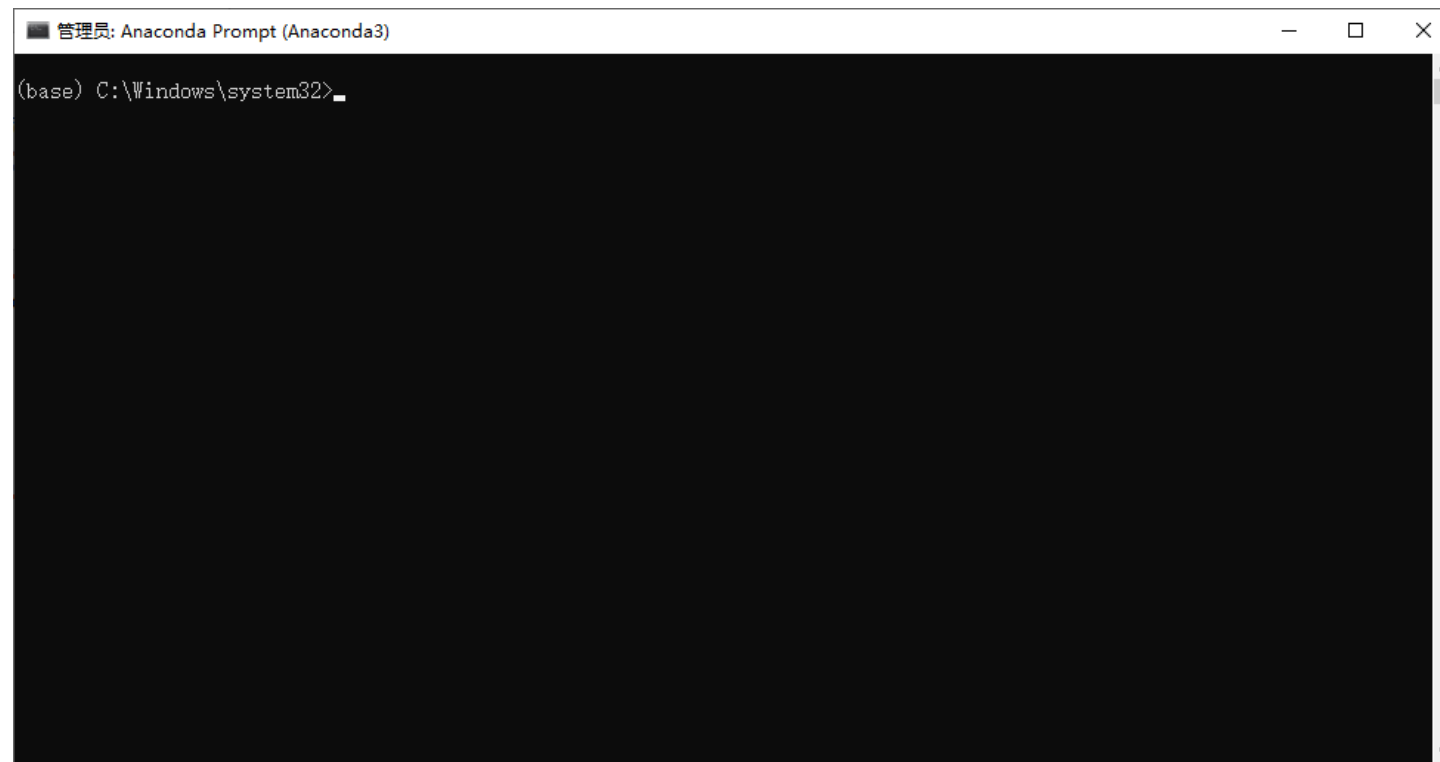


Guide of DeepLabCut

Xiang Zhang

July 22nd, 2020

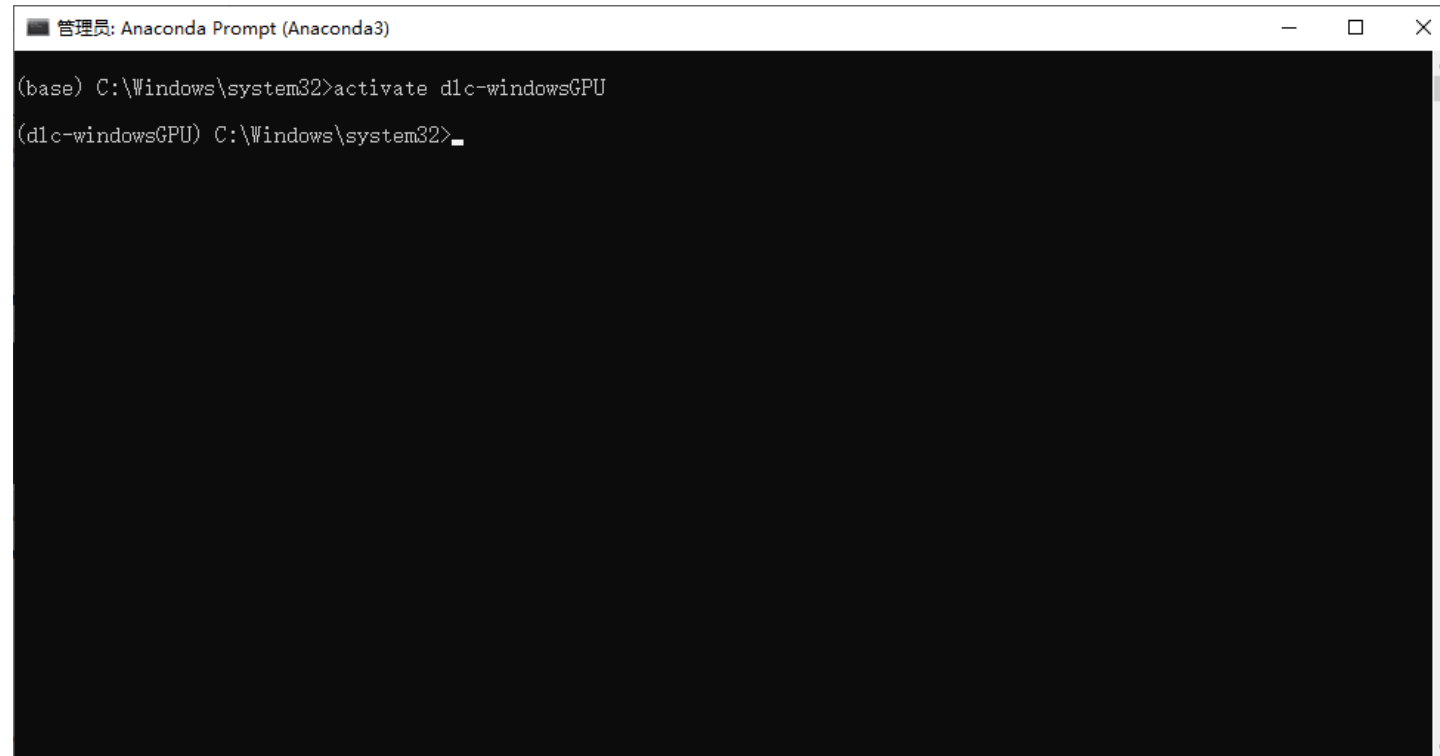
1. Open the terminal in Administrator status



