

# LiDAR360 FAQ

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## 1. Installation and licensing FAQs

### 1.1. After installing LiDAR360, why does the software prompt that the license has expired when running?

There may be several reasons why LiDAR360 cannot be used:

(1) System time change: If the system time has changed during the trial period of LiDAR360, it may cause the trial to expire prematurely.

(2) Trial expiration: The trial period of each version of LiDAR360 is 7 days. If the same version is installed more than 7 days ago, the trial will expire.

(3) Other reasons: Please send an email to [info@greenvalleyintl.com](mailto:info@greenvalleyintl.com) to apply for an extension of the trial license.

### 1.2. How to apply for a trial of LiDAR360 software?

Please visit the GreenValley International website at [www.greenvalleyintl.com](http://www.greenvalleyintl.com), click on SOFTWARE -> LiDAR360 -> Trial Request, and fill out the trial application form. Our staff will then send the software installation package and activation code to your email.

### 1.3. What functions does the LiDAR360 software support during the trial period?

All modules are supported during the trial period, except for the power line module.

### 1.4. What functions can I use after the trial period of LiDAR360 software?

After the trial period ends, the viewer tools of the LiDAR360 software (including data import, point cloud display, selection tools, measurement tools, etc.) can be used normally, and other functions need to be activated before they can be used.

### 1.5. If the computer is damaged and the authorization code cannot be transferred out, how can I continue to use the authorization code on another computer?

Please contact [support@greenvalleyintl.com](mailto:support@greenvalleyintl.com) and we will retrieve the authorization code from the backend, which can then be used on other computers.

## **1.6. Why Can't the Help Manual Be Opened When I Click the Help Button on the License Management Interface?**

Please set the default program to open pdf documents.

## **1.7. License management, single-machine license activation failed, error code: 264, prompt: The server did not respond, please confirm that the server address and port are configured correctly.**

You can check whether the computer can log in to the web page normally. Change both IP4 and IP6 protocols to automatic application in the network adapter and confirm. If it still doesn't work, check whether IP4 and IP6 have been changed. If the IP4 and IP6 changes are not refreshed successfully, adjust them to automatic again.

## **1.8. License management, single machine license activation failed, error code: 1912, prompt: machine hardware information does not match, please re-authenticate.**

It is judged that this problem may be caused by the CPU version. For example, the 12th generation CPU processor i7, i7-12700 series may have this problem when using version V5.3. The software version can be upgraded to LiDAR360V5.4.

## **1.9. License management, group authorization, client device activation failed, error code: 264 , prompt: the server has no impact, please confirm whether the server geology and port configuration are correct.**

Please check the following methods

(1) Please check whether this device is the only one reporting an error or whether other devices authorized by the group are also reporting an error. If all devices report an error, you can turn off the firewall and anti-virus software and try again. If you can access it after turning it off, you need to add a whitelist to the anti-virus software and add TCP outbound/inbound rules for ports 8273 and 8274 in the firewall.

(2) If only one device reports an error, please check whether the device can open [http://Group Service IP Address: Port 8273](http://GroupServiceIPAddress:Port8273) in the browser. If it cannot be opened, you can turn off the firewall and anti-virus software on the machine and try again. If the webpage still cannot be opened, please

proceed to step 3.

(3) Run the command prompt as an administrator and execute the `ipconfig / flushdns` command to clear the local DNS information. Then try to access [the http: //Group Service IP Address: Port 8273](#) page.

(4) If the server is temporarily accessible after executing step 3 but is still inaccessible later, you can only blame the command `netstat -ano | Findstr " 8273 "` and `net stat -ano | findstr "8274"` . If there are a large number of `TIME_WAIT` , you can refer to the instructions on the webpage.

(5) You can check whether there are multiple IP addresses under the group server. If there are multiple IP addresses, it may be because one of the addresses is not an intranet IP. You need to set the IP address to the correct IP.

/IP protocol between the server and the client is normal.

#### **1.10. License management, online activation, group authorization server error, error code: 405 , prompt: license file data does not match .**

Unable to connect to the server, errors that may occur during online activation or upgrade, causes and solutions:

(1) Whether the activated machine can connect to the external network. If it cannot connect to the external network, offline activation is required .

(2) If pirated software has been installed on the machine, you need to delete `127.0.0.1 ws.bitanswer.cn` in `C:\Windows\System32\drivers\etc\hosts` .

(3) The machine cannot resolve the domain name. You need to add `123.57.10.39 ws.bitanswer.cn` in `C:\Windows\System32\drivers\etc\hosts` .

(4) If the first three are not feasible, upgrading to the latest version of the product support module can solve the problem . Otherwise, it is due to machine network problems and can only be activated offline.

#### **1.11. License management, online activation failed, error code: 276 , prompt: The corresponding local authorization license data file was not found.**

Please use the following methods to troubleshoot the group server. The IP address will change after the machine is restarted. The network administrator needs to fix the IP address of the server, or

enter the machine name in the server--Group Authorization Management Center--System Information on the left as the IP address to reactivate .

**1.12. License management, online activation failed, error code: 294 , prompt: The host setting of the group authorization is empty, or the group server address is not set .**

The host is empty in the configuration file for the group service connection that is not configured on the local machine. This can be solved by using the server setting tool to set the group server address once .

**1.13. License management, online activation failed, error code: 405 , prompt: license file data does not match .**

The authorization data is incomplete and can be resolved by reactivating it using the Cleanup tool or updating to the latest Group Service and Product Support module .

**1.14. License management, online activation failed, error code: 289 , prompt: license file data does not match .**

Delete the C:\programdata\bitanswer\authorization directory, restart the group service and activate it again.

**1.15. Why can't the 7.0 version of the software be used after activation in version 8.0?**

The V8 version uses a new license manager, which the older version cannot automatically recognize. It is necessary to transfer and delete the license in the new version before activating it in the older version.

## 2. Platform FAQ

### 2.1. Why can't I open the "Recent Files" on the LiDAR360 homepage?

The file's properties may have changed, or the file's storage location may have moved.

### 2.2. Why does the software exit abnormally?

If the software exits abnormally, please check: (1) whether the screen word retrieval software is open; (2) whether there is enough hard disk space or memory space.

### 2.3. Why does the progress bar move slowly after running the data processing tool?

Please check the size of your data file, or whether there are other programs occupying the computer performance. You can run the tool again after thinning the point cloud while ensuring the accuracy requirements.

### 2.4. What data formats does LiDAR 360 support?

➤ The data types that can be imported by LiDAR360 are divided into five categories: point cloud, raster, vector, table and model. The specific formats are as follows:

Point cloud: LiData file (\*.LiData custom point cloud format), LAS file (\*.las, \*.laz), ASCII file (\*.txt, \*.asc, \*.neu, \*.xyz, \*.pts, \*.csv), PLY file (\*.ply).

