

VineTech

2022-2023

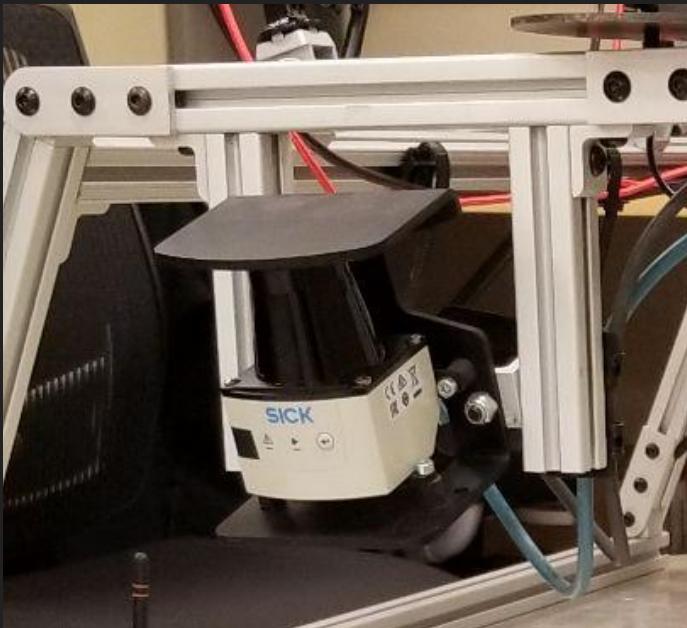
Isaac Castile, Josh Dietz, Samuel Imlig, Cassie Wischhoefer, Kyler Diefenbaugh
Advisors: Dr. J. Walker Orr and Dr. Brian Snider



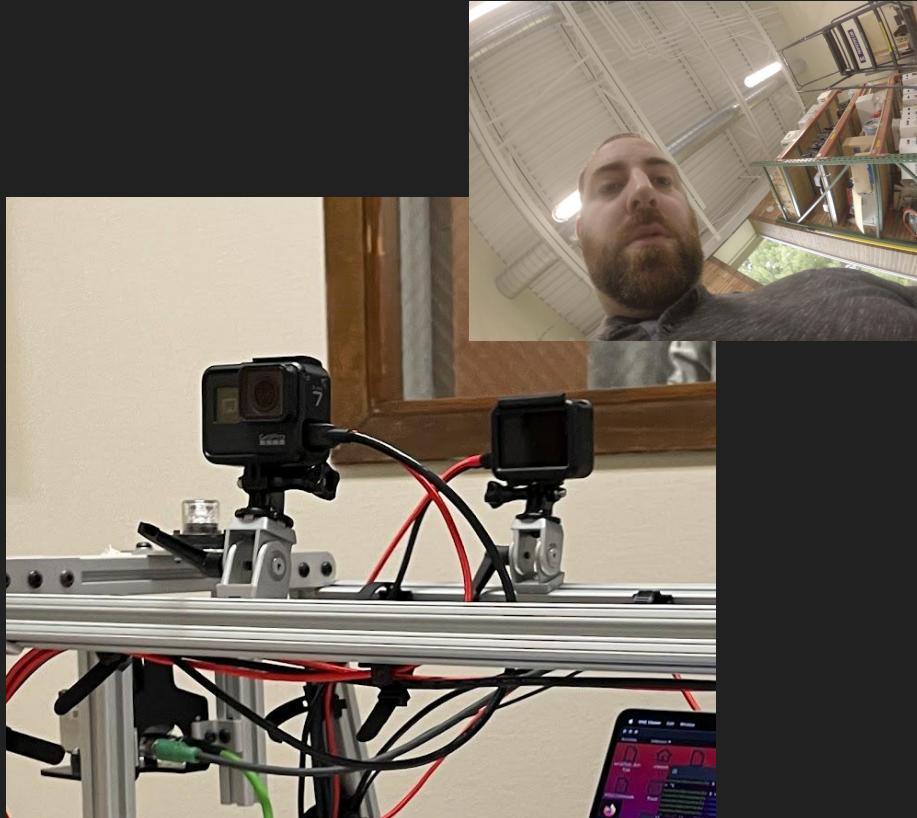
Goal: Navigate a
vineyard and
predict crop yield

