

PARTNERS IN COMMUNITY FORESTRY

2024 CONFERENCE



BRANCHING OUT: INTEGRATING AI INTO COMMUNITY FORESTRY



PRESENTED BY:

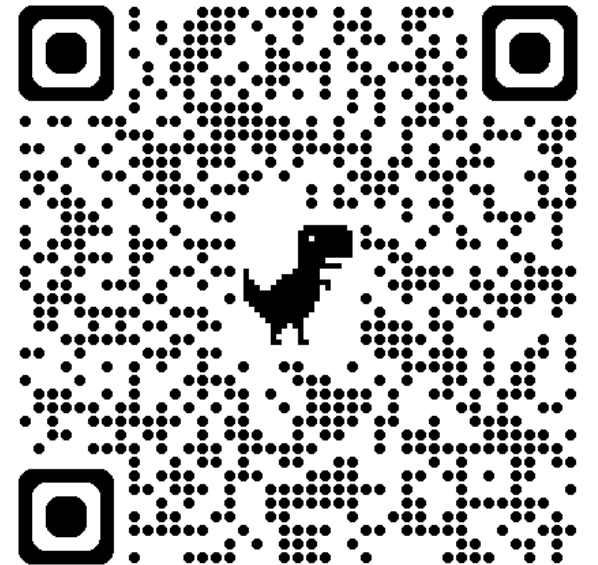
Josh Behounek

Business Development Manager

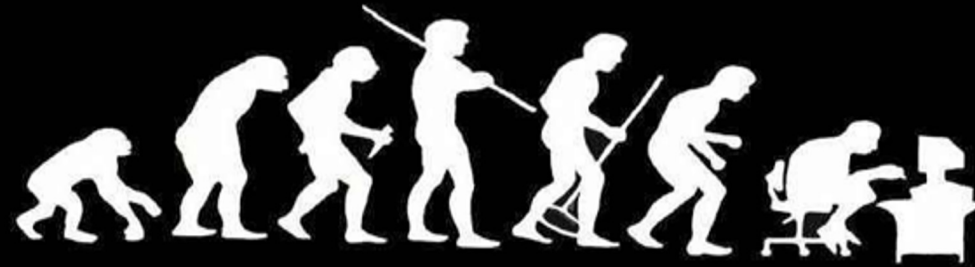
Davey Resource Group

Josh.Behounek@davey.com

573-673-7530



*Technology won't replace arborists but
arborists who use technology will replace
arborist who do not.*

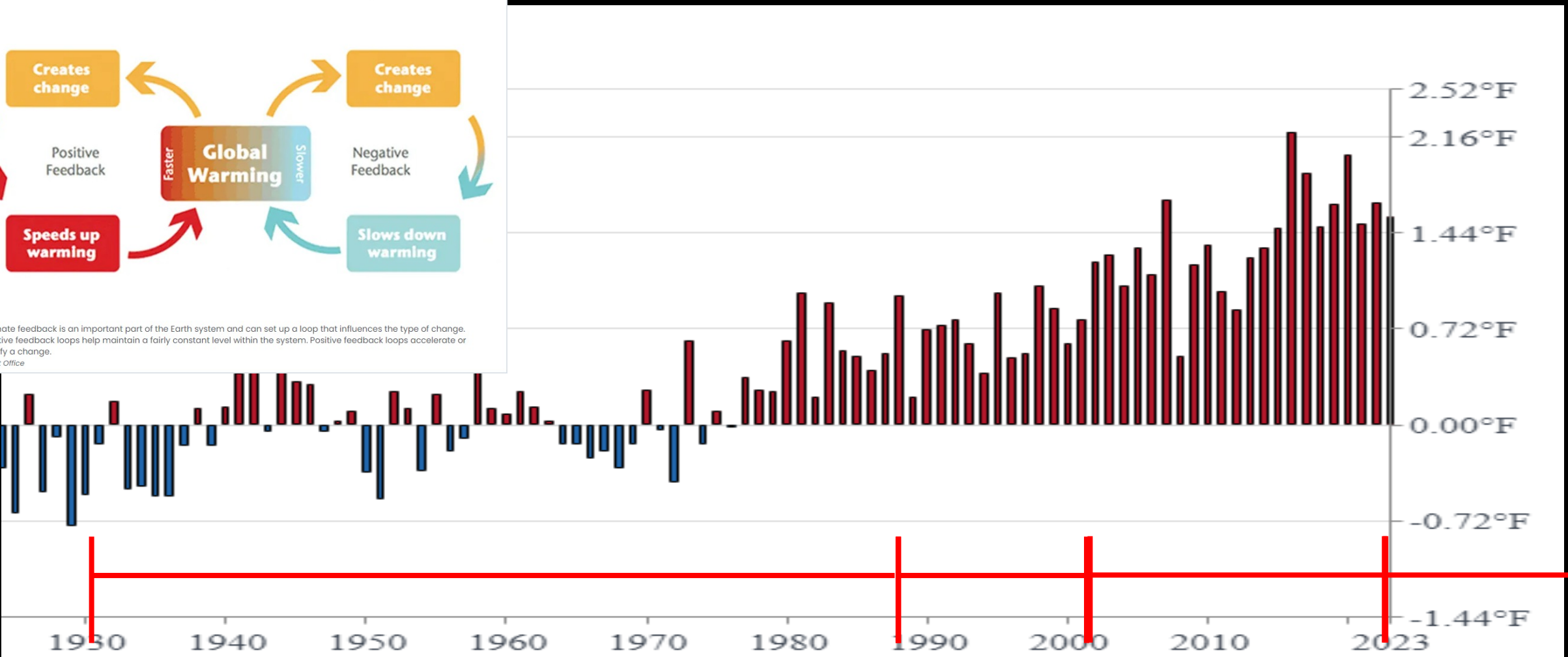


Something, somewhere went terribly wrong

Climate Feedback Loops can be Positive or Negative



A climate feedback is an important part of the Earth system and can set up a loop that influences the type of change. Negative feedback loops help maintain a fairly constant level within the system. Positive feedback loops accelerate or amplify a change.
UK Met Office



Summary of Tree Survey of the City of Oswego, New York.
Conducted from July 6 to July 21, 1974, inclusive.

