My project is about comparing the behavior of ants and humans in traffic. Humans struggle in these environments, while ants often thrive [1] [2]. If we emulate ants' behavior, we can create solutions for humans that help prevent accidents, road blocks, and traffic. Ants are naturally a communal species, all working for the better cause of the colony [3], but on the other hand, humans are more accustomed to serving themselves before others, which is a main cause for issues in transportation [4]. Human productivity stems from means of transportation. The average American spends nearly three days sitting in traffic [5], not accomplishing anything. If the problem of traffic is solved, the three days can be significantly reduced, correlating to more productivity and time doing more important things.

I plan to solve this problem computationally by simulating different traffic scenarios with an ant model and a human model. These models can be compared and used to draw conclusions of what the main differences between humans are and ants are. I will use Python to create these simulations and compute the rate of traffic flow. I will also create movies of the flow of ant traffic and the flow of human traffic, allowing us to see what differences may appear. I will write code that simulates different behaviors in situations of traffic. Using different flux equations and using my Python program to calculate and graph the flow of ants and humans allows an easy way to compare and contrast the two behaviors.

Up to this point, I have made progress on my code and on my research planning. In the coding part, I have begun to do simulations of the flow of the agents. In my code for a toy model, the agents adjust the speed in order to keep a safe distance from the others. In terms of planning, I have multiple sources that have provided me with important information required for my project.

The results I am expecting are that ants have a generally higher flow of traffic compared to humans [1] [2]. Ants and humans obviously do not have exactly the same constraints when it comes to transportation and traffic, but I think that it is still beneficial for humans to look at what other species, like ants, would do in these situations.

1. Couzin, I. D., and N. R. Franks. "Self-Organized Lane Formation and Optimized Traffic Flow in Army Ants." *Proceedings of the Royal Society of London. Series B: Biological Sciences*, vol. 270, no. 1511, 22 Jan. 2003, pp. 139–146, https://doi.org/10.1098/rspb.2002.2210. Accessed 29 Oct. 2020.

2. Poissonnier, Laure-Anne, et al. "Experimental Investigation of Ant Traffic under Crowded Conditions." *ELife*, vol. 8, 22 Oct. 2019, https://doi.org/10.7554/elife.48945. Accessed 29 Oct. 2020.

3. Mlot, Nathan J., et al. "Fire Ants Self-Assemble into Waterproof Rafts to Survive Floods." *Proceedings of the National Academy of Sciences*, vol. 108, no. 19, 10 May 2011, pp. 7669–7673, www.pnas.org/content/108/19/7669, https://doi.org/10.1073/pnas.1016658108. Accessed 24 Mar. 2020.

4. Gaddam, Hari Krishna, and K. Ramachandra Rao. "Speed–Density Functional Relationship for Heterogeneous Traffic Data: A Statistical and Theoretical Investigation." *Journal of Modern Transportation*, vol. 27, no. 1, 5 Dec. 2018, pp. 61–74, https://doi.org/10.1007/s40534-018-0177-7. Accessed 7 July 2021.

5. Fitzpatrick, Alex. "We're Spending More Time Stuck in Traffic than Ever." *Axios*, 28 Oct. 2025, www.axios.com/2025/10/28/traffic-congestion-getting-worse#. Accessed 21 Dec. 2025.