A special thanks to Crawford-Beck Vineyard



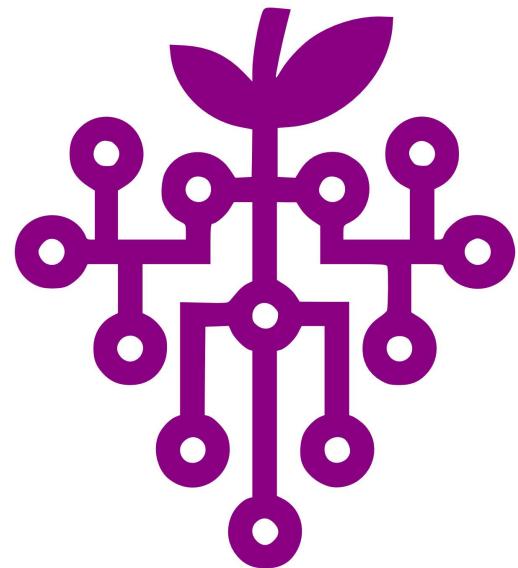


LiDAR



GoPros

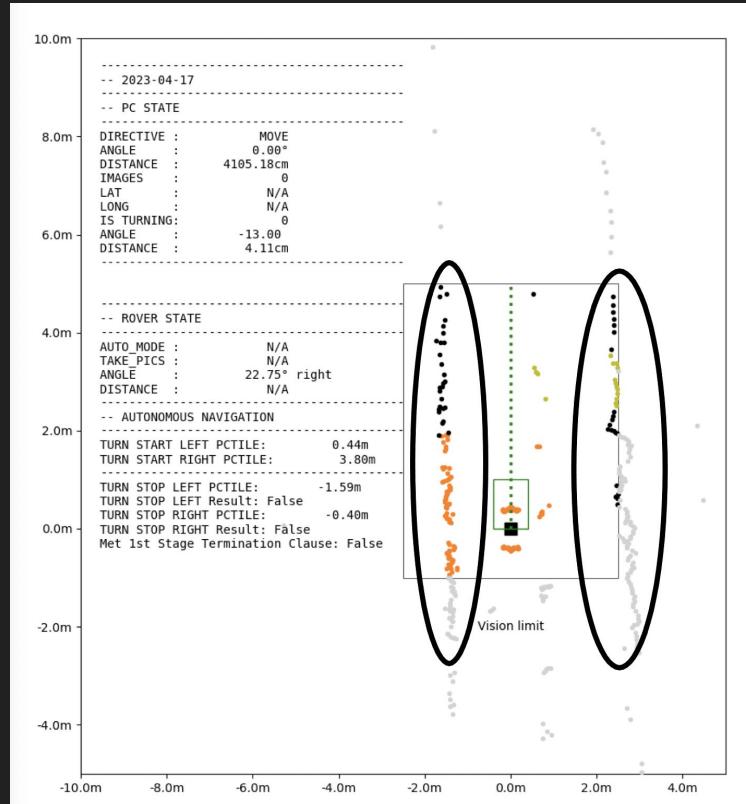




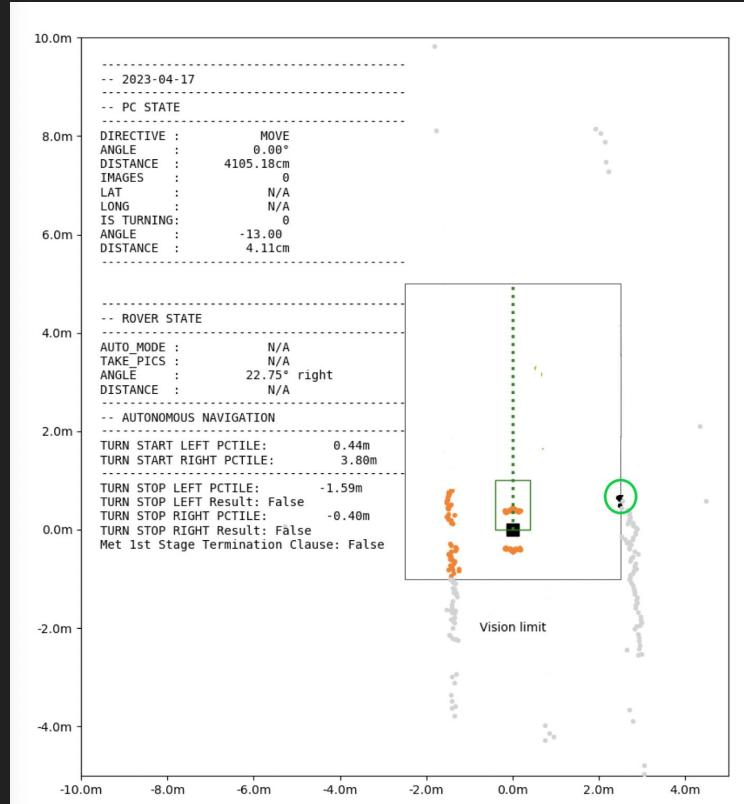
Initial State



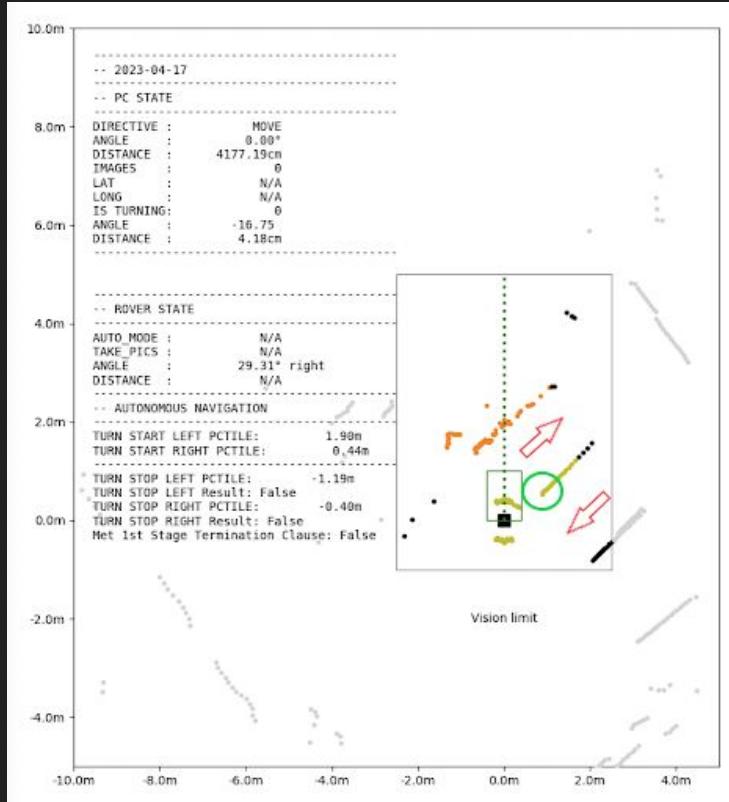
The Rover's View



Turning Threshold



LiDAR Output During A Turn



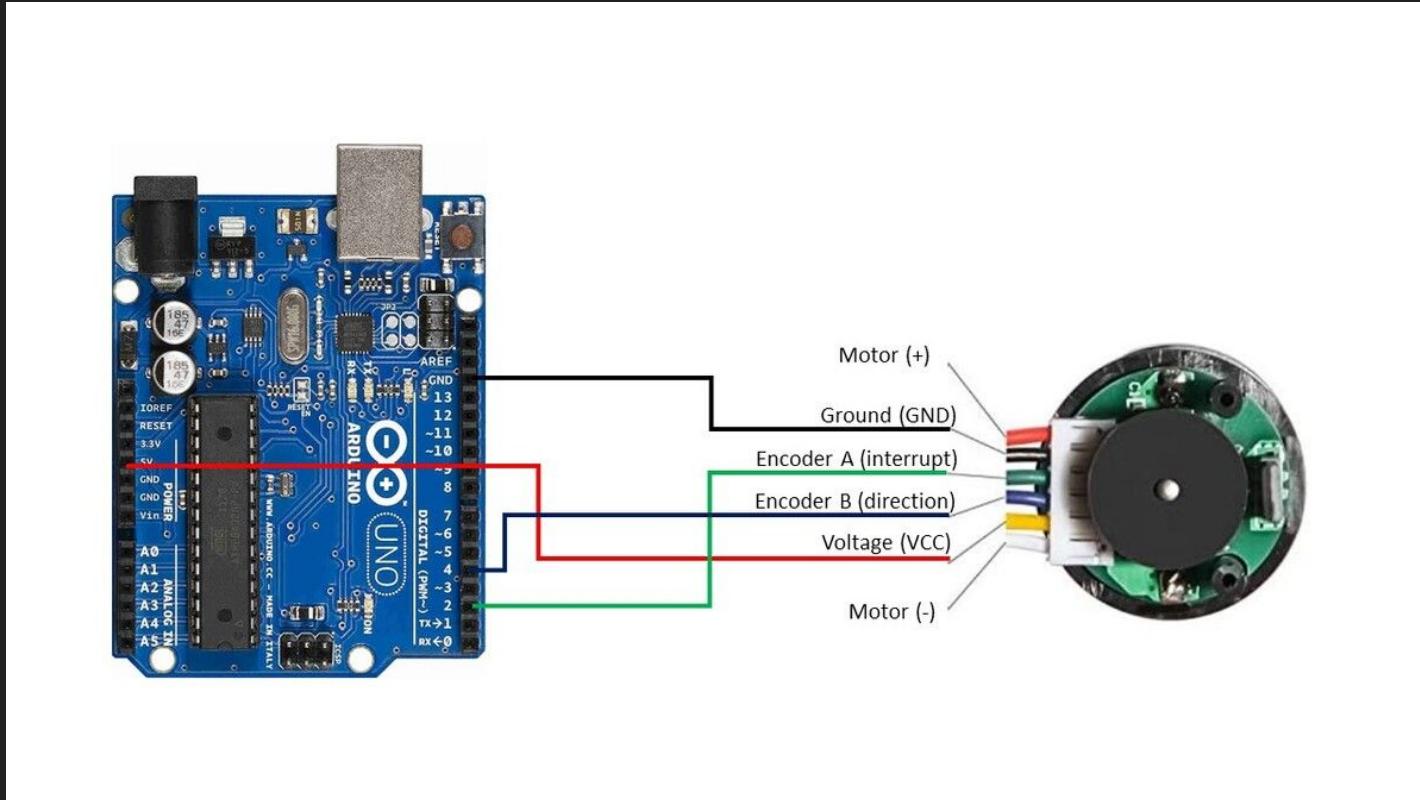
Successful Turn



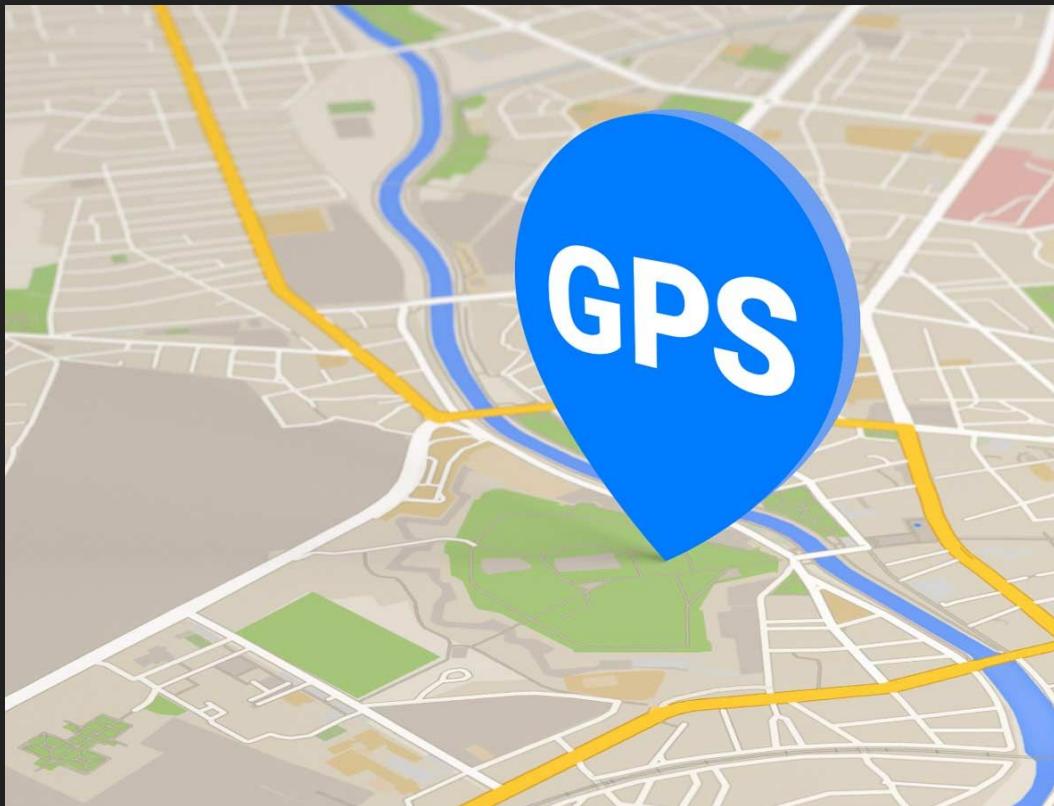
The Consistent Speed Problem



Motor Encoders



GPS



Data Validation/Visualization

Structure of the Vineyard



A	B	C	D	E	F	G	H
row_num	bay_num	num_bucket	bucket1_kg	bucket2_kg	bucket3_kg	bay_gross_l	bay_net_kg
1	01	01	2	9.73	9.26	18.99	17.33
2	01	02	2	7.67	8.53	16.20	14.54
4	01	03	2	4.80	8.96	13.76	12.10
5	01	04	2	7.33	9.37	16.70	15.04
6	01	05	2	10.34	6.05	16.39	14.73
7	01	06	2	6.95	9.92	16.87	15.21
8	01	07	2	7.78	5.71	13.49	11.83
9	01	08	2	5.74	8.56	14.30	12.64
10	01	09	2	9.22	6.95	16.17	14.51
11	01	10	2	5.36	9.12	14.48	12.82
12	01	11	2	6.08	9.30	15.38	13.72
13	01	12	2	10.15	3.60	13.75	12.09
14	01	13	2	7.77	10.04	17.81	16.15
15	01	14	2	9.53	9.67	19.20	17.54
16	01	15	2	8.65	10.29	18.94	17.28
17	01	16	2	8.42	8.13	16.55	14.89
18	01	17	2	9.86	7.38	17.24	15.58
19	01	18	2	9.89	7.69	17.58	15.92
20	01	19	2	10.43	4.37	14.80	13.14
21	01	20	2	9.94	4.53	14.47	12.81
22	01	21	1	6.99		6.99	6.16

