What is the impact of the training regime on task learning in mice?

Project presented by:
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(The Jimmy Jabs)

INTERNATIONAL
BRAIN
LABORATORY

Immediate Goal-:

- We were interested in looking at the effect of training schedule (‘Fixed’ v/s ‘Flexible’, time of the day) on learning in mice.

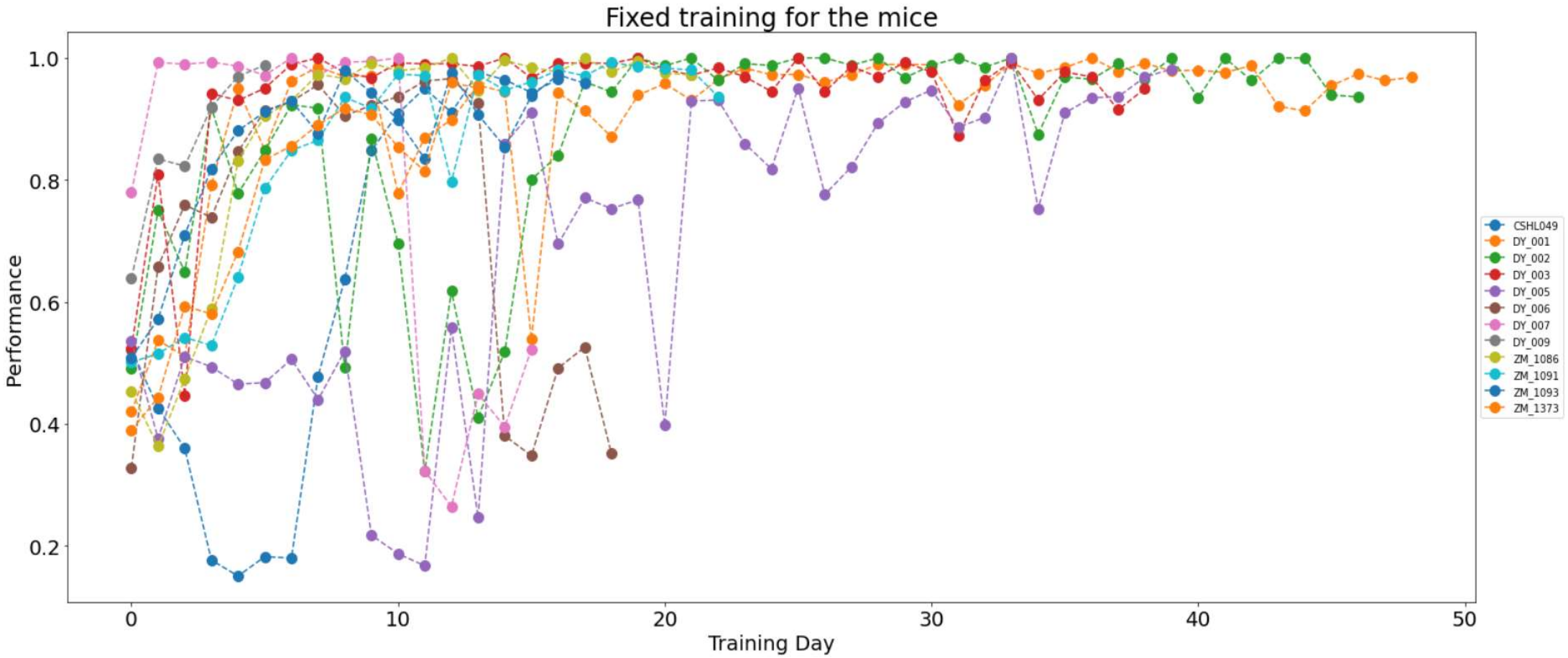
Overall Goal-:

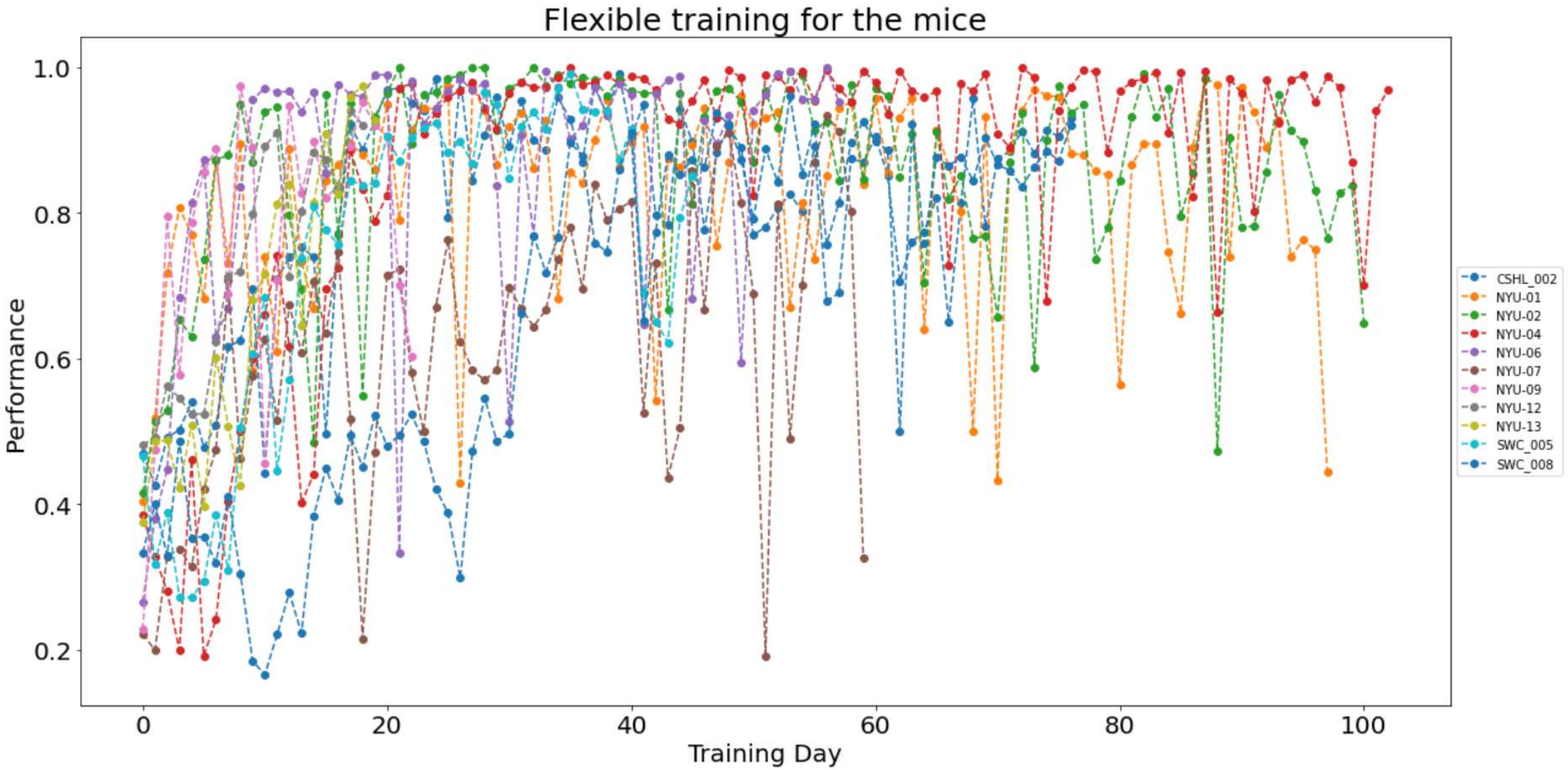
- Impact on cognitive performance. And, can we derive an optimal schedule for any animal based on certain known pointers about their routine?

Data set: The International Brain Laboratory (IBL)

Methodology

- Sorting into ‘Fixed’ and ‘Flexible’.
- Sorting based on the average time of the day.
- Defining the learning rate.
- Plotting the learning curves.
- Comparison.


