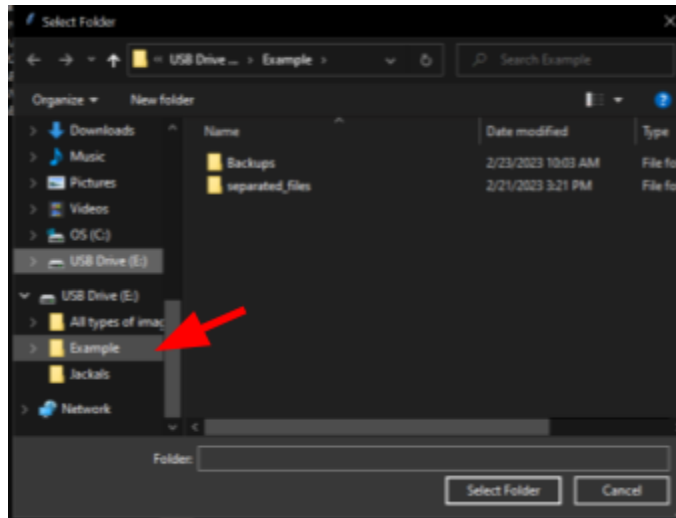
7. Wait until the “MIQPC23: Predictions” window opens, and then click “Browse Folders”



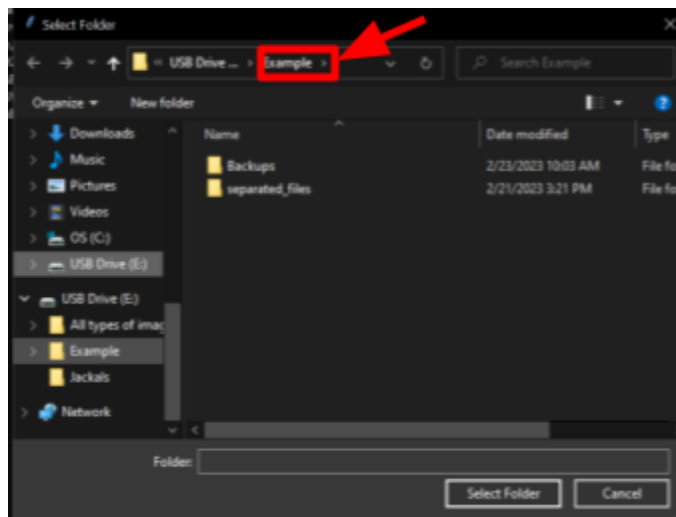
- a. Your file explorer should open. Navigate to the folder that has the subfolders that contain the images to analyze, as well as the JSON file generated by MegaDetector.

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- i. Note: do not select a subfolder of the directory that contains the JSON file. This will interfere with the program.

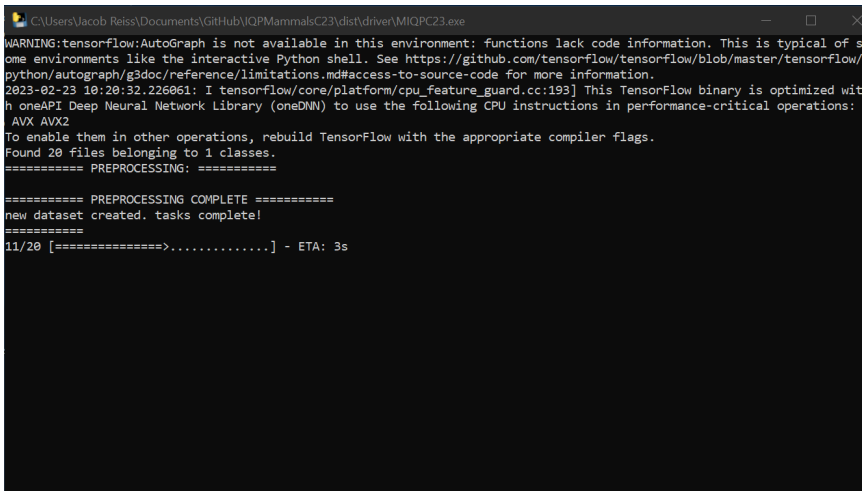


- ii. Note: if you are running this after running it for the first time, when you click “Browse Folders”, the main directory will already be selected. Be careful not to select a subdirectory. You will see that the folder is already selected in the file path.



