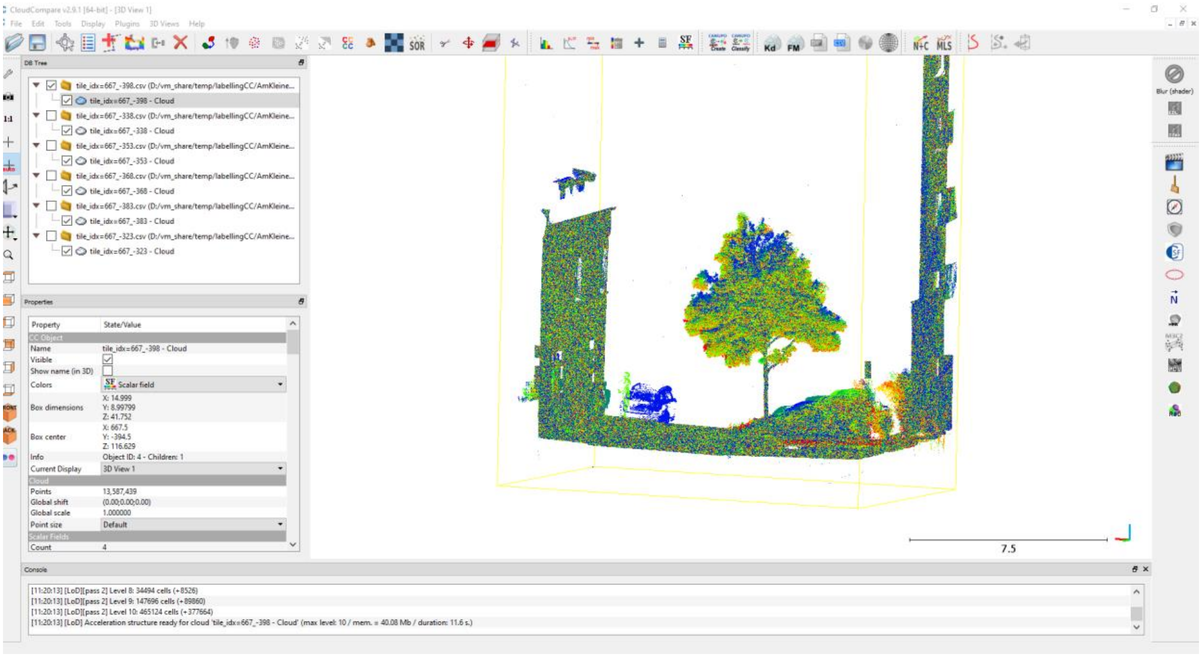
Guide for labelling point clouds using CloudCompare

1. Load data. You can do so via File→Open or via drag and drop. For the exercise, we are using ‘PLY mesh’ files (of binary type, since they are much faster to save and load).
    1.1. In this exercise, for labelling, you will load the file ‘demo_labels.ply’, which is generated by the jupyter notebook you are working on. This provides a very crude initial labelling. You will then edit this to make a better labelling, and store the result as ‘ground_truth.ply’.
    1.2. When CloudCompare opens the file dialogue, you can select the scalar fields to be loaded from the PLY file. Make sure you load at least ‘strip_row’, ‘strip_column’ and ‘label’. You can load more than one scalar field in this dialogue by pressing ‘Add Scalar Field’ for each additional field to be loaded. You may also load other fields, e.g., ‘reflectance’ and ‘rel_height’, for visualization (but they are not required).



DB Tree

- ☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKleine...
    - ☑ tile_idx=667_-398 - Cloud
- □ tile_idx=667_-338.csv (D:/vm_share/temp/labellingCC/AmKleine...
    - ☑ tile_idx=667_-338 - Cloud
- □ tile_idx=667_-353.csv (D:/vm_share/temp/labellingCC/AmKleine...
    - ☑ tile_idx=667_-353 - Cloud
- □ tile_idx=667_-368.csv (D:/vm_share/temp/labellingCC/AmKleine...
    - ☑ tile_idx=667_-368 - Cloud
- □ tile_idx=667_-383.csv (D:/vm_share/temp/labellingCC/AmKleine...
    - ☑ tile_idx=667_-383 - Cloud
- □ tile_idx=667_-323.csv (D:/vm_share/temp/labellingCC/AmKleine...
    - ☑ tile_idx=667_-323 - Cloud

