

Computer vision for developmental research

Many important questions about children's early abilities and learning mechanisms remain unanswered not because of their inherent scientific difficulty but because of practical challenges: recruiting an adequate number of children, reaching special populations, or scheduling repeated sessions. A new online platform, "Lookit," [1] addresses these constraints by allowing families to participate in behavioral studies online via webcam.

Although online testing greatly reduces the amount of time required to recruit and test a participant, coding the video collected remains a bottleneck: to measure looking time, a research assistant must watch the video of the child and record when the child is looking to and away from the screen. This process takes from twice to five times as long as the video itself, depending on the detail required. Clearly, to enable truly large-scale studies, we will need to at least partially automate this process—perhaps requiring human input only in ambiguous cases, or to initially locate the parent's versus the child's eyes. This will, additionally, allow for real-time infant-controlled study designs and adaptive interventions that take into account an infant's responses.

Current algorithms for detecting direction of gaze are not quite ready "out of the box" to handle the degree of movement and variability in position that we see in infant videos. The videos collected for the case studies on Lookit form a training dataset, coded independently by two human coders and including calibration trials where we know the child's expected gaze direction.

For this project, the student will work with a dataset of labeled videos from the Lookit platform. The student will develop a model to extract, preferably in real-time, gaze information from the video, along with confidence estimates. Additional assessment about general video quality would be helpful as well.

Students will have access to 2/3 of the data for training, and the remaining 1/3 will be used for testing. This is in collaboration with Dr. Kim Scott (kimscott@mit.edu) in the department of Brain and Cognitive Sciences. Because of potentially identifying information in the data, students must agree to keep the data private. A successful project could be implemented into the Lookit platform and/or published.



Figure 1: Example stills from Lookit video. [2]

References:

[1] Scott, K., & Schulz, L. (2017). Lookit (Part 1): A new online platform for developmental research. *Open Mind: Discoveries in Cognitive Science*, 1(1), 4–14. doi:10.1162/opmi_a_00002

[2] <https://lookit.mit.edu/>