



Pro-Social Behavior and Empathy in Rats

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Abstract

Selfishness is often a trait associated with rats, but is that a myth? “The ability to determine whether or not another being is a socially relevant entity is necessary for proper social behavior and survival. In the wild, rats display complex social interactions, involving both cooperation and competition. While there is a large repertoire of behaviors that elicit social interaction between rats, how rats determine whether or not a being is worthy of membership in the social domain is not fully established. Understanding the exact repertoire of behaviors that lead to social contact in rats will provide a metric by which we can begin to solve several distinct questions concerning social knowledge. These include the question of whether rats will in fact treat something that is not a rat, such as an artificial lifeform, as a socially relevant entity. Utilizing a synthetic rat (iRat, a navigating robotic rat) to determine what kinds of behaviors elicit social interaction vs non-social interaction will allow for a standardization of such interactions. How must a synthetic rat behave in order to be considered “social”? Must it act with “intention”? Must it move in socially relevant ways, or emit sounds or smells? Our ultimate test will be to discover whether the rat will act “altruistically” to the synthetic rat.¹

What Are We Trying to Do?



For the first part of the experiment we must replicate a project of the same name by Inbal Ben-Ami Bartal, Jean Decety, and Peggy Mason. They conducted test on whether rat will be empathetic towards another rat by trapping one and seeing if its partner will let it out. Then they added another twist. The next test, they put two cages; one with a rat and one with a pile of chocolate chips. The results were quite surprising, 90% of the female rats and 67% of the male rats let out the caged rat and shared the chocolate chips with it.



While we are replicating their experiment, we will be using all males as our subjects. We have five pairs of rats that are housed each other with hopes that they will become more empathetic with one another. We also will be adding another step to the experiment; we will put a stranger rat into the cage and see if they will let him out and share the chocolate chips with him. This will show us if familiarity is the main drive of empathy.

Enriched Environment



Every day the rat pairs spend twenty minutes in an “enriched environment” either playing or exploring. The reason for this is to allow the two to bond, as well as observe the behavior and interaction with one another. One rat might be more dominant than the other which can be crucial on whether he will show empathy to his fellow rat.