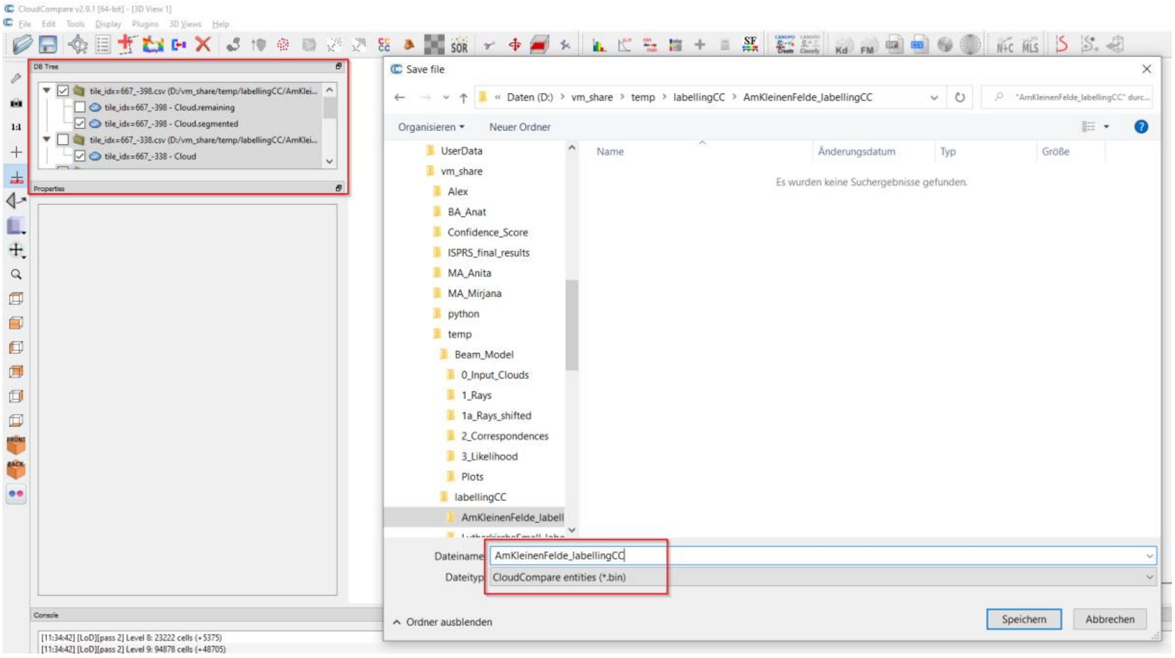
Properties

Property	State/Value
CC Object	
Name	tile_idx=667_-398 - Cloud
Visible	☑
Show name (in 3D)	□
Colors	Scalar field
Box dimensions	X: 14.999 Y: 8.99799 Z: 41.752
Box center	X: 667.5 Y: -394.5 Z: 116.629
Info	Object ID: 4 - Children: 1
Current Display	3D View 1
Cloud	
Points	13,587,439
Global shift	(0.00;0.00;0.00)
Global scale	1.000000
Point size	Default
Scalar Fields	
Count	4

Console

```
[11:20:13] [LoD][pass 2] Level 8: 34494 cells (+8526)
[11:20:13] [LoD][pass 2] Level 9: 147696 cells (+89860)
[11:20:13] [LoD][pass 2] Level 10: 465124 cells (+377664)
[11:20:13] [LoD] Acceleration structure ready for cloud 'tile_idx=667_-398 - Cloud' (max level: 10 / mem. = 40.08 Mb / duration: 11.6 s.)
```

2. Save project
   This is not strictly necessary, but if CloudCompare crashes, this will allow you to recover. Also, if you want to interrupt your work and continue later with labelling, you can save the project.
   2.1. Select all point clouds/ objects
   2.2. Save as *.bin (this is CloudCompare's own format).



☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKlei...
□ tile_idx=667_-398 - Cloud.remaining
☑ tile_idx=667_-398 - Cloud.segmented
□ tile_idx=667_-338.csv (D:/vm_share/temp/labellingCC/AmKlei...
☑ tile_idx=667_-338 - Cloud

« Daten (D:) › vm_share › temp › labellingCC › AmKleinenFelde_labellingCC

"AmKleinenFelde_labellingCC" durc...

