Our Team

Siya Agarwal
4B Urban Planning

experience in social entrepreneurship and business strategy

Nawal Hussain
2B Math

experience in automation development

Karan Khalsa
4B Mechanical Engineering

experience in image processing and operations

Don Ding
4B Math and Business

experience in consulting and strategy

Simplifying carbon data collection.

What's the problem?

3B

Cook over open fire.

[National Geographic, 2017]

What's the problem?

3B

Cook over open fire.

[National Geographic, 2017]

400

cigarettes smoke/ hour

[National Geographic, 2017]

What's the problem?

3B

Cook over open fire.

[National Geographic, 2017]

400

cigarettes smoke/ hour

[National Geographic, 2017]

90%

Of fuel used in developing countries is wood

[International Energy Association, 2002]

Environment

Deforestation

Black Carbon

Wealth

Time & Cost of
Wood Collection

Health

Respiratory infections

Eye damage

Lung Cancer

Women

Disproportionate
Impact

Current Solutions

CLEAN COOKING ALLIANCE

2000+

Partner Organisation

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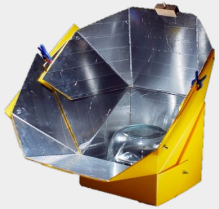
2000+

Partner Organisation

Biogas



Solar

Fuel Efficient

Current Solutions

CLEAN COOKING ALLIANCE

2000+

Partner Organisation

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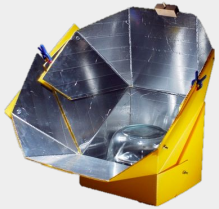

Solar

Fuel Efficient

BIGGEST CHALLENGE:

Measuring Fuel Savings

Measuring fuel savings is key to **financial viability**

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Fuel Savings

Wonderbag reports its measured impact on fuel savings

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Measuring fuel savings is key to **financial viability**

Fuel Savings
Wonderbag reports its measured impact on fuel savings

2 Carbon Credits
are awarded for each bag sold every year

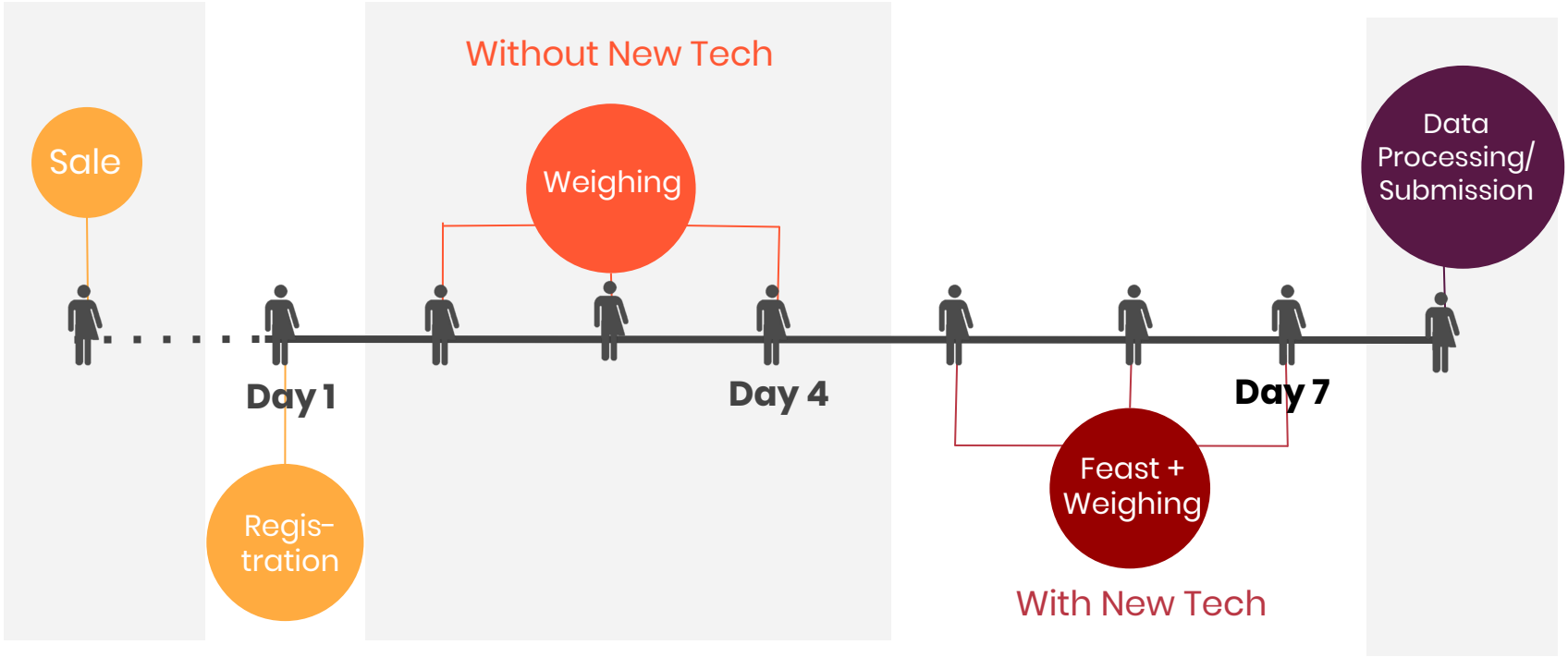
BIGGEST CHALLENGE:

Measuring Fuel Savings

Measuring fuel savings is key to **financial viability**

But... it is **labour intensive**

CURRENT PROCESS



OUR SOLUTION

Recipients take image of wood stack

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Recipients take image of wood stack

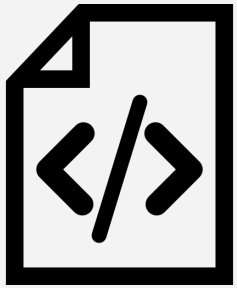


Image Processing algorithms

OUR SOLUTION

Recipients take image of wood stack

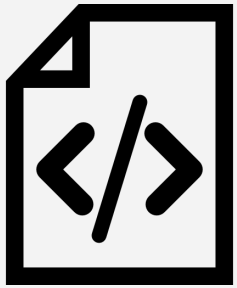
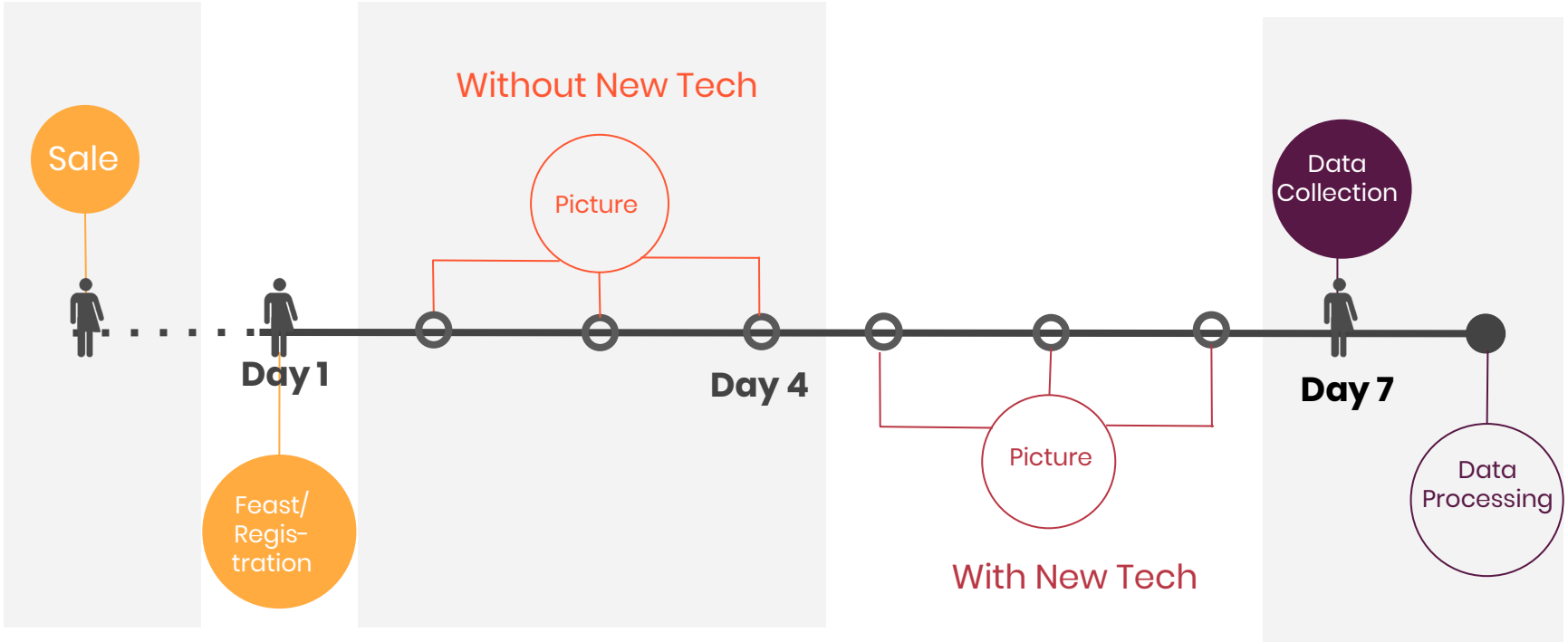


