CONFIDENTIAL - FOR PEER-REVIEW ONLY

Image Inference – Detecting multiple agents from indirect evidence (#34553)

Created: 01/27/2020 10:17 AM (PT)
Shared: 04/13/2021 06:48 PM (PT)

1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
In a previous study (see pre-registration #26990), we showed that people, when given indirect evidence that an agent was in a certain position in space (shown as a small pile of cookie crumbs in a gridworld), can infer where the agent came from and where they were going. We explained those previous findings through a computational model that generates probable actions under an assumption that agents navigate efficiently in space. In this experiment, we test if people can infer how many agents were present in a room, based on similar indirect evidence (two piles of cookie crumbs which may have been dropped by a single agent or by two agents).

After completing a brief tutorial (see Q8 for tutorial), participants will be presented with two-dimensional grid-worlds with three potential goals, up to three labeled doors, and two piles of cookie crumbs that are not placed on/adjacent to a goal, door, or each other (see Q8 for stimuli). Participants will be asked to infer whether they think one or two agents were responsible for dropping the two cookie crumbs (see Q3 for details on how this is collected). Participants will also have to correctly answer an objective question (Which corner is the farthest walk from Door 1? If there is more than one correct answer, just choose one of them.) on each trial in order to be allowed to continue with the task. The experiment consists of 15 trials presented in random order (see Q4 for design). We predict that average participant judgments will correlate with the posterior probability, consisting of the probability that a single agent would drop the two piles of cookie crumbs, and the probability that two different agents would each drop one of the cookie crumbs (using our generative model of efficient action in space).

3) Describe the key dependent variable(s) specifying how they will be measured.
Participants will rate whether they think one or two agents were responsible for dropping the two cookie crumbs in each trial, using continuous sliders ranging from “definitely one agent” (coded as 0) to “definitely two agents” (coded as 1).

4) How many and which conditions will participants be assigned to?
All participants will complete all 15 trials in a random order.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
We will analyze our data by comparing it to a computational model that jointly infers where agents entered, what goal they pursued, and what paths they took, by assuming that each agent was acting efficiently in space. Specifically, our model reconstructs each agent’s actions by computing the posterior probability of different sequences of actions given the observed positions of the cookie crumbs through Bayesian inference. Each agent’s entrance and goal are then computed by integrating over the posterior space of inferred actions.

Our analysis will consist of correlating mean participant responses with the raw predictions from our computational model. Participant responses will be averaged together, per trial, to compute the mean participant responses. Finally, we will compute 95% bootstrapped confidence intervals for the mean participant responses.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
After reading the task instructions, participants will complete a brief, six-question quiz. Participants that fail the quiz once will be redirected to the beginning of the instructions and asked to read them again. Participants who fail the quiz twice will not be included in the study. The quiz questions are listed below, with the correct answers in parenthesis:
1. How many corners are people walking to?
(1) 2 3 Not sure
2. Do people always drop their cookie crumbs on their path to/from a corner?
(Yes) No Not Sure
3. Do people get to choose which door they walk through?
Yes (No) Not sure
4. Do people leave the room out of the same door they entered or the door closest to them?
(Same door) Closest Door Not sure
5. Can people move diagonally?

Yes (No) Not sure
6. What color are the walls?
White (Gray) Red Not sure

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
Our sample size consists of 40 participants, not counting participants who fail the quiz more than once and are thus not eligible to participate. This sample size was determined by the sample size in our previous study (see pre-registration #26990).

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
See the model predictions, procedure, and stimuli at:
https://osf.io/fmcq8/?view_only=6cc28740fc7347ac97e5c0220f226e16