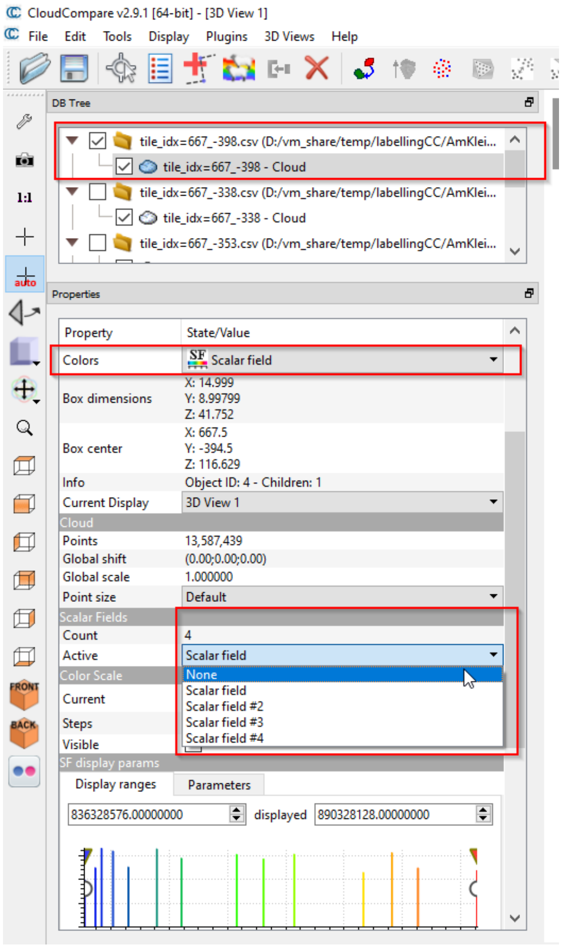
Es wurden keine Suchergebnisse gefunden.

Dateiname: AmKleinenFelde_labellingCC

Dateityp: CloudCompare entities (*.bin)

```
[11:34:42] [LoD][pass 2] Level 8: 23222 cells (+5375)
[11:34:42] [LoD][pass 2] Level 9: 94878 cells (+48705)
```

3. Change view color:
   3.1. Select point cloud
   3.2. Colors = Scalar Field
   3.3. Scalar Field -> Active = ‘label’



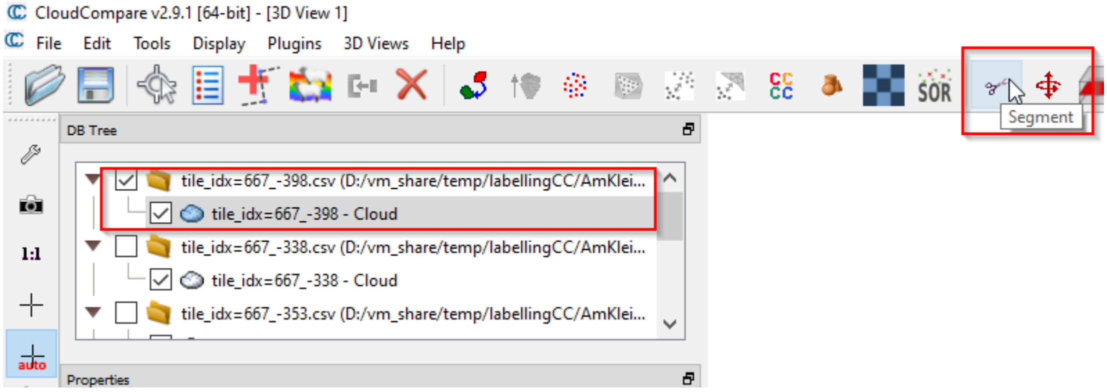
☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKlei...
☑ tile_idx=667_-398 - Cloud
□ tile_idx=667_-338.csv (D:/vm_share/temp/labellingCC/AmKlei...
☑ tile_idx=667_-338 - Cloud
□ tile_idx=667_-353.csv (D:/vm_share/temp/labellingCC/AmKlei...

