IS 517 Final Project Presentation: Predicting Forest Coverage

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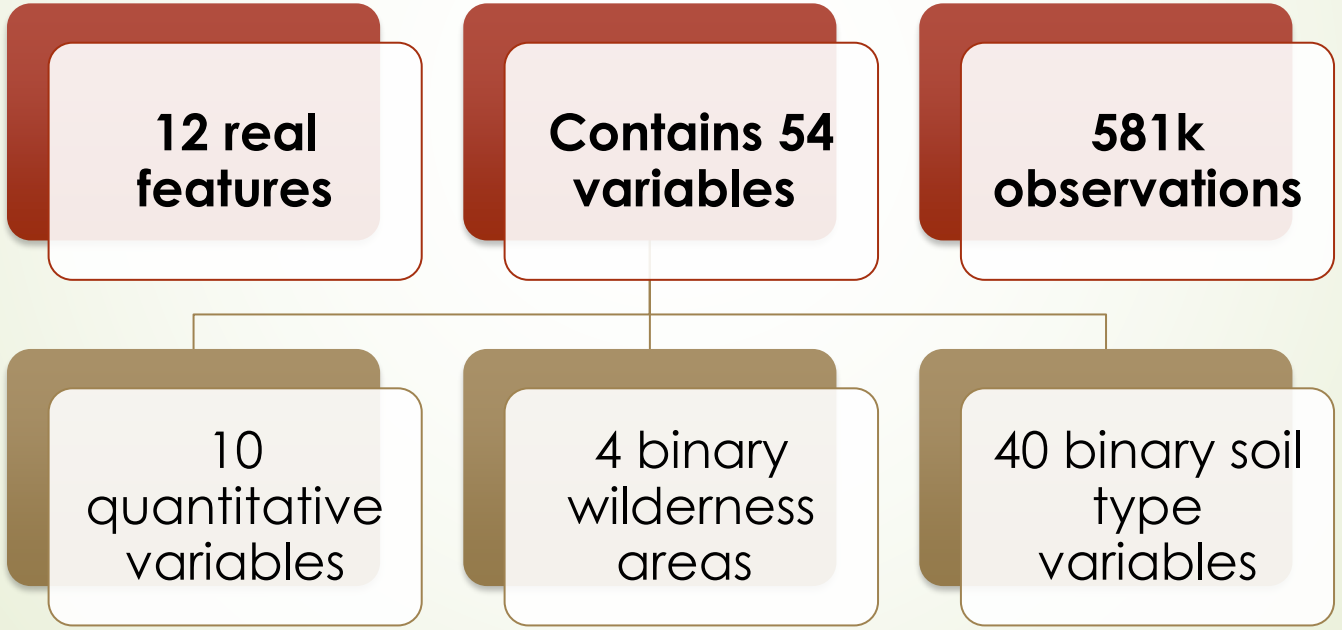
Background - How are the nation's forests doing?

Understanding this question is more important than ever as demand for wood and other forest products grows while land use patterns and public expectations change.

Researchers are developing tools to provide more reliable and more consistent answers to questions about forest conditions and the effects of management practices, pests, and changing climate. using scientifically credible methods we could develop techniques to monitor forest ecosystems more closely.

Techniques are being developed to monitor forest ecosystems accurately to answer questions about forest condition due to global warming, population explosion, etc.

Data set Description



Dataset Description

Data Variable	Description
Elevation	Elevation in meters
Aspect	Aspect in degrees azimuth
Slope	Slope in Degrees
Horizontal/Vertical distance_to_hydrology	Indicating Horizontal/ Vertical distance to the nearest surface water features (2 columns)
Horizontal_distance_to_roadways	Horizontal distance to nearest roadway
Hillshade 9am/noon/3pm	Hillshade index at 9am/noon/3pm, summer solstice (0 to 255 index) (3 columns)
Horizontal_distance_to_firepoints	Horizontal Distance to nearest wildfire ignition points
Wilderness Area	Wilderness area designation (4 binary columns)
Soil Type	Soil Type designation (40 binary columns)
Cover Type	Tree types - 7 trees available

