# Multi-modal measurement of children's response to name

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## Background

Measuring child response to name is an important cue for assessing child development and is both widely practiced by clinicians and technically feasible to automate "in the wild". Our goal is to enhance observations by fully automating response to name measurements in a naturalistic setting.

- Clinical Perspective - Failure to respond to ones name being called is one of the early signs of autism (e.g, ADOS)

- Technical Perspective –Measuring responses automatically calls for solving difficult vision and speech challenges.
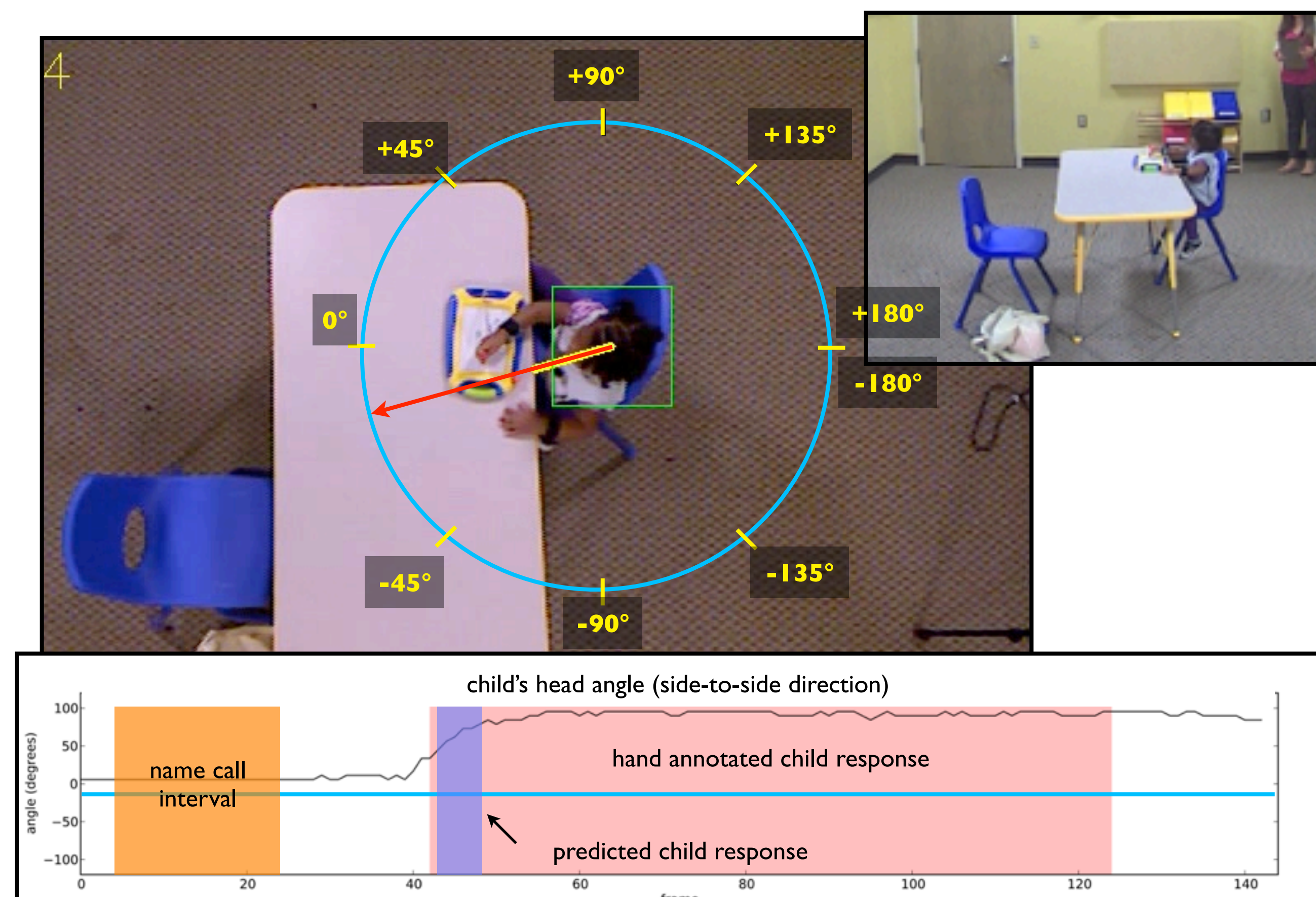


## Method

Our approach is to track child head movements from a frontal camera and an overhead Kinect camera. Examiner vocalizations are extracted from a lapel microphone. Head motion and voice signals are used for automatically predicting eye contact between a child and an examiner.