Fixed training for the mice
Performance
Training Day
1.0
0.8
0.6
0.4
0.2
0
10
20
30
40
50
CSHL049
DY_001
DY_002
DY_003
DY_005
DY_006
DY_007
DY_009
ZM_1086
ZM_1091
ZM_1093
ZM_1373


Flexible training for the mice
Performance
Training Day
1.0
0.8
0.6
0.4
0.2
0
20
40
60
80
100
CSHL_002
NYU-01
NYU-02
NYU-04
NYU-06
NYU-07
NYU-09
NYU-12
NYU-13
SWC_005
SWC_008

What was inspiring?

- Variability detected in training duration, despite following standardized training protocols.
- Hypothesized that different training schedules for the mice might account for the variability.
- Planned to have both qualitative and quantitative analysis to support our claim.

What was challenging?

- Familiarizing with the data was time consuming.
- Data visualization took some time.
- Defining a suitable learning rate.
- Python unfamiliarity.
- Time constraints.

Future Goals:

Implications of circadian rhythm on cognitive learning.

Optimizing the training schedule to ensure rapid and accurate learning in mice.

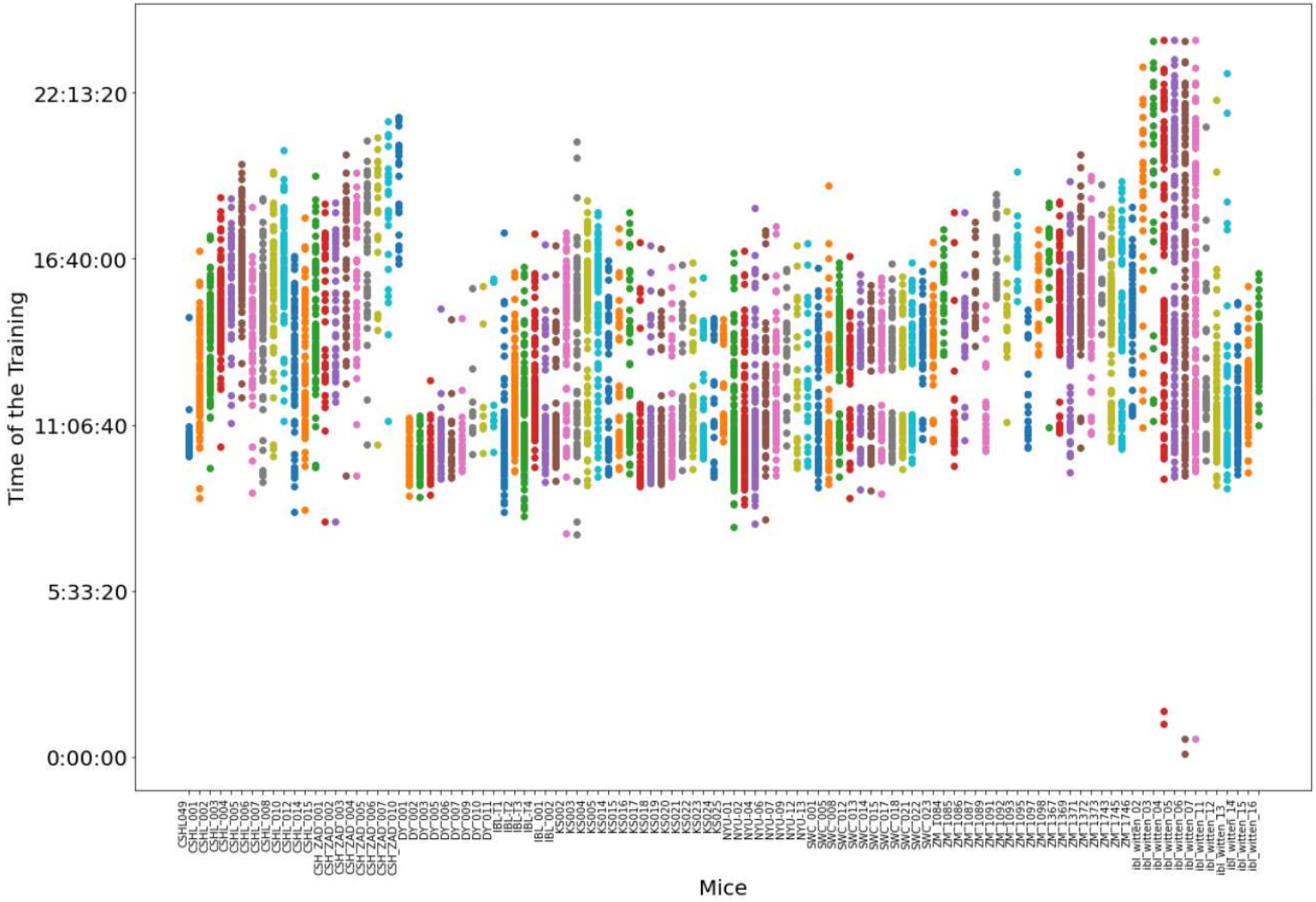
Group Dynamics:

The Brainer - Yatin

The Coder - Reema

The sangfroid - Vinsea

Supplementary Figure



Teacher's Pets

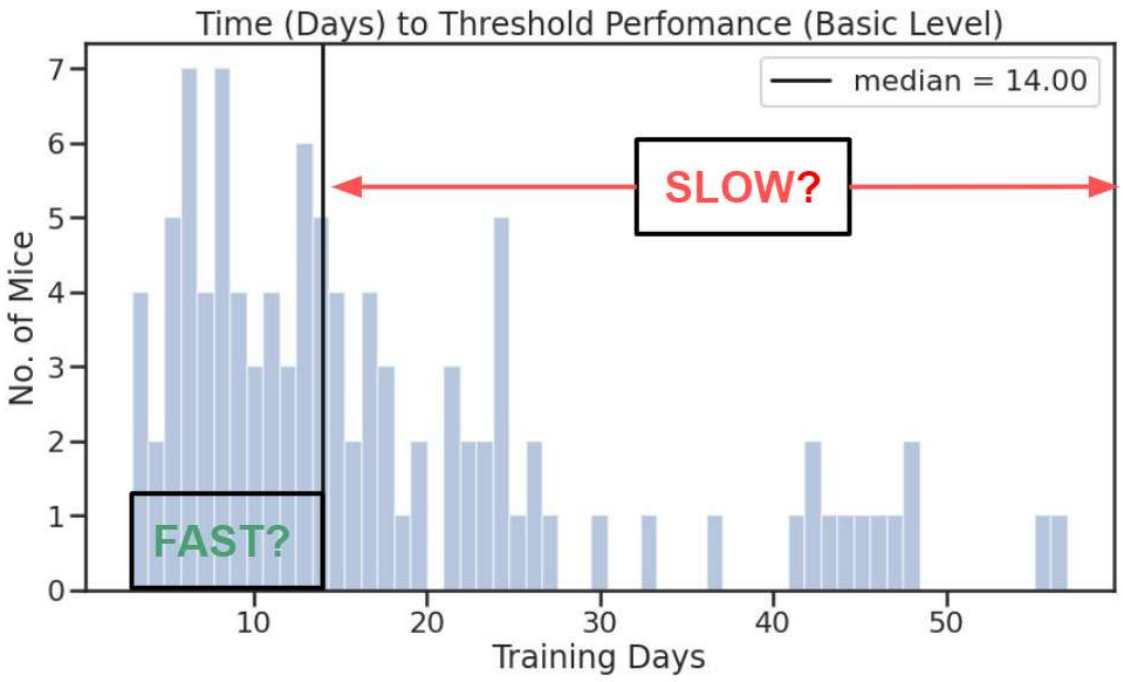
What makes some mice learn faster than others?