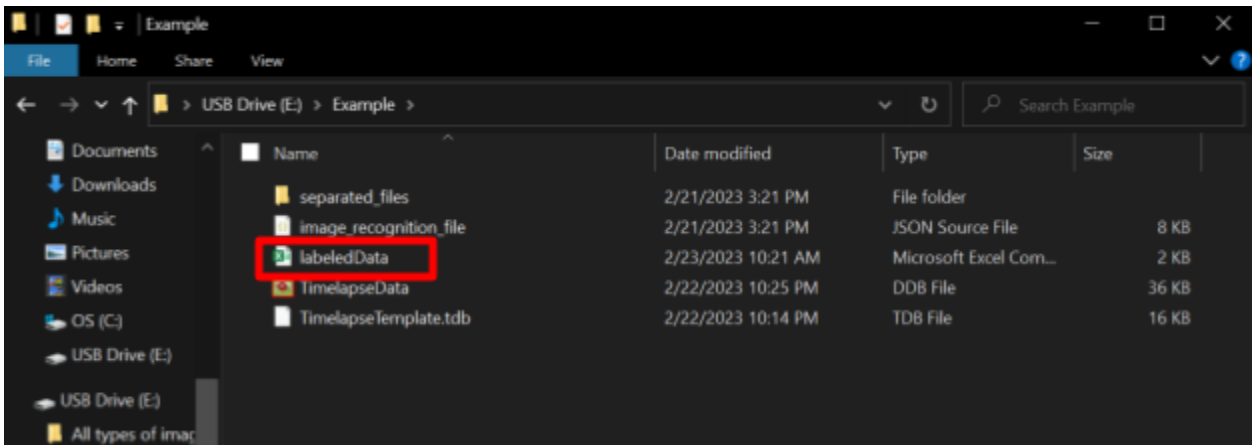
8. The MIQPC23 windows will now close, leaving just the command line terminal open. Progress bars will be shown here. Note that your computer entering sleep mode could interfere with this process. See the [Disabling Sleep Mode](#) section to learn how to disable

sleep mode.



```
CAUsers\Jacob_Reiss\Documents\GitHub\IQPMammals\C23\dist\driver\MIQPC23.exe
WARNING:tensorflow:AutoGraph is not available in this environment: functions lack code information. This is typical of some environments like the interactive Python shell. See https://github.com/tensorflow/tensorflow/blob/master/tensorflow/python/autograph/g3doc/reference/limitations.md#access-to-source-code for more information.
2023-02-23 10:20:32.226661: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations:
AVX AVX2
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
Found 20 files belonging to 1 classes.
===== PREPROCESSING: =====
===== PREPROCESSING COMPLETE =====
new dataset created. tasks complete!
=====
11/20 [=====>.....] - ETA: 3s
```

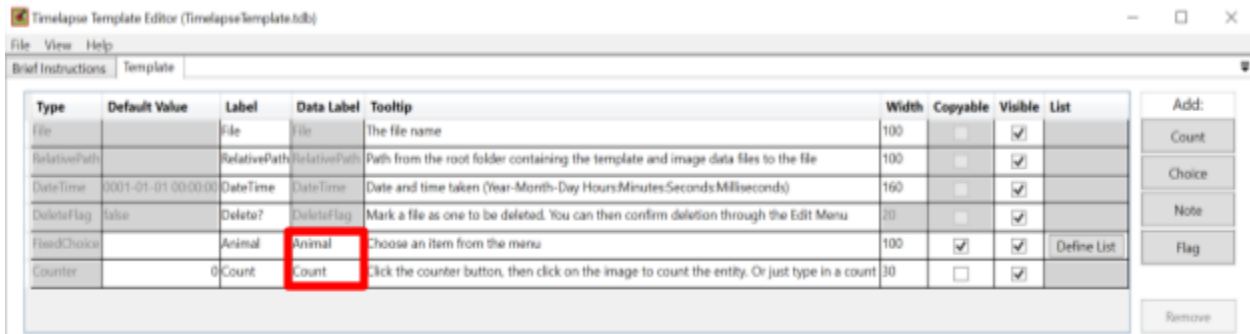
9. The windows will now close. You can see the progress in the command terminal. Wait until the command terminal closes.
10. Once the window closes, navigate to the directory that contains the JSON file and subdirectories. You should now see a CSV file. This contains the predictions.