2. Enter the environment of DLC*

Code: activate dlc-windowsGPU

*DLC: DeepLabCut

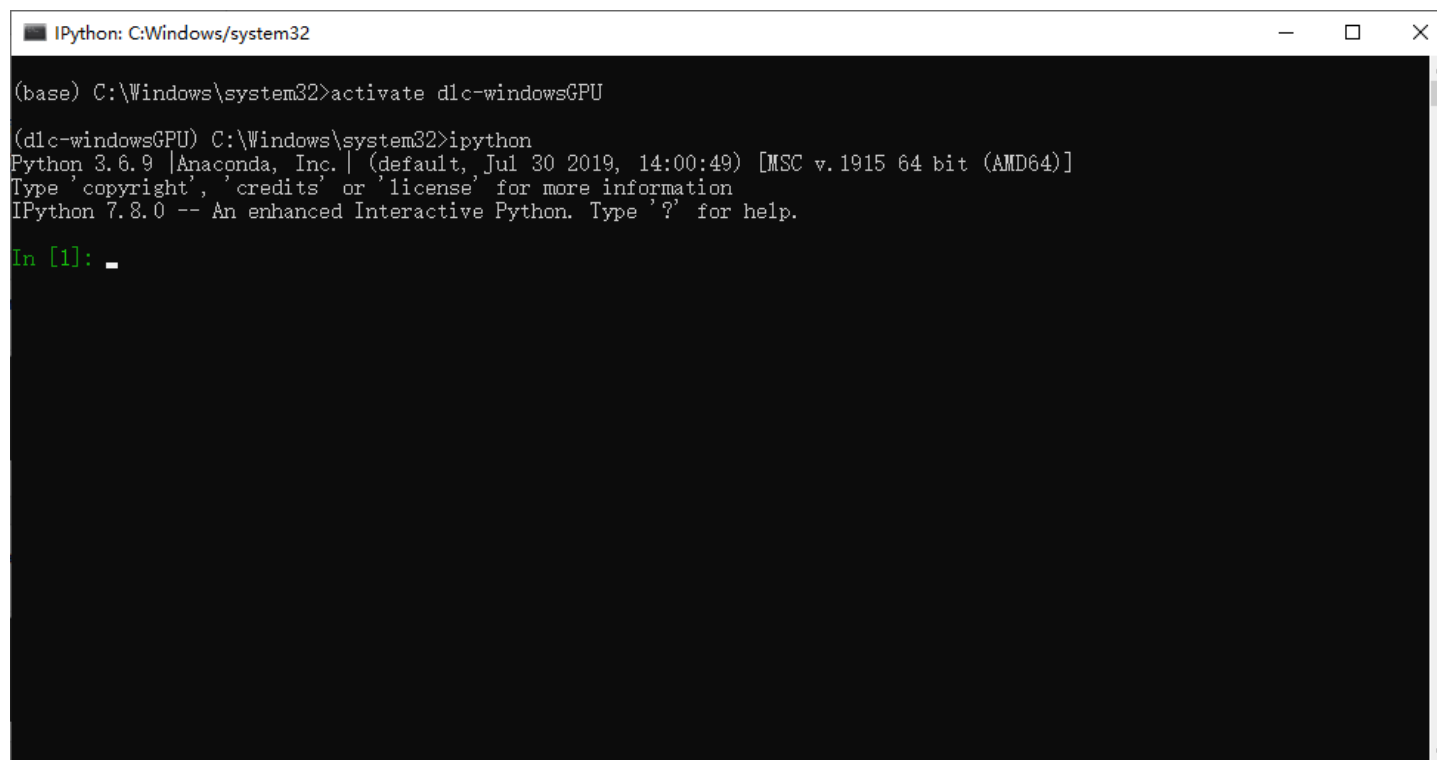


```
管理员: Anaconda Prompt (Anaconda3)
(base) C:\Windows\system32>activate dlc-windowsGPU
(dlc-windowsGPU) C:\Windows\system32>_
```

The screenshot shows a Windows command prompt window titled "管理员: Anaconda Prompt (Anaconda3)". The prompt is at the C:\Windows\system32 directory. The user has entered the command "activate dlc-windowsGPU", and the prompt has changed to "(dlc-windowsGPU) C:\Windows\system32>_", indicating that the environment has been successfully activated.

3. Open IPython

Code: ipython



```
IPython: C:\Windows\system32

(base) C:\Windows\system32>activate dlc-windowsGPU

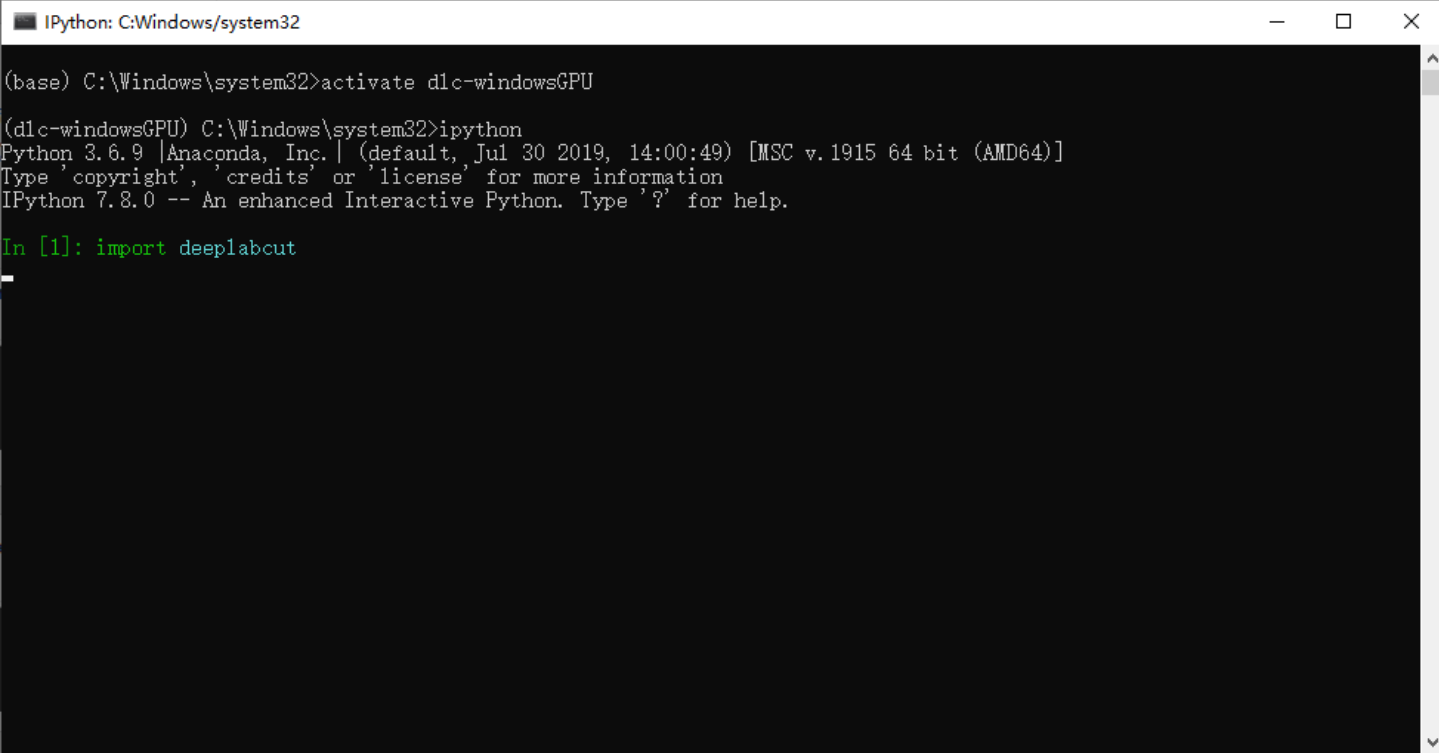
(dlc-windowsGPU) C:\Windows\system32>ipython
Python 3.6.9 |Anaconda, Inc.| (default, Jul 30 2019, 14:00:49) [MSC v.1915 64 bit (AMD64)]
Type 'copyright', 'credits' or 'license' for more information
IPython 7.8.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: _
```

4. Import DLC

Code:

```
import tensorflow as tf
import deeplabcut
config = tf.ConfigProto()
config.gpu_options.allow_growth = True
session = tf.Session(config=config)
```



```
IPython: C:\Windows\system32

(base) C:\Windows\system32>activate dlc-windowsGPU

(dlc-windowsGPU) C:\Windows\system32>ipython
Python 3.6.9 |Anaconda, Inc.| (default, Jul 30 2019, 14:00:49) [MSC v.1915 64 bit (AMD64)]
Type 'copyright', 'credits' or 'license' for more information
IPython 7.8.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: import deeplabcut
```