neuromatch academy

by Team Hebbian Yearning

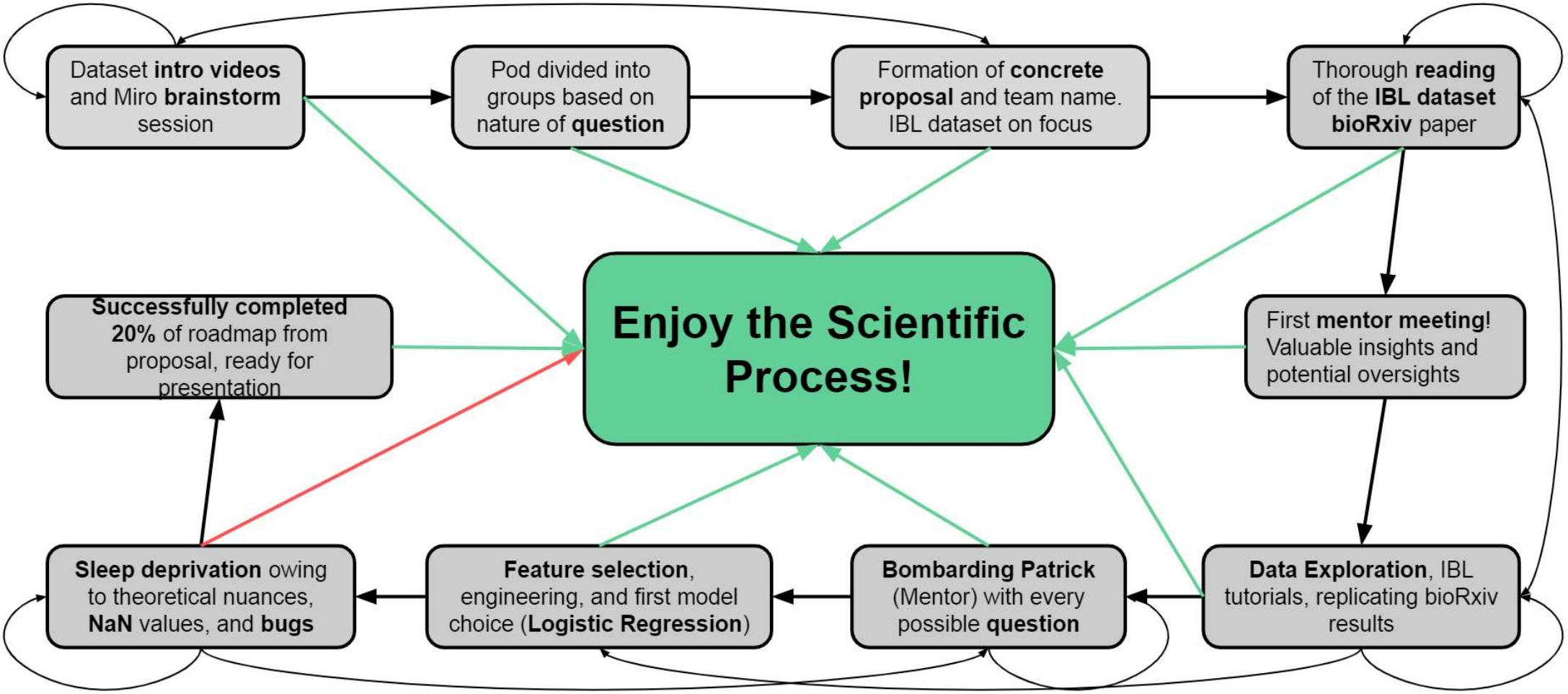
All mice are NOT the same!

- The **Bottom 50%** of mice take **more than 75%** of total training time!
- A naturally expected divide?
- Needs investigation at the individual level
- Does **early performance** hold the key?
- The **IBL Behavioral Dataset**[1] is the right choice!