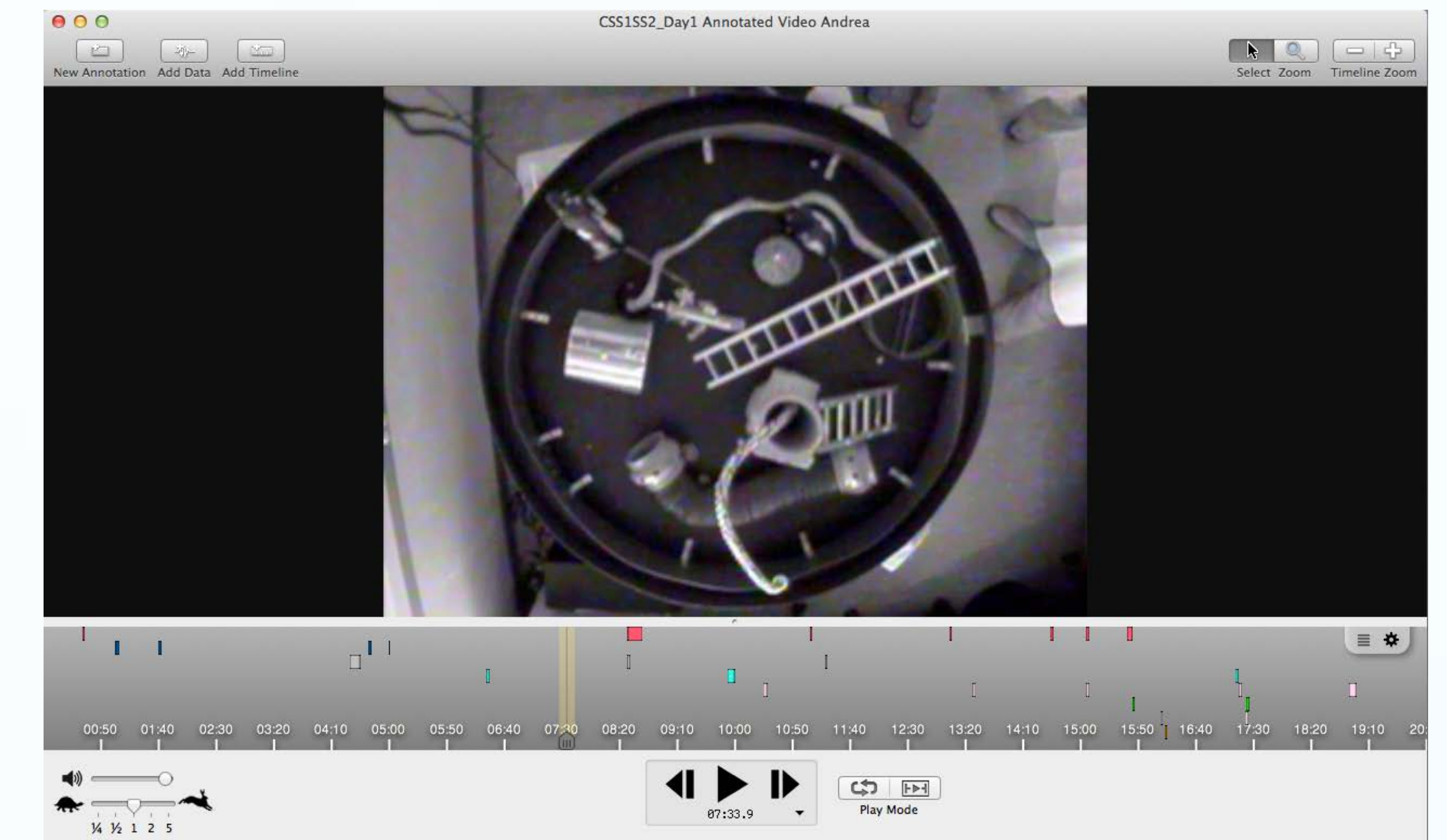


Each day one “enriched environment” item is switched out for a novel item. Thus making the environment different every day. It’s important to for the rat to get use to new objects since they must become acquainted very quickly with interacting with buttons to open the trapped rat’s cage.

Conclusions

Because of such a short time span, we were unable to conduct the actual experiment of “trapping” a rat allowing his friend to free him or go for the chocolate chips. However we’ve gained much knowledge from simply conditioning the rats. We’ve already seen empathetic actions by the rats such as, grooming each other and sharing cheerios. While the Academic Connections program is coming to a close, I will remain in the Chiba lab and continue to finish this experiment with hopes of promising results.