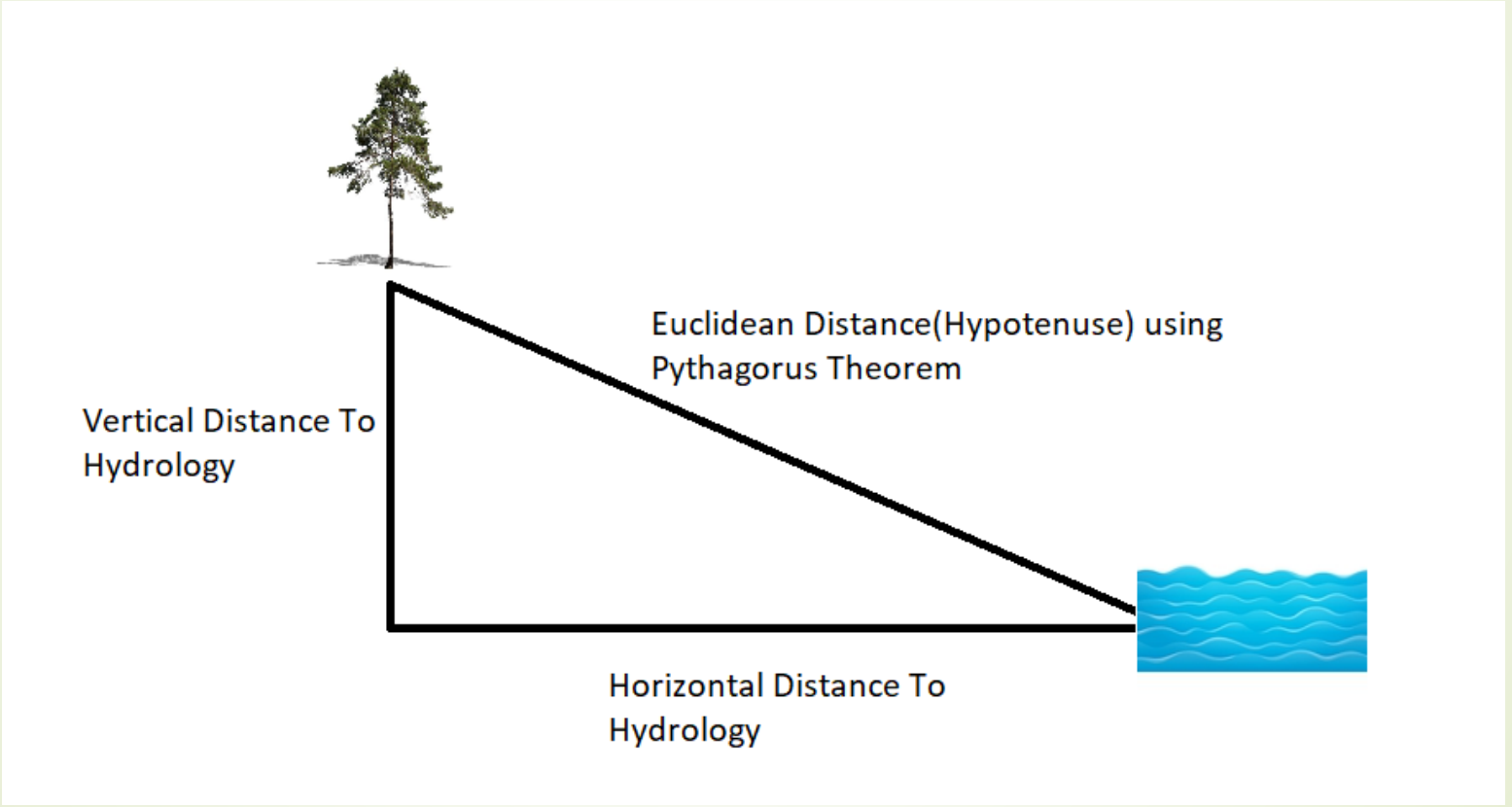
Feature Engineering

Soil_Type1	Soil_Type2	Soil_Type3	.....	Soil_Type39	Soil_Type40	Soil_Type
1	0	0	.....	0	0	1
0	1	0	.....	0	0	2
0	0	1	.....	0	0	3
.....	.....	.....	.....	.....	.....	.....
0	0	0	.....	1	0	39
0	0	0	.....	0	1	40

Hillshade_9am	Hillshade_Noon	Hillshade_3pm	Hillshade_mean
221	232	148	200.3333333
220	235	151	202
234	238	135	202.3333333

Wilderness_Area1	Wilderness_Area2	Wilderness_Area3	Wilderness_Area4	Wilderness_Area
1	0	0	0	1
0	1	0	0	2
0	0	1	0	3
0	0	0	1	4

Feature Engineering



Research & Analysis

- Which model will be best suited to classify the type of predominant tree that will develop in each location based on the environment?
- What are the most prevalent tree species in the Roosevelt National Forest?
- Which tree species can thrive in a wider range of conditions?
- Are there any tree species that are more susceptible to environmental factors like elevation or soil type than others?

Walk through the Analysis

MDS_Final_Project.pdf

Models

- Planned: SVM, KNN & Random Forest
- Actual: Bagging, Random Forest & Boosting
- Future Scope: Decision Trees

Results & Findings

Predicting the most predominant tree

The model best suited to predict the types of trees that will develop in each location based on the environment:

Models <chr>	Accuracy <dbl>
Bagging	0.7076190
Random Forest	0.6566667
Boosting	0.9376190

Most prevalent tree species

Cover_Type	Count
Lodgepole Pine	283301
Spruce/Fir	211840
Ponderosa Pine	35754
Krummholz	20510
Douglas Fir	17367
Aspen	9493
Cottonwood/Willow	2747

Tree species that can thrive

- Tree types that can grow in most diverse environments:

- After looking at the EDA, we can say that Krummholz seems to grow in much diverse environments like widespread elevation, distance to hydrology and soil type.

Trees more susceptible to environmental factors

- Cottonwood/Willow has lowest count of trees in the Roosevelt National Forest and the EDA also confirms that this tree type is the most susceptible to all the factors.

Recommendations

- Krummholz cover type would be highly preferred at extremely high elevations. Krummholz is not dependent on the distance from water bodies, and they can also be seen growing in areas farther away from the roadways. Krummholz grow predominantly in soil types that are extremely rocky and stony.
- Lodgepole Pine are suitable for majority of the soil types and hence can grow anywhere, with soil type 25 - warm and stony being exclusive to them.
- Cottonwood/Willow trees are ideal in low elevation areas. They are an appropriate choice for areas close to water bodies, roads and even fire points.

Thank you

Questions?