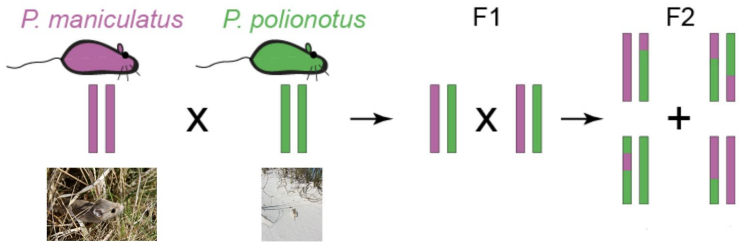
# Exploratory Mice Behavior

Capstone Group FY1821

# Project Goal

**Goal**: link the exploratory behavior of mice to their genetic makeup.

- Two pure strains of mice are known to behave differently in the wild
- One strain is used to open areas and is willing to explore, the other prefers to hide in enclosed spaces
- By breeding the mice with one another, we create offspring with combinations of the genes of each strain of mouse.

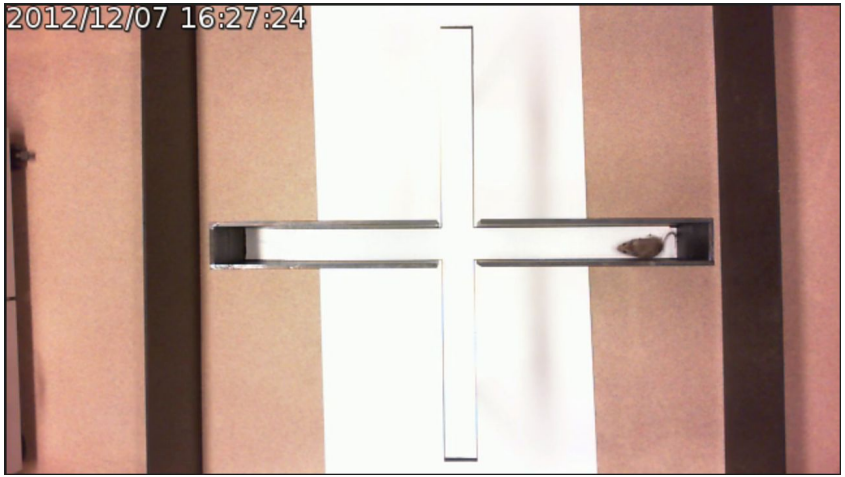


# Methodology

- Find quantifiable behaviors where the two pure breeds differ
- Calculate the differing behaviors for offspring of each breed
- Use these differences to find out which of the offspring exhibit each behavior
- Determine which genes lead to a quantifiable difference in behavior

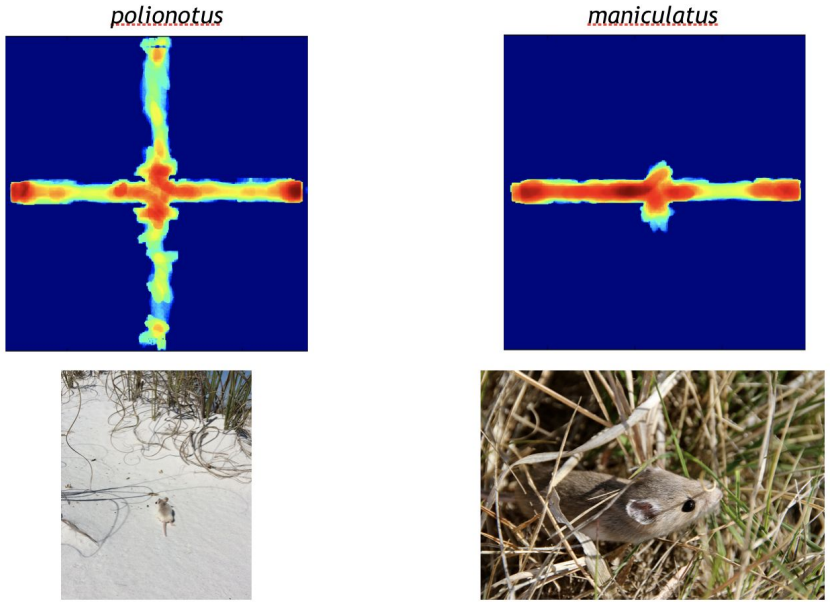
# Experiment

- Drop each mouse into a maze
- The left and right arm of each maze have walls (Closed arms)
- The top and bottom arm of each maze have no wall (Open arms)
- Record the mouses movements for upto 5 minutes each