It was found impracticable to scale the distances so no attempt has been made to trace the trees on the tally sheets according to the distance between them but the distance is indicated numerically between each tree. Transparence trees 10 feet apart appear as far apart on the tally sheets as trees 60, 70, 75 feet or more apart. All distances are determined by pacing.

All maples and box elders should be replaced by Norway Maples, Sugar Maples or another Elm spaced at least thirty feet apart.

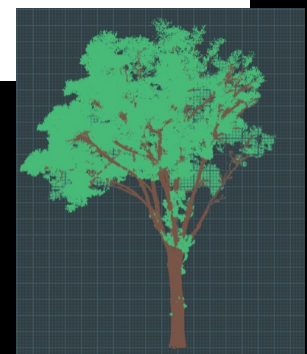
All of those trees marked (C) should be removed; the removal of some of the Sugar maples marked (D) depends upon the choice of the riggerman. Care must be taken when removing trees not to injure adjacent trees.

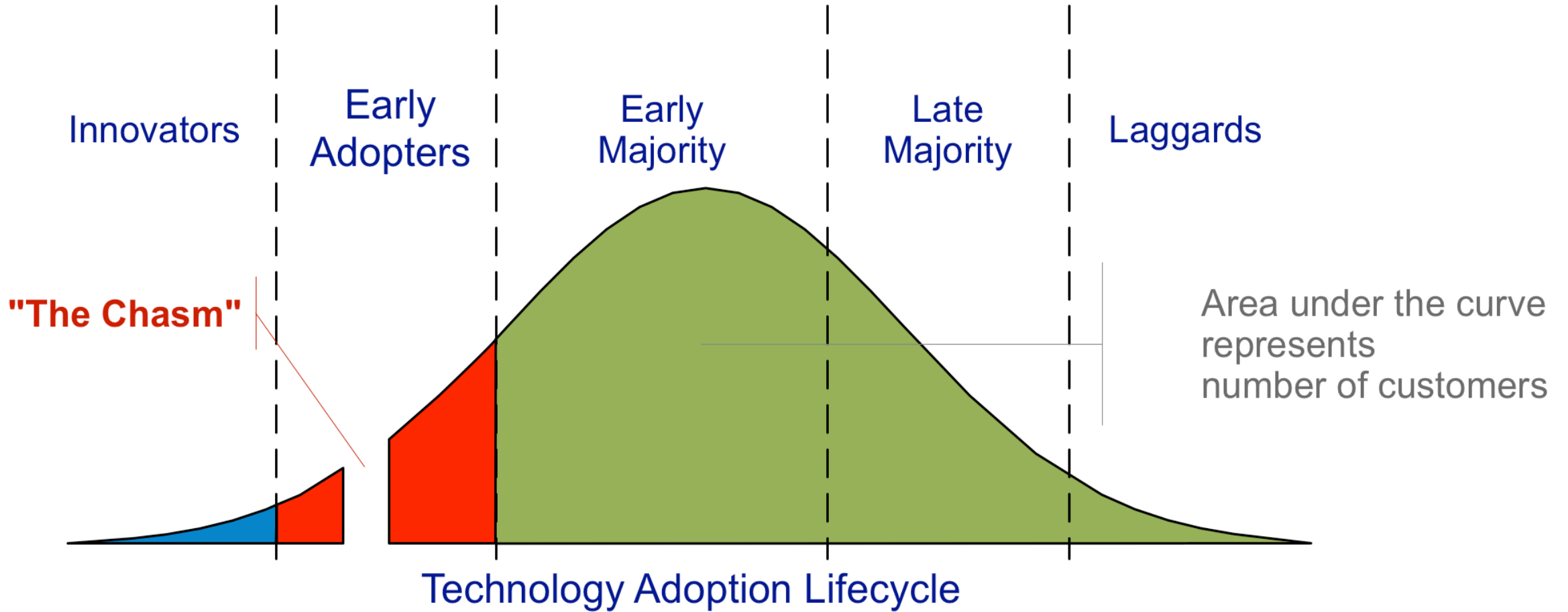
All of the transmarked (E) are dangerous and must be removed immediately.

All of the maples are more or less subject to girdling roots and they must be taken into account in any operations.

Many of the trees marked (F) must be pruned as soon as possible for many large dead branches limbs are present.