11. The predictions have successfully been made. See [Importing CSVs into Timelapse](#) to learn how to read this data.

Importing CSVs into Timelapse:

1. Open “Timelapse2TemplateEditor”
2. Construct a Timelapse template to your specifications in the same directory as the images you are classifying, or edit a pre-existing template.
 - a. For information on how to do this, please visit <http://saul.cpsc.ucalgary.ca/timelapse/pmwiki.php?n=Main.UserGuide>
3. **MANDATORY:** Make sure the template includes the following columns:
 - i. "Animal"
 - ii. "Count"
 - a. Make sure that when constructing/editing the template, these columns have the “Data Label” field set to their names. The “Label” field can be whatever the user desires.



- i. If the “Animal” column is a choice, please add the following options to the definition list
 1. Jackal
 2. Fox
 3. Empty
 4. Review
 - ii. If the “Animal” column is a note, then step i is not required.
 - b. These column names can be changed after the data is imported into Timelapse, but the “Data Label” field must always be set to “Animal” and “Count”.
4. Open the Timelapse Template file you just created by searching for “Timelapse2.exe”.
5. Navigate to File > import data from a .csv file...

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- a. Select the CSV file generated by the program in the same folder as the images that were labeled. This should be "labeledData.csv"
- b. Timelapse should update the template to contain the labeling data. The labels are:
 - i. "Jackal"
 - ii. "Fox"
 - iii. "Empty"
 - iv. "Review"
- c. Note that "Review" means that the AI was either unsure what was present in the image, or found something that was not a jackal or a fox

Troubleshooting the Application:

MegaDetector failed to run

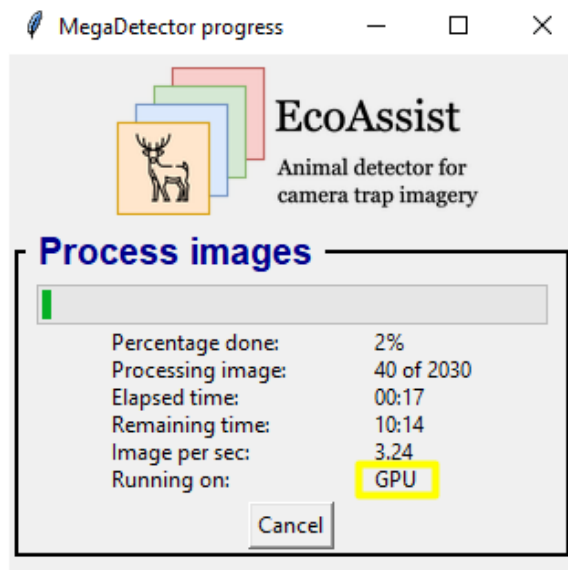
This is most likely caused by an incompatibility between your GPU or CPU with MegaDetector.

You can check whether the GPU or CPU is in use by running MegaDetector and looking at the highlighted section of the progress popup below.

This can be solved in two ways:

1. Purchase a CUDA enabled GPU that fits the specifications in the [Computer Specifications](#) section.
2. Send the images to be processed to MegaDetector and have them send back a .JSON file.

If neither of those options are viable, you can click “Ignore” in the application. The AI can run without MegaDetector, however there will be no count of how many animals are in an image.



The AI is making too many inaccuracies

To address this, the simplest method is to keep reviewing the predictions it makes and retraining the model. While this will take time, as more and more data gets processed, it will perform better.

If this is not an option, you can also contact someone who has a background specified in [Maintenance and Upkeep](#). Additionally, you can reach out to an organization, such as WPI, and request a project that will address this issue.

If none of these options are viable, utilizing just MegaDetector is also a solution. However, this will only separate the images that contain nothing from the images that contain animals. Manual analysis of each animal image will still be required.

I can't import the CSV file into Timelapse

This is most likely because there is an incompatibility between the template you are using in Timelapse and the CSV the application generates.

To fix this, use the Timelapse template editor to edit the template you are using for the images you are analyzing. Make sure that the “DataLabel” field for wherever you are recording the type of animal is set to “Animal”. Additionally, make that the “DataLabel” field for wherever you are recording the number of animals (may be called Abundance, Counter, etc.) is set to “Count.”

Additionally, if “Animal” is set to a fixed choice and not a note, make sure that the following are included in the defined list:

- “Jackal”
- “Fox”
- “Empty”
- “unknown animal”

If these are not in the defined list, Timelapse will not be able to recognize the CSV.

