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CSCI 3104, Algorithms **Profs. Grochow & Layer**
Explain-It-Back 10 **Spring 2019, CU-Boulder**

One of your colleagues studies the foraging patterns in ants and wants to better characterize the movements of a particular colony. Her graduate students have already performed aerial surveys of the routes these ants use, and she wants to know how many sensors she needs to best capture the ebb and flow of the colony. While many ants go in and out from the various tunnel entrances, they are most interested in tracking those ants that venture all the way to end of the surveyed routes. Explain to your colleague how this problem can be modeled as a flow network and how algorithms on these networks could help inform where to place the sensors.

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If we approach the ant colonies movements using a flow network we will be able to see the traffic certain areas receive and the amount of ants that flow from certain routes to arrive at that area. What we can do is create a graph where each vertex is a spot of interest, maybe a food source or a water hole. After mapping out all the points of interest, or finding all the vertices, we can then place sensors at all incoming paths to those points. As the sensors keep track of flow of ants on certain paths to a certain point, we can then begin assigning weights to the routes, or "edges", between vertices. These weights will represent the rate in which ants flow between points in a certain direction. With this data we can pinpoint the colony's foraging patterns. We can then better analyze what makes the ants want to venture far from their home and how far they are willing to travel for certain commodities. You can also begin to see what routes ants are taking to get to the edges of the surveyed routes and possible trace the ants back to certain regions of their colony. With this information you can begin learning more of how the ants function within their own homes and how certain ants may keep up the same behaviour while foraging away from the colony. The air data will be perfect for gathering where these vertices are and the edges or routes that the ants take to migrate between them!