Image Processing algorithms

Weight of wood

OUR PROCESS

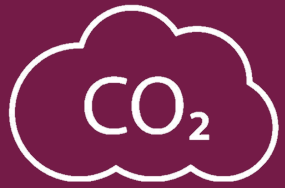

Without New Tech
Sale
Picture
Data Collection
Day 1
Day 4
Day 7
Feast/ Regis- tration
Picture
Data Processing
With New Tech

23%

Time Savings

257

No. of additional wonderbags (per village)



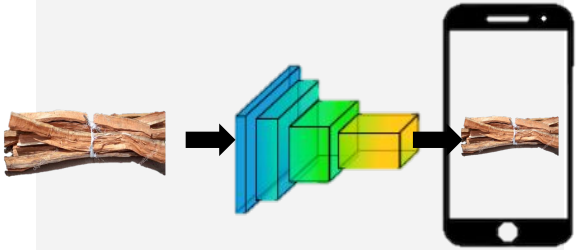
514

Tons of CO_2 saved (per village)

How does it work?

1

Take a picture



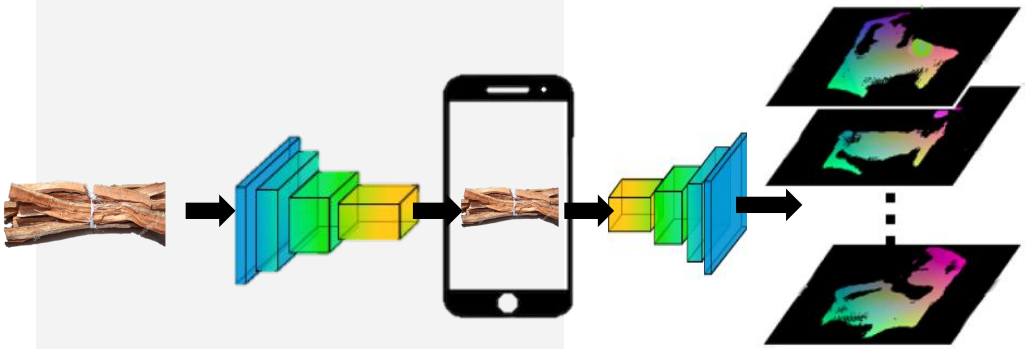
How does it work?

1

Take a picture

2

ML algorithm 1 predicts 2D views from different angles



How does it work?

1

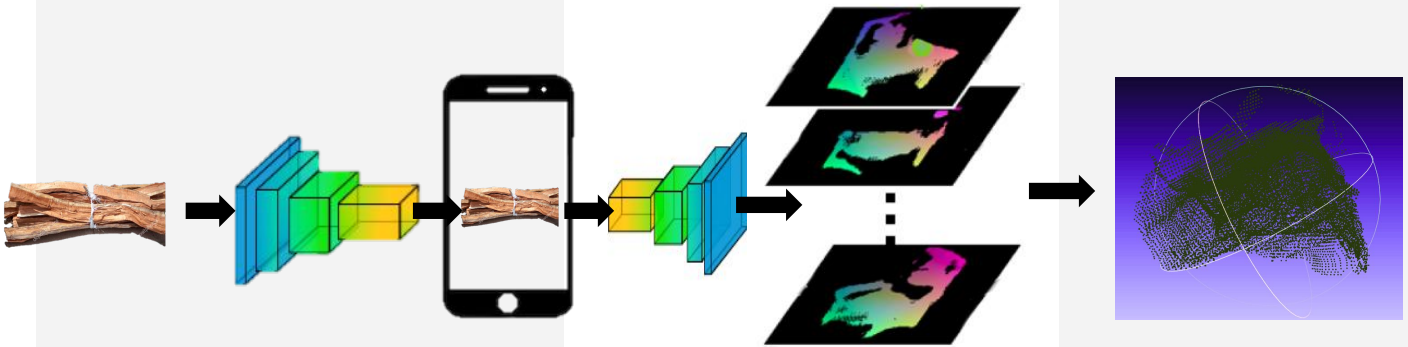
Take a picture

2

ML algorithm 1 predicts 2D views from different angles

3

ML algorithm 2 projects 3D point cloud from 2D views



How does it work?