Note: You may want to rename the template file to avoid confusion with other templates

EcoAssist is stuck on Step 2

Sometimes the JSON file will fail to generate, or will generate in the wrong folder. To fix this, follow the steps below:

1. Search for image_recognition_file.json to check if it exists in a different folder. (Note: all folders generate the JSON file with the same name. Consider renaming some of these files)
2. If the file is in the wrong folder: simply move the file to the folder specified in Step 1 of [Running EcoAssist](#)

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3. If the file was not generated: redo Step 2 in [Running EcoAssist](#) again on the top level directory of the desired folder. Ex. If you want the data from camera 2055, run Step 2 on the 2055 folder rather than the DCIM folder.

Maintenance and Upkeep:

In the event you wish for the system to do more than it can currently do, or if the application needs repair, someone who is experienced in artificial intelligence is required to help address any issues. This person should have the following background:

Required:

- Background in artificial intelligence
- Computer programming skills

Preferred:

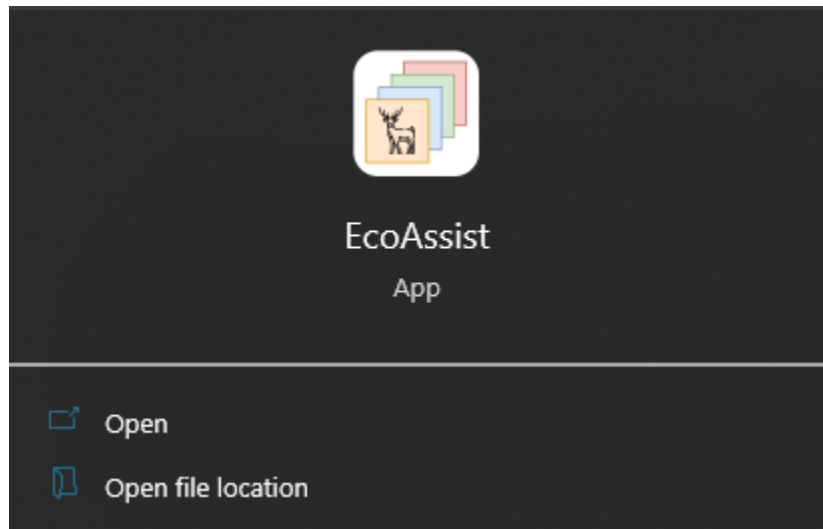
- Familiarity with GitHub
- Familiarity with Python3
- Familiarity with Tensorflow and Keras

You can also reach out to an organization, such as WPI, and request a new project that will improve upon the application further.

Uninstalling EcoAssist:

You may want to uninstall EcoAssist for a variety of reasons. Luckily, this process is very straight forward:

1. Locate the EcoAssist folder on your machine using the Windows search bar
 - a. You can also locate the app and click “Open file location”



2. Click on “Windows_uninstall_EcoAssist.bat”

Uninstalling MIQPC23:

You may want to uninstall MIQPC23 for a variety of reasons, including if you need to update the program. Luckily, this process is very straight forward:

1. Move the folder that contains all the extracted files from *Installing MIQPC23* to you recycle bin
 - a. You could also right-click the folder, and click “Delete”
2. If you made a shortcut, you should also delete this

FAQ:

I want the AI to label more animals than just jackals and foxes. How do I do this?

This problem requires the source code of the AI to be altered. The best course of action is to contact an organization like WPI for a new research project to expand on this application, or find someone who has the background specified in [Maintenance and Upkeep](#).

I would like to move the application to a cloud service. How do I do this?

In order to move the software to a cloud service, you will have to read the instructions on the website for whatever cloud service you choose. It is highly recommended you have someone with a background specified in [Maintenance and Upkeep](#), or someone who is familiar with using the cloud service.

Can I generate predictions without one of the specified GPUs?

Yes, you can. However, the process will be significantly slower- roughly 3-4 seconds per image. If you have to run EcoAssist without a specified GPU, either do so at night, or as soon as you start your workday. While it is running, you can do other tasks.

Alternatively, if you want faster results, you can skip the [Running EcoAssist](#) steps and go straight into [Running MIQPC23](#). Note that this may result in more inaccuracies in classifying empty images. Additionally, verifying the predictions will be harder as you won't be able to filter through empty images as easily, and you won't have access to bounding boxes.

There was an issue not addressed in Troubleshooting the Application. What do I do?

This depends on what the issue is. If it is concerned with using EcoAssist or MegaDetector, the best course of action is to either contact the developers of these applications, and/or contact someone who is familiar with these programs for help. If the issue is concerned with MIQPC23, the best course of action is to find someone with the background specified in [Maintenance and Upkeep](#). Furthermore, make sure that any files that are supposed to generate as specified in the manual are appearing where they should be. This should fix most of the problems.