Characterizing the Urban Tree Canopy in Ann Arbor, MI

Thomas Estabrook, Christian Schluter, Alyssa Sklar, Lyndsay Zemanek

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Meet the Team

Thomas Estabrook
Originally from central Illinois, Thomas graduated from Grinnell College with a Bachelor of Arts in Mathematics in 2017. After three years working as an academic coach, he enrolled in the Geospatial Data Science track at SEAS in order to apply his math skills to worthwhile ends.

Christian Schluter
Having spent most of his life on the Massachusetts coast, Christian developed a passion for conservation from an early age. Graduating from Salem State University with a degree in Geography in 2018, he then spent a year in Vermont as a mapping technician, and then a year and a half in South Carolina as an environmental GIS analyst. Deciding that he wanted to further his education, he now studies Geospatial Data Science at the University of Michigan.

Alyssa Sklar
Originally from Eastern Pennsylvania. Graduated from DePaul University in 2020 with a BA in Geography concentrating in Geographic Information Systems and Geotechnology and minored in Architecture and Urbanism. Dual-degree M.S. candidate at the School for Environment and Sustainability studying Geospatial Data Sciences and School of Information studying Librarianship and Archival Practices.

Lyndsay Zemanek
Hailing from western Washington, Lyndsay has a deep appreciation and reverence for forests. She graduated from the University of Portland in 2019 earning a Bachelor of Arts in Mathematics, and left Oregon looking for ways to apply her analytic and problem solving skills in an environmental context. That led her to the University of Michigan's School for Environment and Sustainability where she also studies Geospatial Data Science.

Background on Canopy

Benefits and Importance of Tree Canopy

- Prevents acceleration of stormwater runoff
- Regulates temperature
- Provide habitat for local organisms
- Carbon ‘sink’

Native Forest Fragments

- Native trees are generally better adapted to climate
- Better integrated with local environment
- Source of native seeds and resources for native fauna

An example of forest fragmentation in Celaque National Park, courtesy of user Emeinke at English Wikipedia

