

# Project Green

Using Technology and AI for Climate Good



# Problem: We Need to Plant More Trees



- Planting trees is crucial to many aspects of our planet's processes
- Trees filter the air and produce oxygen while storing carbon dioxide gas
  - Helps contribute to the fight against global warming
- Trees are also home to millions of different species of animals all across the world

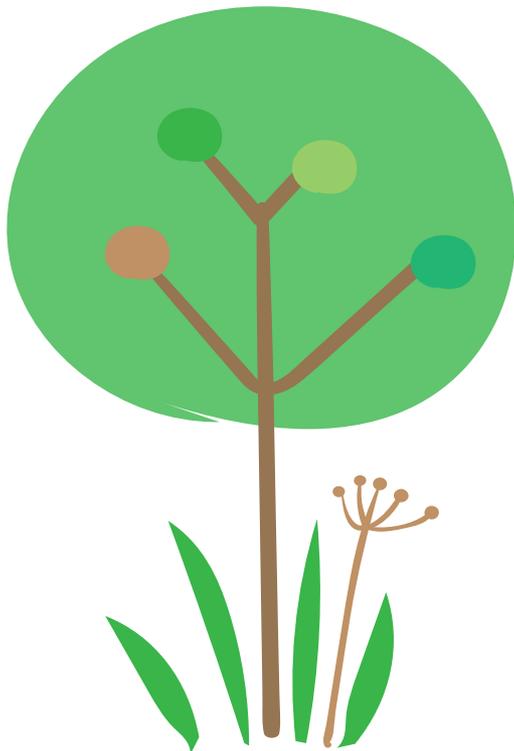
# Solution: Requirements for Tree Health

## Soil

It is important to choose good, fertile soil to plant trees in. Dry or nutrient lacking soil will not suffice.

## Climate

Trees need a proper climate to grow. It is necessary for areas with proper rainfall, and weather to be chosen to plant trees.



## Resources

Trees need their own share of water and sunlight and they should not have to compete with other trees for this. It is important to not overcrowd forests by planting more trees.

## Species

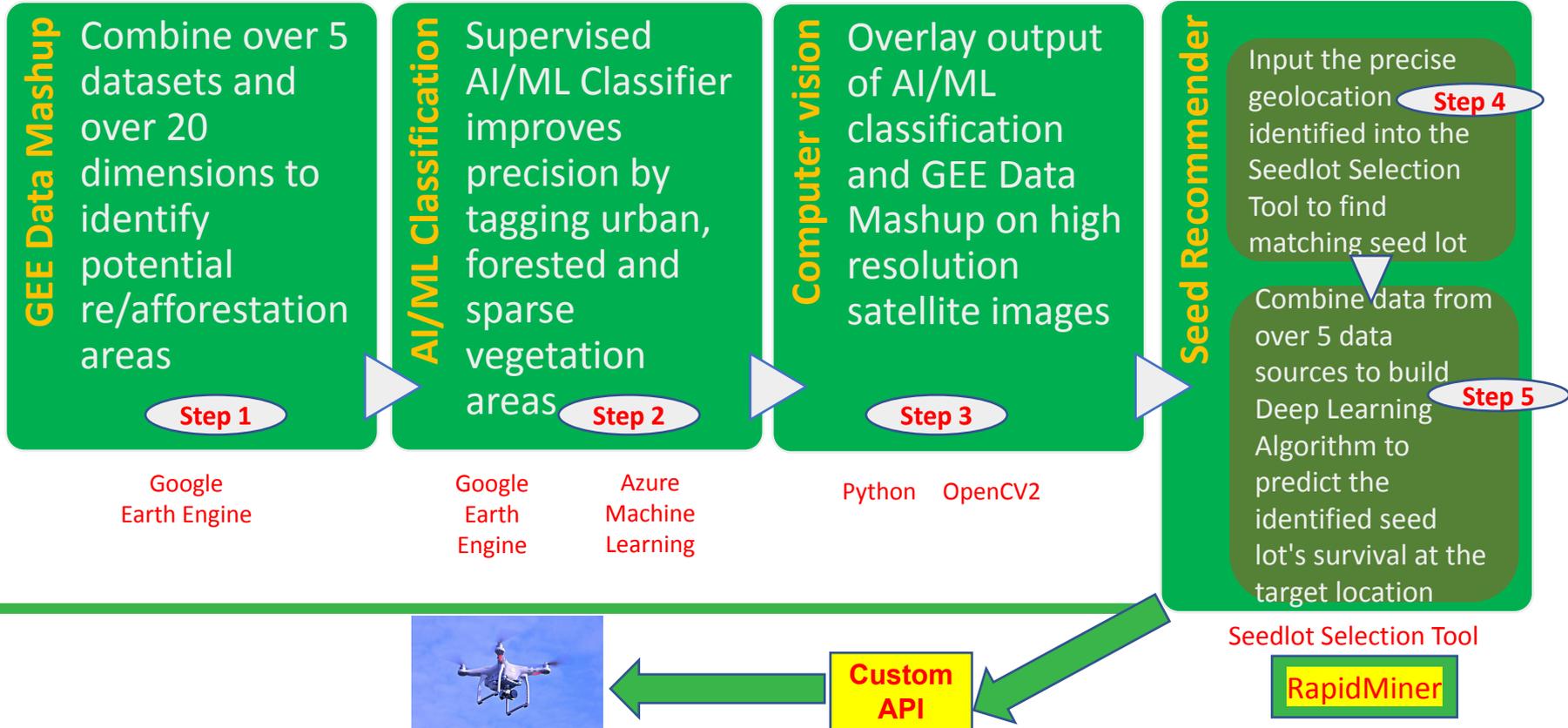
Different locations across the world will require different species of trees to be planted. This must be taken into account when planting in different parts of the world