5. Open DLC UI

Code: `deeplabcut.launch_dlc()`

```
IPython: C:\Windows\system32
Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np_resource = np.dtype([('resource', np.ubyte, 1)])
D:\ProgramData\Anaconda3\envs\dlc-windowsGPU\lib\site-packages\tensorboard\compat\tensorflow_stub\dtypes.py:541: FutureWarning: Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np Quint8 = np.dtype([('Quint8', np.int8, 1)])
D:\ProgramData\Anaconda3\envs\dlc-windowsGPU\lib\site-packages\tensorboard\compat\tensorflow_stub\dtypes.py:542: FutureWarning: Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np Quint8 = np.dtype([('Quint8', np.uint8, 1)])
D:\ProgramData\Anaconda3\envs\dlc-windowsGPU\lib\site-packages\tensorboard\compat\tensorflow_stub\dtypes.py:543: FutureWarning: Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np Quint16 = np.dtype([('Quint16', np.int16, 1)])
D:\ProgramData\Anaconda3\envs\dlc-windowsGPU\lib\site-packages\tensorboard\compat\tensorflow_stub\dtypes.py:544: FutureWarning: Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np Quint16 = np.dtype([('Quint16', np.uint16, 1)])
D:\ProgramData\Anaconda3\envs\dlc-windowsGPU\lib\site-packages\tensorboard\compat\tensorflow_stub\dtypes.py:545: FutureWarning: Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np Quint32 = np.dtype([('Quint32', np.int32, 1)])
D:\ProgramData\Anaconda3\envs\dlc-windowsGPU\lib\site-packages\tensorboard\compat\tensorflow_stub\dtypes.py:550: FutureWarning: Passing (type, 1) or 'ltype' as a synonym of type is deprecated; in a future version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
np_resource = np.dtype([('resource', np.ubyte, 1)])

In [2]: deeplabcut.launch_dlc()
```



6. Create or load a project

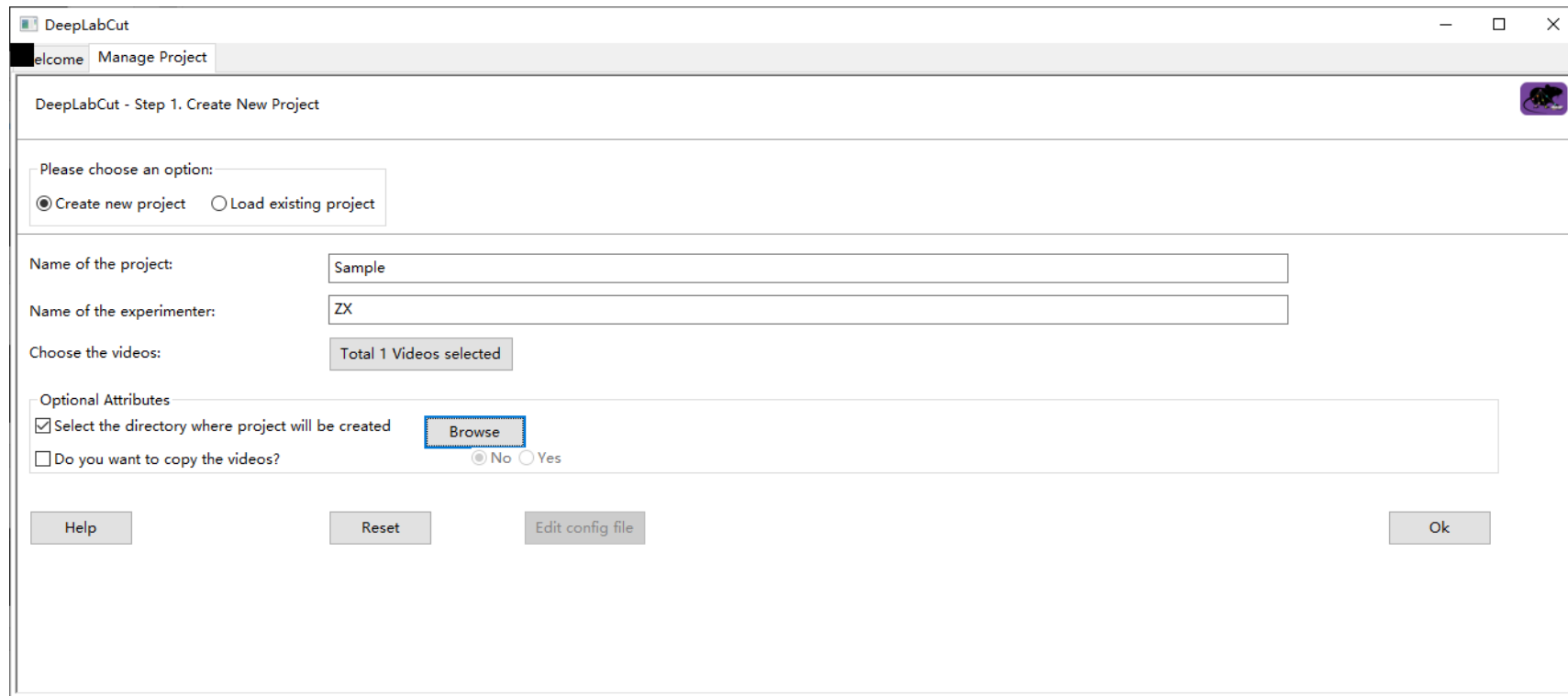
Create:

Enter the name of the project, the name of experimenter;

Choose the video you want to analyze;

Select the path you want to put this project;

Click 'Ok' button.



The screenshot shows the 'DeepLabCut - Step 1. Create New Project' window. It has a title bar with 'DeepLabCut' and standard window controls. Below the title bar is a tabbed interface with 'Welcome' and 'Manage Project' tabs. The main content area is titled 'DeepLabCut - Step 1. Create New Project'. It contains a section 'Please choose an option:' with two radio buttons: 'Create new project' (selected) and 'Load existing project'. Below this are three text input fields: 'Name of the project:' with the value 'Sample', 'Name of the experimenter:' with the value 'ZX', and 'Choose the videos:' with a button labeled 'Total 1 Videos selected'. There is also an 'Optional Attributes' section with a checked checkbox 'Select the directory where project will be created' and a 'Browse' button next to it. Below that is an unchecked checkbox 'Do you want to copy the videos?' with radio buttons for 'No' (selected) and 'Yes'. At the bottom of the window are four buttons: 'Help', 'Reset', 'Edit config file', and 'Ok'.

DeepLabCut

Welcome Manage Project

DeepLabCut - Step 1. Create New Project

Please choose an option:

☒ Create new project ☐ Load existing project

Name of the project: Sample

Name of the experimenter: ZX

Choose the videos: Total 1 Videos selected

Optional Attributes

☒ Select the directory where project will be created Browse

☐ Do you want to copy the videos? ☒ No ☐ Yes

Help Reset Edit config file Ok

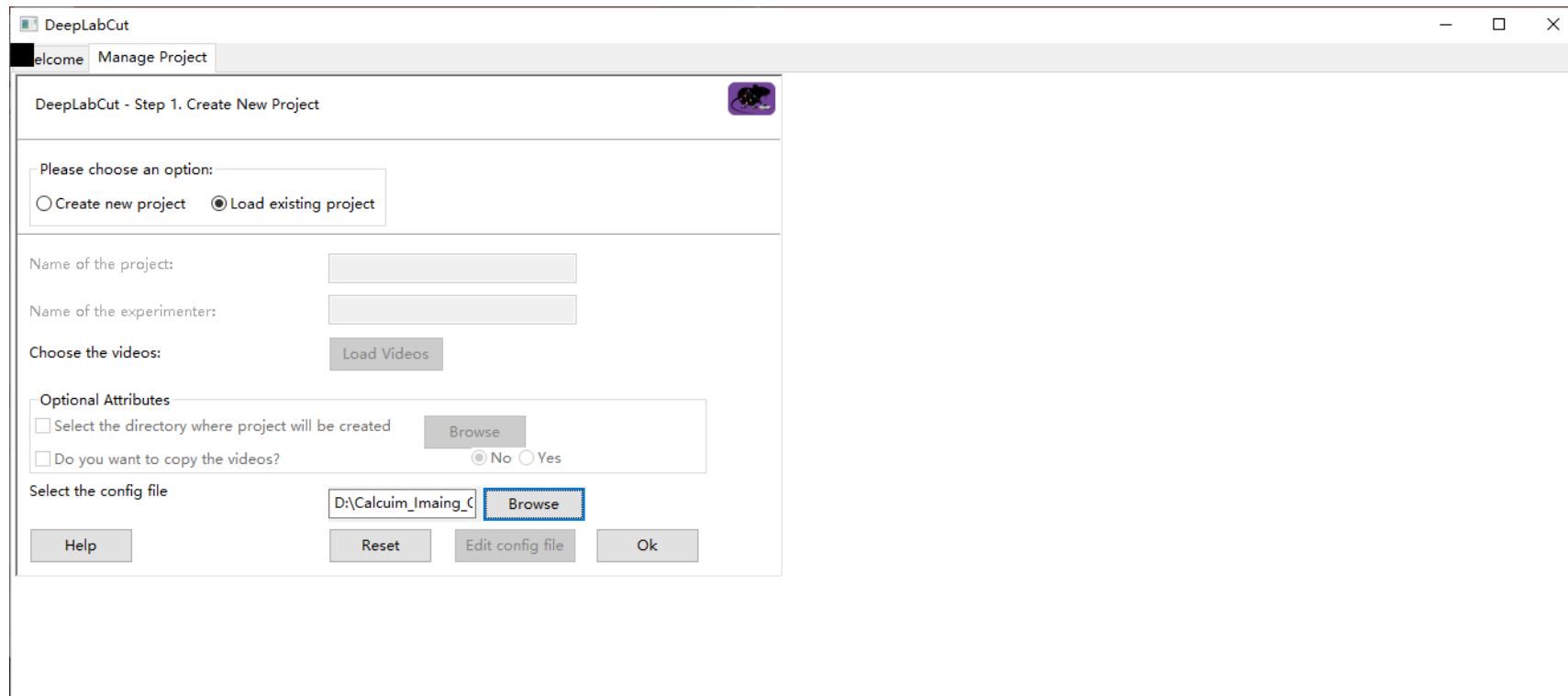
6. Create or load a project (*continued*)

Load:

Select the config file in the project (the extension is 'yaml');

Click 'Ok' button.

(Then jump to step 12.)



The screenshot shows the 'DeepLabCut - Step 1. Create New Project' dialog box. The window has a title bar with 'DeepLabCut' and standard minimize, maximize, and close buttons. Below the title bar is a tabbed interface with 'Welcome' and 'Manage Project' tabs. The main content area is titled 'DeepLabCut - Step 1. Create New Project'. It contains the following elements:

- A section titled 'Please choose an option:' with two radio buttons: 'Create new project' and 'Load existing project'. The 'Load existing project' option is selected.
- Two text input fields: 'Name of the project:' and 'Name of the experimenter:'.
- A section titled 'Choose the videos:' with a 'Load Videos' button.
- A section titled 'Optional Attributes' with two checkboxes: 'Select the directory where project will be created' (with a 'Browse' button) and 'Do you want to copy the videos?' (with 'No' and 'Yes' radio buttons, where 'No' is selected).
- A section titled 'Select the config file' with a text input field containing 'D:\Calcuim_Imaing_C' and a 'Browse' button.
- A row of four buttons at the bottom: 'Help', 'Reset', 'Edit config file', and 'Ok'.

6. Create or load a project (*selected*)

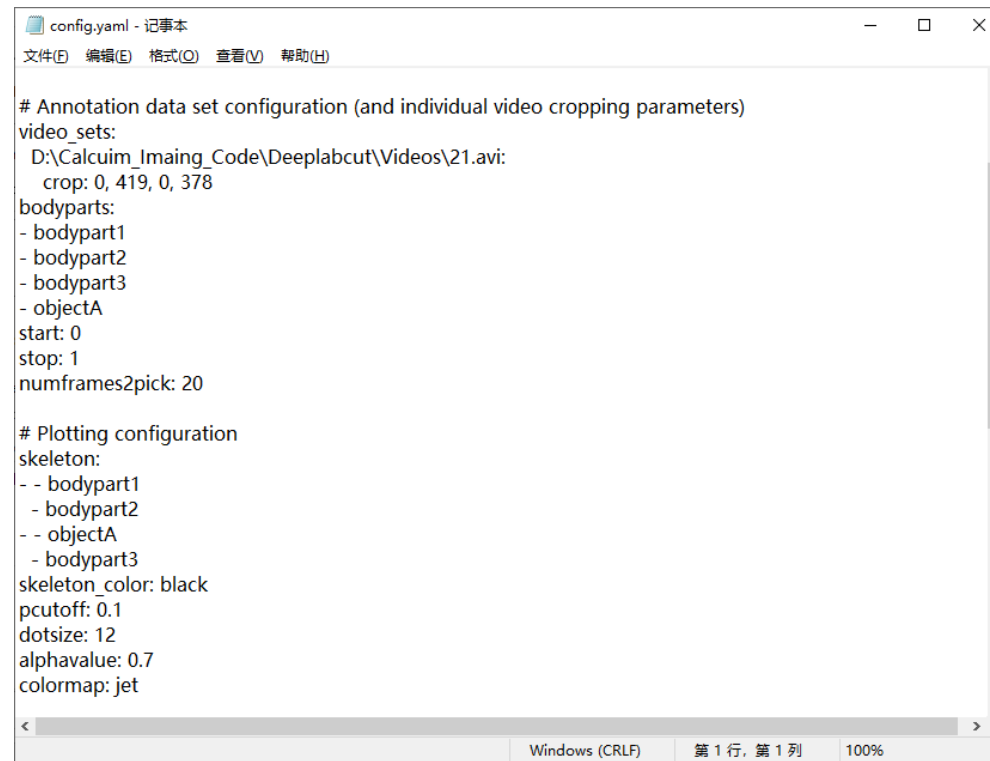
Edit the config file:

Click 'Edit config file' button;

Edit the parameters you want to change;

Save the file;