- Raster: image data (\*.tif, \*.jpg).
- Vector: Vector data (\*.shp).
- Table: Tabular data (\*.csv).
- Model: custom model file (\*.LiModel custom model file, \*.LiTin custom triangulation file), OSG model (\*.osgb, \*.ive, \*.desc, \*.obj).

➤ The data formats that can be exported by LiDAR360 are as follows:

- Point cloud: LiData file (\*.LiData custom point cloud format), LAS file (\*.las, \*.laz), ASCII file (\*.txt, \*.asc, \*.neu, \*.xyz, \*.pts, \*.csv), PLY file (\*.ply).
- Raster: image data (\*.tif, \*.jpg, \*.bmp).
- Vector: Vector data (\*.shp, \*.dxf).
- Table: Tabular data (\*.csv).

- Model: Custom model file (\*.LiModel, \*.LiTin).

### **2.5. The color bar in the LiDAR 360 data window is not displayed correctly. How can I set it?**

Right-click on the desktop, select NVIDIA Control Panel, select Manage 3D Settings -> Program Settings -> Add, and add the LiDAR360 software to the High Performance Graphics Mode list.

### **2.6. Why is the EDL effect not obvious when adding multiple data in the same window?**

It is recommended that you drag data that is far apart to different windows for EDL display (or remove irrelevant data in the current window).

### **2.7. What is the unit of point cloud data processed by LiDAR 360 software?**

LiDAR360 V5.2 and later support user-defined unit settings. You can set custom units through Display Settings -> Measurement Settings in the upper right corner of the window. Currently supported units include meters, feet, decimeters, centimeters, millimeters, and inches.

### **2.8. Can LiDAR 360 process the point cloud generated by images?**

Yes, as long as the data format is supported by LiDAR 360, it is OK

### **2.9. Can I select the center of rotation when using the Multi-Point Selection tool?**

Yes. When using the multi-point selection tool, hold down the left mouse button to rotate the view.

### **2.10. What are the POS data formats supported by LiDAR 360?**

LiDAR360 supports POS data in text file format (\*.pos) and binary format (\*.out). \*.out is a binary POS data format customized by Applanix.

### **2.11. What filtering algorithm is used in LIDAR 360 software?**

LiDAR360 uses the Improved Progressive TIN Densification (IPTD) algorithm. For more information on the algorithm, please refer to the paper: Zhao et al (2016) Improved progressive TIN

densification filtering algorithm for airborne lidar data in forested areas.

### 2.12. What are the definitions and relationships of Fill and Excavation in Volume Measurement in LiDAR360?

**Excavation:** This refers to the process of removing earth or soil from a site. The measurement unit for excavation is typically the natural dense cubic meter, and it is quantified based on the soil type classification. The appropriate quota is applied depending on the soil characteristics.

**Filling:** This involves adding earth or soil to a site to raise the ground level. The measurement unit for filling is the compacted cubic meter, and it is based on the compaction quota applied to the soil after it has been added to the site.

### 2.13. Can the software automatically identify boundaries like rivers, and can it perform some smoothing when generating boundaries?

Currently, the software does not support automatic identification of rivers. However, it can semi-automatically identify and extract features such as road shoulders, producing a vector line for these boundaries. For extracting rivers or similar features, manual vector editing is required.

As for smoothing boundaries, LiDAR360 can apply smoothing techniques during the boundary generation process to enhance the visual quality and accuracy of the extracted features.

### 2.14. Why does the LiDAR360 software on my computer always crash when opening data after it is successfully installed?

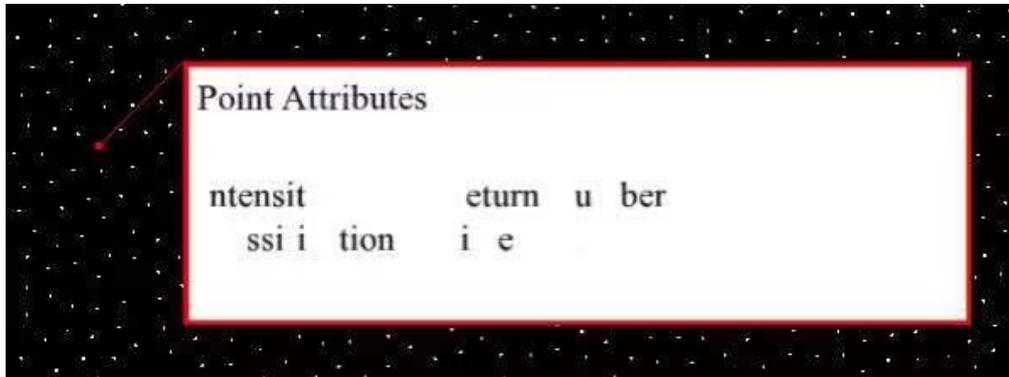
Please check whether the software installation environment meets the recommended hardware configuration. If so, please check:

(1) Check whether the graphics card is running normally (right-click My Computer, select Device Manager, find the corresponding graphics card in Display Adapters, and check the graphics card properties. If it displays "This device is working properly", it means that the graphics card device is running normally). (2) Update the independent graphics card driver to the latest version, and then run the software in high-performance graphics mode. For the steps, see Adjusting High-Performance Graphics Mode.

If the error still occurs, please send an email to [support@greenvalleyintl.com](mailto:support@greenvalleyintl.com) to contact