Property	State/Value
Colors	Scalar field
Box dimensions	X: 14.999 Y: 8.99799 Z: 41.752
Box center	X: 667.5 Y: -394.5 Z: 116.629
Info	Object ID: 4 - Children: 1
Current Display	3D View 1
Cloud	
Points	13,587,439
Global shift	(0.00;0.00;0.00)
Global scale	1.000000
Point size	Default
Scalar Fields	
Count	4
Active	Scalar field None Scalar field Scalar field #2 Scalar field #3 Scalar field #4
Color Scale	
Current	
Steps	
Visible	
SF display params	

Display ranges | Parameters

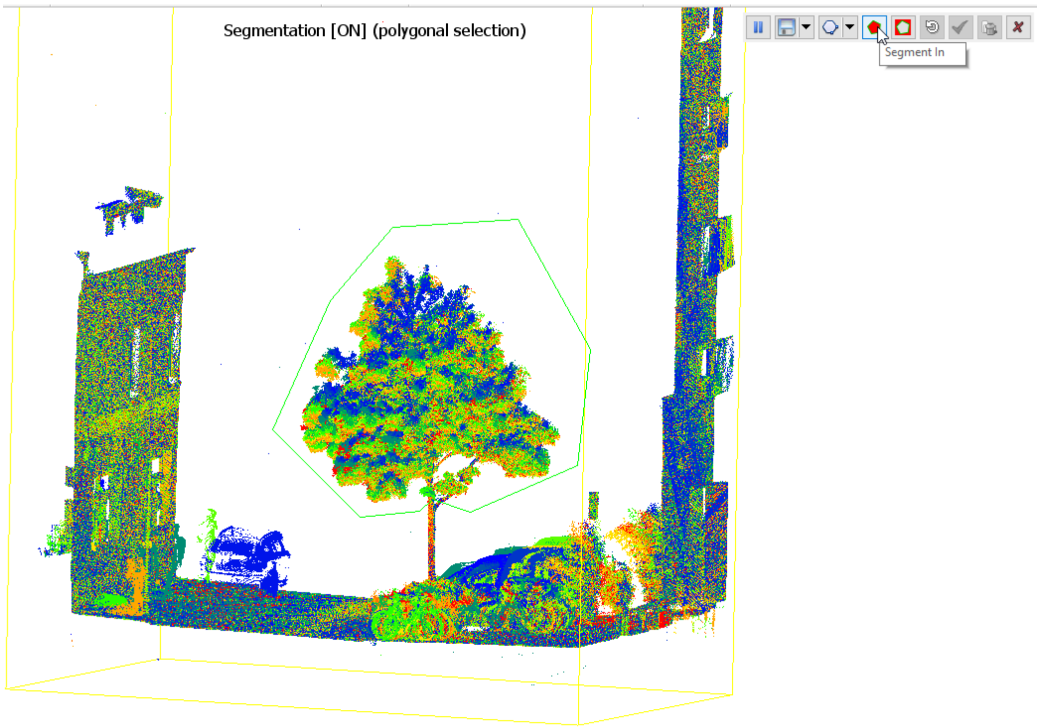
836328576.00000000 displayed 890328128.00000000

4. Segmentation
   4.1. Select point cloud (multiple possible)
   4.2. Select segmentation tool (scissors)

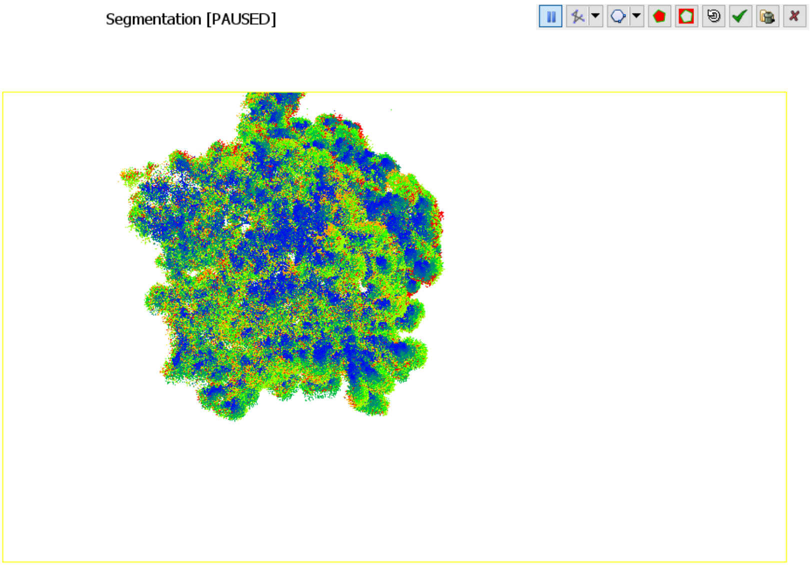


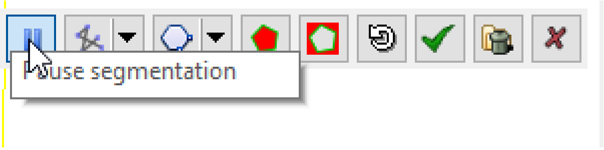
☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKlei...
☑ tile_idx=667_-398 - Cloud
□ tile_idx=667_-338.csv (D:/vm_share/temp/labellingCC/AmKlei...
☑ tile_idx=667_-338 - Cloud
□ tile_idx=667_-353.csv (D:/vm_share/temp/labellingCC/AmKlei...

