Review of Deep neuroethology of a virtual rodent

In this paper, the authors aimed to recreate the cognitive systems in a rodent and study the motor control. The authors introduce the virtual rodent by showing its complex skeletal and muscular system and claim that the body of the rodent has 38 controllable degrees of freedom controlled by tendons. The rodent also has access to information from sensors on its body and is equipped with the ability to "see" using a camera on its head.

The authors implemented 4 tasks for the rodent to learn so that it is able to learn how to use many different motor skills. The rodent was trained to run along a corridor and jump over gaps, collect blue orbs in a maze, escape from a bowl-shaped terrain, and touch an orb twice after 800 ms. Interestingly, the rodent was not informed of its task and was supposed to derive it from visual input. To do all of this, the authors used several state-of-the-art strategies using LSTMs. The authors also mention that the key advantage to their approach is that it allows researchers to fully observe sensory inputs, neural activity, and behavior.

I think a strong reason for reading this paper in the scope of HLAI is to ask the question "Can we apply this to humans?". While human skeletal structure is much more complex than a rodent, this paper does open the door to modeling the human in deep neural networks to gain a better understanding of how humans perform the actions we do, much like in this paper. We also have the ability to gain further understanding of the behavior of humans and how they develop and adapt over time. While there are still limitations to this paper, specifically the oversimplified model of a rat and the perhaps too simplistic model architecture for such a project, it still gives interesting insight into the future of understanding the neural sensors that cause living beings to act in the way we do.