**Training Inputs – 40 audio & hand annotated video sessions**
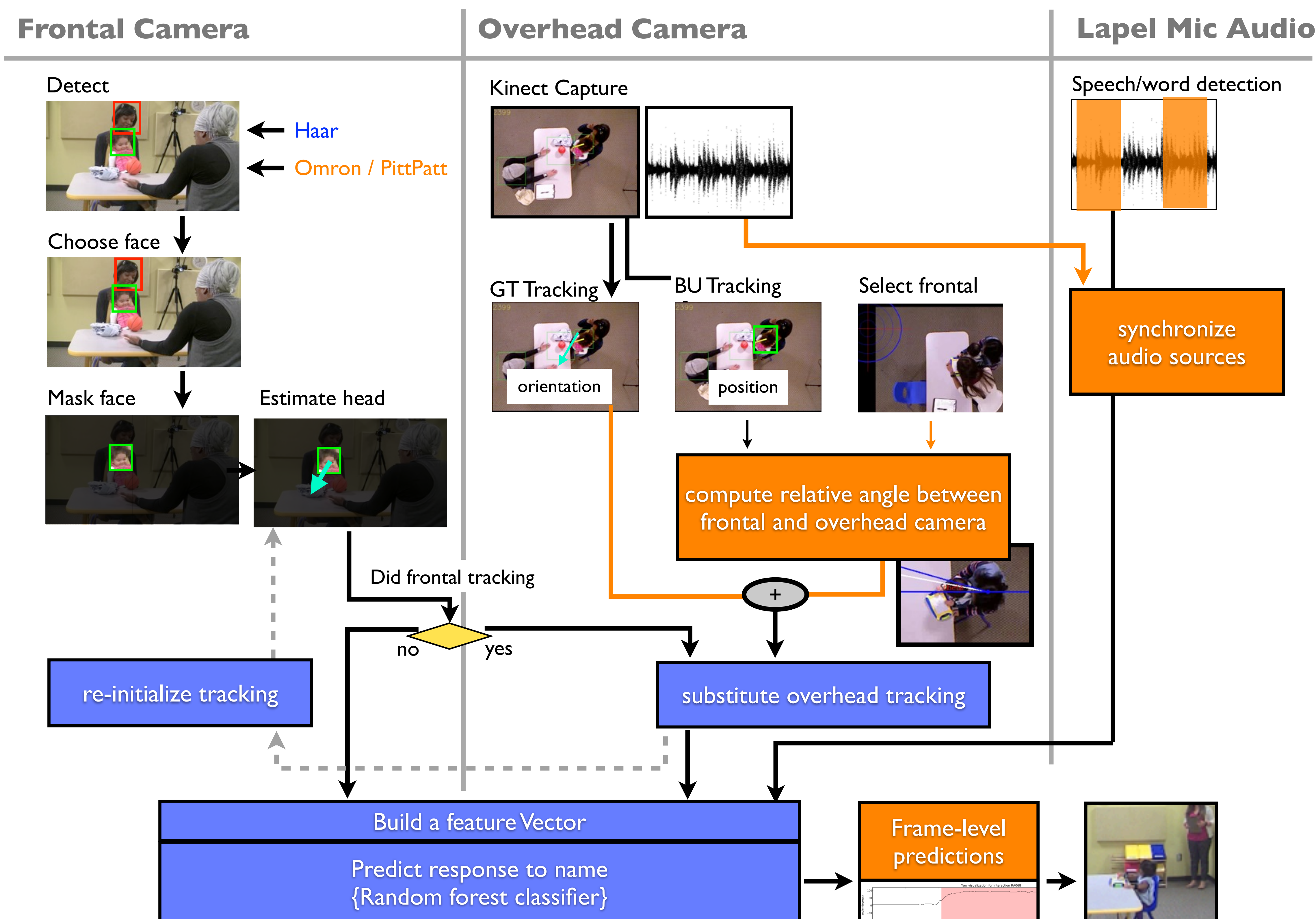


Child responses are predicted using a classifier. In our study we trained a random forest classifer using a combination of hand annotated examiner name calls and child response intervals and automated child head tracking measurments during 40 RABC sessions.

The resulting classifer can then automatically predict if and when children respond to name calls during RABC sessions without the need for additional human input.

**Classifer Output – Child response to name predictions given automatically extracted head tracking and speech detection measurments**

## Findings

**Eye contact classification was then performed on 40 video sessions and compared against hand coded ground truth**

|  | Actual | |
|---|---|---|
| Predicted | True | False |
| Child Response | 20 | 3 |
| No Response | 5 | 8 |

| Precision | Recall |
|---|---|
| 0.87 | 0.80 |

40 sessions

## Future work

**Our results highlight opportunities for automatically predicting child response to name using head tracking and speech detection software.**

- **Pediatrician office of the future** – Measure child responses at the doctor's office using an overhead kinect and doctor lapel worn microphone
- **Daycare *circle time* –** Measure multiple children's response to name at a daycare with a single camera.