1

Take a picture

2

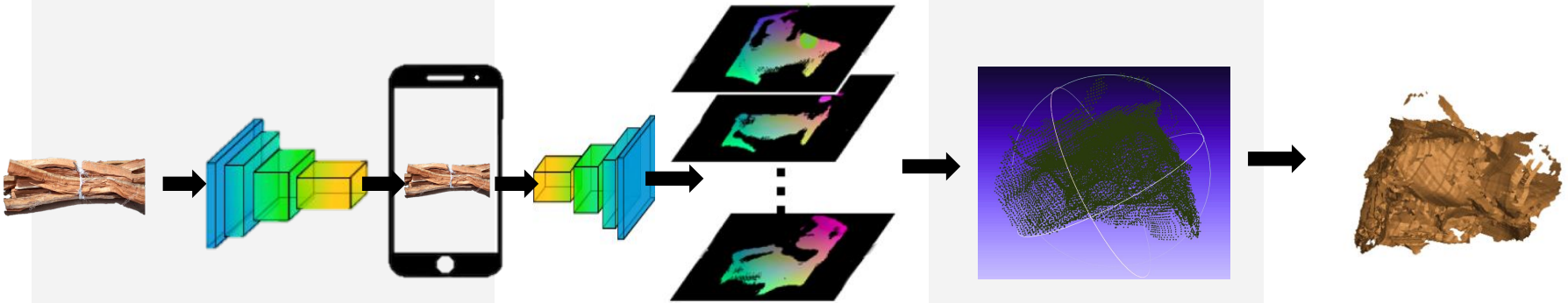
ML algorithm 1 predicts 2D views from different angles

3

ML algorithm 2 projects 3D point cloud from 2D views

4

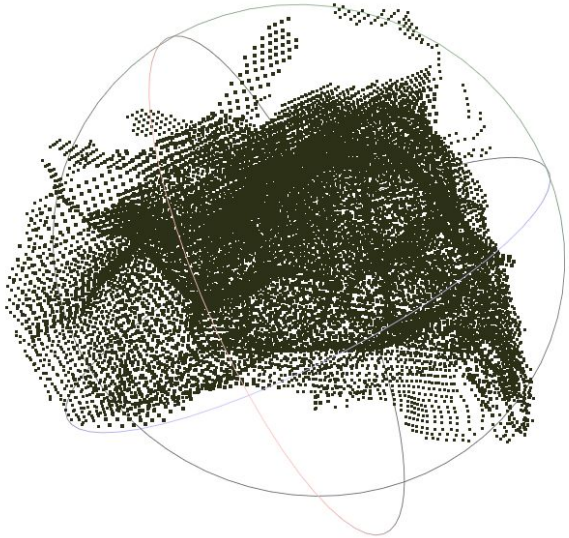
Meshlab generates 3D model & calculates volume from point cloud



DEMO

Input png

Point cloud



MeshLab 2020.02 - [Project_1]

File Edit Filters Render View Windows Tools Help

Project_1

0 64wood
1 Poisson-disk Samples
2 64wood(1)

Poisson-disk Samples

Shading Vert Dot Decorator None
Color Mesh User-Def
Point Size
apply to all visible layers

sets in 157 msec
Reconstructed surface. Added 39756 faces
Applied filter Surface Reconstruction: Ball Pivoting in 1359 msec
Saved Mesh E:/Don and Qiuyi Hackathon/pytorch-3d-point-cloud-generation/results/ORIG_STG2_adam_trueWD_restart/68wood.stl in 28 msec
Opened mesh E:/Don and Qiuyi Hackathon/pytorch-3d-point-cloud-generation/results/ORIG_STG2_adam_trueWD_restart/64wood.ply in 32 msec
All files opened in 33 msec