Close the file.



```
config.yaml - 记事本
文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

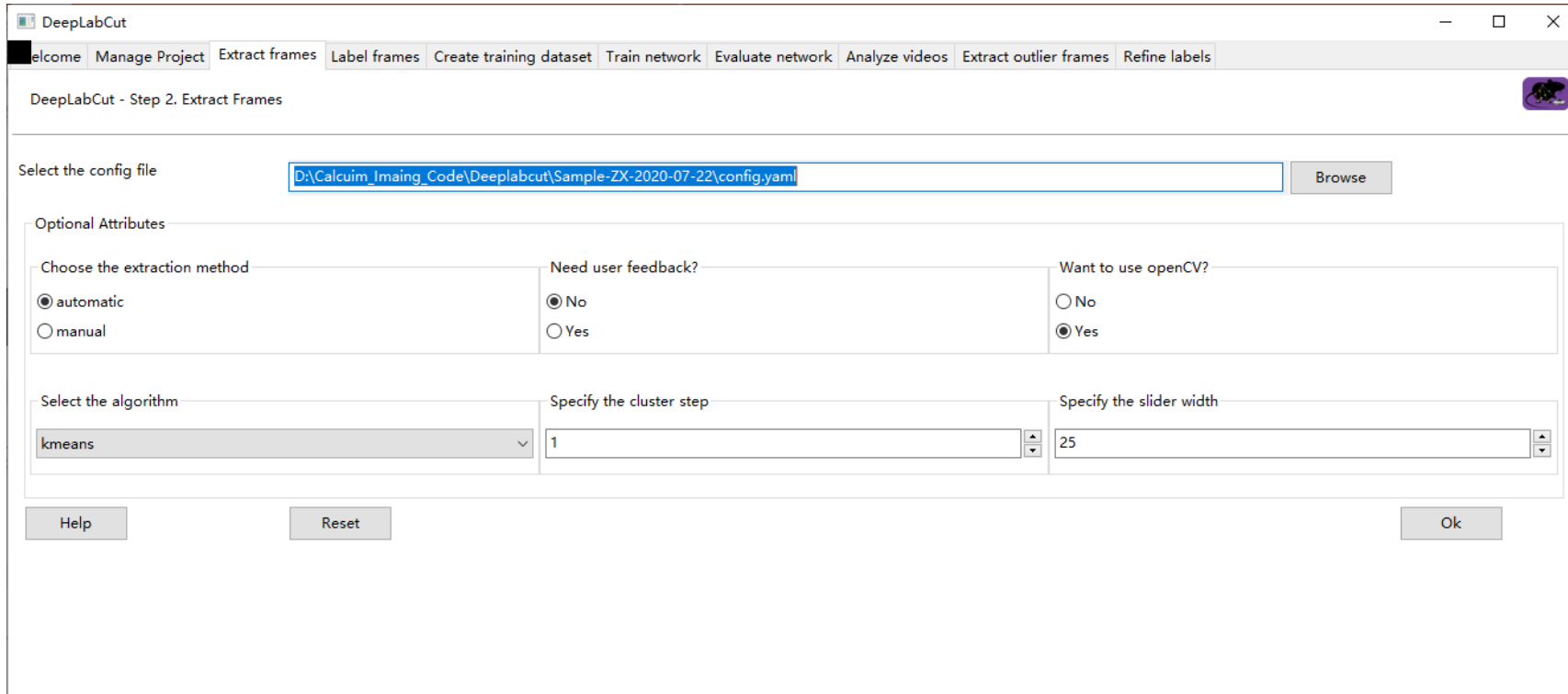
# Annotation data set configuration (and individual video cropping parameters)
video_sets:
  D:\Calcuim_Imaing_Code\Deeplabcut\Videos\21.avi:
    crop: 0, 419, 0, 378
bodyparts:
- bodypart1
- bodypart2
- bodypart3
- objectA
start: 0
stop: 1
numframes2pick: 20

# Plotting configuration
skeleton:
- - bodypart1
  - bodypart2
- - objectA
  - bodypart3
skeleton_color: black
pcutoff: 0.1
dotsize: 12
alphavalue: 0.7
colormap: jet
```

Windows (CRLF) 第 1 行, 第 1 列 100%

7. Extract frames of the videos

Click 'Ok' button.



DeepLabCut

Welcome | Manage Project | Extract frames | Label frames | Create training dataset | Train network | Evaluate network | Analyze videos | Extract outlier frames | Refine labels

DeepLabCut - Step 2. Extract Frames

Select the config file

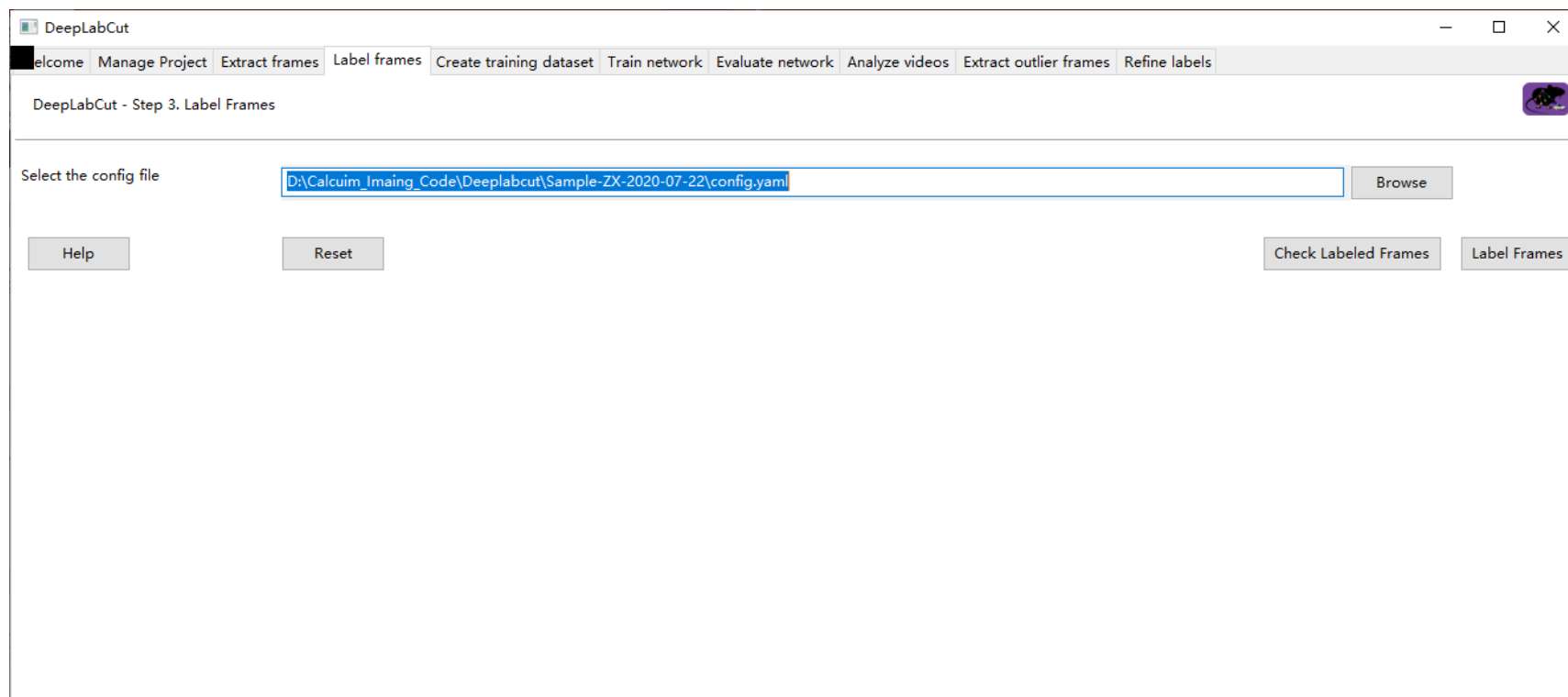
Optional Attributes

Choose the extraction method	Need user feedback?	Want to use openCV?
<input checked="" type="radio"/> automatic	<input checked="" type="radio"/> No	<input type="radio"/> No
<input type="radio"/> manual	<input type="radio"/> Yes	<input checked="" type="radio"/> Yes

Select the algorithm	Specify the cluster step	Specify the slider width
kmeans	1	25

