Package 'PiC'

February 18, 2025

Type Package

Title Pointcloud Interactive Computation for Forest Structure Analysis

Version 1.0.3

Description Provides advanced algorithms for analyzing pointcloud data in forestry applications. Key features include fast voxelization of large datasets; segmentation of point clouds into forest floor, understorey, canopy, and wood components. The package enables efficient processing of large-scale forest pointcloud data, offering insights into forest structure, connectivity, and fire risk assessment. Algorithms to analyze pointcloud data (.xyz input file). For more details, see Ferrara & Arrizza (2025) <https://hdl.handle.net/20.500.14243/533471>. For single tree segmentation details, see Ferrara et al. (2018) <doi:10.1016/j.agrformet.2018.04.008>.

License GPL (>= 3)

Depends R (>= 4.3)

Imports collapse, data.table, dbscan, dplyr, foreach, magrittr, stats, tictoc

Suggests ggplot2, testthat (>= 3.0.0), withr

Config/testthat/edition 3

Encoding UTF-8

RoxygenNote 7.3.2

URL https://github.com/rupppy/PiC

BugReports https://github.com/rupppy/PiC/issues

NeedsCompilation no

Author Roberto Ferrara [aut, cre] (<https://orcid.org/0009-0000-3627-6867>), Stefano Arrizza [aut]

Maintainer Roberto Ferrara <roberto.ferrara@cnr.it>

Repository CRAN

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Contents

`Floseg` *Forest floor segmentation*

Description

Segments the input .xyz pointcloud file into different forestry layers: forest floor and above ground biomass.

Usage

```
Floseg(a, filename="XXX", soil_dim = 0.3, th = 20, N=500, output_path = tempdir())
```

Arguments

`a`	- Input file (.xyz)
`filename`	- Output file prefix
`soil_dim`	- Voxel dimension (m) for forest floor segmentation - Default = 0.30
`th`	- Minimum number of point to generate a voxel. Default = 20
`N`	- Minimum number of voxel to generate a cluster. Default = 500
`output_path`	Directory in cui scrivere i file di output. Default = tempdir()

Value

2 files (.txt) output. 1. Forest floor pointcolud; 2. AGB pointcloud

Forest_seg *Forest component segmentation*

Description

Segments the input .xyz pointcloud file into different forestry layers.

Usage

```
Forest_seg (a, filename="XXX", dimVox = 2, th = 2,
eps = 2, mpts = 6, h_tree = 1, soil_dim= 0.3,
N = 500, R = 30, Vox_print = FALSE, WoodVox_print = FALSE, output_path = tempdir())
```

Arguments

a	- Input file (.xyz)
filename	- Output file prefix
dimVox	- Voxel dimension (cm) - Default = 2
th	- Minimum number of point to generate a voxel. Default = 2
eps	- size (radius) of the epsilon neighborhood - Default = 1
mpts	- number of minimum points required in the eps neighborhood for core points (including the point itself) - Default = 4
h_tree	- minumum trunk lenght (m)
soil_dim	- Voxel dimension (m) for forest floor segmentation - Default = 0.30
N	- Minimum number of voxel in a wood cluster - Default = 1000
R	- R = Standard deviation * Proportion of Variance - Default = 30
Vox_print	- Print point cloud voxelization. Default FALSE
WoodVox_print	- Print wood voxelization
output_path	Directory in cui scrivere i file di output. Default = tempdir()

Details

Whole pointcloud segmentation process

Value

6 files (.txt) output. 1. Voxelized pointcloud. 2. Forest floor (vox). 3. AGB (vox) 4. DTM. 5. Wood (vox) 6. AGB no wood

SegOne *Single Tree wood leaf segmentation*

Description

Wood - leaf segmentation of single tree

Usage

```
SegOne(a, filename = "Elab_single_tree", dimVox = 2, th = 2,
eps = 1, mpts = 4, N = 1000, R = 30, output_path = tempdir())
```

Arguments

dimVox	- voxel dimension in cm - Default = 2
th	- Minimum number of points to generate a voxel - Default = 2
filename	- Output file prefix
a	- AGB voxelized input file
eps	- size (radius) of the epsilon neighborhood - Default = 1
mpts	- number of minimum points required in the eps neighborhood for core points (including the point itself) - Default = 4
N	- Minimum number of voxel in a wood cluster - Default = 1000
R	- R = Standard deviation * Proportion of Variance - Default = 30
output_path	Directory in cui scrivere i file di output. Default = tempdir()

Value

Two file (.txt) in output - Wood points and non wood points

Voxels *Voxelize point cloud*

Description

Transform pointcloud in voxel

Usage

```
Voxels(a, filename = "XXX", dimVox = 2, th = 2, output_path = tempdir())
```

Arguments

a	- input file
filename	- file output prefix
dimVox	- voxel dimension in cm - Default = 2
th	Minimum number of point to generate a voxel (Default = 1) Is a parameter that should be used with caution; it generates a lightened cloud with fewer points. To be evaluated in relation with the dimVox parameter, for high point densities it is efficae to remove noise (outliers)
output_path	Directory in cui scrivere i file di output. Default = tempdir()

Value

Voxelized pointcloud

Woodseg *Wood voxels segmentation*

Description

Point cloud segmentation to identify wood voxels

Usage

```
Woodseg(a, filename = "XXX", eps = 1, mpts = 4, N = 1000, R = 30, output_path = tempdir())
```

Arguments

filename	- Output file prefix
a	- AGB voxelized input file
eps	- size (radius) of the epsilon neighborhood - Default = 1
mpts	- number of minimum points required in the eps neighborhood for core points (including the point itself) - Default = 4
N	- Minimum number of voxel in a wood cluster - Default = 1000
R	- R = Standard deviation * Proportion of Variance - Default = 30
output_path	Directory in cui scrivere i file di output. Default = tempdir()

Value

One file (.txt) output - Wood voxels (vox)

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