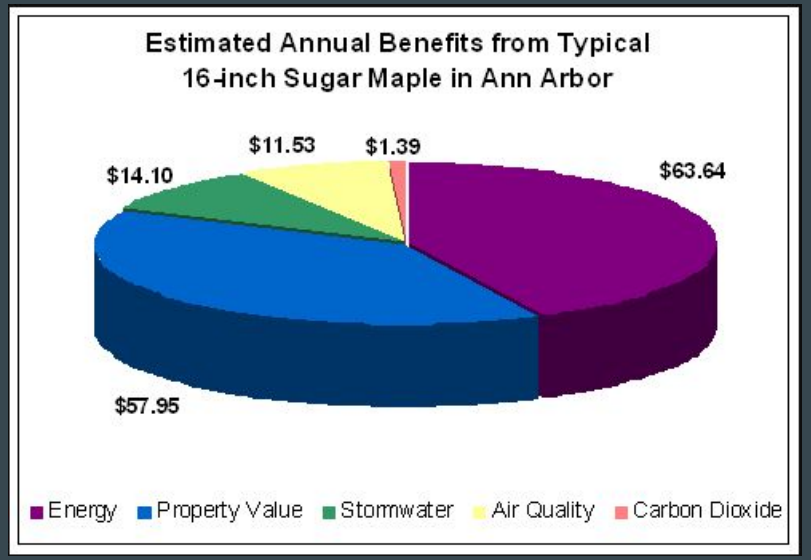
What We Currently Know

iTree

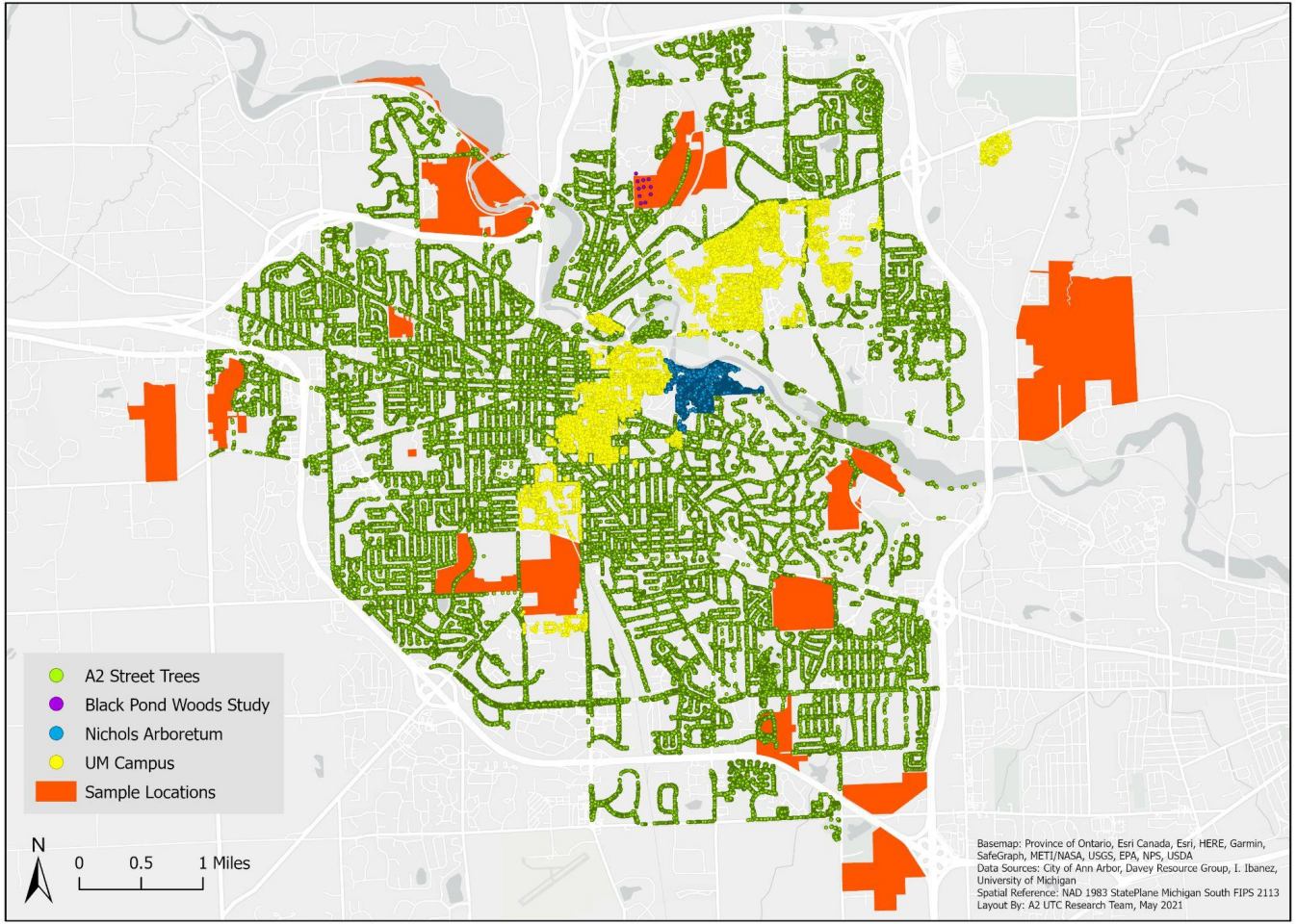
- City conducted an eco-analysis with iTree in 2012
- Estimated over 1.45 million trees, which remove 405 tons of Carbon Dioxide per year