They have weak crotches and weak crotches are dangerous and must be called to prevent splitting. Calling applies only to those trees where a (G) is present; usually





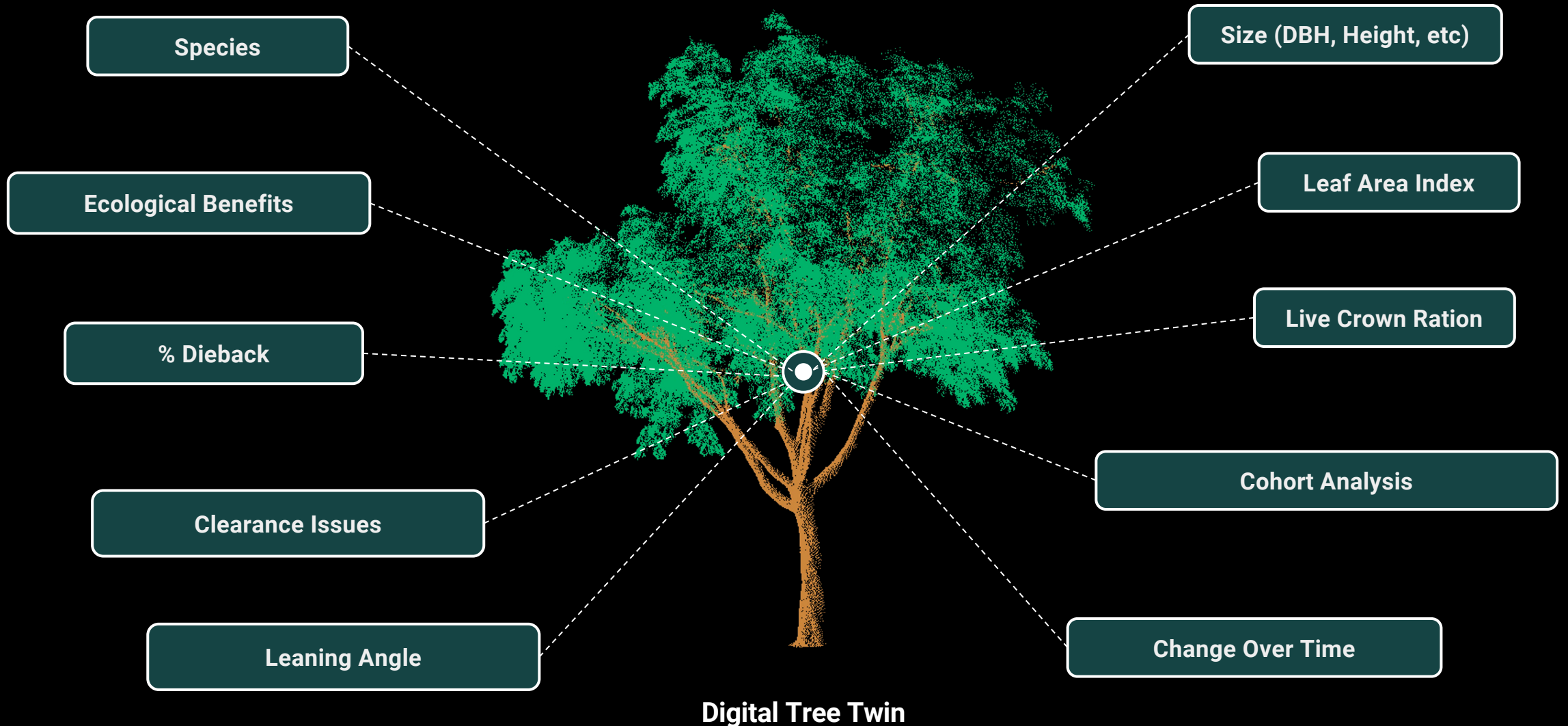
TURN INTO THE SKID



Smart Tree Inventories

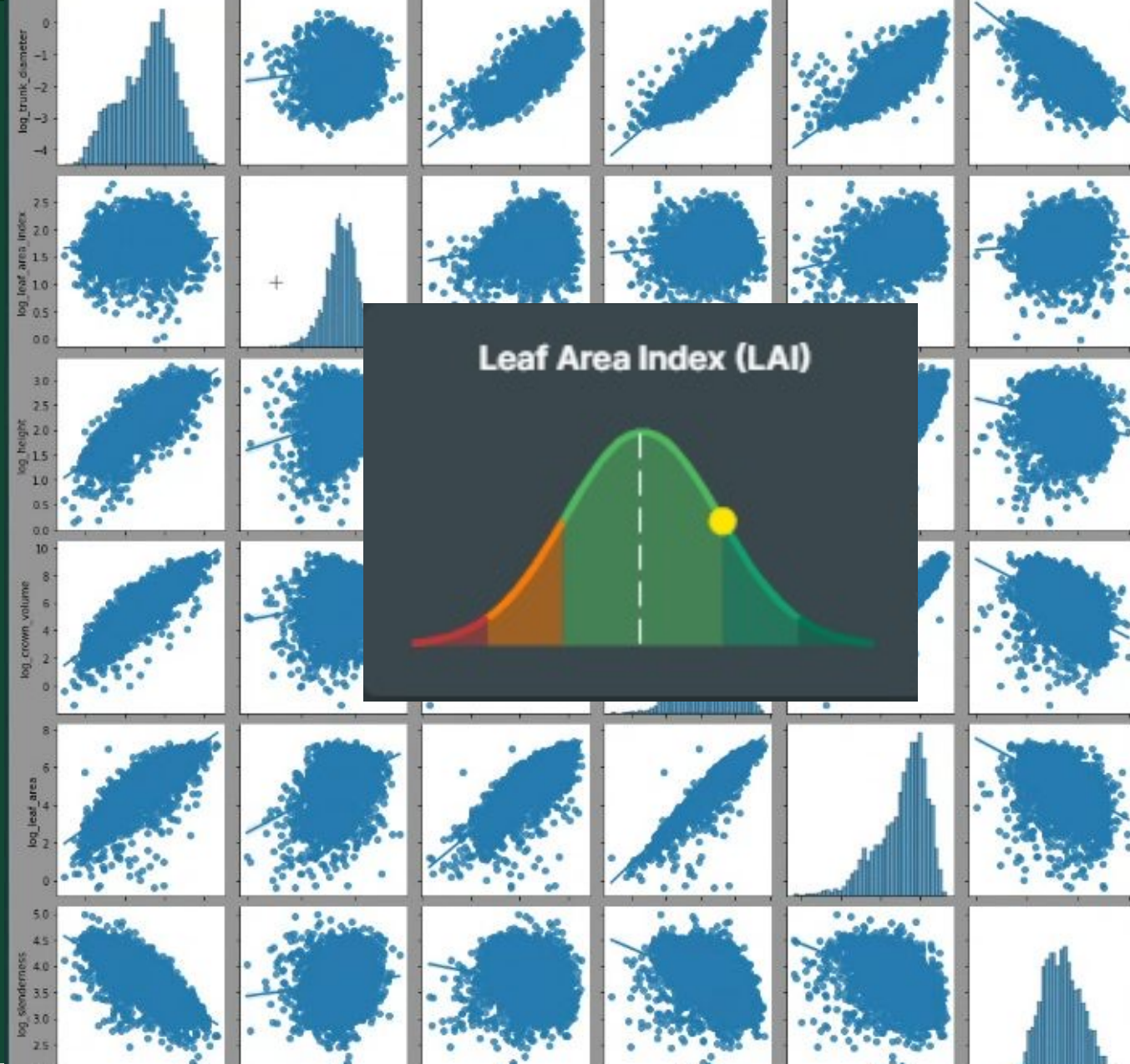


Extracting Precision Information



Big Data & Outliers

- Dead trees
- Lean angle
- Leaf Area Index
- Canopy Size
- Species
- Dieback





02. 05. 2022

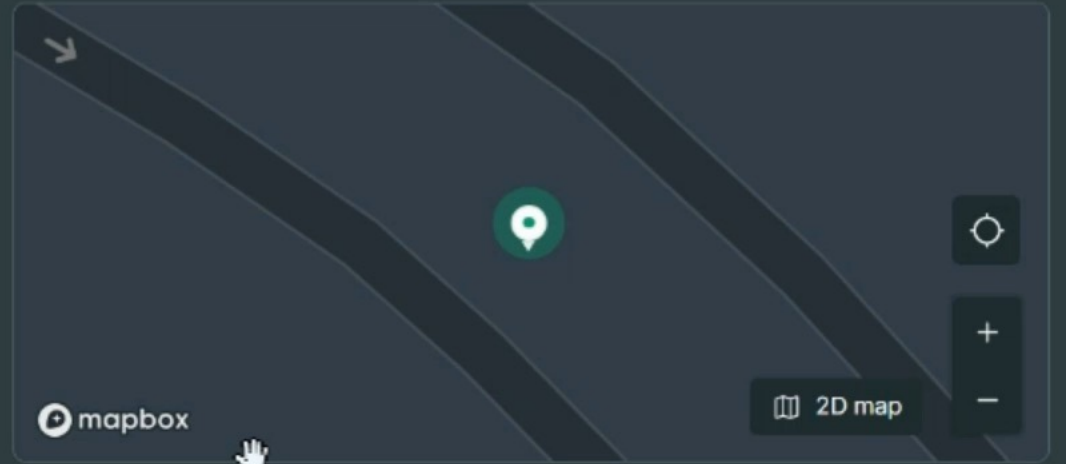