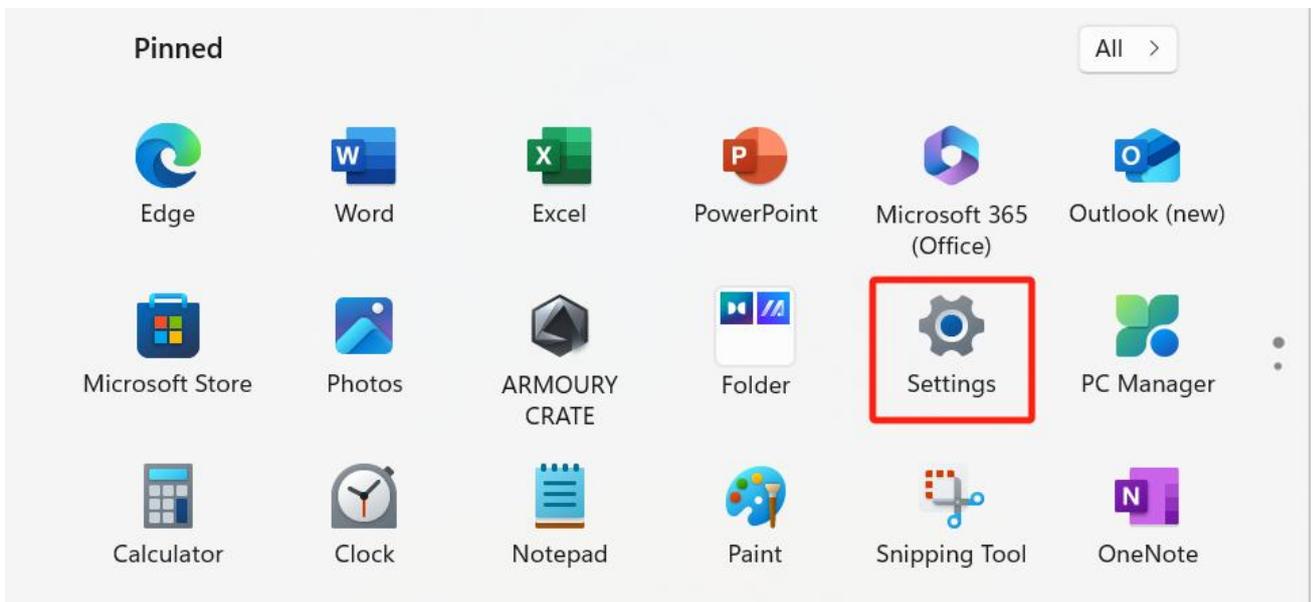
technical personnel to remotely check the cause.

**2.15. Why is it that when viewing single-point point cloud information, the dialog box text is not fully loaded or garbled? The situation is as shown in the following figure:**

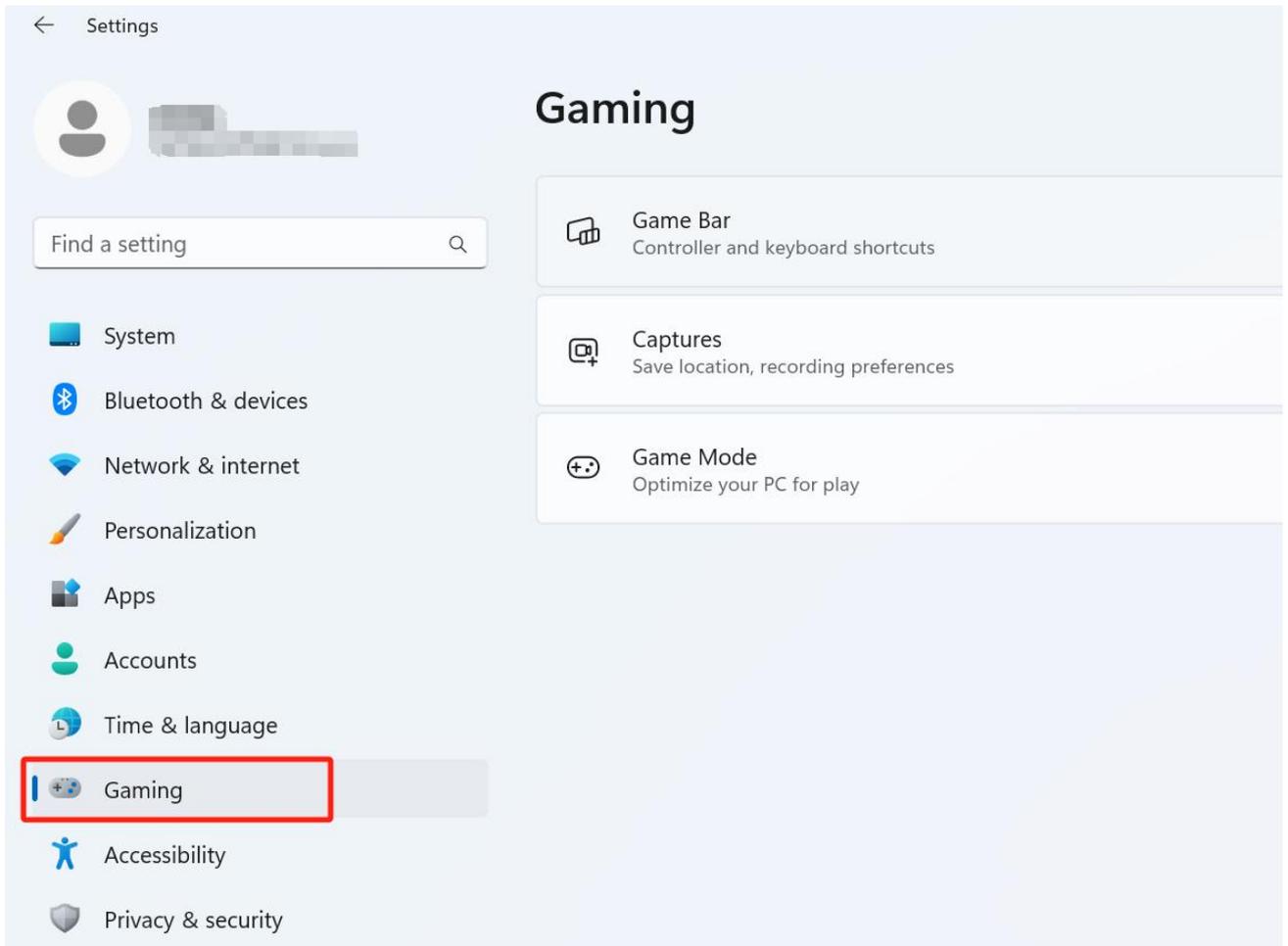


Update the independent graphics card driver to the latest version, and then run the software in high-performance graphics mode. The high-performance setting method under the Win10 operating system is as follows:

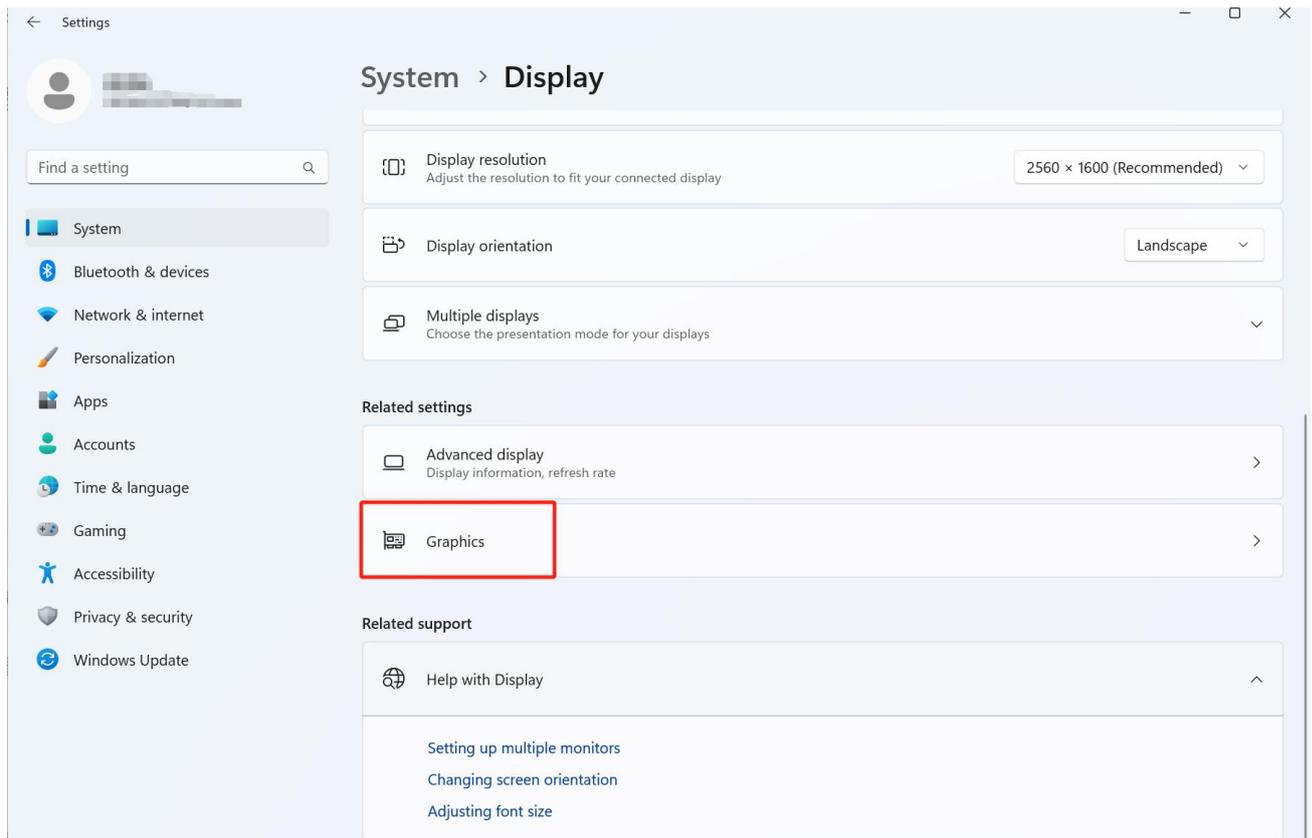
Step 1: Open the system settings button



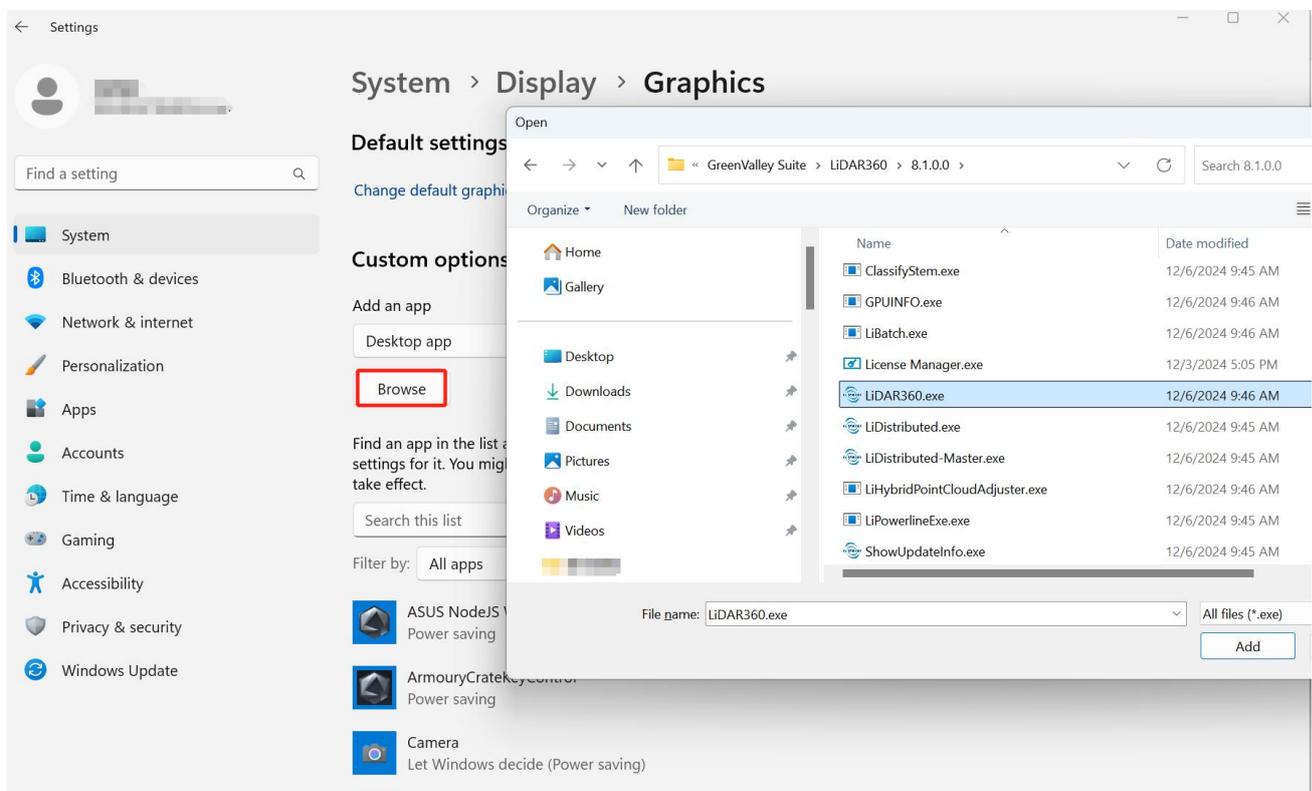
Step 2: Click on the "Game" settings



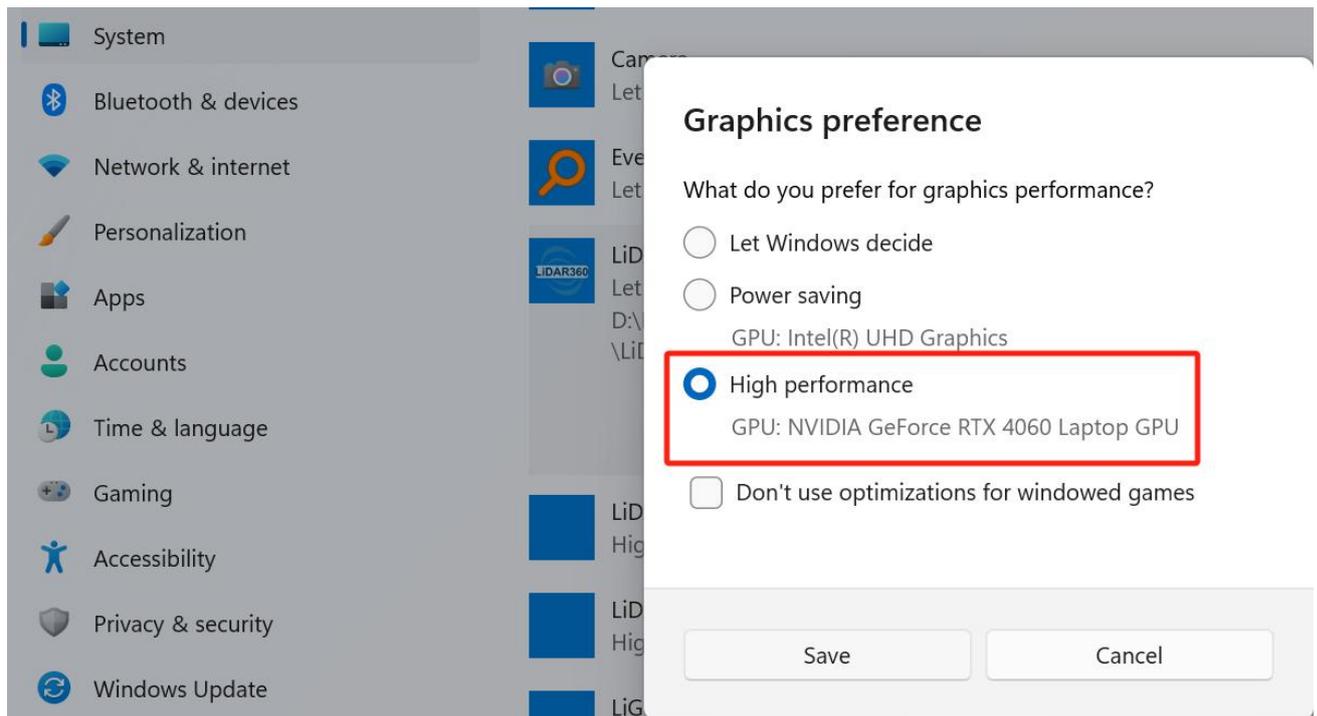
Step 3: Pull down the menu to the bottom and find "Graphics Settings"



Step 4: Click Browse to select the application you want to set up



Step 5: Under the "Options" menu, set it to high performance mode



The above is how to set LiDAR360 to high-performance display mode under Win10.

### 2.16. Why does LiDAR360 suddenly fail to work properly, such as the software cannot be opened, data loading fails after opening, a gray screen appears when part of the data is loaded, the software cannot run normally after loading data, or the program freezes?

You can first eliminate the problem by updating the NVIDIA graphics driver and adjusting the NVIDIA graphics performance mode. If the above methods cannot solve the problem, you can check the status of AMD integrated graphics card, such as whether it is identified as the Windows default graphics card and whether the graphics card driver is the stable version driver officially recommended by AMD. If not, you can solve it by updating the AMD integrated graphics driver.

AMD official website: <https://www.amd.com/en/support>

### 2.17. Is it possible to generate a custom length and width frame outline based on the opened total point cloud data?

Yes, you can use the "Tile by Range" option under Data Management -> Tile to specify a custom length and width. Additionally, the point cloud tiling tool supports other segmentation methods, such as by number of points, by straight lines, and by polygons.

### **2.18. Li DAR360 software takes too long to start up, is there a computer performance issue?**

Delete the contents of the BitAnswer folder and re-run the software to re-activate it to solve the problem of slow start-up.

### **2.19. The fonts and icons of the LiDAR360 software are too large/too small on a high-resolution screen. How can I adjust them ?**

You can adjust the "Scale and Layout" option in the computer's display settings to scale the software interface to an appropriate size.

### **2.20. The LiDAR360 software prompts that a certain DLL file is missing. What should I do ?**

This issue is often caused by antivirus software mistakenly deleting the DLL file. Even though LiDAR360 is added to the whitelist of many antivirus programs, false positives can still occur. To resolve this issue, restore the missing DLL file from the quarantine or exclusion list in your antivirus software.