Street Tree Survey

- City contracted Davey Resource Group to conduct an inventory of urban trees



Ann Arbor Urban Tree Canopy



Our Goals for This Project

1. Create a comprehensive GIS layer of Ann Arbor's urban tree canopy

2. Develop a script utilizing machine learning algorithms to classify trees, estimate biomass

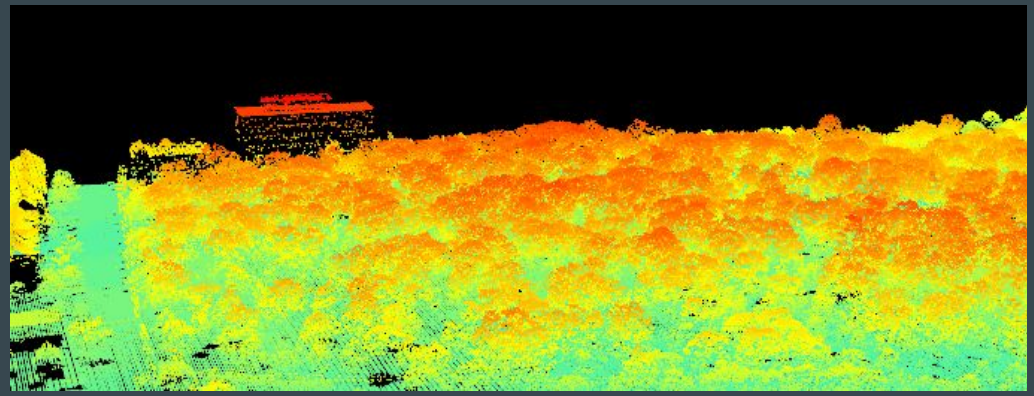
3. Develop a StoryMap to convey our findings to interested parties in a clear and comprehensive manner

Image of Dolph Park, captured by photographer Corey Seeman in 2012

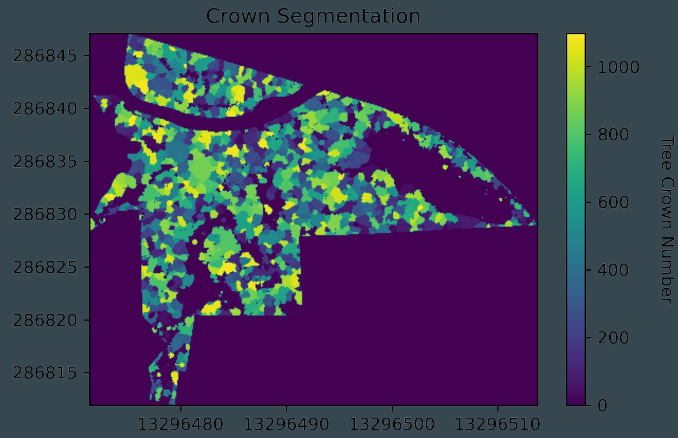
Remote Sensing and Canopy Classification

The city has:

- Aerial photography
- Satellite imagery
- LiDAR pointclouds

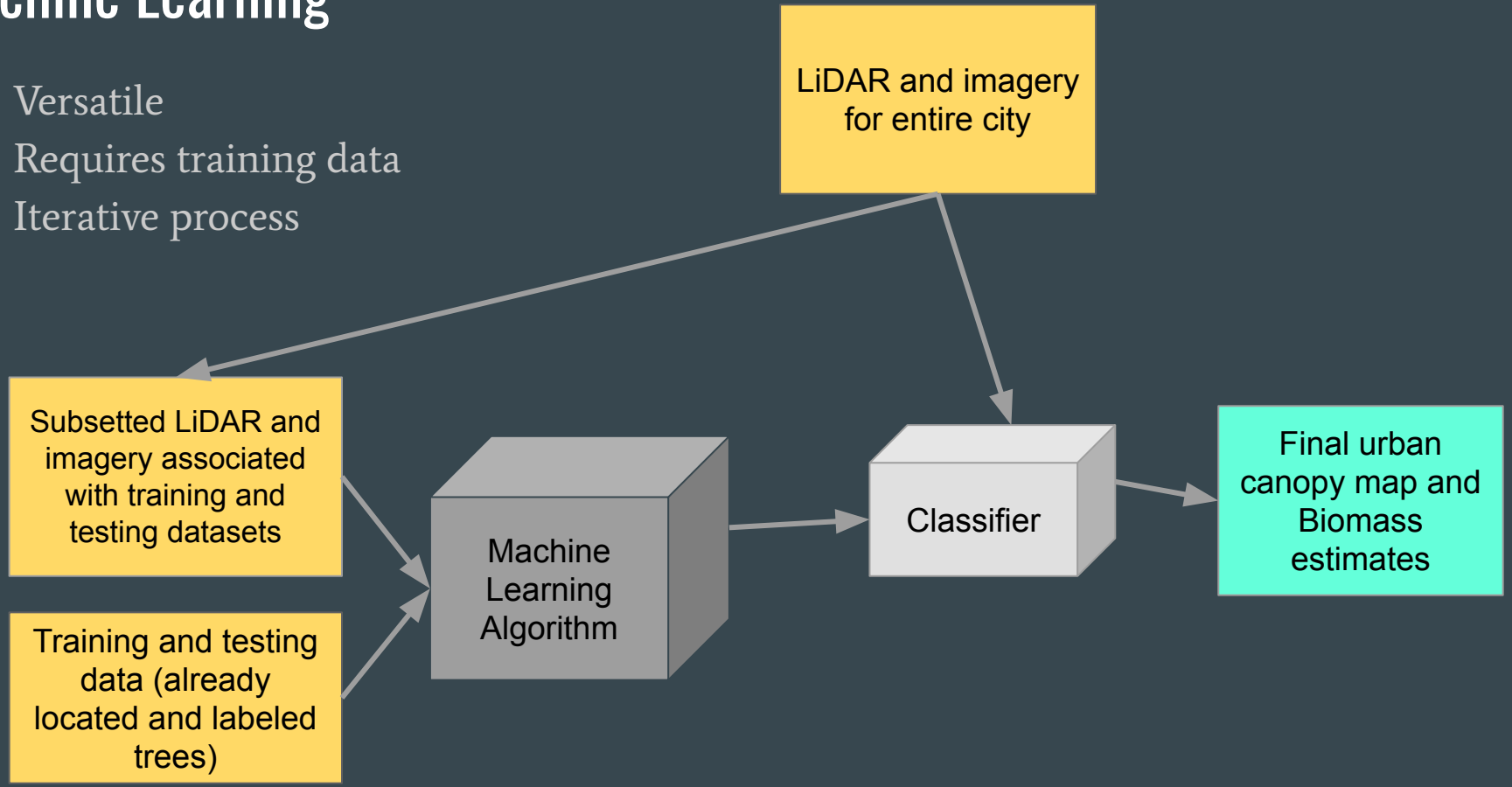


Above: Close-up of a LiDAR pointcloud for the Nichols Arboretum
Left: USGS NAIP Aerial Photo of Nichols Arboretum
Right: Example of how LiDAR can be used to locate individual trees