Example image of a row

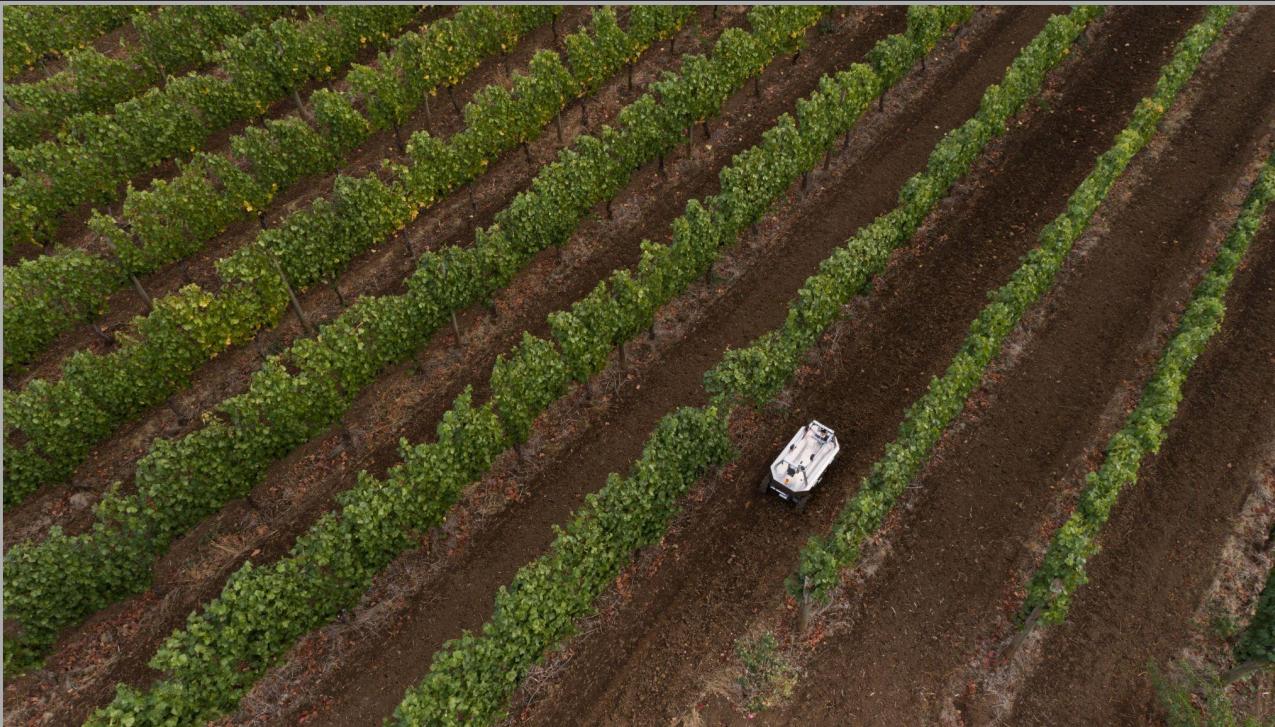
Structure of the Vineyard



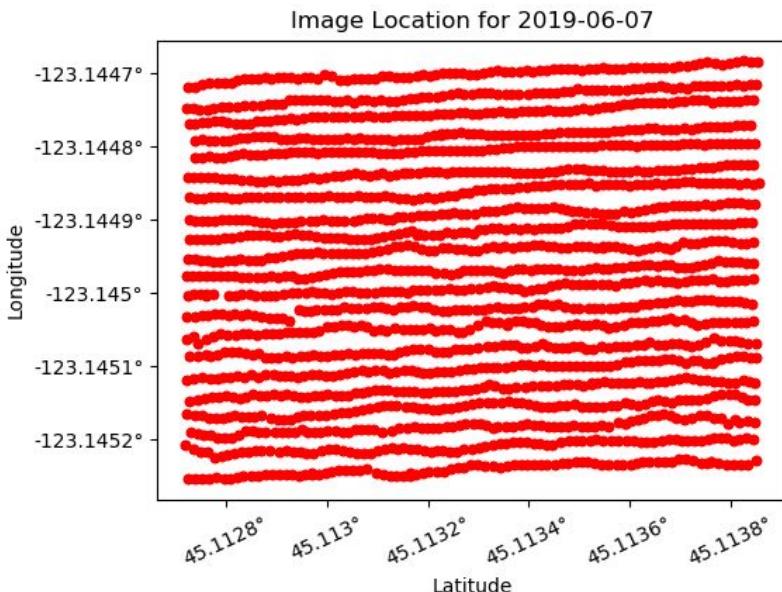
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4	01	03	2	4.80	8.96	13.76	12.10
5	01	04	2	7.33	9.37	16.70	15.04
6	01	05	2	10.34	6.05	16.39	14.73
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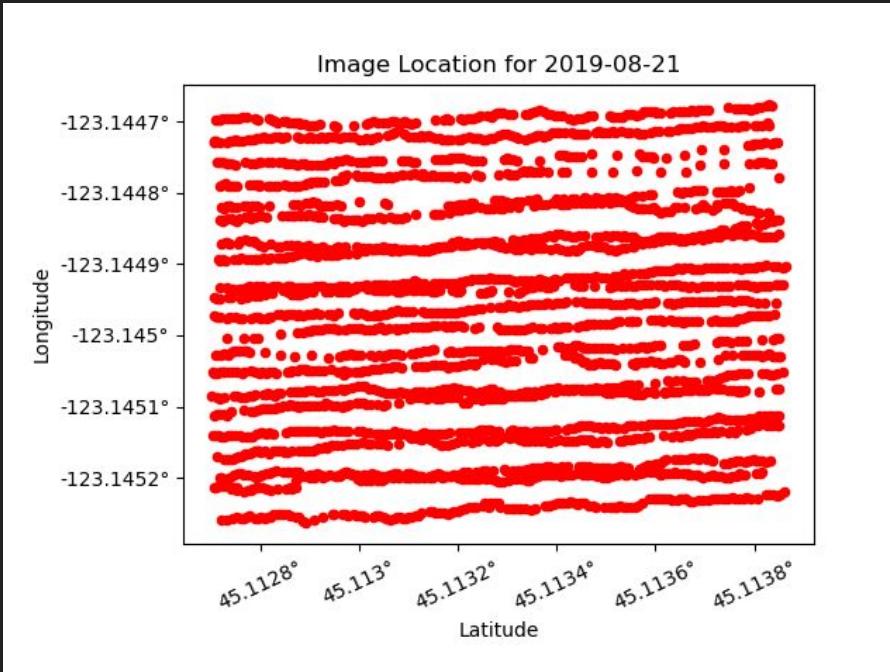
GPS Inaccuracies