# Data Collection

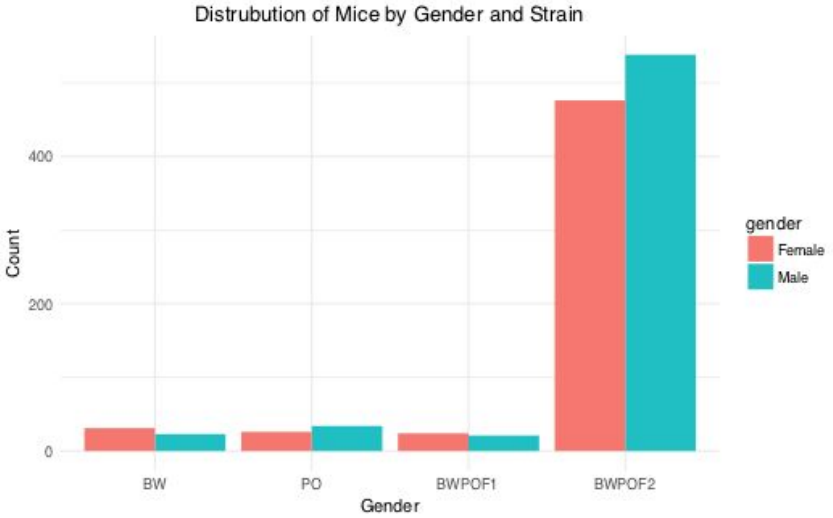
- Video Data
  - 5 min video of each mouse in maze
- Quantitative Data
  - Software tracks mouse location and provides bounding box of location over time
  - Script provided gives us location and speed of mouse over time.



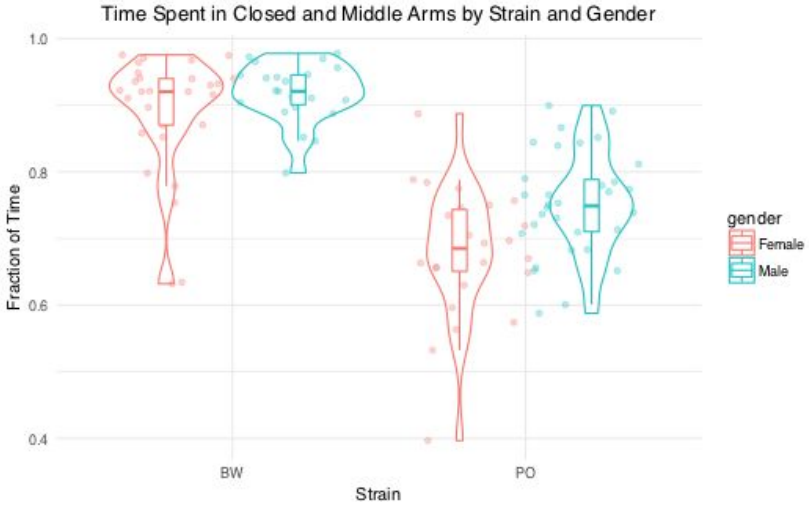

Heat maps of mice in maze

# EDA

1173 mice across four strains




Time in closed arms is clearly different for BW and PO mice (pure breeds)



# Feature Engineering

## List of Features we have

- Fraction of time in each arm
- Median Speed in each arm
- Smoothed* median speed in each arm
- Total distance travelled in each arm
- Smoothed* total distance in each arm
- Number of Entries into each arm

## List of Features plan to add

- Median/Average directional speed per arm
- Fraction of time at rest (In closed/open arms)
- Fraction of time in safety
- Fraction of time peeking
- Average length of peek
- Region to Region Frequency
- Mouse size

# Next Steps

- Calculate all new behavioral features
- Test features using video data to ensure accuracy
- Identify features with significant difference among pure bred species
- Find specific genes that lead to differing mouse behaviors