Machine Learning

- Versatile
- Requires training data
- Iterative process



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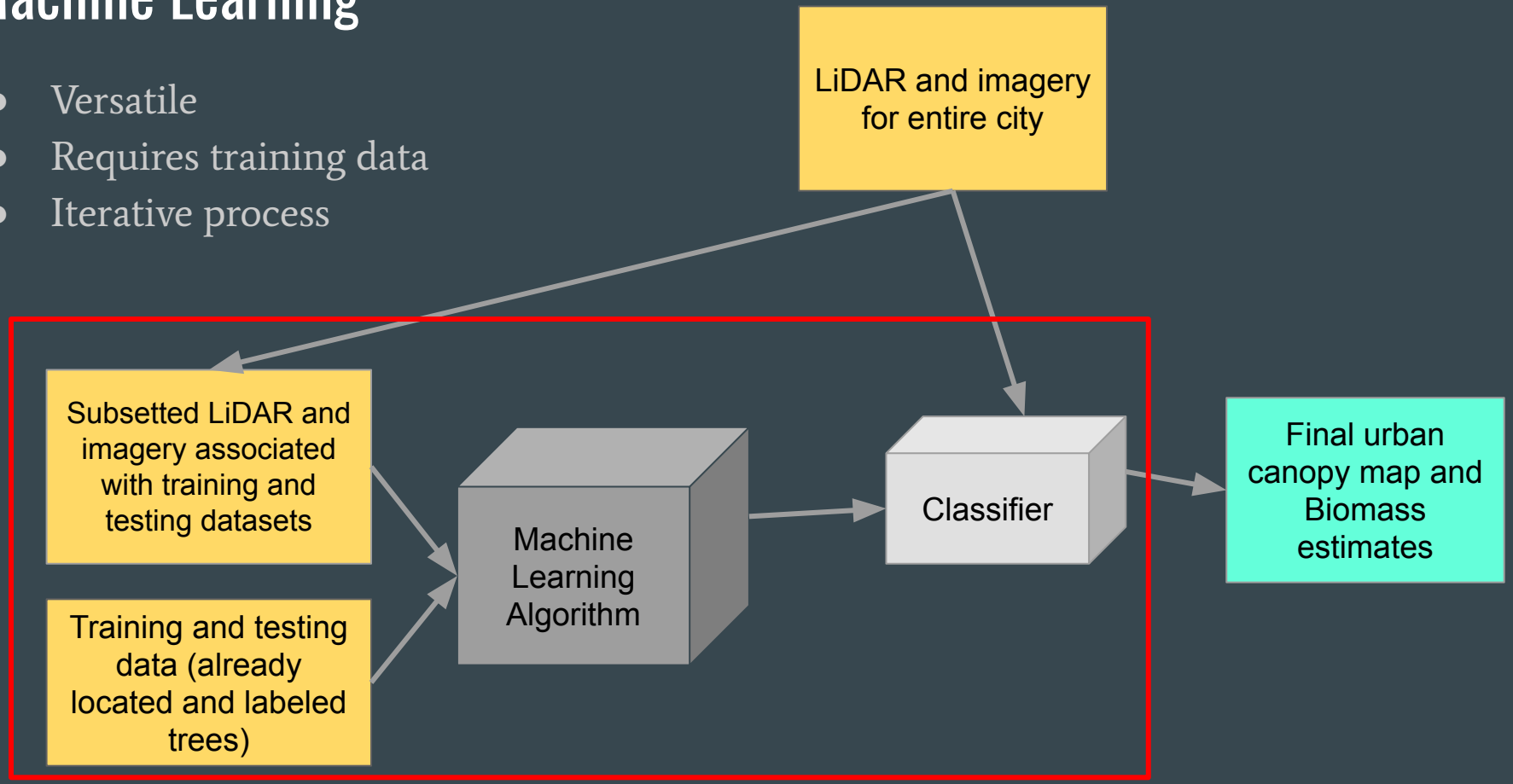