Visualizing GPS Data

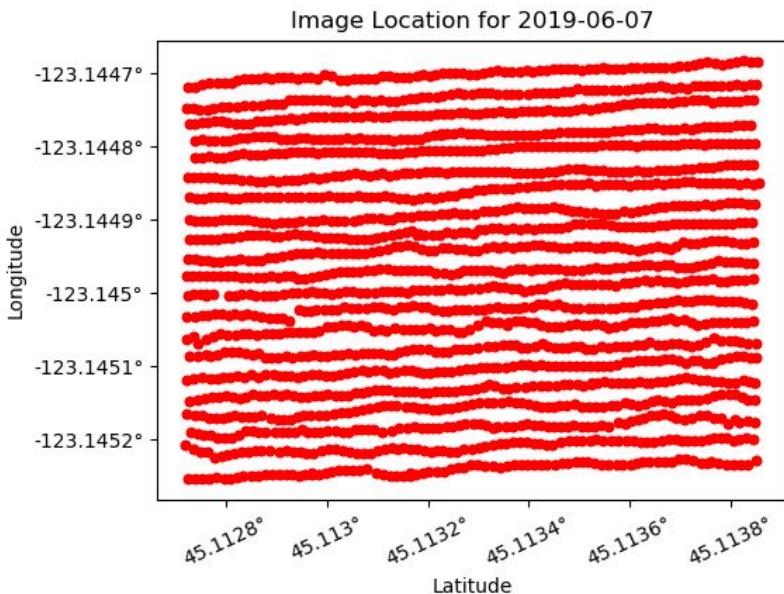


Weather.com recorded a high of 61°F on this day

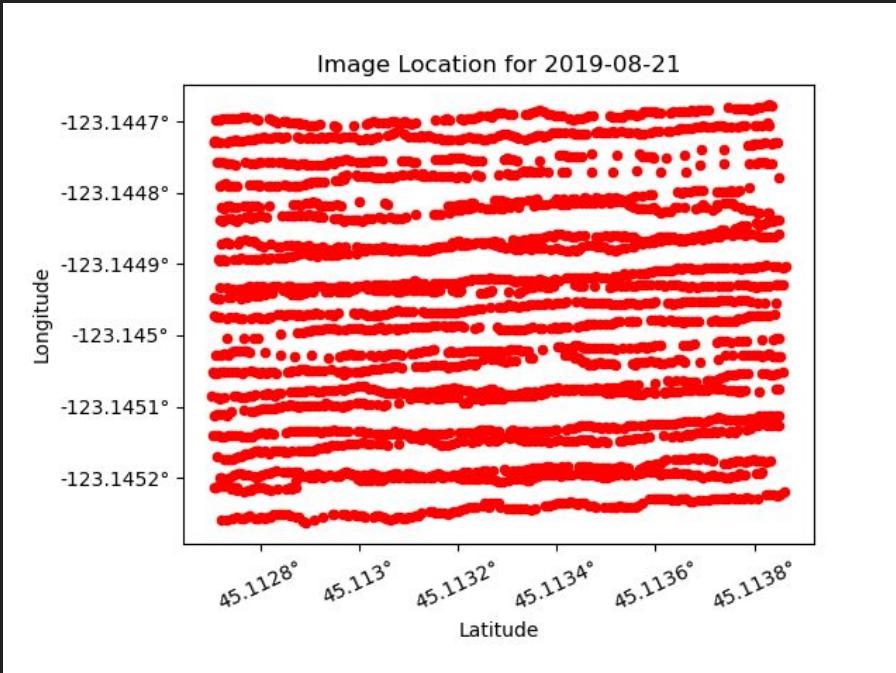


Weather.com recorded a high of 96°F on this day

Visualizing GPS Data

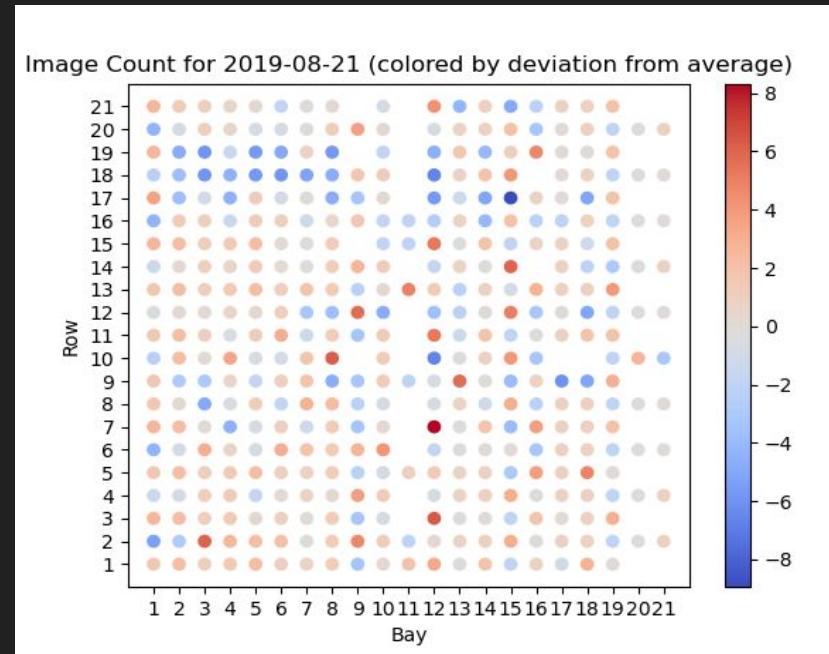
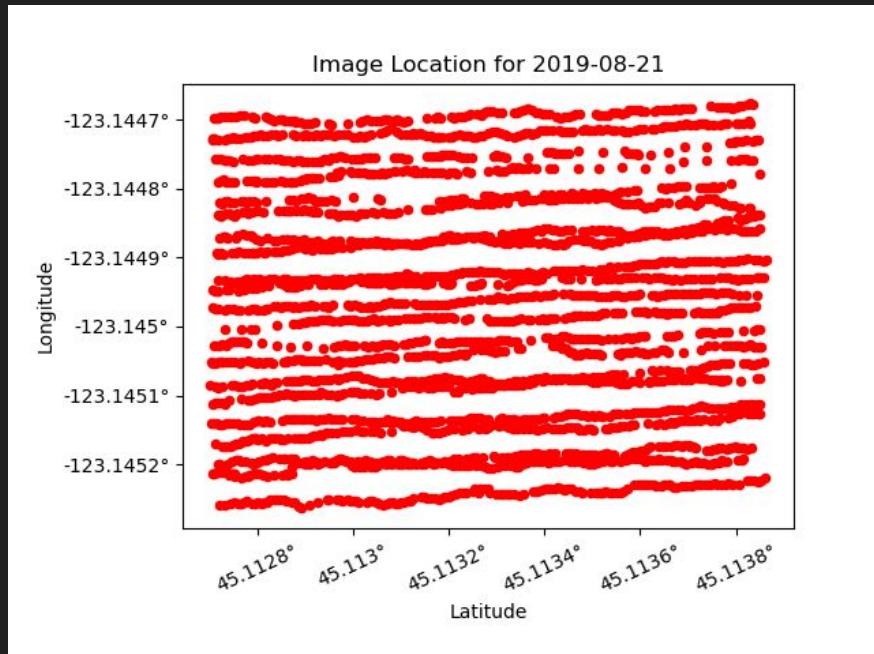


