



Smart Vine Monitoring

Arturo Nunez Gomez, Jonathan Vialpando, Ethan Shea, Dr. Roya Salek Shahrezaie
Department of Computer Science, Sonoma State University, Rohnert Park
As part of a CS 470 Capstone Project with Dr. Gurman Gill



Background

- Iron Horse Winery has 139 acres of grapevines
- Leaf diseases can spread quickly across vines
- Manual detection is time-consuming and not scalable

Objective

- Develop a YOLO-based AI model that can detect diseased or unhealthy vine leaves in Iron Horse Vineyards.

Current Results

		True	
		Unhealthy	Background
Predicted	Unhealthy	46	37
	Background	69	0

- Accuracy: 47.00%
- Recall: 42.60%
- mAP50: 38.97%

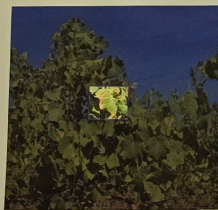
Pipeline



Dataset

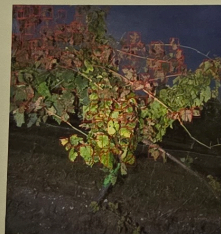
Iron Horse:

- 4 360 degree videos -> 250 Unlabeled Images
 - Parsed with Python to get the images
 - Manually labeled unhealthy leaves



Expertized Database:

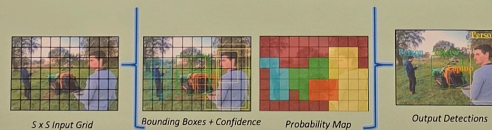
- ~1,000 labeled images
 - Prelabeled diseased leaves
 - Imported into Google Colab to train on



YOLO

• You-Only-Look-Once

- An object detection model that identifies objects and their locations in an image



• How YOLO was used

- Started with a pre trained YOLO model
- First trained on the Expertized data set
- Then fine-tuned on the Iron-Horse data set to adapt to the differences between both data sets
- Final model was used to detect unhealthy leaves

Discussion

• What's worked so far:

- Successfully build a pipeline that goes from 360 degree videos and ends with unhealthy/diseased detection

• Challenges we faced:

- The pre-trained model that we are using only achieved ~50%
- We have limited and low quality data to work with
- Difficult to label hundreds of images accurately and efficiently

• Future Plans:

- Adding more labeled data to improve our model
- Expand our data set (lighting, seasons, vine condition)