4.3. Select area and ‘segment in’ or ‘segment out’

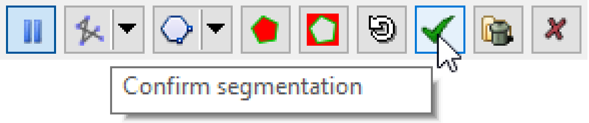

Segmentation [ON] (polygonal selection)

4.4. The segmentation is paused automatically, so that die view can be changed. If additional selections are required, ‘unpause’ and go ahead.

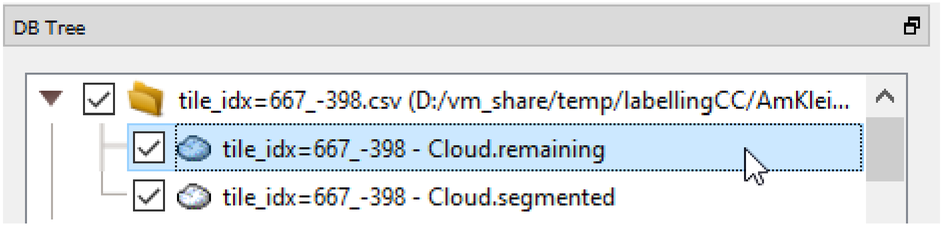

Segmentation [PAUSED]



4.5. When done with selection: ‘Confirm segmentation’



4.6. After this step, the point cloud is separated into two:



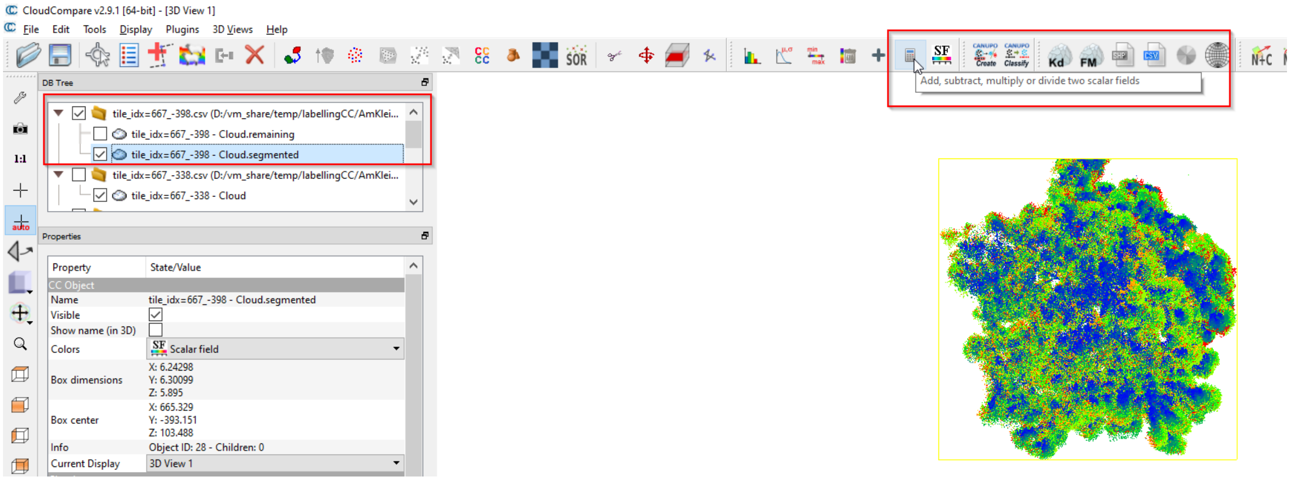
☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKlei...

☑ tile_idx=667_-398 - Cloud.remaining

☑ tile_idx=667_-398 - Cloud.segmented

5. Set the label (assign a class to the selected segment)

5.1. Select the point cloud of the segment, and select ‘Add, subtract, multiply, divide two scalar fields’ (calculator)



☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKlei...

