Mapping and detecting structural changes in a *Cytisus scoparius* population using UAV-LiDAR

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Natural grasslands are experiencing a severe pressure from anthropogenic influences such as nutrient enrichment, and land-use change which may favor the encroachment of certain shrub species. Plant diversity dynamics in dry, temperate grasslands can be influenced by shrub encroachment that may structurally homogenize the landscape and thereby influencing taxonomic diversity negatively. Dense populations of *Cytisus scoparius* are known to be problematic in grassland ecosystems, but there is little research on the structural features that characterize the species. This study investigates how accurate we can classify and map different *C. scoparius* and estimate structural metrics important for plant diversity. Previous studies have used laser-scanning data (LiDAR) to classify vegetation using traditional two-dimensional techniques, however without exploiting the full capability of LiDAR. Thus, structural measurements are usually delimited to vegetation height and cover. With the integration of novel light weight laser scanners for drone platforms (UAV-LiDAR), we are now able to achieve a much higher level of detail in the resulting pointcloud. The increased amount of information means that we can separate different shrub species based on their structural appearances using a 3D point-based random forest classification. Therefore, it is now possible to compute structural measures as volume, density and biomass, which might be more indicative for assessing the effect from shrubs in grassland areas. Our study demonstrates a workflow of processing ultra-high density point clouds from a UAV-LiDAR system to detect and map C. scoparius. The results are then applied to quantify biomass and biomass change in a semi-natural grassland area in Denmark.