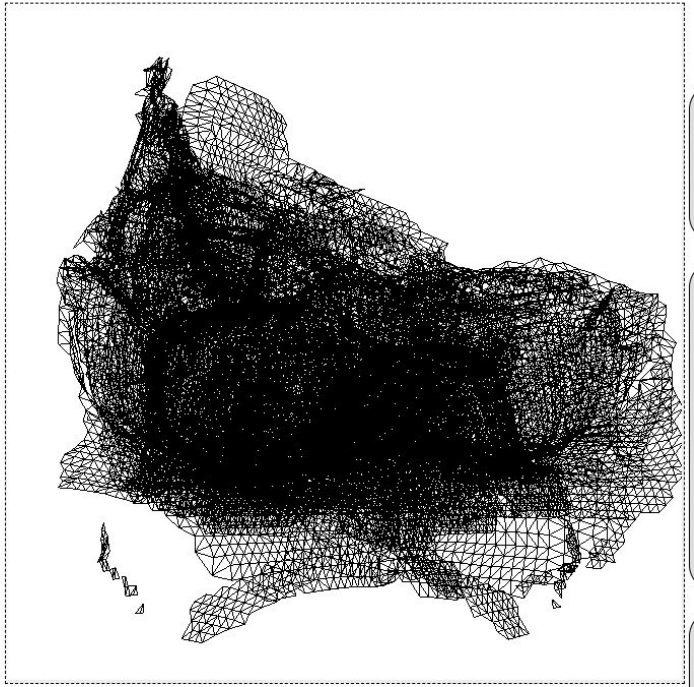
FOV: 60
FPS: 625.0
BO_RENDERING

Current Mesh: Poisson-disk Samples
Vertices: 22,610 (72,076)
Faces: 39,756 (39,756)
Selection: v: 0 f: 0

Mem 12% 994/8192 MB

Welcome to the free online STL viewer!
View 3D STL files directly in your browser - no software installation is required.
We upload nothing to our server - everything is done client side.
* NEW - Stand Alone Javascript Plugin

Meshed



68wood.stl

Model info

Size (mm ▾)	14 x 14 x 13
Volume (mm^3)	24
File units	○ mm ◉ in
Triangles	39,756

Options

Display: ○ Flat Shading ○ Smooth Shading ◉ Wireframe

Color:

Orientation: Bottom ▾

Edges: ◉ Yes ○ No

Auto-rotation: ○ Yes ◉ No ○ Fixed

Actions

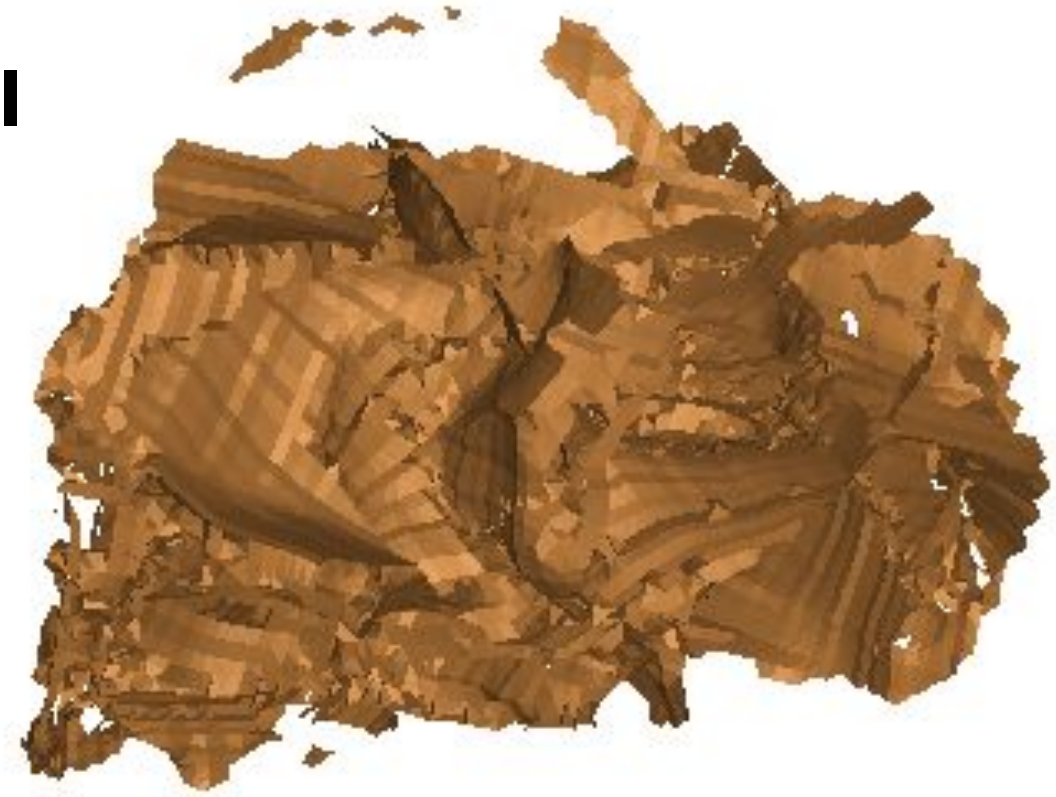
Snap a picture

Check if print-ready (coming soon)

