

HALO: High Autonomous Low-SWaP Operations

Team Members:

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Progress Matrix of Milestone 2

Task	Completion %	Sloan	To Do
Literature Review	95%	Research	Slightly more reading
Post Processing Scripts	80%	Find or develop post processing scripts	Finish writing
8-bit Representation	80%	Find 8-bit representation packages	Finish writing post processing scripts
4-bit Representation	0%	Find 4-bit representation packages	Implement

Discussion of Accomplished Tasks for Milestone 2:

- **Literature Review**
 - The goal of the literature review was to gain more knowledge and understanding of post-processing scripts and available 4-bit representation packages.
- **Post-Processing Scripts**
 - Currently, a neural network is running on the Raspberry Pi 5 AI HAT+; however, the software packages that are being used do not come with their own post processing scripts. As a result, the model's detections are only displayed as raw terminal output. In order for there to be more than just terminal output; i.e., for there to be actual object detection running with logged detections and bounding boxes, the terminal outputs need to be run through custom post processing scripts. These scripts take the terminal outputs and turn them into a visualization that shows proper object detection. Custom post processing scripts are currently being written, and they work to some extent, but they still need to be tweaked so that they accurately and consistently represent the detections.
- **8-bit Representation**
 - Technically, the neural network is running off of an 8-bit representation; however, it can not be fully demonstrated through visual representation, as the custom post processing scripts still need to be modified. There is still neural network tensor output on the terminal; however, that is not a sufficient demonstration of functionality.

- **4-bit Representation**

- Since the 8-bit representation could not be fully achieved, I was not able to move on to the 4-bit representation packages. This representation will most likely require us to move from the Raspberry Pi 5 AI HAT+ to one of the Jetson computers, as the Raspberry Pi will most likely not have the proper software and hardware support required for the 4-bit representation.

Discussion of Contribution to Milestone 2:

- **Sloan Hatter:** Tasks contributed to this milestone include literature reviews on 8 and 4-bit representations for neural networks deployed on Low SWaP hardware. Tasks also include writing custom post processing scripts for the 8-bit representation in order to provide an accurate visual demonstration of the neural network performing object detection.

Task Matrix for Milestone 3:

Task	Sloan
Finish up Post Processing Scripts	100%
Demonstrate 8-bit Representation	100%
4-bit Representation	100%

Discussion of Planned Tasks for Milestone 2:

- Finish up Post Processing Scripts
 - In order to fully demonstrate that a neural network is running and performing proper object detection, the custom post processing scripts need to be completed.
- Demonstrate 8-bit Representation
 - After the custom post processing scripts are completed, I should be able to fully demonstrate that the hardware is running object detection on an 8-bit representation, providing a clear benchmark for the system's capabilities. The 8-bit representation serves as a crucial step in verifying quantize model performance, ensuring that reduced precision does not compromise detection accuracy or stability.
- 4-bit Representation
 - Once 8-bit representation can be fully demonstrated, I can move on to 4-bit representation packages and more easily write post processing scripts or find 4-bit specific scripts to use. Transitioning to 4-bit representation will further reduce memory and computational requirements while also serving as a test for the model's limitations when it comes to maintaining accurate, real-time object detection.

Date of Meetings:

- 10/3/25
- 10/17/25
- 10/24/25

Client Feedback on Milestone 2:

See Faculty Advisor Feedback below.

Faculty Advisor Feedback on Milestone 2:

- Literature Review:
- Post Processing Scripts:
- 8-bit Representation:
- 4-bit Representation:

Faculty Advisor Signature: _____ Date: 29 Sept 2025

Evaluation by Faculty Advisor

Sloan Hatter	0	1	2	3	4	5	5.5	6.5	7	7.5	8	8.5	9	9.5	10
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Faculty Advisor Signature: _____ Date: 29 Sept 2025