□ tile_idx=667_-398 - Cloud.remaining

☑ tile_idx=667_-398 - Cloud.segmented

□ tile_idx=667_-338.csv (D:/vm_share/temp/labellingCC/AmKlei...

☑ tile_idx=667_-338 - Cloud

Property	State/Value
CC Object	
Name	tile_idx=667_-398 - Cloud.segmented
Visible	☑
Show name (in 3D)	□
Colors	Scalar field
Box dimensions	X: 6.24298 Y: 6.30099 Z: 5.895
Box center	X: 665.329 Y: -393.151 Z: 103.488
Info	Object ID: 28 - Children: 0
Current Display	3D View 1

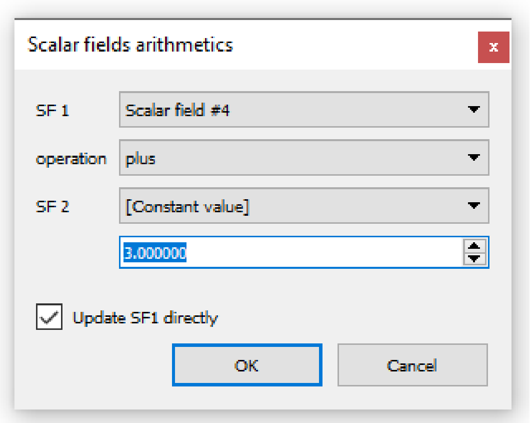
5.2. Set the correct label:

5.2.1. For SF1, select ‘label’ (this is important!)

5.2.2. As operation, select ‘plus’

5.2.3. As SF2, select ‘constant value’

5.2.4. Below that field, type the code of the class (as listed in the jupyter notebook)



Scalar fields arithmetics

SF 1: Scalar field #4

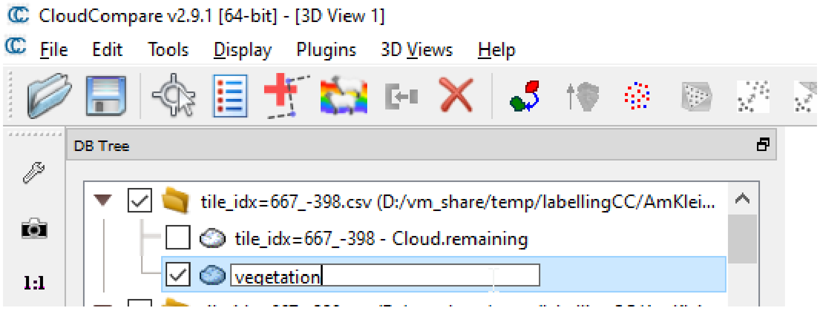
operation: plus

SF 2: [Constant value]

3.000000

☑ Update SF1 directly

5.2.5. Rename segment (not necessary, but could be useful in order not to lose overview): double-click on the segment and type in a name



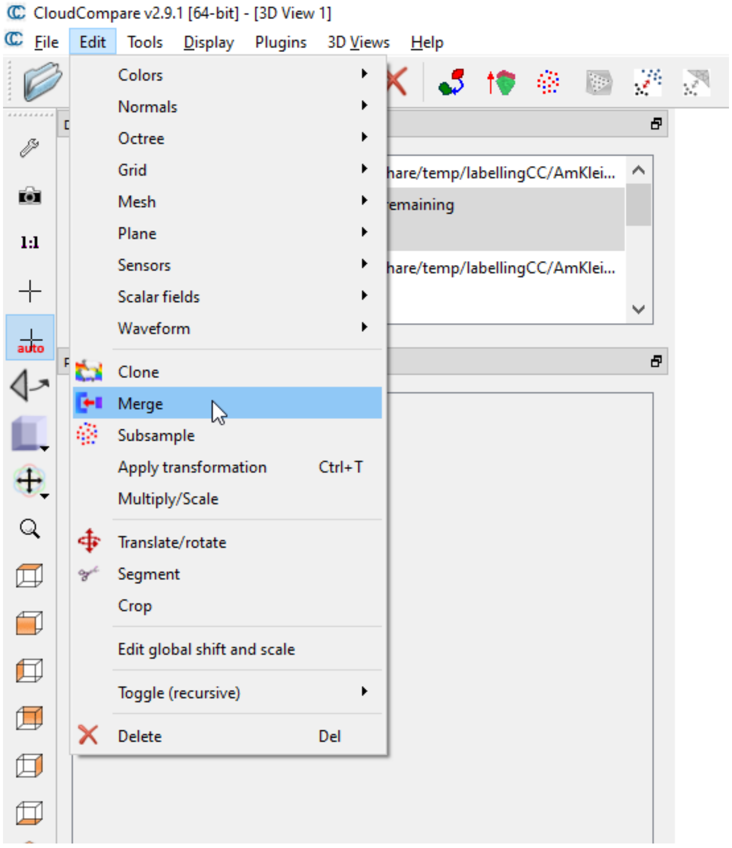
CloudCompare v2.9.1 [64-bit] - [3D View 1]