### **2.21. Why can't I enable split-window rendering for LiDAR360 ?**

Before using the split-window rendering function, you need to go to Settings > Check "Use Shader Color Strategy" in the "Rendering" option and restart the software for the split-window rendering function to take effect.

### **2.22. When using the custom deep learning classification function, it prompts that nvmf.dll cannot be found . What should I do?**

First, please confirm whether the graphics card driver is installed. If the graphics card driver is installed but the problem still occurs, you can re-install the C: \ Program Files \ C:\Program Files\ NVIDIA Corporation\NVSMI (the path is determined by the user's graphics driver installation directory) and add it to the system environment variable Path.



### 3. Preprocessing module FAQ

#### 3.1. Can LiDAR 360 verify checkpoint accuracy (can it perform control point checks)?

Yes, the specific operation is "Preprocessing->Control Point Report", or open the file in point mode and measure and compare manually.

#### 3.2. How to perform seven-parameter transformation for LiDAR 360?

The process is as follows: Click Data Management -> Projections and Transformations -> Reprojection, enter the values of seven parameters: Dx: X translation, Dy: Y translation, Dz: Z translation, Rx: X rotation, Ry: Y rotation, Rz: Z rotation,  $\lambda$ : scale change, and select the target coordinate system (if the point cloud data has no projection information, you need to define the projection first). In addition to manually entering parameters, LiDAR 360 V5.2 and later supports importing existing parameter files for solution. For detailed operations, please refer to the user manual for conversion relationship definition.

#### 3.3. Why subsample point clouds?

Subsampling can reduce the volume of data and optimize processing speed while ensuring data quality.

#### 3.4. How to evenly thin the point cloud?

LiDAR360 provides three thinning methods: minimum point spacing, percentage, and octree. Among them, the thinning method according to the octree is uniform (the process is as follows: Data Management -> Point Cloud Tools -> Subsampling, select Octree as the sampling type, and set the corresponding number of layers).

#### 3.5. Why are the point cloud coordinates incorrect after conversion using LiDAR 360's 3D affine transformation?

The units of Rx, Ry, and Rz in LiDAR360 are degrees, you need to convert angles from radians to degrees before conversion. ( $\text{Angle} = 180 \cdot \text{radians} / \pi$ )

### **3.6. Why is the data error so large after geometric correction? How to solve it?**

Large residuals in the selected point pairs with the same name may cause significant data errors. To resolve this, remove the pairs with large residuals.