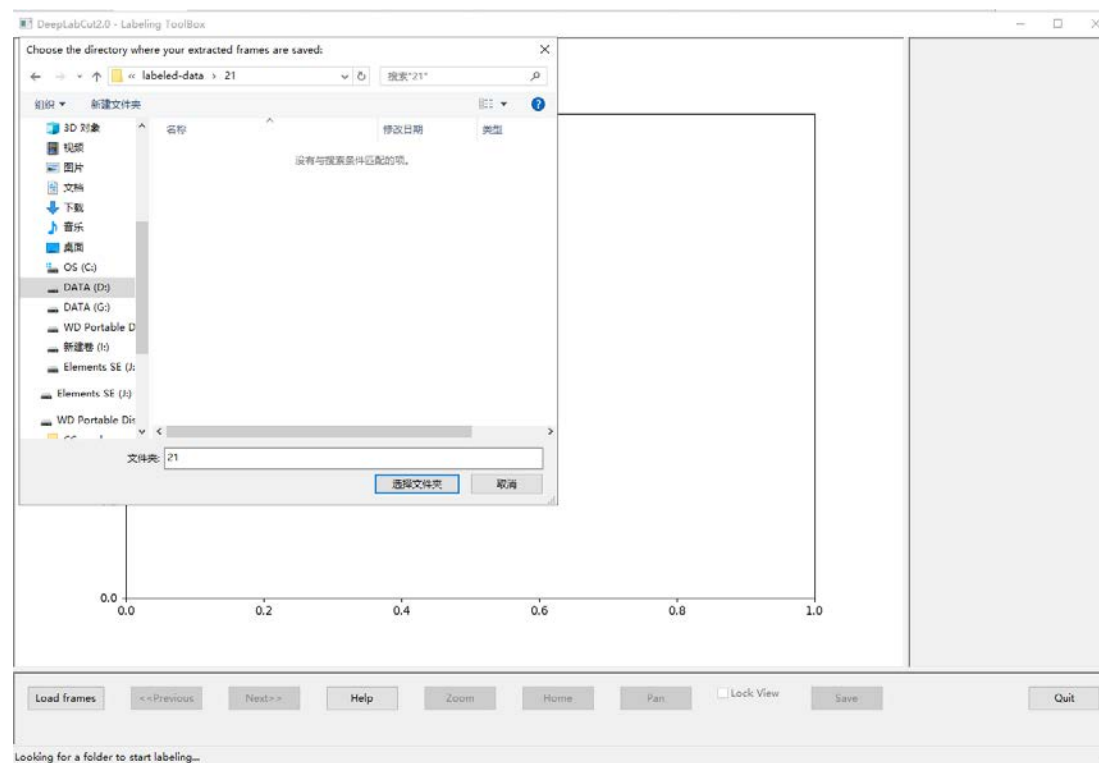
8. Label frames

Click 'Label Frames' button.



8. Label frames (continued)

Click 'Load frames' button;
Choose the folder.



8. Label frames (*continued*)

Label the parts you are interested (right click of mouse);

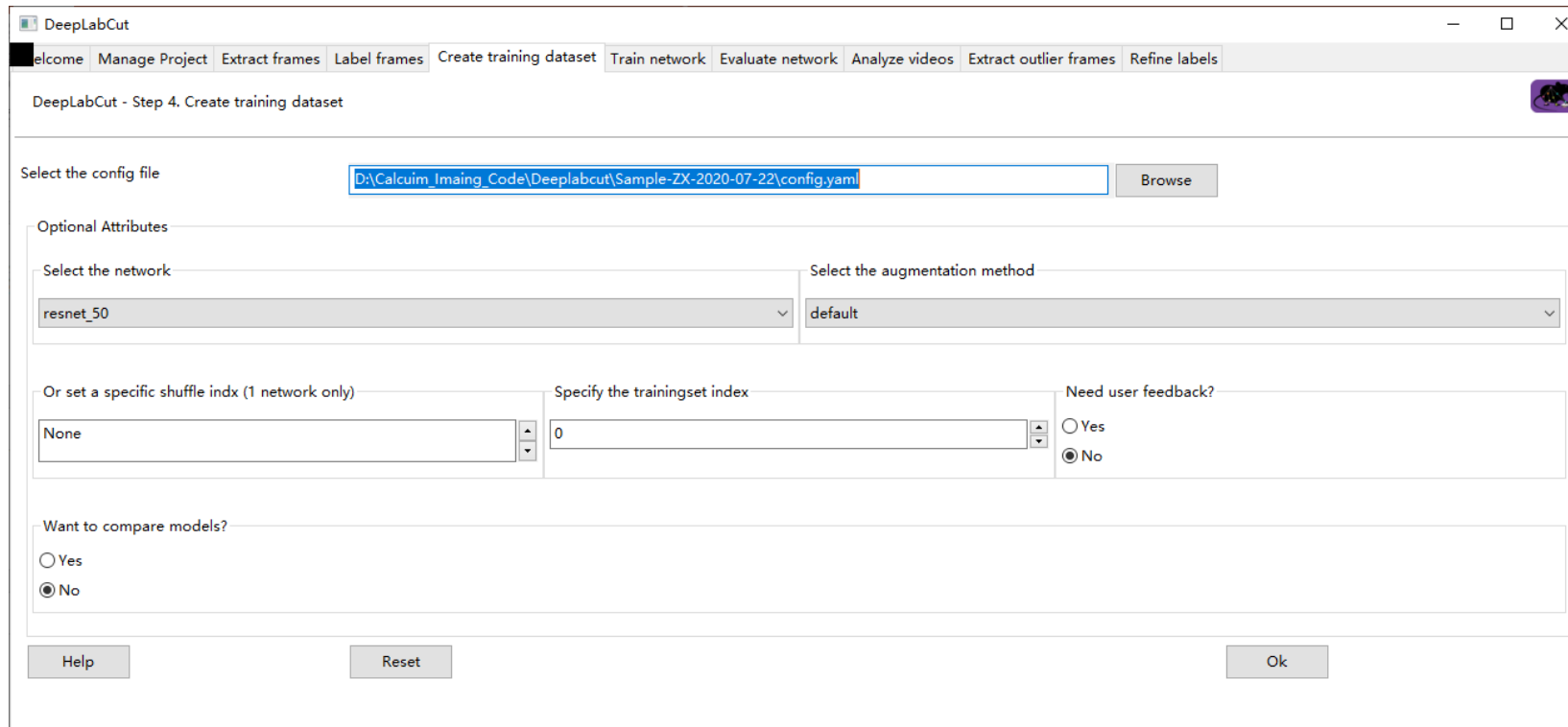
Click 'save' button after labeling all frames;

Click 'quit' button or close the window directly;

Click 'Check Labeled Frames' button.

9. Create training dataset

Click 'Ok' button.



The screenshot shows the 'DeepLabCut' application window, specifically the 'Create training dataset' step. The window has a menu bar with options: Welcome, Manage Project, Extract frames, Label frames, Create training dataset (active), Train network, Evaluate network, Analyze videos, Extract outlier frames, and Refine labels. Below the menu bar, the title bar reads 'DeepLabCut - Step 4. Create training dataset'. The main area contains several input fields and buttons. At the top, there is a text field for 'Select the config file' with the path 'D:\Calcuim_Imaing_Code\Deeplabcut\Sample-ZX-2020-07-22\config.yaml' and a 'Browse' button. Below this is a section titled 'Optional Attributes'. It contains two dropdown menus: 'Select the network' (set to 'resnet_50') and 'Select the augmentation method' (set to 'default'). Below these are three more fields: 'Or set a specific shuffle indx (1 network only)' (set to 'None'), 'Specify the trainingset index' (set to '0'), and 'Need user feedback?' (with 'No' selected). At the bottom, there is a 'Want to compare models?' section with 'No' selected. The window ends with three buttons: 'Help', 'Reset', and 'Ok'.

DeepLabCut

Welcome Manage Project Extract frames Label frames Create training dataset Train network Evaluate network Analyze videos Extract outlier frames Refine labels

DeepLabCut - Step 4. Create training dataset

Select the config file Browse

Optional Attributes

Select the network

Select the augmentation method

Or set a specific shuffle indx (1 network only)

Specify the trainingset index

Need user feedback?
☐ Yes
☒ No

Want to compare models?
☐ Yes
☒ No

Help Reset Ok

10. Train network

Click 'Ok' button (it takes hours).

DeepLabCut

Welcome Manage Project Extract frames Label frames Create training dataset Train network Evaluate network Analyze videos Extract outlier frames Refine labels

DeepLabCut - Step 5. Train network

Select the config file

D:\Calcuim_Imaing_Code\Deeplabcut\Sample-ZX-2020-07-22\config.yaml Browse

Optional Attributes

Specify the shuffle Specify the trainingset index Want to edit pose_cfg.yaml file?