Monitor over time

TwIn view

Map navigation controls: zoom in (+), zoom out (-), reset view (circular arrow), and a share icon.

Inventory

GENUS	SPECIES	STREET NAME AND NUMBER
Prunus	No data	No data

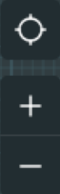
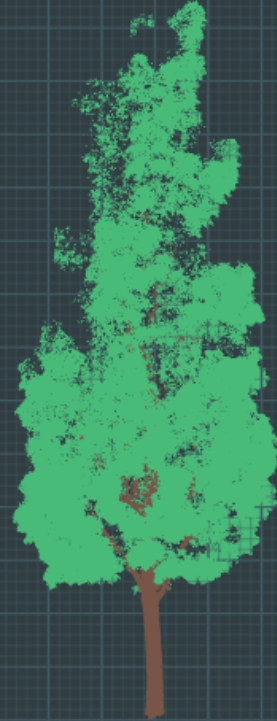


Metrics

Crown height 26.22 ft Height 22.24 ft

- > Risk
- Health & Vitality
- Environment
- Benefits

2024



5/5/2024

▼ Monitor over time

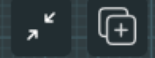
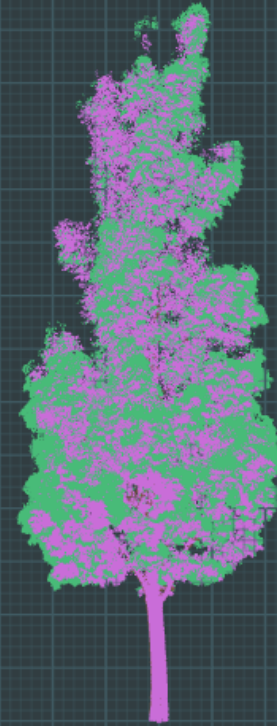