# Solution: Project Green

- Technology and AI based project determining areas of potential afforestation/deforestation to plant trees
- Uses several different algorithms to find areas with proper soil quality, and sparse vegetation to plant trees
- Uses many different factors to create a prediction of what species of tree to plant in that area



# Design and Method: Development of Prototype



# Execution: Construction, Testing and Results

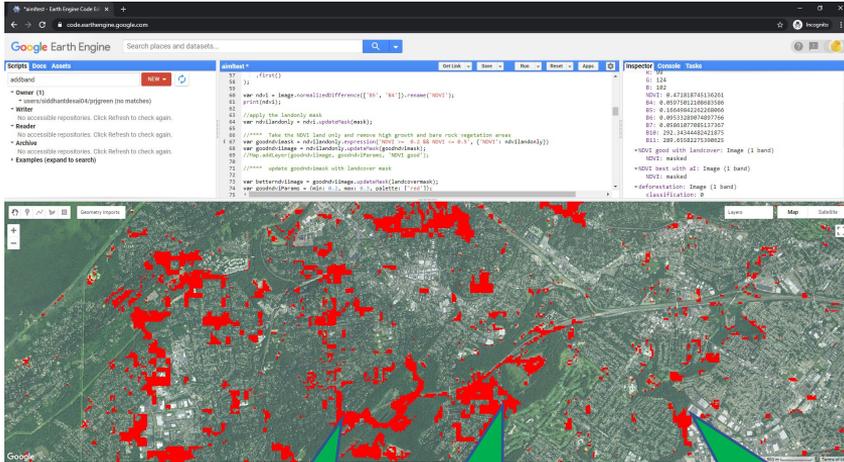
GEE Data Mashup

Combine over 5 datasets and over 20 dimensions to identify potential re/afforestation areas

Both images on this slide are created and captured by Om Desai and Siddhant

Step 1 Desai

Result: Red = candidate areas for forestation



Heavily forested areas identified as candidates



Urban areas identified as candidates



Excludes human maintained areas (parks, fields, golf courses, etc.)

AI/ML Classification

Supervised AI/ML Classifier improves precision by tagging urban, forested and sparse vegetation areas

Step 2

Result: Red = Urban; Green = Forest; Blue = Forestable



Blue clusters imply areas with sparse vegetation

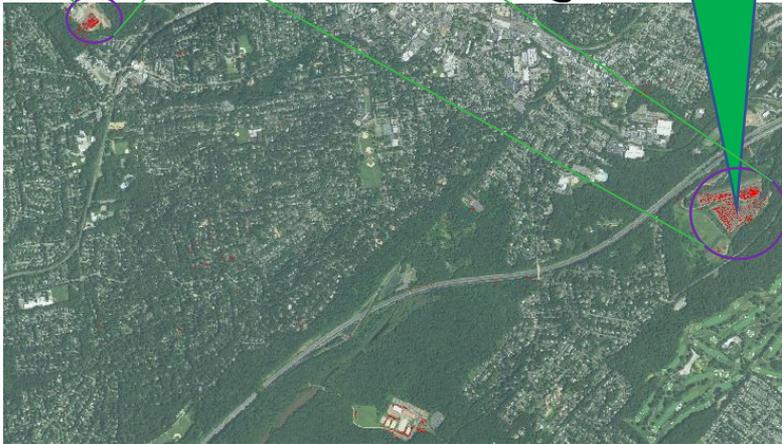
# Execution: Construction, Testing and Results

Computer vision

Overlay output of AI/ML classification and GEE Data Mashup on high resolution satellite images for higher precision

Step 3

Higher Precision: Identifies areas with sparse vegetation correctly and includes the rest



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Step 4

Input the Specific Location identified in the step -3 in the Seed lot Selection Tool

Build a Deep Learning algorithm using RapidMiner to recommend seeds based on its survival prediction at the specific locations

Step 5

# Execution: Model Building and Features Engineering

Step 5

The image on this slide is created and captured by Om Desai and Siddhant Desai

**Soil**  
It is important to choose good, fertile soil to plant trees in. Dry or nutrient lacking soil will not suffice.