1 0 ☐ Yes ☒ No

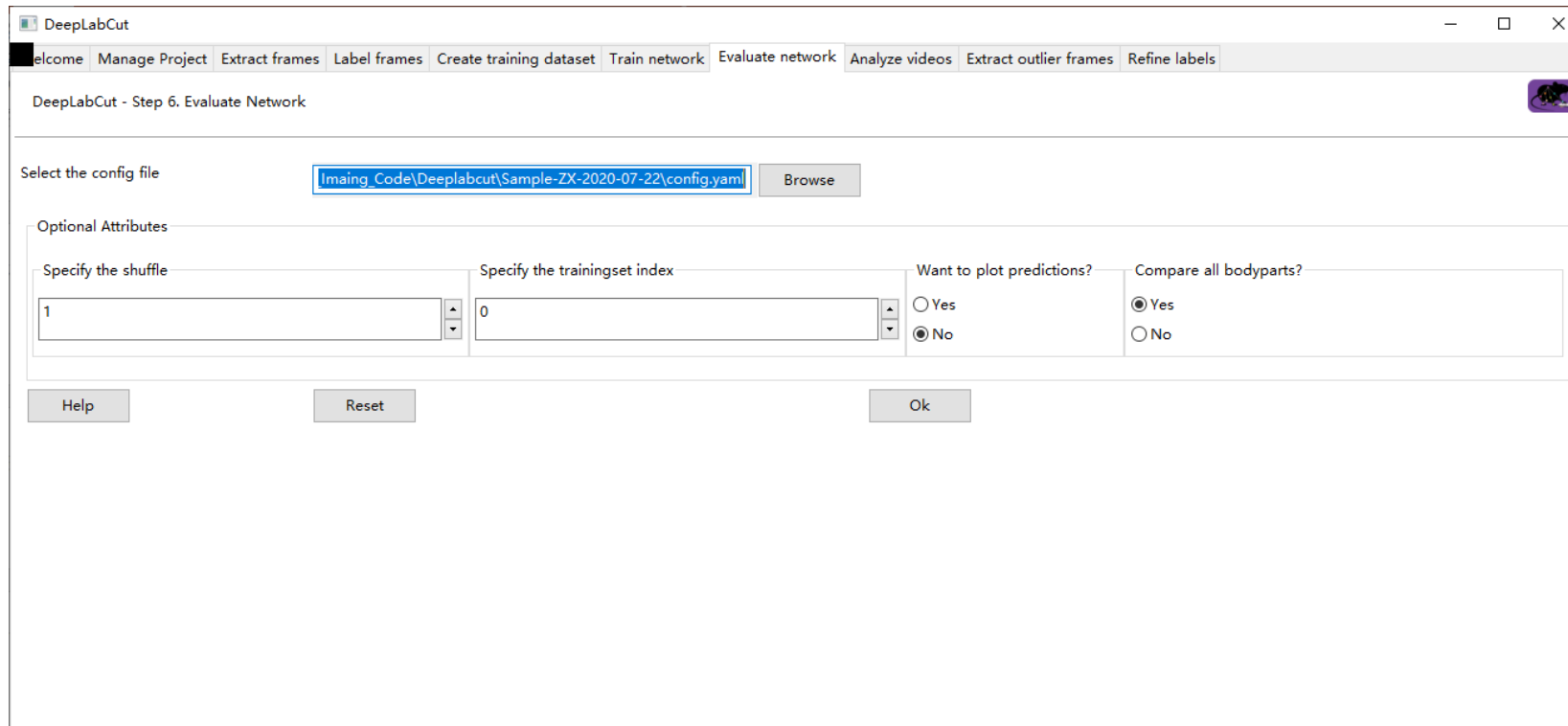
Display iterations Save iterations Maximum iterations Number of snapshots to keep

1000 50000 1030000 5

Help Reset Ok

11. Evaluate network

Click 'Ok' button.



The screenshot shows the 'DeepLabCut' application window, specifically the 'Evaluate network' step. The window has a title bar with standard minimize, maximize, and close buttons. Below the title bar is a menu bar with the following options: Welcome, Manage Project, Extract frames, Label frames, Create training dataset, Train network, Evaluate network (which is currently selected), Analyze videos, Extract outlier frames, and Refine labels. The main content area is titled 'DeepLabCut - Step 6. Evaluate Network'. It contains a section for 'Select the config file' with a text box containing the path 'Imaing_Code\Deeplabcut\Sample-ZX-2020-07-22\config.yaml' and a 'Browse' button. Below this is an 'Optional Attributes' section with four sub-sections: 'Specify the shuffle' with a dropdown menu showing '1', 'Specify the trainingset index' with a dropdown menu showing '0', 'Want to plot predictions?' with radio buttons for 'Yes' and 'No' (where 'No' is selected), and 'Compare all bodyparts?' with radio buttons for 'Yes' and 'No' (where 'Yes' is selected). At the bottom of the window are three buttons: 'Help', 'Reset', and 'Ok'.

DeepLabCut

Welcome Manage Project Extract frames Label frames Create training dataset Train network Evaluate network Analyze videos Extract outlier frames Refine labels

DeepLabCut - Step 6. Evaluate Network

Select the config file

Imaing_Code\Deeplabcut\Sample-ZX-2020-07-22\config.yaml Browse

Optional Attributes

Specify the shuffle

1

Specify the trainingset index

0

Want to plot predictions?

☐ Yes ☒ No

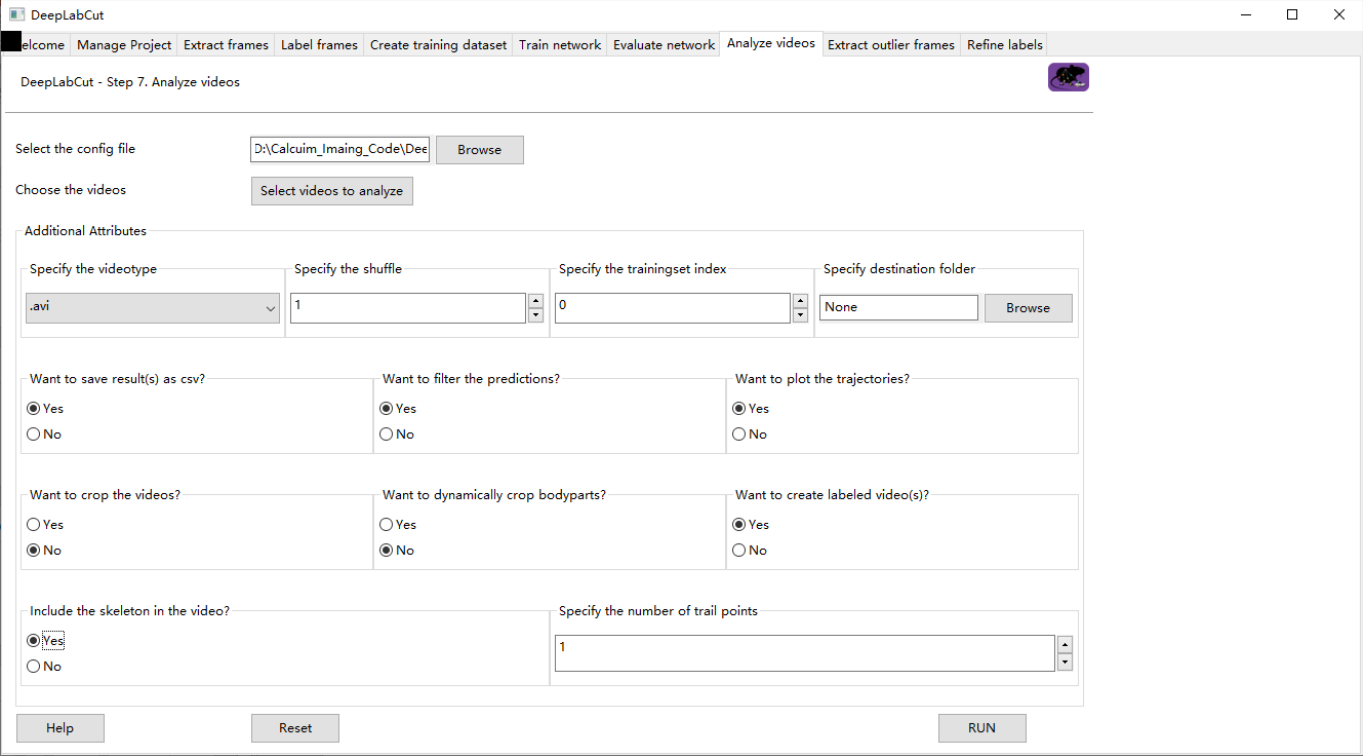
Compare all bodyparts?