🔄 Twin view

GRAPH

	Crown Height [m]	Crown Width [m]	DBH [m]	Tree Height [m]	First Bifurcat... [m]	LAI (Leaf are...)	Trunk stabili...	Avoided run... [m ³ /yr]	CO ₂ [g/yr]	Gross CO ₂ S... [kg/yr]
👁 2022	10.76	4.73	0.27	13.27	2.14		4.26	0.20	2.10	18.80
2024	11.15	4.95	0.29	13.47	2.03					

2022



5/5/2024

▼ Monitor over time



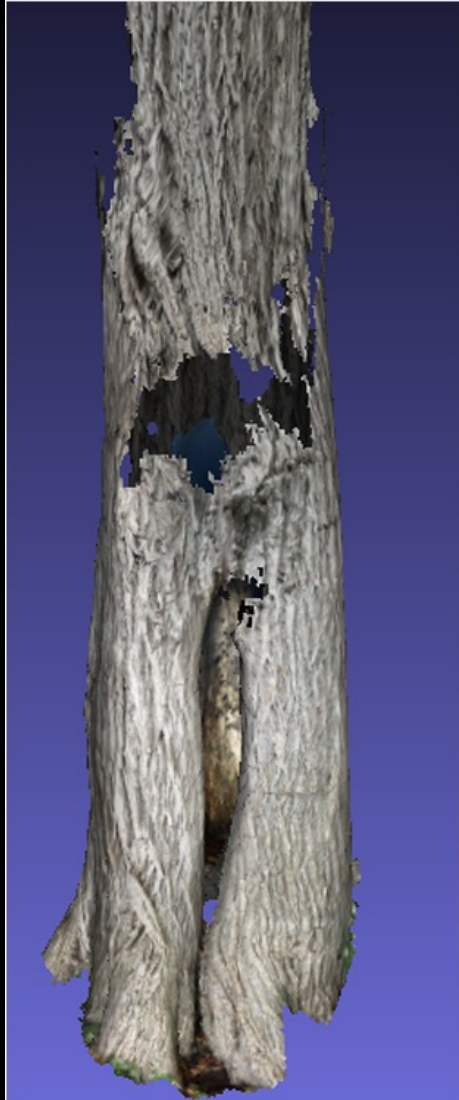
GRAPH

	Crown Height [m]	Crown Width [m]	DBH [m]	Tree Height [m]	First Bifurcat... [m]	LAI (Leaf are...)	Trunk stabili...	Avoided run... [m ² /yr]	CO ₂ [g/yr]	Gross CO ₂ S... [kg/yr]
2022	10.76	4.73	0.27	13.27	2.14		4.26	0.20	2.10	18.80
2024	11.15	4.95	0.29	13.47	2.03					



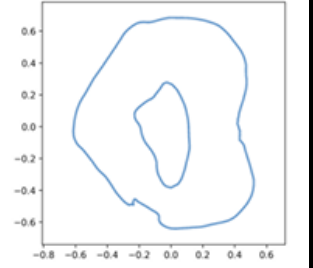
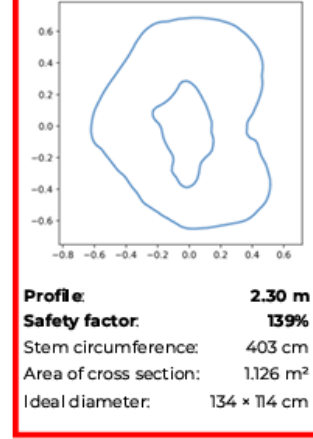
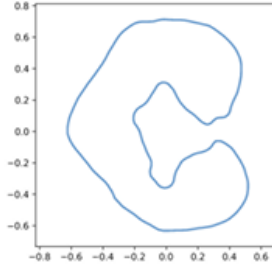
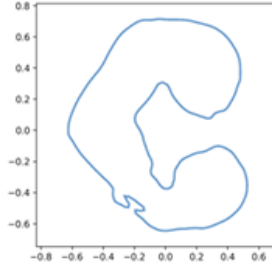
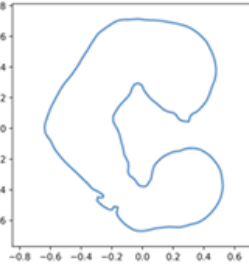