**Climate**  
Trees need a proper climate to grow. It is necessary for areas with proper rainfall, and weather to be chosen to plant trees.

```
# 1year-volume monitoring
@ Block Id
@ Elev
# Latitude
# Longitude
# Max Source P
# Max Source T
# Mean Elevation m
# Min Source P
# Min Source T
# Precipitation
@ Seedlot id
@ Seedzone
# Shrub Cover
@ Site
# Soil Moisture
@ Species
@ Survived
# Temperature
```

**Resources**  
Trees need their own share of water and sunlight and they should not have to compete with other trees for this. It is important to not overcrowd forests by planting more trees.

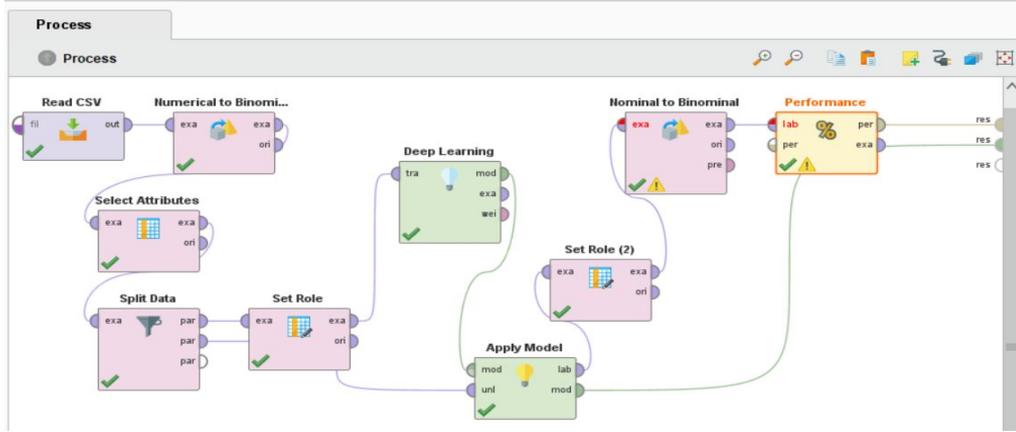
**Species**  
Different locations across the world will require different species of trees to be planted. This must be taken into account when planting in different parts of the world

**Label: Target variable**

# Findings and Discussions

Step 5

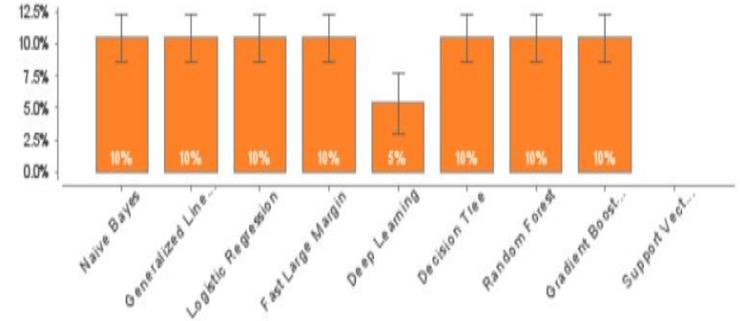
## Custom Deep Learning



All images on this slide are created and captured by Om Desai and Siddhant Desai

## Auto Model Comparisons: Deep Learning Win

### Classification Error



accuracy: 92.31%

## Deep Learning Model Confusion Matrix

	true TRUE	true FALSE	class precision
pred. TRUE	190	5	97.44%
pred. FALSE	12	14	53.85%
class recall	94.06%	73.68%	

## Model Performance

Accuracy: 92.31%  
 Classification error: 7.59%  
 AUC: 0.91  
 Precision: 97.44%  
 Recall: 94.06%

# Purpose

- Our artificial intelligence model can effectively detect where trees can be planted and how and where to best perform reforestation.
- By detecting these areas and taking factors into account, it can help bring many more well-intentioned people into reforestation initiatives and vastly increase the chance of success of these initiatives
- Make an open source platform that allows all people to access it and determine where they can plant trees to make a difference



# Challenges



- Doing research to determine various different testing variables
- Learning Google Earth Engine
  - How to extract data and build our own models
- Having to design and test to figure out what the best model is for our purposes

# Impact



- By being able to better detect deforestation, and by being able to know exactly where to replant, the effects of rampant deforestation can be fought.
- Helping stop this deforestation can help lessen the damage to biodiversity caused by climate change, as well as helping absorb more carbon dioxide.
- These tools can make it much more likely for reforestation efforts to succeed, making a better world for everyone.
- Eventually integrate this tool to be used with drones to create cheap, efficient, and large scale reforestation operations

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