### **3.7. Is the flight zone matching in LiDAR 360 done automatically or manually?**

LiDAR360 supports both automatic and manual flight zone matching. It allows you to view stitching results in real time, which helps in generating high-precision point clouds.

### **3.8. What is the time base of POS data in LiDAR 360? Does it have to be GPS time?**

In LiDAR360, the time reference of the POS data should be consistent with the time reference in the point cloud data (e.g., both using GPSTime or both using UTCTime). Typically, the time in the point cloud data is based on week seconds or day seconds. If the time references are different, corresponding conversions will need to be made.

### **3.9. Why do some areas of data not splice well or not splice at all after Strip Alignment, and why are there crossovers?**

The Strip Alignment module in LiDAR360 primarily addresses matching between flight strips by correcting Boresight errors between the LiDAR and the inertial measurement unit. For effective alignment, the accuracy of the POS data after flight processing must meet the required specifications. If the POS accuracy is insufficient, it can cause local deformations in the point cloud data. Relying solely on Boresight error calibration may not yield satisfactory alignment results, particularly when using low-precision POS files obtained through real-time processing.

### **3.10. Why does cropping point cloud data with POS trajectory not generate results?**

Please check whether the start and end GPS time of the POS data overlap with the GPS time range of the point cloud, or whether the time units of the trajectory and the point cloud are consistent. Only when the units are consistent and there is overlap in time can the point cloud be cropped.

### **3.11. What is the difference between Trajectory Adjustment and Boresight?**

Boresight corrects the systematic errors of the equipment installation, while Trajectory

Adjustment is used for overall adjustment of errors in the POS and point cloud data.

**3.12. If the accuracy still cannot meet the requirements after Automatic Alignment and Trajectory Adjustment, is it possible to calculate the error correction through control point adjustment?**

No, the control point report only provides an accuracy assessment of the Z value and does not address the correction of Boresight errors. The Boresight calibration module primarily matches flight strips by correcting Boresight errors between the LiDAR and the inertial measurement unit. For effective calibration, the accuracy of the POS data after flight processing must meet the required specifications. It is recommended that users manually adjust the Boresight error values based on the results of Automatic Alignment for better calibration.

**3.13. For data collected by DJI L1 equipment, if there is an inconsistency between the trajectory time reference and the point cloud GPS time reference (e.g., the trajectory time is in week seconds while the point cloud time information is in adjusted GPS time), how should this be addressed? (GPS week seconds range from 0 to 604800, which can be used to distinguish between GPS week seconds and adjusted GPS time.) How should the GPS time conversion be handled?**

- **Preprocessing > Trajectory Adjustment:** Input the trajectory file. The DJI L1 device trajectory file is in .out format.
- **Convert GPS Time:** After inputting the trajectory file, a dialog box will appear for GPS time conversion and coordinate system selection.

Choose the source GPS time and specify the conversion target. convert the trajectory time to point cloud time.

**3.14. When reprojecting using the geoid model, the elevation of the point cloud does not change. What could be the reason?**

In addition to downloading the geoid model file, you also need to download the vertical reference grid data for conversion when using Geoid. The software provides the EGM 2008 geoid model elevation conversion by default. If you need to support the geoid model of other regions, you

need to download the corresponding grid data file.

You can refer to the method described in the user manual "The geoid model" to perform the operation. In addition, since different regions have different applicable geoid models, you can check the effective range and specific information about which coordinate systems can be converted on the [PROJ Datumgrid CDN](#) website.

## 4. Classification Module FAQ

### 4.1. What should I do if machine learning classification does not achieve the expected results?

Machine learning classification relies on the quality of the training samples and their alignment with the test samples. To improve results, ensure that the labels of the training samples are accurate and closely match the test samples. You can try different classification methods and make multiple attempts to identify the most effective data for achieving better classification results.

### 4.2. The ground points automatically generated by the LiDAR software are the lowest level point cloud. Will this affect the accuracy of the DEM? Will point cloud smoothing and extraction of median ground points conflict with automatic ground point classification?

No, the ground point classification process divides the point cloud into blocks according to specific rules, taking the lowest layer of points as ground points. Typically, the position of this point will be more discrete compared to other ground points. Extracting the median ground point can correct the relative position of the ground points as a whole. Point cloud smoothing can thin the discrete point cloud, and can be combined with extracting the median ground point to obtain a more appropriate ground point.

### 4.3. Can LiDAR360 realize classification of specific areas, such as lakes and rivers?

LiDAR360 V5.2 and later versions support classification of specific areas. The specific operation process is as follows: Classification -> Classification editor -> TIN -> Add Breaklines -> Flatten Area (Lake)/Double Breaklines (Rivers) -> Set Initial Category, Target Category, such as Water Body -> Add, Complete Lake Area Classification

### 4.4. After point cloud classification is completed, how to export it as raster data?

You can export the data to raster format through "Point Cloud Conversion" under the "Tools" menu bar. In addition, the conversion of point cloud data also supports: Convert LiData to LiData, Convert to ASCII, Convert to TIFF, Convert to Shp, Convert to DXF, Convert to LAS, Convert to E57, Convert Las to LiData

#### **4.5. Can I delete a certain type of points separately, such as the low point class?**

YES, LiDAR360 supports extracting point cloud data by category. In the "Tools" menu bar, select "Extract by Class " under the Extraction drop-down menu. Uncheck the category to be removed in the initial category, such as "Low Point", and the low point data can be removed.

#### **4.6. After the classified point cloud data is converted to tiff, will the attribute table contain the classified attributes?**

NO, After the point cloud data is converted into raster data, the attribute table does not contain classified attributes.

## 5. Terrain Module FAQ

### 5.1. What is the difference between Remove Outliers and Noise Filter?

Unlike the Remove Outliers function, the Noise Filter is more effective for objects with planar surfaces (such as walls, tunnel walls, and the ground) and is capable of filtering out more noise points.

### 5.2. The density of laser points actually collected is much greater than the point density requirement for producing the corresponding DEM. Can the data be thinned out?

YES, If the actual density of collected LiDAR points is much higher than the production requirements, the resampling function can be used to achieve data thinning. LiDAR360 provides three thinning methods: minimum point spacing, percentage, and octree.

### 5.3. Why are there interruptions in the contour lines generated by point cloud in LiDAR 360?

The interruptions in the contour lines are caused by the lack of ground points. The contour lines can be made continuous by increasing the parameter "Maximum side length of triangle (m)" on the interface (e.g., adjusting 30m to 50m). After V 5.2, when generating contour lines, it is supported to import break lines to optimize the contour line model.

### 5.4. When scanning land features such as rice fields and cultivated land, there are no ground points entered, resulting in no true value for the crop area when producing DEM. Can the software automatically optimize this?