Analysis & Recommendations



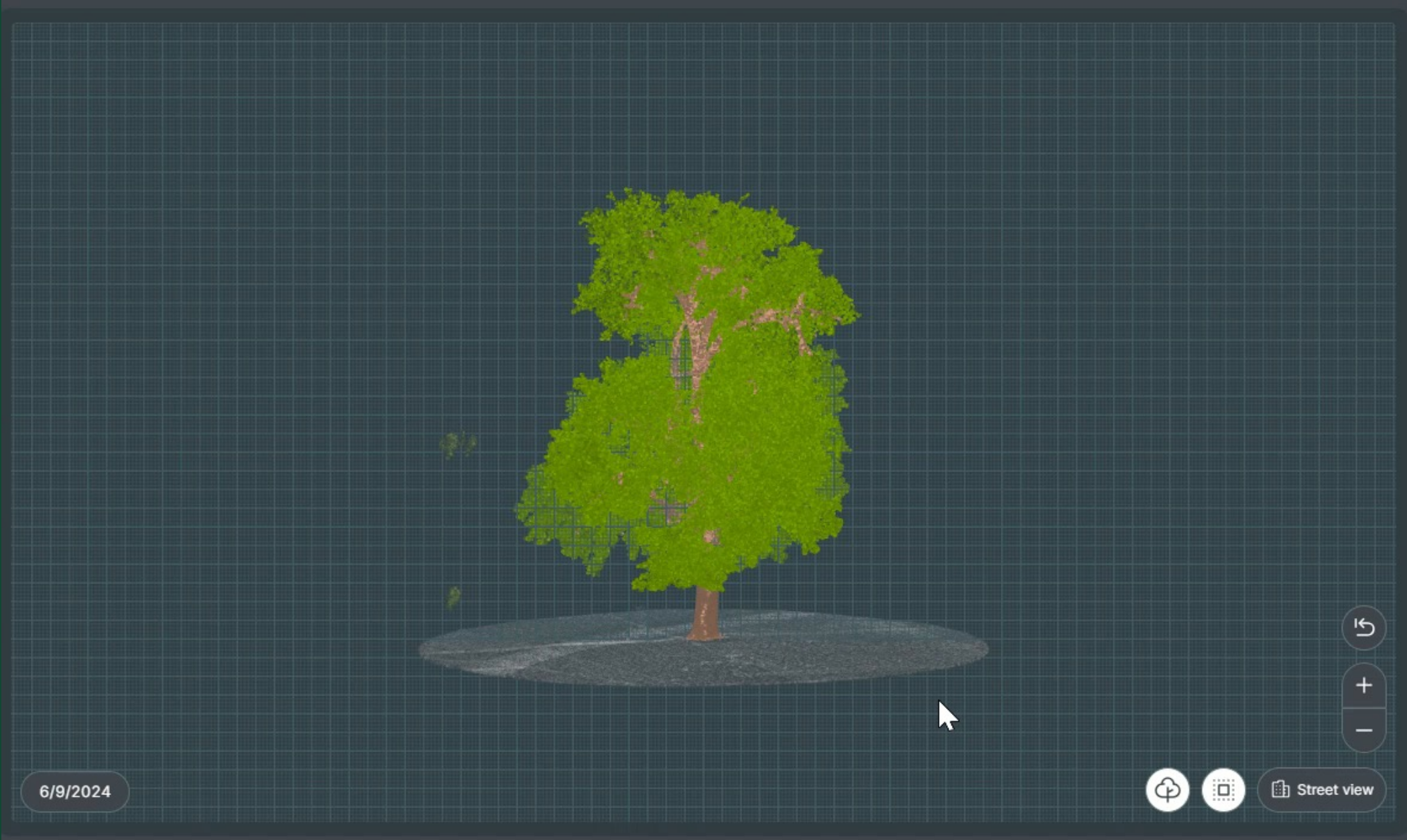
0.40 m	153 × 140 cm	0.1785 m ⁴	0.2551 m ³	7.1 MPa	280%
0.50 m	151 × 133				
0.60 m	149 × 129				
0.70 m	145 × 126				
0.80 m	143 × 124				
0.90 m	142 × 123				
1.00 m	141 × 123				
1.10 m	141 × 122				
1.20 m	142 × 122				
1.30 m	142 × 121				
1.40 m	142 × 121				
1.50 m	143 × 120				
1.60 m	142 × 120	Profile:	2.00 m	Profile:	2.10 m
1.70 m	141 × 119	Safety factor:	155%	Safety factor:	154%
1.80 m	141 × 117	Stem circumference:	588 cm	Stem circumference:	602 cm
1.90 m	140 × 116	Area of cross section:	0.955 m ²	Area of cross section:	0.937 m ²
2.00 m	138 × 116	Ideal diameter:	138 × 116 cm	Ideal diameter:	136 × 115 cm
2.10 m	136 × 115 cm	0.0764 m ⁴	0.1256 m ³	13.0 MPa	154%
2.20 m	135 × 114 cm	0.0763 m ⁴	0.1265 m ³	12.8 MPa	156%
2.30 m	134 × 114 cm	0.0687 m ⁴	0.1117 m ³	14.4 MPa	139%
2.40 m	132 × 113 cm	0.0694 m ⁴	0.1116 m ³	14.3 MPa	140%
2.50 m	131 × 113 cm	0.0714 m ⁴	0.1139 m ³	13.9 MPa	144%
2.60 m	130 × 114 cm	0.0736 m ⁴	0.1162 m ³	13.6 MPa	147%
2.70 m	129 × 115 cm	0.0754 m ⁴	0.1187 m ³	13.2 MPa	152%
2.80 m	129 × 117 cm	0.0772 m ⁴	0.1227 m ³	12.7 MPa	158%
2.90 m	129 × 118 cm	0.0775 m ⁴	0.1236 m ³	12.5 MPa	160%
3.00 m	128 × 118 cm	0.0781 m ⁴	0.1249 m ³	12.3 MPa	163%
3.10 m	126 × 116 cm	0.0857 m ⁴	0.1393 m ³	10.9 MPa	183%
3.20 m	125 × 113 cm	0.0791 m ⁴	0.1305 m ³	11.6 MPa	173%