Weather.com recorded a high of 61°F on this day

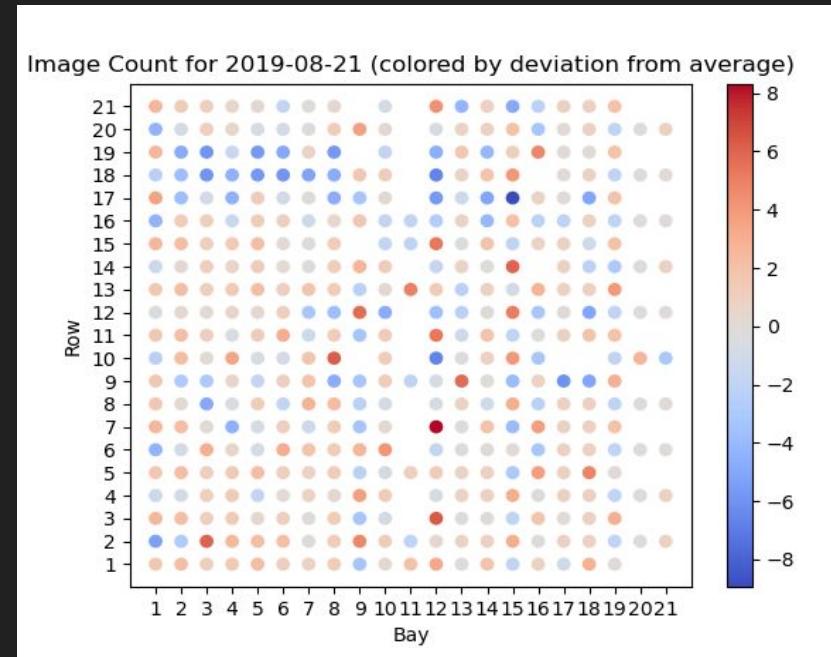
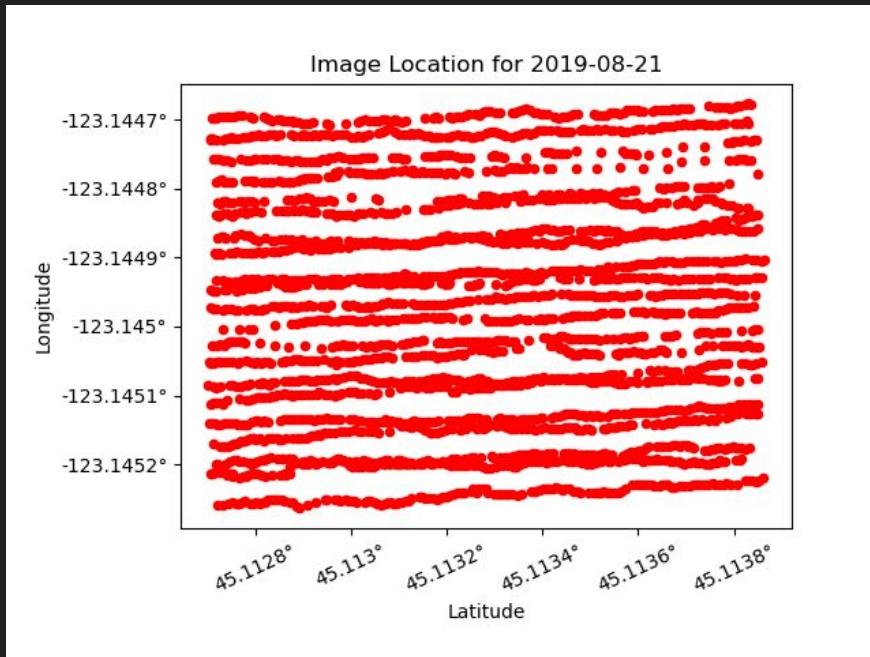


