Early Autism Detection
- Autism detection at an early age improves the child’s outcome.
- Atypical motor behaviors are among the first indicative signs of autism.
- E.g., arm-and-hand flapping, body rocking, toe walking, asymmetrical gait patterns [1].
- Analysis of arm asymmetry by estimating the toddler’s pose in video segments.
- Computer Vision may provide unintrusive tools to aid in such detection task [2].

Computer Vision in Autism Assessment
- Video data from real in-clinic autism assessment.
- The clinician repositions the camera at will.

Segmentation and Pose Estimation Using Clouds
- We extend the Cloud System Model (CSM) automatic segmentation framework [3] to deal with articulated objects (human bodies) in video data.
- The CSM is a set of fuzzy objects (clouds) that performs synergistic object location and segmentation during the automatic body pose search.

Arm Asymmetry Measurements
- Temporal graphs about the asymmetry score \( AS^\tau \) give clinicians quantitative measurements for posterior analysis.

Arm Asymmetry Detection From Pose
- The overall asymmetry score \( AS^\tau \) is a function of the upper arm and forearm asymmetry scores, obtained from corresponding left and right arm segments.

\[
AS^\tau = \max \{ AS_u, AS_f \}
\]

\[
AS_u = AS(b_l - b_r)
\]

\[
AS_f = AS(l_l - l_r)
\]

Arm asymmetry usually occurs when there is a \( \tau = 45^\circ \) angle difference between corresponding left and right arm segments.

References

Acknowledgements
Work supported by CAPES (BEX 1018/11-6) & FAPESP (2011/01434-9) PhD scholarships, CNPq Grant 303673/2010-9, and NSF Grants 1059741 & 1028076. Approval for this study was obtained from the Institutional Review Board at the University of Minnesota. The images are blurred and downsampled to preserve the anonymity of the participants.