

Research Project / Master thesis: Generating/Estimating individual tree data based on freely available LiDAR-Data on federal state-level

Background:

As part of the project "WINMOL", the Thünen Institute is working on methods for storm damage risk assessment and prevention. We want to use freely accessible LiDAR-data of the federal state North Rhine-Westphalia to derive single tree parameters. This data will be used to compare characteristics of trees which are damaged by storm events and trees which remain undamaged.

Research objectives of this thesis:

- A research area is to be determined which fulfils the following requirements:
 - Full point cloud LiDAR-data available
 - Pre-storm LiDAR-data for both storm damaged areas and undamaged reference areas are included
- Methods and parameter settings for selected algorithms are evaluated and a suitable combination is suggested
- Individual tree parameters for the research area are calculated:
 - Required parameters are trunk foot coordinates, height, species, dbh, crown base, crown width, stem volume, crown volume
 - Possible additional parameters are e.g. cross-sectional area in main wind direction, forest borders, forest gaps
- Parameters will be derived mostly from LiDAR-Data while also considering related research as well as further data sources

Methods:

- Calculating single tree parameters using an innovative 3D algorithm from the R package "crownsegmentr" (unpublished beta-version available at the institute)
- Integrating results of related research
- Optimization of parameter settings for different forest characteristics
- Single tree inventory data is available as reference data
- Comparison with algorithms from different R packages (e.g. lidR)
- Evaluation of the results

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