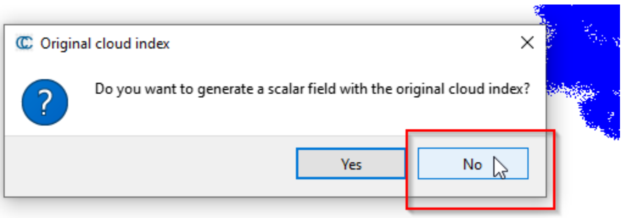
☑ tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKlei...

□ tile_idx=667_-398 - Cloud.remaining

☑ vegetation

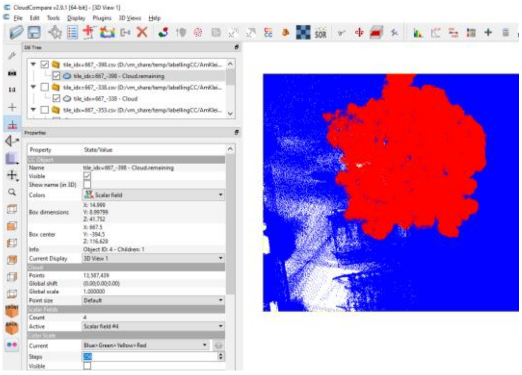
6. After all segments are labeled:
    6.1. Select all point clouds (independent of their label)
    6.2. Merge them (Edit→Merge), do NOT generate an extra scalar field (in the pop-up dialogue box)




Original cloud index

Do you want to generate a scalar field with the original cloud index?

    6.3. Verification: color by label and view the point cloud.

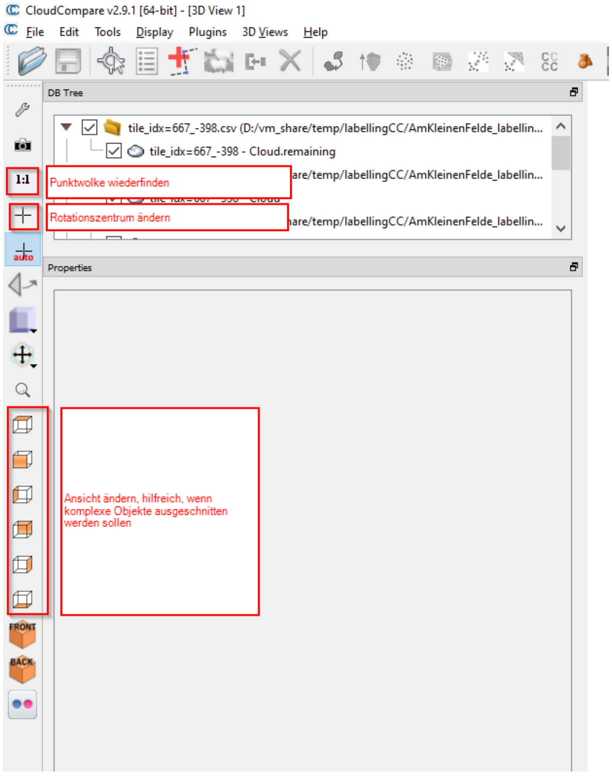


6.4. Save as PLY:

6.4.1. Select point cloud (should be only one, since you merged them)
6.4.2. From the menu, select File→Save
6.4.3. In the file save dialogue, select ‘PLY mesh’
6.4.4. As filename, use ‘ground_truth.ply’
6.4.5. Click ‘Save’. If a dialogue appears asking for BINARY or ASCII, select BINARY (ASCII will work as well but it will be very slow.)

