Summary of Research Progress Since the Last Report:

Maze assay to measure cognitive decline:
The primary focus of my recent efforts has been on advancing the maze assay project to measure cognitive decline. I have worked on transitioning my model pipeline from a non-generalizable keypoint detection network, to a cutting-edge library called mmpose, capable of using various models. I have begun some initial analysis of the aged C57BL/6J dataset which I plan to write up into a NeurIPS manuscript that I'll submit by the end of May.

Key achievements since the last meeting include:

- Developing a pipeline to convert previous keypoint detection annotations to the new library/method
- Execution of experiments on the remaining aged C57BL/6J mice
- Preliminary analysis of both 5XFAD and aged C57BL/6J mice

Homeostatic behaviors:
I have made significant progress on this project, with most figures and analyses being complete. I will soon have my finalized dataset and have plans to make final versions of the figures this summer. Efforts towards unsupervised clustering were inconclusive, which prompted us to revert to the original analysis approach. Manuscript writing is in progress, with draft versions of many sections already completed.

- Presented a poster of my work at The Allied Genetics Conference
- Gave a talk at the JAX Data Science Symposium
- Presented my work at an invited talk at La Sierra University Biology department (alma mater)

Grants:

- Resubmitted F31 for December 8th deadline
    - Got improved scores ad feedback compared to previous submission
    - Unfortunately, it did not get discussed. Seems like the biggest hurdle is still my lack of papers so far from grad school.
- Applying to SIG-HPC fellowship

Summary of Research Plans for 2024 Spring TAC meeting:

Before the next TAC meeting this Fall, my focus is on finalizing versions of figures, completing manuscript writing, and submitting the homeostatic manuscript to Nature Communications. I will be spending a lot of time analyzing the aged C57BL/6J maze data to show interesting results on the impacts of aging on cognitive decline. I am also applying to the SIG-HPC fellowship and plan to also apply for the NIH's Artificial Intelligence/Machine Learning Consortium to Advance

Health Equity and Researcher Diversity (AIM-AHEAD) fellowship once they open up a new cohort later this year.

Highlights of Results:

A significant portion of my time and effort was dedicated to upgrading the maze keypoint detection network, which I'll present during the meeting.

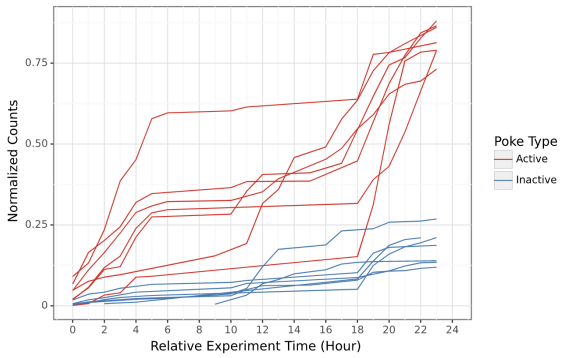
Maze assay to measure spatial learning and cognitive flexibility

Building on my previous findings, I performed preliminary analysis of both 5XFAD and aged C57BL/6J mice. Last time, I presented several levels of learning. This time I show preliminary analysis on my 5XFAD mice and my aged C57BL/6J mice.

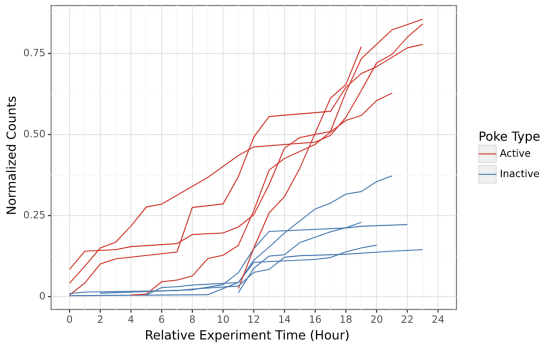
While the 5XFAD mouse data is currently **inconclusive**, I am in the process of investigating analysis bugs. It appears as though the control 5XFAD mice are not learning spatial navigation. We have a few hypotheses that we are investigating to determine the cause. Hypothesis: The aged control B6-SJL 5XFAD mice barber the other mice' whiskers, causing them to have a deficit in navigation. We are in the process of checking this. The preliminary data from aged C57BL/6J experiments indicate promising results, with 15-month-old mice exhibiting faster adaptation during reversal learning compared to 25-month-old counterparts.

5XFAD Analysis:

Mutant nose pokes

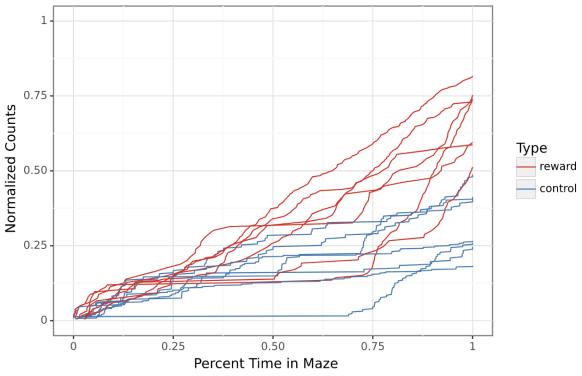


Control nose pokes

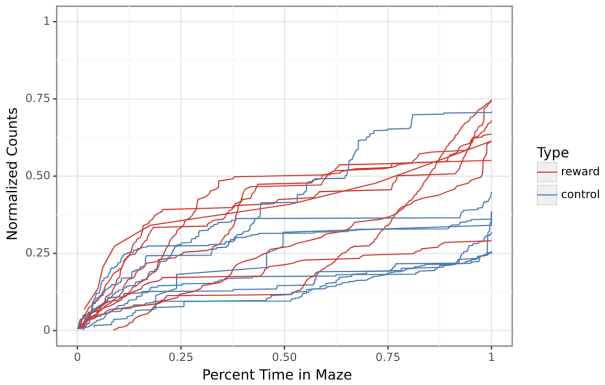


Mutant paths to reward

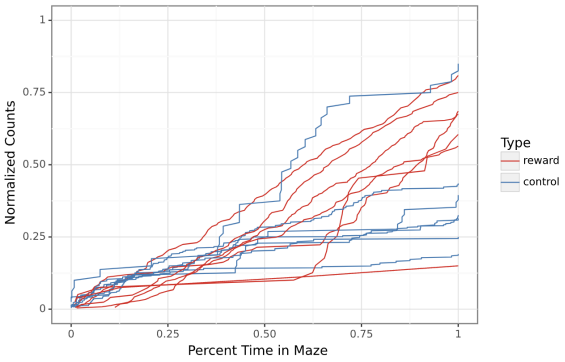
Control paths to reward

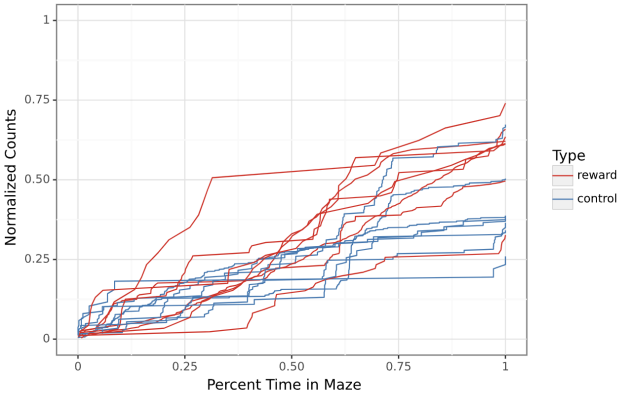


Mutant paths to new reward



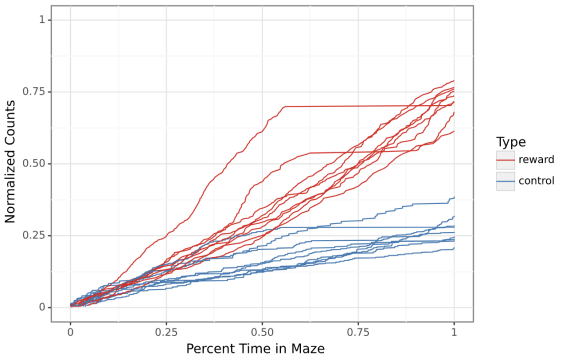
Control paths to new reward



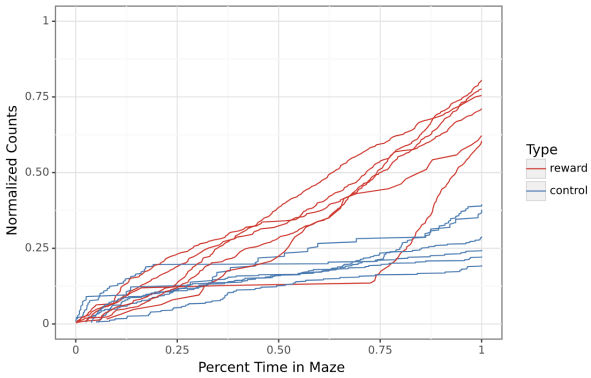


I also ran aged C57BL/6J experiments and have some of the preliminary data for that.

15-month old paths to reward

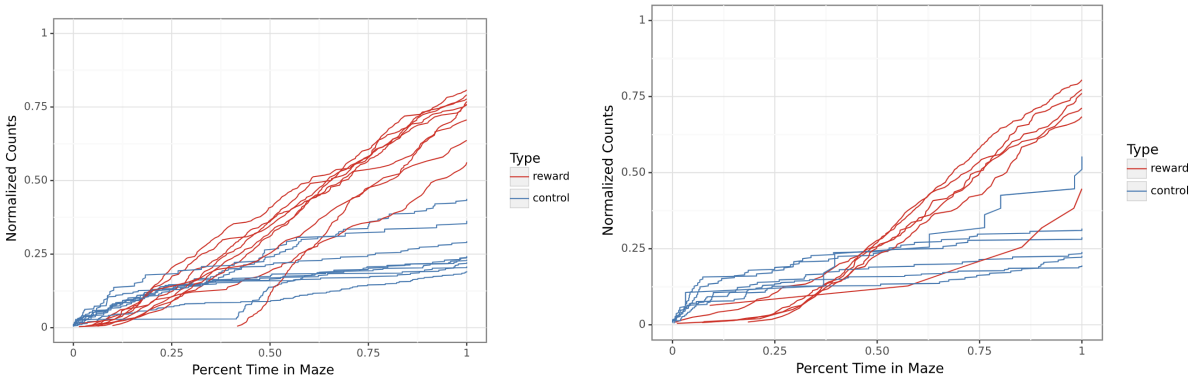


25-month old paths to reward



15-month old paths to new reward

25-month old paths to new reward



Appears as though they both learn the initial path and discriminate. The 15-month old mice seem to understand/learn the reversal swap quicker than the 25-month old mice.