Weather.com recorded a high of 96°F on this day

Additional Verification



Additional Verification



Post-Tagger & HMM



Example of a image with a clear post



Example image that could result in a false positive

Due to post seen in the background

Post-Tagger & HMM



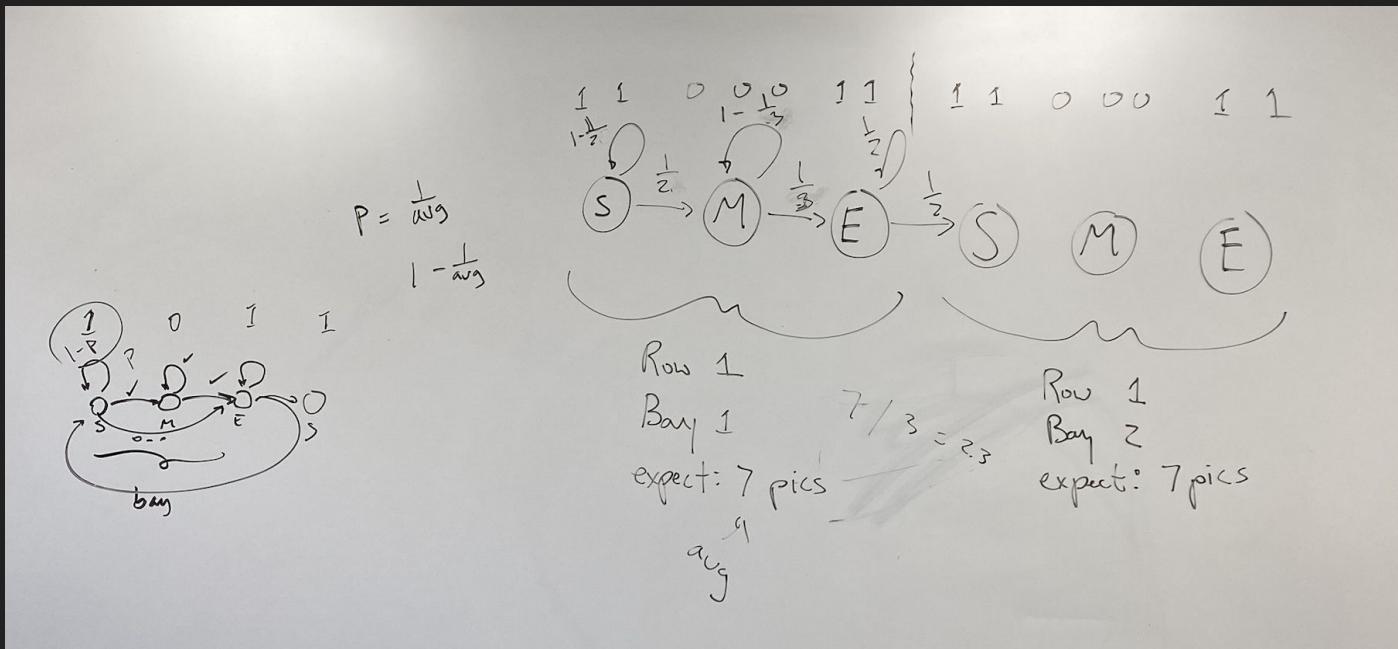
Example of a image with a clear post



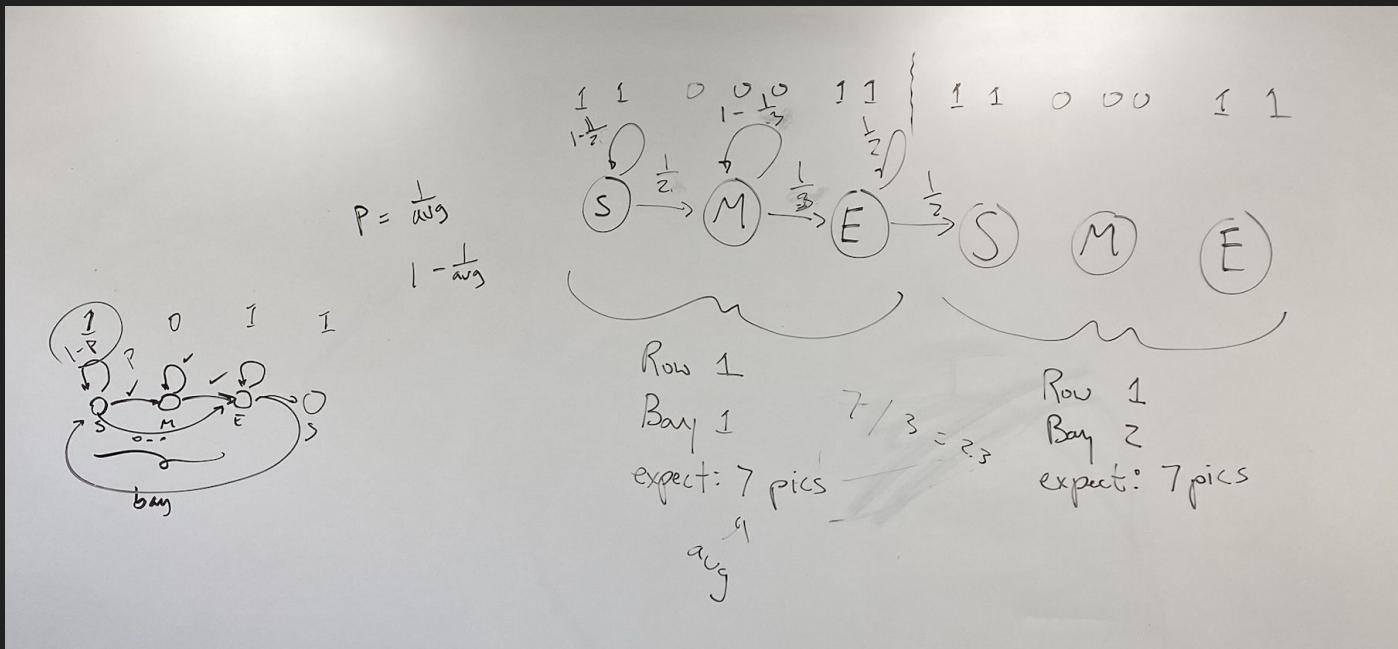
Example image that could result in a false positive

Due to post seen in the background

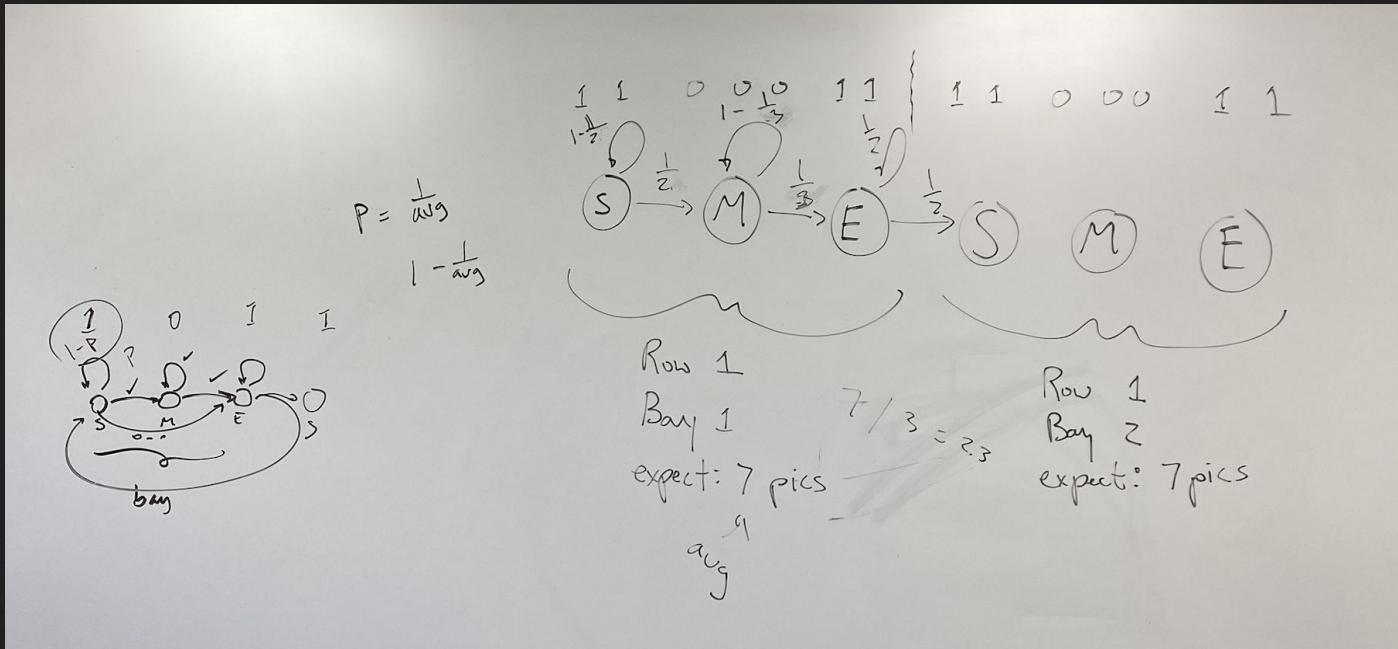
Hidden Markov Model (HMM)



Hidden Markov Model (HMM)



Hidden Markov Model (HMM)