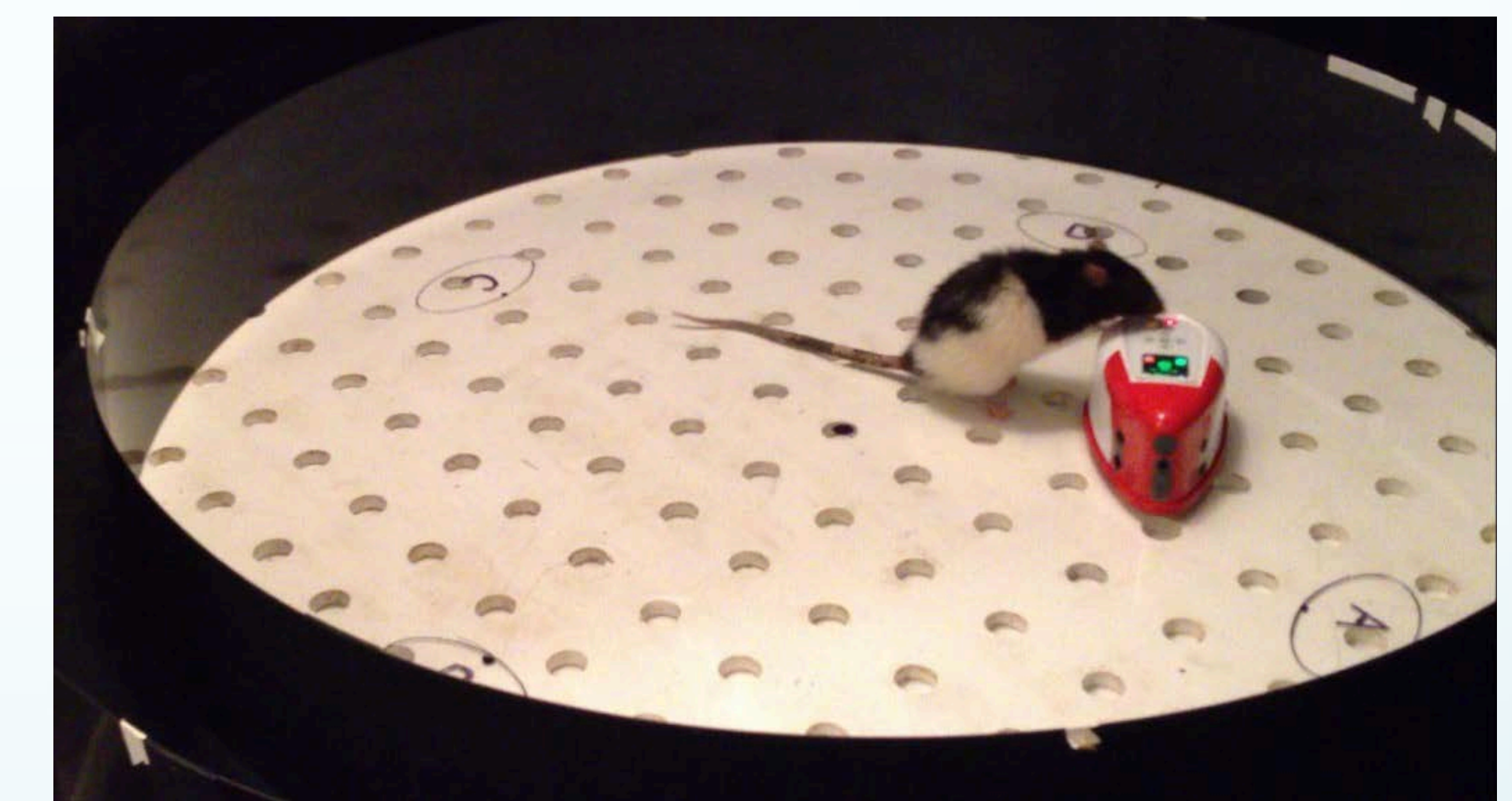
Recording and Coding



We record every session in the enriched environment from a bird’s eye view camera. Using the Chronoviz program, developed by Adam Fouse at UCSD, we are able to code specific actions throughout the video. Certain colors represent certain interactions with the environment such as, grooming, interest in novel item, and wrestling with fellow rat.

This allows us to keep record of their progression throughout the experiment. It tells us whether the rats are either accepting or rejecting certain tasks over time. The average amount of time to code an entire twenty minute video is around two hours.

The Next Step



In the by Inbal Ben-Ami Bartal, Jean Decety, and Peggy Mason experiment the control was a toy rat and 0% of the rats open the cage for it. The next for us is iRat. “We will undertake extensive social interaction studies with pairs of rodents, in order to hypothesize the most relevant features for developing a social companion for the laboratory rat. Preliminary investigations indicate that temporal coordination of pack following behaviour, submissive social retreat, and food competition may be sufficient. Further, we will bestow iRat with appropriate social vocalizations, using ultrasonic speakers. In order to test whether the iRat garners social attention from the laboratory rat, we will undertake a replication of the “jail-break” experiment in which a laboratory rat unlocks the cage of a trapped conspecific. In this case, the experiment will be conducted with real rats and with trapped iRats. If iRat is sufficiently relevant to the laboratory rat, we expect the laboratory rat to release iRat from his trappings.”

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¹ &²: Chiba and Quinn, Kavli Mind-Brain Proposal, 2013