SENIOR CAPSTONE/
SENIOR DESIGN EXPERIENCE
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RAPID ACQUISITION FOR THINGS DASHBOARD (RATDASH)

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Objective

- Produce a prototype of a sensor data-tracking system for use in industry and research
- Develop a viable business model based on the software with a 20% ROI
- Demonstrate the use of RATDash in winemaking as an example industrial application

PROBLEM: Data tracking can be difficult and require intermittent physical sampling of a process, which is labor-intensive and occasionally destructive.

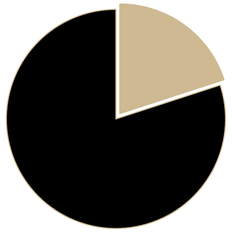
SOLUTION: Data dashboards and sensor systems provide continuous monitoring and precise control.

Market Analysis

- **Using a subscription-based model…**

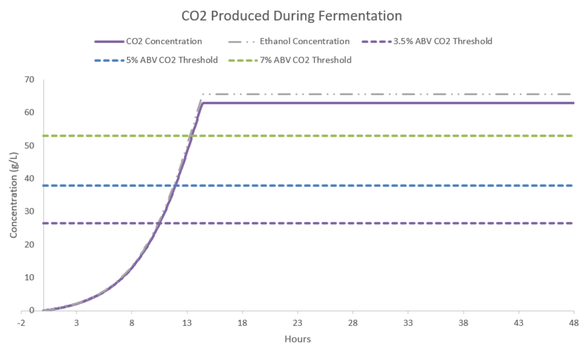
RATDash costs $37 per monthly subscription

- RATDash can prevent spoilage implementing controlled precision fermentation and precision pasteurization.
- Through precision pasteurization alone, RATDash can prevent loss of at least $10,509., cost of spoilage of a barrel.



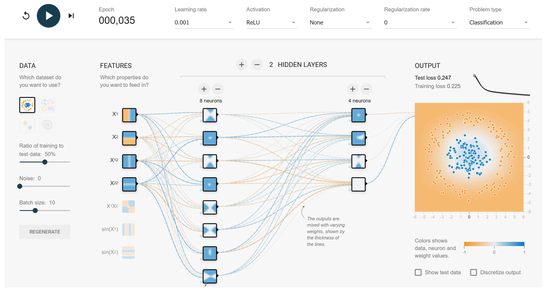
20% of the 11,000 vineyards in the US use specialized vineyard software.

EXPLORING RATDASH'S USE IN THE WINEMAKING INDUSTRY



..FOR OPTIMIZATION: CO2 Thresholds for Fermenting

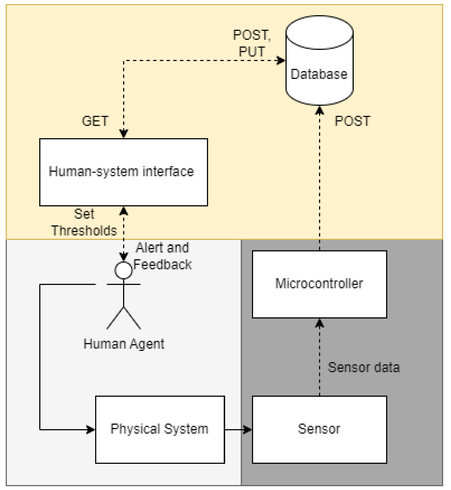
The Maiorella model was used for modeling fermentation over time. CO2 has a direct correlation to fermentation progress and CO2 thresholds can be set to alert human users when fermentation is finished. These dashed lines represent thresholds corresponding to 3.5, 5, and 7% ABV while the purple line represents CO2 concentration.



Flash Pasteurization (15sec): 25°C -> 74°C -> 4°C

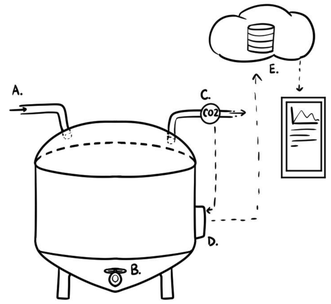
..FOR LOSS PREVENTION: Machine Learning Classifier

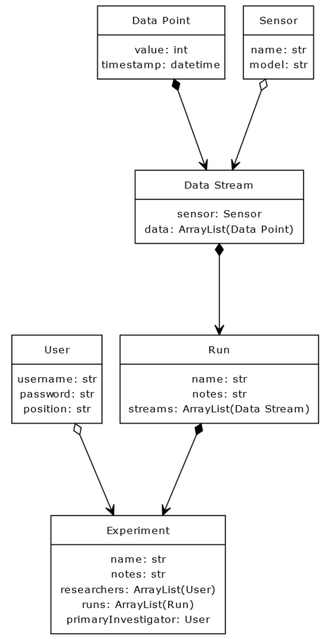
A machine learning model was developed that used data for pressure, temperature, flow rate, and CO2; sensors included in the equipment (KHS Group, 2014). The model will in real time classify the wine profile determined by the user (ie. [dry, off-dry, sweet]), when the profile deviates from the expected profile determined by the user, it would remediate the process.



↑ ***Bridging the gap…:*** *RATDash is an application for the display and logging of data from physical systems such as fermentation vats. It alerts and informs human agents to changes in sensor readings.*

→ ***..And keepin' it organized.:*** *RATDash was designed for multiple users to have access to data being transmitted by sensors. It was ultimately designed to be a dashboard and digital experimental notebook. This image represents a UML diagram showing RATDash's backend data model, which is split between Redis (data streams) and MySQL (everything else).*





Software Stack

RATDash was developed using:

- Flet – A Flutter UI toolkit for Python
- Redis – For sub-millisecond latencies in sensor data acquisition
- MySQL – For persistent data such as user login information
- FastAPI – For HTTP request handling

Machine Learning Model:

- Tensor Flow

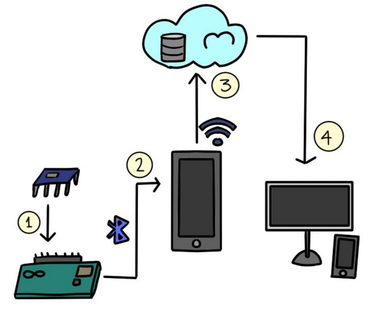
Design Considerations

Security	Transparency	Economics
SHA 256 hashed passwords	Open-source design	Low cost for accessibility

The Future of RATDash

Plans for RATDash include:

- Continuing building the frontend
- Adding Bluetooth support to a mobile application
- Statistical and analytical features for research and industry alike
- Moving away from Redis towards an open-source alternative.
- Possible development into an actual company.



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