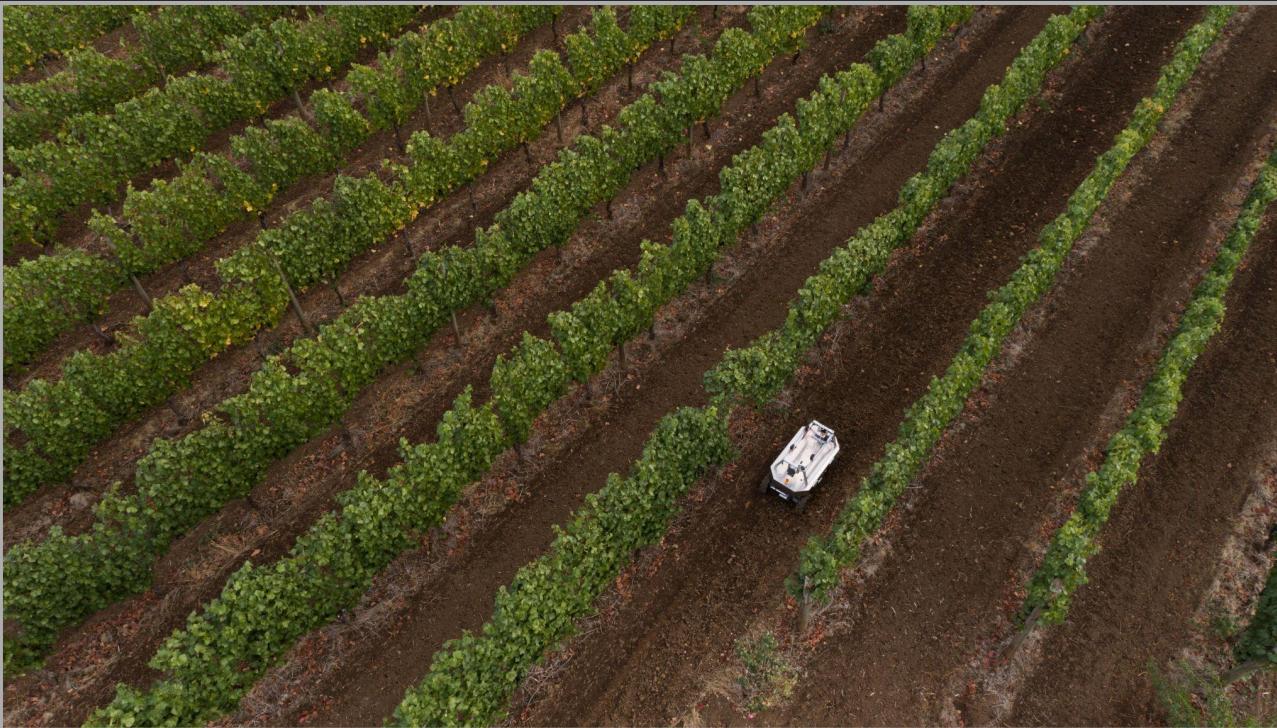
Successes & Work for Next Year

- 2019: ✓
- 2020: ✓
- 2021: ✗
- 2022: ✗

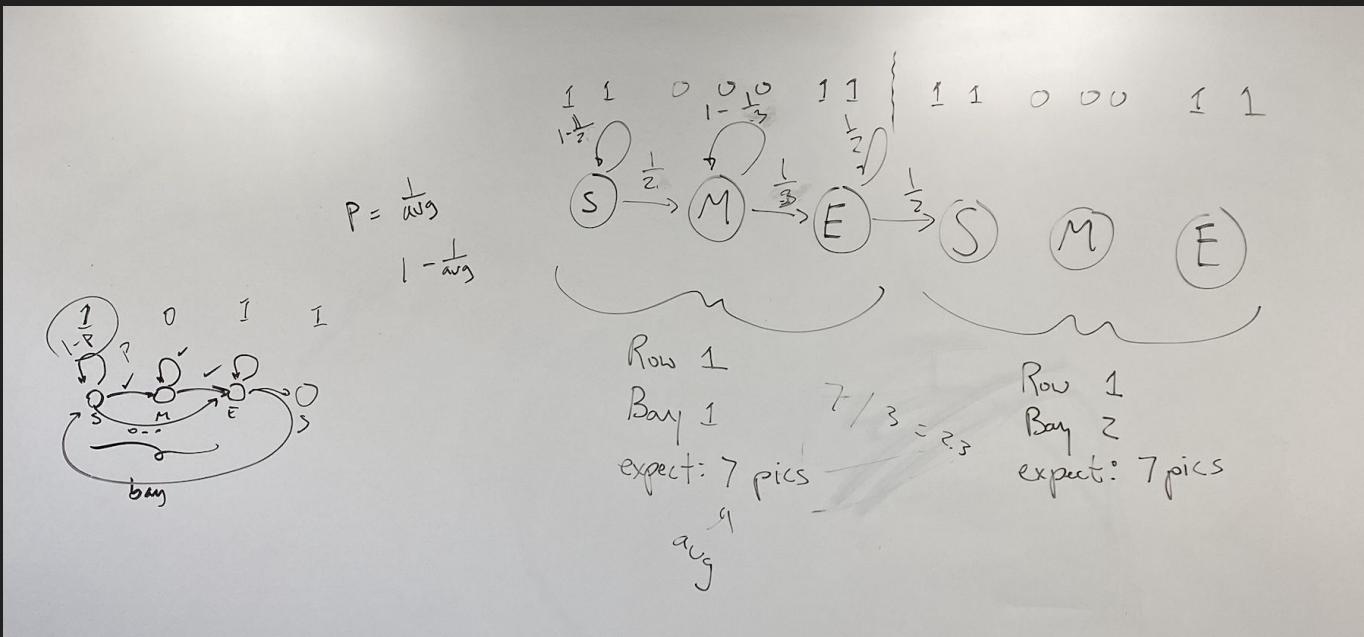
Data Issues



Bay Size Variability



More Refined States



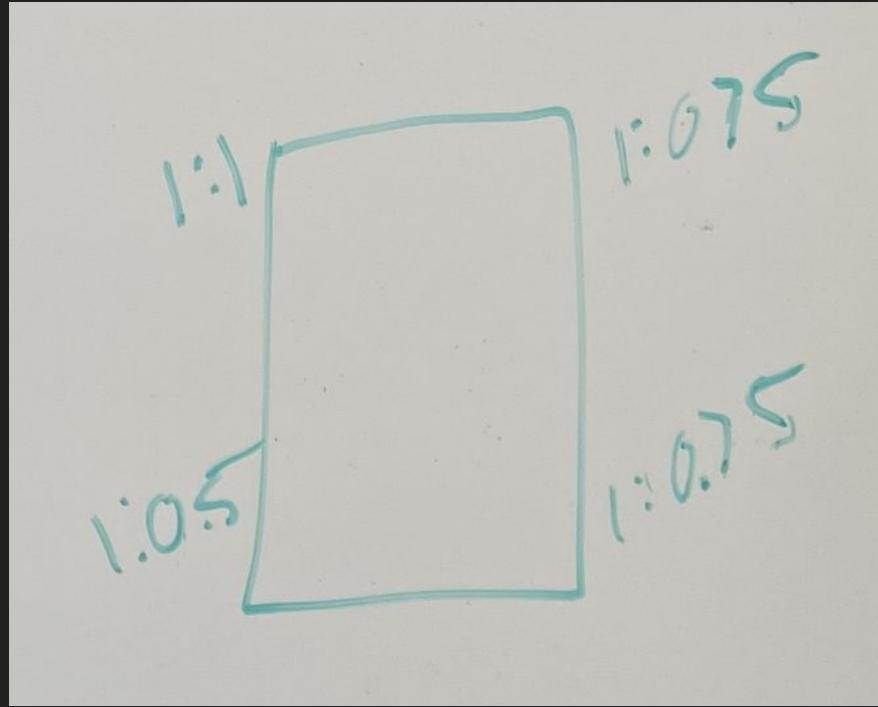
Adaptive Speed Issues



Adaptive Speed Issues



Turning Gear Ratios



Looking Forward



Looking Forward



Looking Forward



Looking Forward



Looking Forward





Thank You