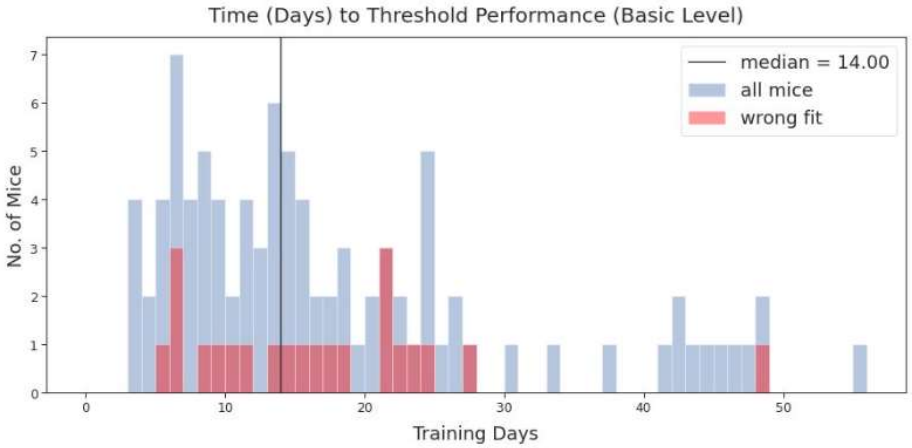


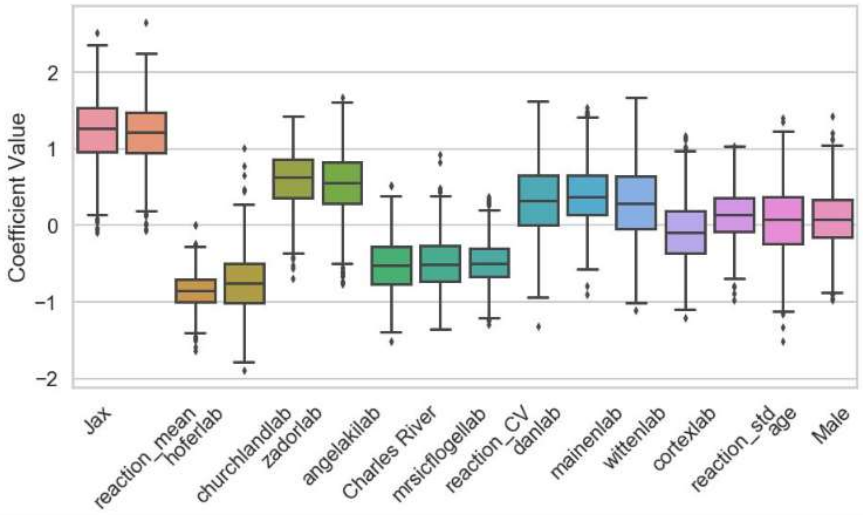
[1] *Laboratory, T. I. B., (2020). A standardized and reproducible method to measure decision-making in mice. BioRxiv, 2020.01.17.909838. https://doi.org/10.1101/2020.01.17.909838*

6 students, 14 days, 101 mice... **1 goal!**



Speed matters





- **Logistic regression** fits data with **~66% accuracy** (chance baseline = 50%)
- **Jackson Lab Strain** mice have the highest coefficient
- Among other factors, **Mean reaction speed in early** (first 200) **trials had** the most weight
- Leads to **further questions**: confounders, traits of incorrectly classified mice, performance on biased stimuli
- **Longer term**: models that can finely reproduce this behavior

Thank You!

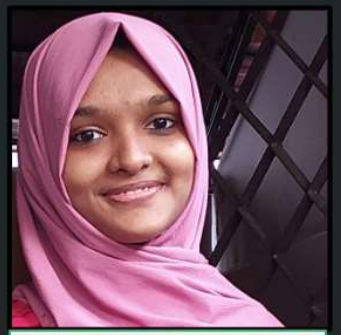
Mentor	TAs (pod-079-valiant-whale)	
		
Patrick	Madhukar	Amin

Tanya

Sveekruth

Tanishta

Kinshuk



Kajal

Team Hebbian Yearning