Due to the occlusion, the point cloud of the real ground points is not scanned. At present, when the software produces DEM, if the missing range is not large, the built-in interpolation algorithm can automatically repair the elevation of the missing point cloud to generate DEM. If the range is large, it may not be able to automatically make up for the missing value. For this kind of situation where a large number of ground points are missing, it is recommended that technicians use RTK to measure the real terrain points where the point cloud is missing. The number of control points should be determined based on actual needs. Afterward, import the control points into LiDAR360 and display them as point clouds. Then, classify all control points as ground points using the classification tool,

and merge them with the original point cloud before re-producing the DEM.

### **5.5. Is it possible to uniformly assign an elevation to a point cloud within a vector range?**

After LiDAR360 V5.2, the breakline function has been optimized to support the insertion of closed area breaklines and unified elevation value assignment.

First, open "Classification editor", generate TIN based on ground points, click "Add Breakline", select "Closed Area Breakline", draw the area to be unified in elevation, you can specify the elevation, or pick up triangulated mesh points with the mouse to unify the elevation.

### **5.6. Does the elevation adjustment of the LiDAR360 software involve elevation surface adjustment or elevation difference correction?**

The elevation adjustment of LiDAR360 software refers to elevation difference correction.

### **5.7. Why does LiDAR360 show scattered points and black blocks in some areas ?**

This issue is usually caused by the ground points' density being too low. You can increase the resolution of DEM generation (i.e. Xsize, Ysize parameters) within the required range, or adjust the parameters according to the user manual to generate denser ground points before using the DEM function.

### **5.8. Why can't the control point report function in LiDAR360 calculate the results?**

Before using the control point report function, you need to classify the ground points first. Set the ground points to the initial category to enable result calculation. When the control points are on a hard surface other than the ground, you can also classify the object and select it in the initial category.

### **5.9. Why can the DEM boundary still be clearly seen after using the DEM edge tool in LiDAR360, and why is it also clearly shown when imported into other software ?**

The boundary is still visible because the DEM consists of separate data sets that are shadow-rendered independently. To resolve this, uncheck the "Overlay Mountain Shadow" option in the rendering settings of LiDAR360; Additionally, use the "Raster Mosaic" function to merge the

multiple DEMs into a single file. This will eliminate the boundaries between DEM blocks when opened in other software.

## 6. Forestry Module FAQ

### 6.1. How to choose the value method to generate DSM?

For forest areas, it is recommended to use IDW interpolation to generate DSM; for urban areas, it is recommended to use spike-free TIN to generate DSM.

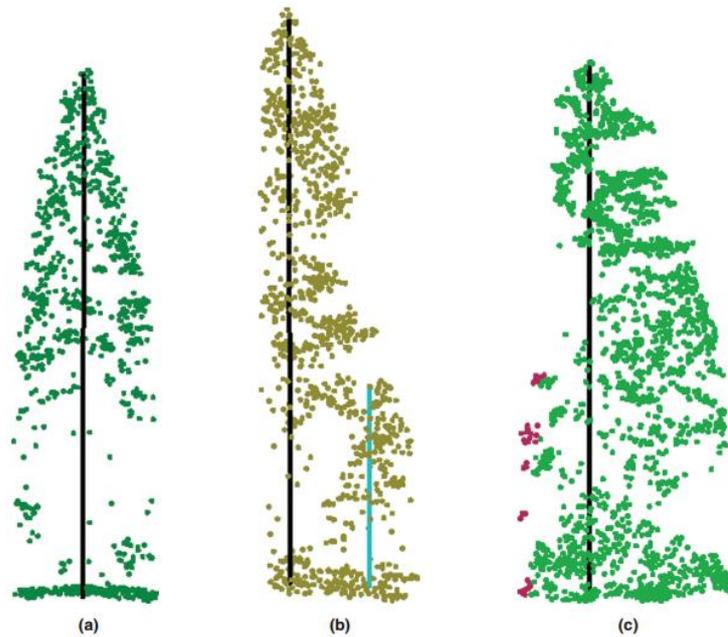
### 6.2. Can LiDAR 360 generate CHM in batches?

YES, LiDAR360 can generate CHM in batches (the process is as follows: ALS Forest -> Batch Process -> Canopy Height Model(CHM) Segmentation).

### 6.3. How to evaluate the accuracy of point cloud segmentation results?

For the evaluation of the accuracy of single tree segmentation, please refer to the article of Li et al. (Li et al., 2012). By comparing with the measured values, the total number of trees segmented, the number of correctly segmented trees, the number of incorrectly segmented trees, and the number of missed trees are recorded respectively, and the values of recall (r), precision (p), and F-score (F) are calculated according to the following formulas. Recall represents the detection rate of trees, precision represents the correct rate of tree segmentation, and F-score is the overall accuracy that comprehensively considers the wrong and missed classifications. The range of variation of the three is between 0 and 1.

$$r = \frac{TP}{TP + FN}$$
$$p = \frac{TP}{TP + FP}$$
$$F = 2 \times \frac{r \times p}{r + p}$$



(a) Trees are correctly segmented (True Positive, TP) (b) Trees are not detected (False Negative, FN) (c) False Positive, FP)

#### 6.4. Which parameters affect CHM segmentation accuracy and how should these parameters be set?

The accuracy of CHM (Canopy Height Model) segmentation is influenced by two main parameters: CHM resolution and Gaussian smoothing factor.

**CHM Resolution:** The resolution of the CHM, which is derived from the difference between DSM (Digital Surface Model) and DEM (Digital Elevation Model), should not exceed one-third of the crown width. Typically, a resolution in the range of 0.3 to 1 meter is used, with a resolution of 0.5 to 0.6 meters generally providing higher segmentation accuracy.

**Gaussian Smoothing Factor (Sigma):** The Gaussian smoothing factor, with a default value of 1, affects the smoothness of the CHM. A higher value increases smoothness, which can affect the number of segmented trees:

If under-segmentation occurs, reduce the value (e.g., to 0.5).

If over-segmentation occurs, increase the value (e.g., to 1.5).

### **6.5. How to remove some results with small crown area after CHM segmentation?**

After CHM segmentation, a shp file containing tree boundaries can be obtained. The attribute table contains the ID, center position coordinates, tree height, crown diameter and crown area of each tree. The data can be imported into third-party software (such as ArcGIS) and filtered according to the crown area attribute to delete the segmentation results with a smaller crown area.

### **6.6. How to make point cloud data below 2m participate in segmentation?**

The parameter "Height Above Ground" on the point cloud segmentation interface means that points below this value are considered not to be part of the tree and will be ignored during the segmentation process. The default value is 2m. If you need to allow point clouds below 2m to participate in the segmentation, you can reduce this value appropriately.