3D Print with Treatstock

Save to computer

3D Model



Future Steps

Technology

Improving Accuracy

- Creating training sets
- Improving hardware
- Running iterations

Completing the Model

- Implementing Coke can for scale
- Adding density of wood data

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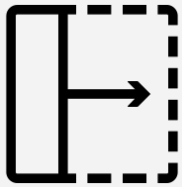


Scalability

Expanding to other organizations

- 2000+ possible companies
- 75,000,000 households

Thank you.

Appendix

1.0 Alternative Methodology

Edge/ object detection algorithms to estimate dimensions of log pile + algorithm to calculate volume (inaccurate)

Amazon Mechanical Turk to count log pile + algorithm to calculate volume (inaccurate + expensive)

2.0 Opportunities for Improvement

	Ideal	Our Hackathon
Dataset	Large number of wood pile pictures & 3D models	Large number of furniture pictures & 3D models
Training Iterations (Epochs)	Thousands of epochs for both algorithms	400 for ML Algorithm 1 6 for ML Algorithm 2
Hardware	Amazon Web Service EC2 32GB GPU designed for ML	Gaming Desktop

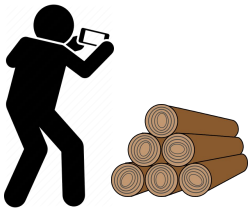
3.1 Business Case

Business Type: Non for Profit

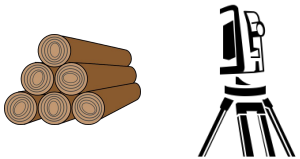
Costs	
Creating training data	29175
Hardware	1590
Finishing Code	0
Total	30765
Funding	
Grants (Clean cooking alliance)	30765

3.1 Training Set Creation

Start off with collecting **1000** data points



Set up &
Take Picture:
10 minutes



Lidar Scan to
Point Cloud:
30 minutes

Point cloud to
Mesh:
30 minutes

70 minutes per data point * **1,000** = **1,167 hours**
1,167 * $25/hour for CAD drafter = **$29,175**

4.0 Impact Model

Assumptions

Time Constant		
Time to travel to village and back	720	Minutes
Travel time between locations in one village	10	Minutes
Orientation Time	240	Minutes
Feast Time	1200	Minutes
Time to weight wood	30	Minutes
Costs		
Overnight Costs	20	$/Night
Cost of Wonderbag	5	$
Number of		
Number of Wonderbags in 2017	598548	Wonderbags
Number of people in village	500	people
Number of people in a village (sampled)	50	people
Number of volunteers per village	6	Volunteers
Number of nights per volunteer	7	Nights
Number of orientations/feasts	5	times

4.1 Impact Model

Scenarios

Current Registration	Time (Village) (mins)	Cost (Village) ($)	Time (per WB) (mins)	Cost (per WB) ($)
Individual				
Time for weighing (7 days)	9000	378.02	18	0.76
Incentive (give wonderbag)		250.00		0.50
Travel between locations	3000	126.01	6	0.25
Collective				
Orientation + Instructions	7200	302.42	14.4	0.60
Feast	36000	1512.10	72	3.02
Travel to village and back	4320	181.45	8.64	0.36
Overnight Costs		720.00		1.44
Total	**59520.00**	**3470.00**	**119.04**	**6.94**
Value of Time				**0.04**

4.2 Impact Model

Scenarios

Scenario 1 (Household Collection) (Per Unit)		
Individual	Time (mins)	Cost ($)
Time for weighing (7 days)	0.00	0
Incentive (give wonderbag)		250
Travel between locations	0.00	0
Collective		
Orientation + Instructions	7200	302
Feast	36000	1512
Travel to village and back	2880	121
Overnight Costs	0	0
Total	46080	2185

4.3 Impact Model

Scenarios

Scenario 2 (Volunteer Collection) (Per Unit)		
Individual	Time (min)	Cost ($)
Time for weighing (7 days)	3000	126.00
Incentive (give wonderbag)		250
Travel between locations	3000	126
Collective		
Orientation + Instructions	7200	302
Feast	36000	1512
Travel to village and back	8640	363
Overnight Costs	0	720.00
Total	57840	3399