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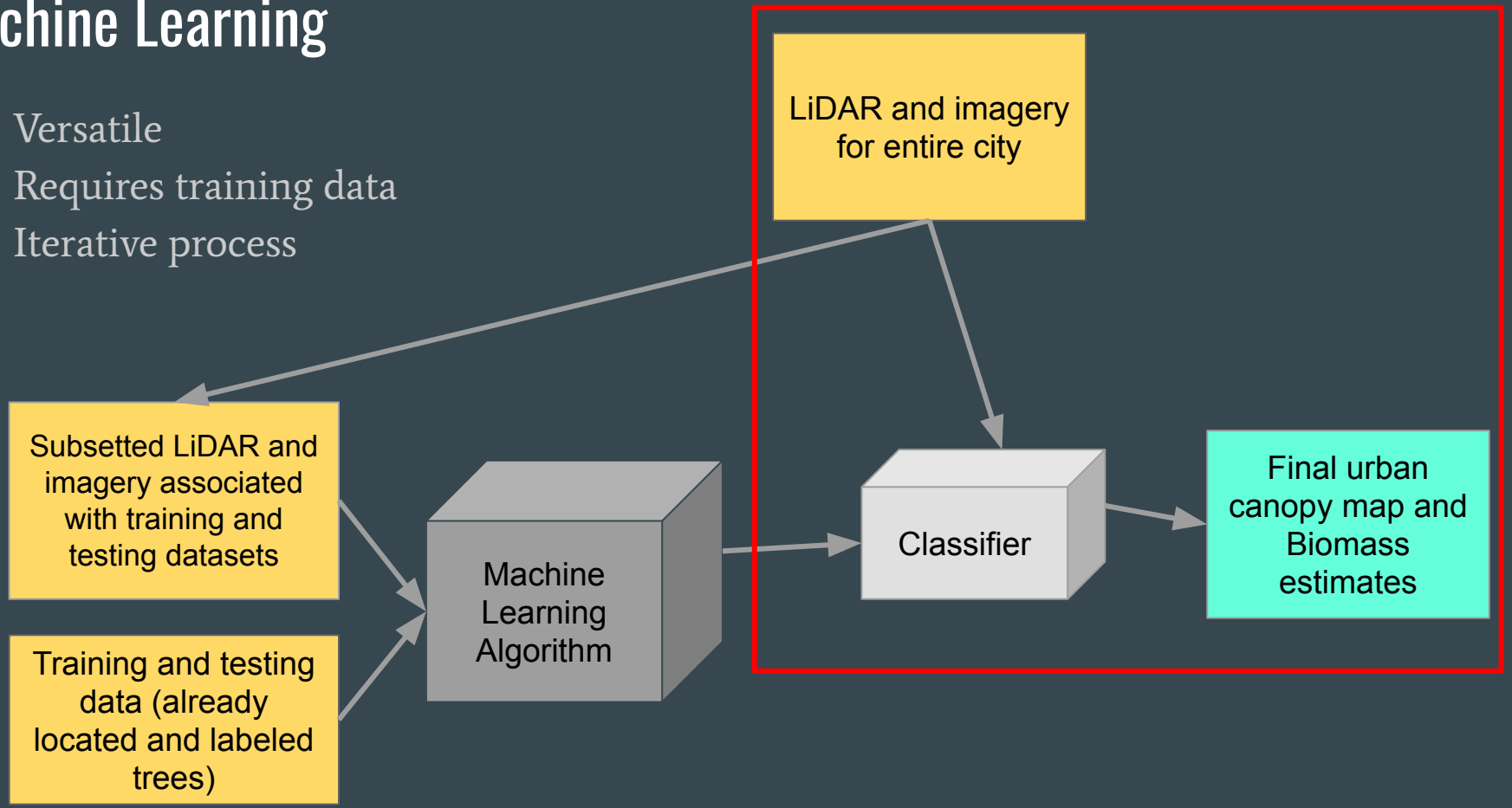
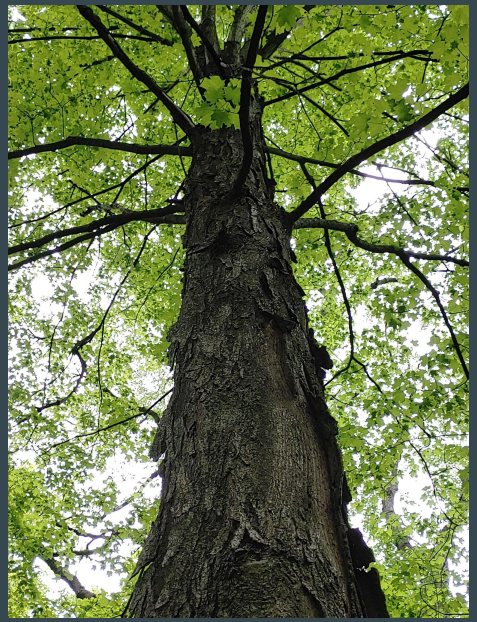


Gathering Training Data

- Taking samples from around Ann Arbor
- IDing all canopy trees in randomly located 100m plots



Current Fieldwork Update

One of our plots at Bird Hills

Locations:

Barton Nature Area
Bird Hills Nature Area (*in progress*)
Black Pond Woods Nature Area ✔
Dolph Nature Area
Eberwhite Nature Area
Greenview Nature Area
Hilltop Nature Area
Kuebler Langford Nature Area
Lakewood Nature Area
Miller Nature Area
Pioneer Woods Nature Area
Scarlett-Mitchell Nature Area
County Farm Park
Lillie Park (*in progress*)
Mary Beth Doyle Park
Radrick Forest
Saginaw Forest
Huron Hills Golf Course
Leslie Park Golf Course
UM Golf Course

Planned Timeline

Summer 2021
Gather training & testing data within Ann Arbor
Data cleaning and preparation for testing models

Fall 2021
Begin testing different machine learning algorithms for canopy classification
Test possible biomass estimation models on training plots
Create turf grass map

Winter 2022
Compile data layers (tree classification, turfgrass, biomass est.) into web map
Produce final project report and presentation

THANK YOU!!

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City of Ann Arbor Environmental Commission
Office of Sustainability & Innovations
Shannon Brines & Jason Tallant