### **6.7. What segmentation method can achieve higher accuracy for coniferous and broad-leaved mixed forest data?**

For large-scale coniferous and broad-leaved mixed forests, CHM segmentation is recommended. For small-scale coniferous and broad-leaved mixed forests, it is recommended to manually add seed points and then use single tree segmentation based on seed points.

### **6.8. Trees grow differently. How can we segment them with higher accuracy?**

For data with large differences in growth, it is recommended to use the selection tool or clipping tool to save the point clouds of different growth as different files and process them separately.

### **6.9. How to export the Point cloud segmentation results of LiDAR 360 to third-party software for analysis?**

Click ALS Forest -> Extract by Tree ID to export the segmented point cloud to LiData, CSV and LAS formats for subsequent analysis using other software. The software supports exporting each tree as a separate CSV file, or exporting all points as one file.

### **6.10. How many sample survey data are needed for regression analysis?**

There is generally no clear regulation on the number of sample plots used for regression

analysis. Generally speaking, the more sample plots there are, the higher the accuracy of the regression analysis, provided that the location and measurement accuracy of the sample plots are guaranteed. Sample plots should be randomly selected and representative, covering different forest types in the study area. Samples with a size of less than 30 are called small samples, and samples with a size of 30 or more are called large samples. In order to ensure the accuracy of regression analysis, the recommended sample size should be greater than or equal to 30 (the size and complexity of the study area should also be considered), and the number of samples should be greater than the number of regression independent variables.

#### **6.11. How to choose independent variables for regression analysis?**

The variables involved in regression analysis are generally selected from the height percentile variables obtained from the lidar data. However, the selection of specific height percentile parameter variables varies in different study areas and different parameter variables, and is not universal.

#### **6.12. Can the independent variables (e.g., height percentiles) of the LiDAR 360 software be imported into third-party software (e.g., SPSS, R) for regression analysis?**

YES, LiDAR360 calculates the independent variables in a universal format.

#### **6.13. After point cloud segmentation, which column in the result table contains the tree's elevation? What if there is no column?**

After the point cloud segmentation, there is no tree elevation value in the result table, only X and Y coordinate values. To obtain the elevation attributes of each tree in the table, follow these steps: first use the DEM tool to generate the DEM of the plot, and then use the "TLS Forest -> Tree Attribute -> Increase Individual Tree Attributes" tool to assign the elevation values to the CSV table according to the coordinate positions of the trees segmented from the single tree .

#### **6.14. What should I do if the seed point coordinates in the CSV table after tree segmentation are not in longitude and latitude? I need longitude and latitude.**

First, copy the tree ID, x-coordinate, and y-coordinate in the CSV table, and then paste them into a newly created TXT document. Then use the toolbox in LiDAR360 - Data Management -

Projections and Transformations - Convert ASCII to BLH to convert the coordinates in this file to longitude and latitude. Finally, paste the coordinates in the generated new document back into the original single tree segmentation table.

**6.15. Why is the tree flat when viewing the cross section of the scanned data? Is there any way to improve this (the scan is performed along a normal trajectory)? In this case, it is easy to have problems fitting the DBH through software?**

Considering that the trunks of trees appear flat in the tree scanning results, it may be because the saplings are relatively small. For large-scale forest data, it is recommended to make the scanning trajectory more curved. When solving the data, in the LiFuser-BP software, do not check the smoothing option and do not smooth the data.

**6.16. Why is there a significant difference between the result of point cloud segmentation and the actual number of single trees? (Excluding DBH fitting inaccuracy and parameter setting problems)**

Excluding the DBH fitting accuracy and parameter setting issues, the cause of this problem may be the inconsistency between the units of the original data and the LiDAR360 settings. For example, the original data units are feet, while the units of LiDAR360 data processing are uniformly meters. Unit conversion is required before data processing.

Conversion method: If the original data is in las format, directly "convert las to LiData" and select "feet" as the source unit; if the original data format is LiData, first "convert to las" and then perform the above operation.

**6.17. Why can't I generate seed points or perform CHM segmentation after the CHM file is generated normally ?**

This problem is usually caused by poor CHM quality, which is difficult for the algorithm to identify, and is usually associated with poor DEM quality. You can generate TIN based on the point cloud according to the manual, edit TIN to ensure terrain quality, generate high-quality DEM based on TIN, and then generate seed points/segmentation for CHM.

### **6.18. Why is the number of trees in the segmentation result different from the number of seed points when segmenting individual trees based on seed points ? How to deal with this situation?**

The discrepancy between the number of trees in the segmentation result and the number of seed points is due to the competitive strategy used in point cloud segmentation. Trees with poor morphology may be incorrectly identified as other trees. To solve this, Import the CSV table and seed point table generated by single tree segmentation into the software at the same time. The position of a single tree and the position of the seed point are usually very close, forming a point pair. At this time, the isolated point is the seed point that has not formed a single tree. The single tree point cloud can be manually edited at this position to adjust the result.

## 7. Data Management Module FAQ

### 7.1. Why is the DJI L1 data displayed as a straight line when opened through LiDAR360 (data display is incorrect)?

This is because LiDAR360 supports the display of projection coordinates. The geographic coordinates need to be converted into projection coordinates through data management-point cloud format conversion-Las to LiData. The converted data can be re-imported into the software for correct display.

### 7.2. When importing L1 data into the software, the projection is not automatically read. Do I need to redefine the projection?

Yes, if the data does not automatically read the projection, you can define the projection manually to properly project the data.

### 7.3. How to enable split-window rendering mode?

To enable this function, first, check if "Use DoSeqi rendering color strategy" is selected under the "Rendering" tab in the settings menu at the top right corner of the interface. If it is not selected, you need to check this option and then restart the software for the split-window rendering function to take effect.

### 7.4. Why is the position offset when a vector file in \*.dxf format is imported into 360?

The default unit of LiDAR 360 data in \*.dxf format is meter. When the unit of the externally imported data is not meter, a conflict will occur, resulting in position offset. There are two ways to solve this problem: 1. Set the unit of the \*.dxf file to meter in the external software and then export it; 2. Open the file in text format (such as \*.txt ) and manually set its unit to meter. Usually, the unit is represented by a number, and the number "6" represents the unit of "meter".

## 8. Photo Module FAQ

### 8.1. Why are the forest areas in the DOM relatively blurry?

In DOM production, there is an occlusion detection parameter. When using LiDAR point clouds for DOM production in forestry scenarios, the point clouds can penetrate the depressions in the forest, but the imagery may not capture these areas due to the angle of the shot, resulting in blurry depressions. Occlusion detection is not recommended in forested areas.