☒ Yes ☐ No

Help Reset Ok

12. Analyze videos

Select videos you want to analyze;
Set parameters as shown below or use default settings;
Click 'RUN' button.



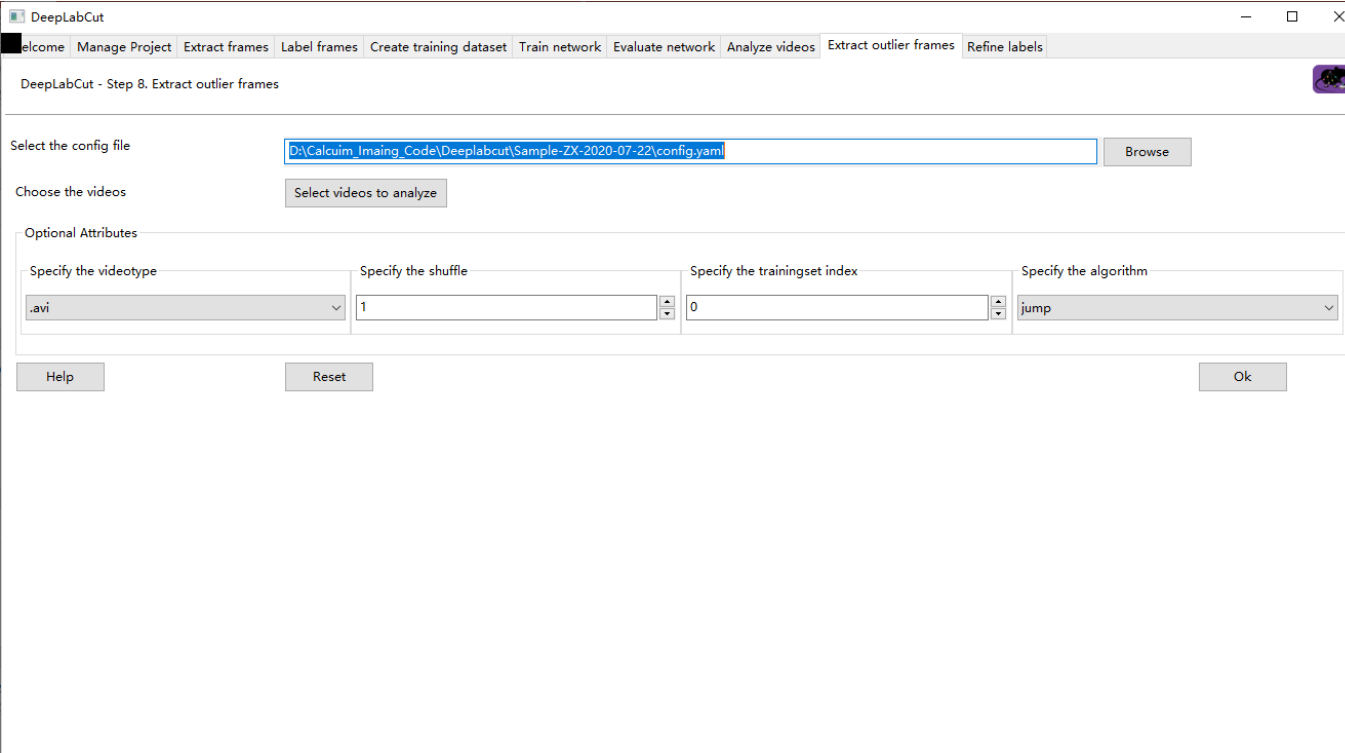
The screenshot shows the 'DeepLabCut - Step 7. Analyze videos' window. The interface includes a tabbed menu at the top with 'Analyze videos' selected. Below the menu, there are several configuration sections:

- Select the config file:** A text box containing 'D:\Calcuim_Imaing_Code\Dee' and a 'Browse' button.
- Choose the videos:** A button labeled 'Select videos to analyze'.
- Additional Attributes:** A section with four sub-parameters:
 - Specify the videotype:** A dropdown menu showing '.avi'.
 - Specify the shuffle:** A spinner box set to '1'.
 - Specify the trainingset index:** A spinner box set to '0'.
 - Specify destination folder:** A text box with 'None' and a 'Browse' button.
- Radio button options:** Three rows of radio buttons for various settings:
 - Row 1: 'Want to save result(s) as csv?' (Yes selected), 'Want to filter the predictions?' (Yes selected), 'Want to plot the trajectories?' (Yes selected).
 - Row 2: 'Want to crop the videos?' (No selected), 'Want to dynamically crop bodyparts?' (No selected), 'Want to create labeled video(s)?' (Yes selected).
 - Row 3: 'Include the skeleton in the video?' (Yes selected), 'Specify the number of trail points' (1 selected).

At the bottom of the window, there are three buttons: 'Help', 'Reset', and 'RUN'.

13. Extract outlier frames (*selected*)

Select videos you want to refine;
Click 'Ok' button.



The screenshot shows the 'DeepLabCut' application window, specifically the 'Extract outlier frames' step. The window has a title bar with standard OS controls and a menu bar with options: Welcome, Manage Project, Extract frames, Label frames, Create training dataset, Train network, Evaluate network, Analyze videos, Extract outlier frames, and Refine labels. Below the menu bar, the title 'DeepLabCut - Step 8. Extract outlier frames' is displayed. The main interface includes a 'Select the config file' section with a text box containing 'D:\Calcuim_Imaing_Code\Deeplabcut\Sample-ZX-2020-07-22\config.yaml' and a 'Browse' button. Below this is a 'Choose the videos' section with a 'Select videos to analyze' button. The 'Optional Attributes' section contains four dropdown menus: 'Specify the videotype' (set to '.avi'), 'Specify the shuffle' (set to '1'), 'Specify the trainingset index' (set to '0'), and 'Specify the algorithm' (set to 'jump'). At the bottom of the window are three buttons: 'Help', 'Reset', and 'Ok'.

13. Refine labels (*selected*)

Click 'Ok' button;

Click 'Load frames' button;

Select the '.h5' file in folders;

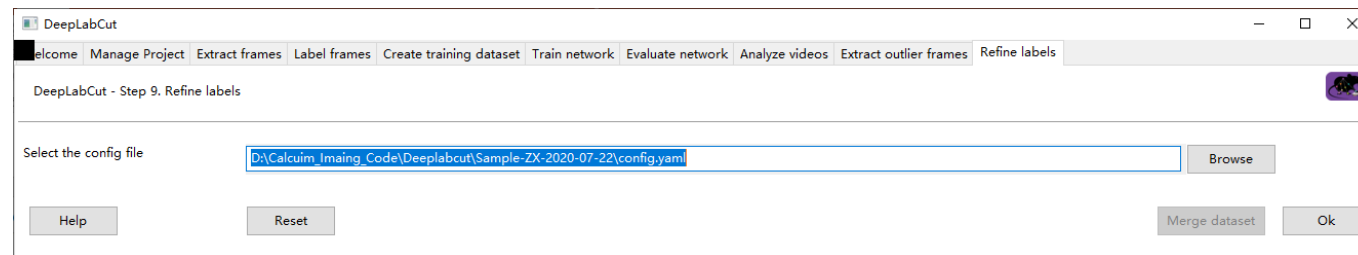
Refine frames;

Click 'save' button after refining all frames;

Click 'quit' button or close the window directly;

Click 'Merge dataset' button.

(Then jump to step 10.)



Reference

<http://www.deeplabcut.org>

Nath T , Mathis A , Chen A C , et al. Using DeepLabCut for 3D markerless pose estimation across species and behaviors[J]. Nature Protocols, 2019, 14(7):1.