Beam model - bearing profiles 2/3



Profile: 2.30 m
Safety factor: 139%
 Stem circumference: 403 cm
 Area of cross section: 1.126 m²
 Ideal diameter: 134 × 114 cm

Profile: 2.40 m
Safety factor: 140%
 Stem circumference: 405 cm
 Area of cross section: 1.120 m²
 Ideal diameter: 132 × 113 cm



MACHINE LEARNING ADVANTAGES

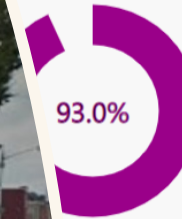
- Efficient
 - Cheaper & Faster
- Objective
- Repeatable
- Precise



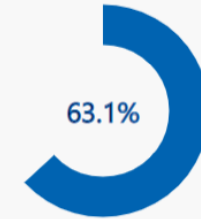
Iteration 3

Finished training on 4/4/2019, 12:51:24 PM using General domain
Finished as: TreeDetectionPOC

Precision ①



Recall ①

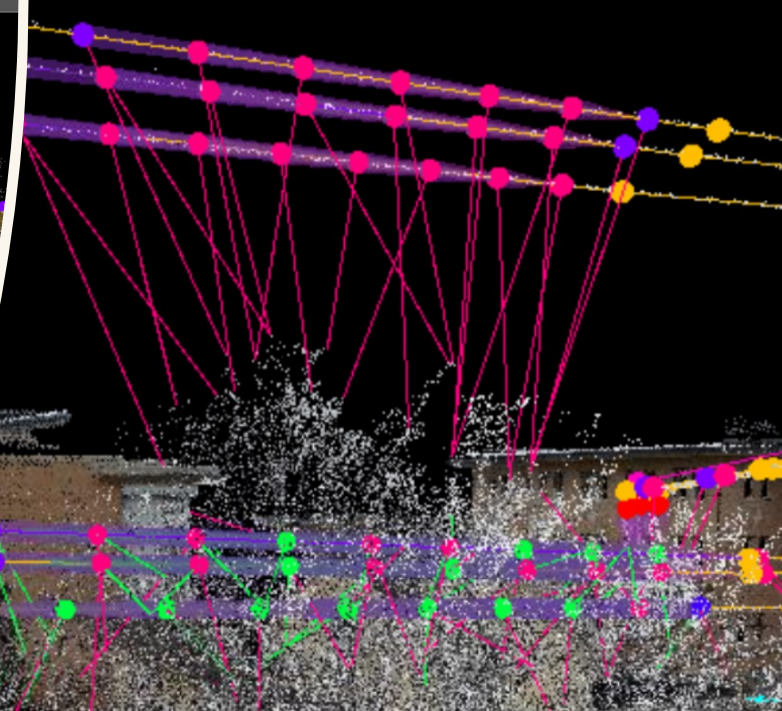
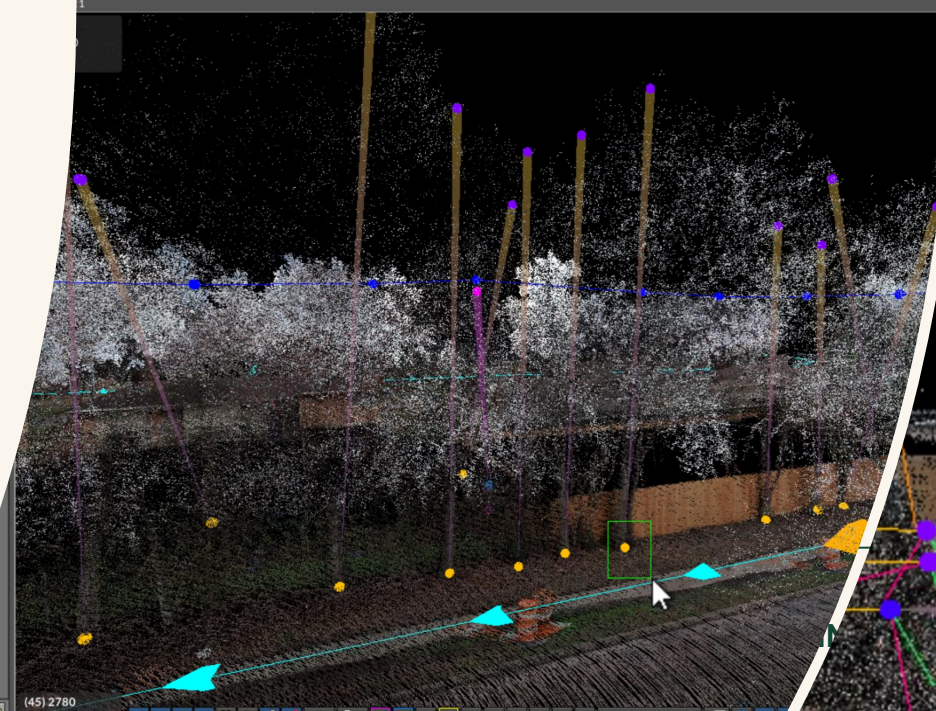


