CS Capstone Design

Technical Demo Grading Sheet (100 pts)

TEAM: LumberHack

Overview: The main purpose of the "Technical Demos" is to very clearly communicate the extent to which the team has identified key challenges in the project, and has proven solutions to those challenges. Grading is based on how complete/accurate the list of challenges is, , and how convincingly and completely the given demos cover the given challenges.

This template is fleshed out by the team, approved by CS mentor, and brought to demo as a grading sheet.

Risky technical challenges

Based on our requirements acquisition work and current understanding of the problem and envisioned solution, the following are the key technical challenges that we will need to overcome in implementing our solution:

C1: User data upload

Uploading large files can be time consuming. It will be challenging to reduce upload times and maintain accurate data. In order to demo a good solution we need a GUI that allows data upload and some sort of chunking algorithm that improves upload times.

C2: Cleaning of user data

It will be challenging to quickly clean lots of user data after it is uploaded. When chunking the data, we will need to be able to keep it organized to not lose accuracy of data. We would need to demo some sort of cleaning algorithm that can be run on the data and produce a cleaned set.

C3: Calculate useful information

With the data, we need to calculate the height, volume, diameter, and above ground biomass. Certain methods that could be used are height above ground method, stem curve, eigenvalues, hough transformation, etc.

C4: Visualize data

After we calculate the attributes, we need to be able to visualize the data set clearly with ecologically relevant attributes. These attributes include height, volume, above ground biomass. We need to use RANSAC for cylinder shape fitting, defined at center at 1.37m.

Challenges covered by demos:

In this section, we outline the demonstrations we have prepared, and exactly which of the challenge(s) each one of them proves a solution to.

Demonstration 1: User data upload with GUI

Challenges addressed: User data upload

Flight Plan: Step by step overview of demo

1. First users will be prompted by a GUI to upload data
2. They will then select the file they want to upload
3. The data will be chunked to improve upload speeds
4. The data will be uploaded and the application will show failure or success

Evaluation:

- ✔ Convincingly demo'd each of listed challenges?
- ✔ Other evaluative comments:

Demonstration 2: Cleaning of user data

Challenges addressed: Cleaning of user data

Flight Plan: Step by step overview of demo

1. First user data will have already been uploaded
2. Then the user will use the GUI button to clean the data
3. The data will be returned to the interface as a cleaned point cloud

Evaluation:

- ✔ Convincingly demo'd each of listed challenges?
- ✔ Other evaluative comments:

Demonstration 3 : Calculate Useful Information

Challenges addressed: Calculate Useful Information

Flight Plan:

1. First a lidar point cloud will need to already be loaded and cleaned.
2. Points then will be assigned eigenvalues for determining orientation.
3. We will then identify each individual tree by id using the individual tree segmentation(ITS) function from the lidR package which will assign ids to each point.
4. From the ITS function we then can pull out tree heights
5. Once all points have been assigned a tree id we will begin to loop through each tree id.
6. Starting at the lowest point we then loop upwards through points by the segmentation distance.
7. For a segment of points, if the points are identified as being the bole of the tree perform a Hough transform to find the center and radius for a tree. Repeat until the highest point has been reached.
8. We then find the volume of the points not identified as the bole of the tree.
9. Using the volume we then calculate above ground biomass.

Evaluation:

- ✔ Convincingly demo'd each of listed challenges?
- ✔ Other evaluative comments:

Demonstration 4: Visualizing Data in LiDAR package viewer

Challenges addressed: Visualize data

Flight Plan: Step by step overview of demo

1. First we need to collect the data that has been collected, cleaned, and calculated
2. Then check what attributes that user wants to visualize
3. Users can then visualize it in 3D, toggle it, rotate it, & zoom in/out
4. With the visual, users are able to see data information

Evaluation:

- ✔ Convincingly demo'd each of listed challenges?
- ✔ Other evaluative comments:

Other challenges recognized by not addressed by demo:

If there were challenges you listed earlier that were *not* covered by a demo, list here. This will hopefully be a short list…but better to be clear about where you are. If you have items here, you could list (if applicable) any pending plans to reduce these risks.

- Vignettes explain the functionality of the package and the Shiny app
- Package uploaded and passing all CRAN checks so it can be an official "CRAN" package