Additional hints:

- Cloud Compare:
  - Frequently save your current results (*.bin)
  - Quick hints:
    - *1:1*: Zoom on point cloud
    - +: Change rotation center (it will change automatically if ‘auto’ is on)
    - *Boxes*: Change the view, top-view, side-view, etc. Useful to cut out complex objects.

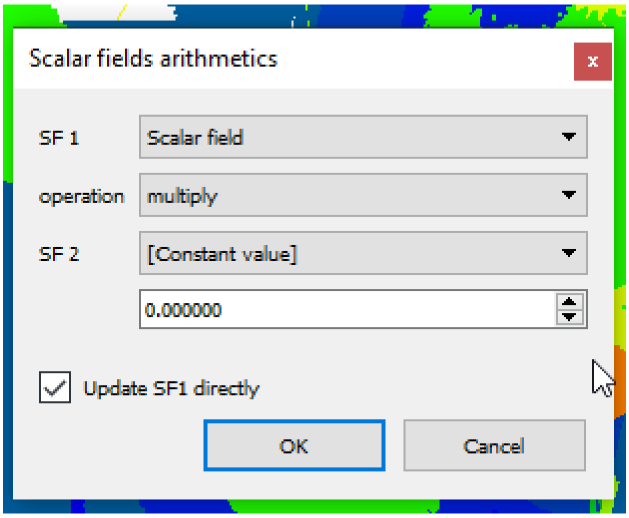

CloudCompare v2.9.1 [64-bit] - [3D View 1]
File
Edit
Tools
Display
Plugins
3D Views
Help
DB Tree
tile_idx=667_-398.csv (D:/vm_share/temp/labellingCC/AmKleinenFelde_labellin...
tile_idx=667_-398 - Cloud.remaining
are/temp/labellingCC/AmKleinenFelde_labellin...
hare/temp/labellingCC/AmKleinenFelde_labellin...
1:1
auto
Properties
FRONT
BACK

Punktwolke wiederfinden

Rotationszentrum ändern

Ansicht ändern, hilfreich, wenn komplexe Objekte ausgeschnitten werden sollen

– In case a wrong label was assigned and one (merged) object contains multiple labels, you may want to reset the label (of a segment, i.e., a subset of the point cloud) to zero. Since CloudCompare does not allow this directly, here is a workaround: Select the scalar field, and multiply by zero (0). After this, you can select it again and set the label by using the ‘plus’ operation, as described above.



Scalar fields arithmetics

SF 1: Scalar field

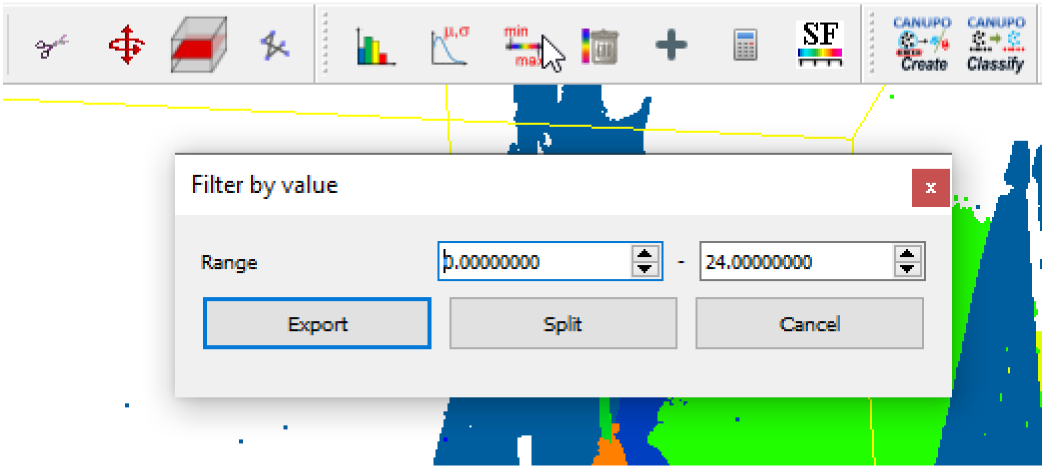
operation: multiply

SF 2: [Constant value]

0.000000

☑ Update SF1 directly

– In case of wrongly ‘merged’ objects, they can be split again using ‘filter points by value’ (if the scalar field is suitable):



Filter by value

Range: 0.00000000 - 24.00000000