mAP ①



Score Per Tag

Precision	Recall	A.P.	Image count
93.0%	63.1%	83.0%	150

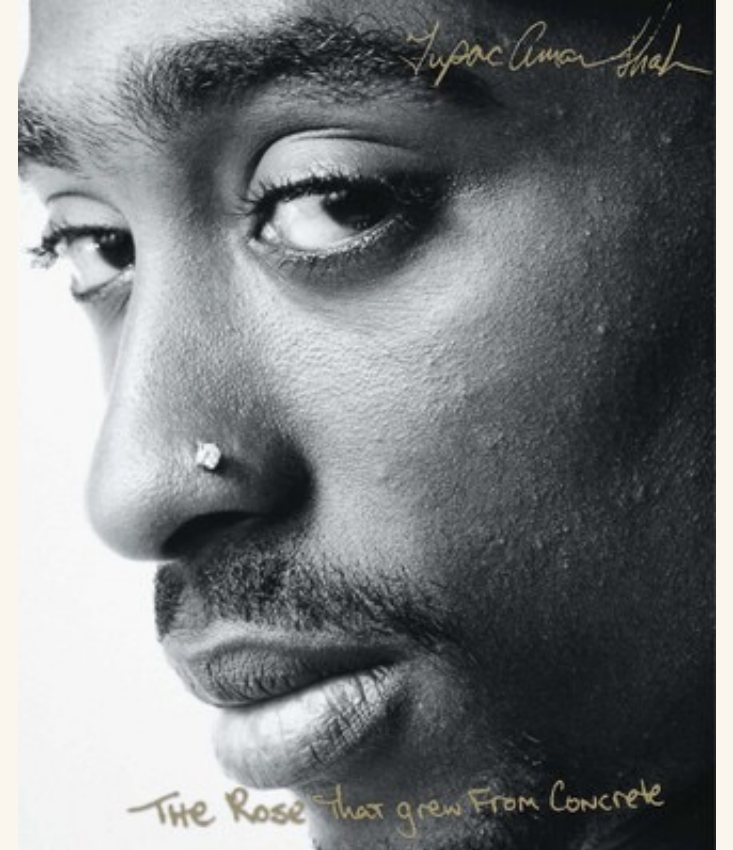


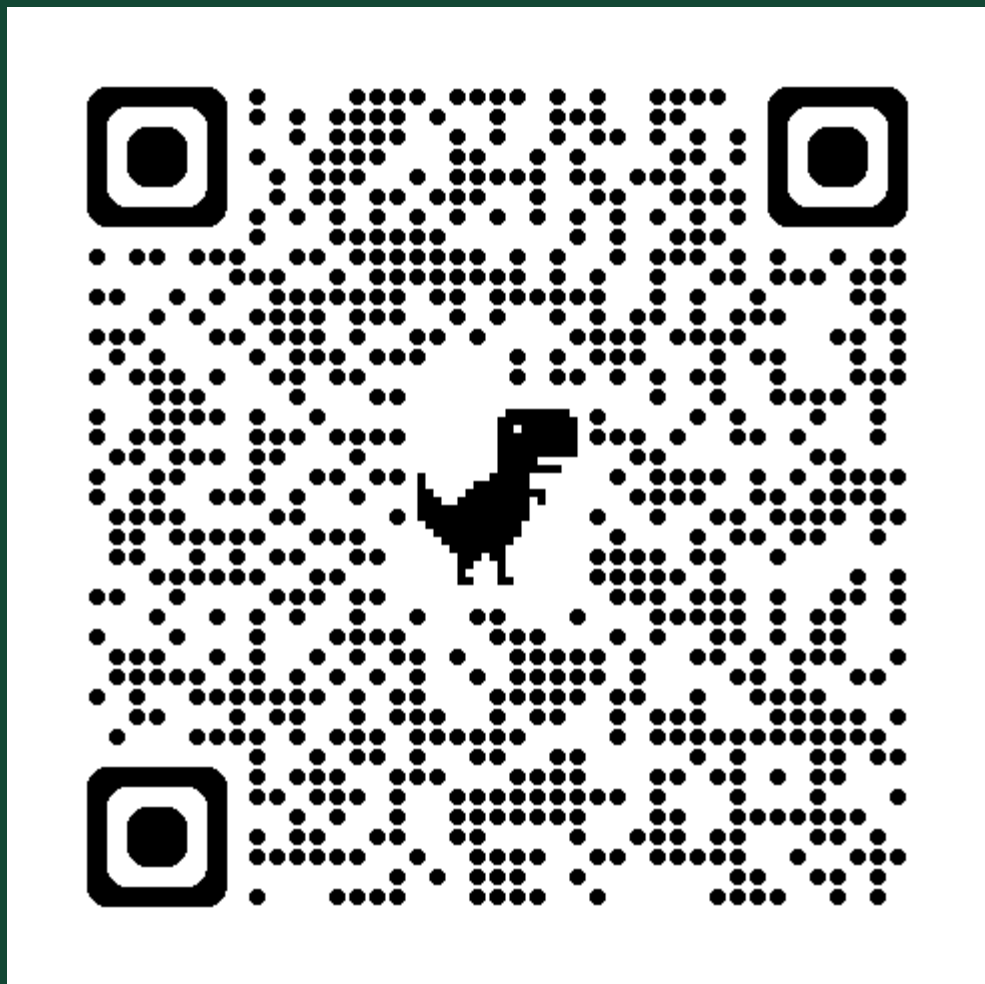
REMOVING IMPLICIT BIAS

Did you hear about the rose that grew from
a crack in the concrete?
Proving nature's law is wrong it
learned to walk with out having feet.
Funny it seems, but by keeping its dreams,
it learned to breathe fresh air.
Long live the rose that grew
from concrete when
no one else ever cared.



LivingCharm.com





Thank you.

Josh Behounek

Josh.Behounek@davey.com

573-673-7530

