



## The Autism Glass Project at Stanford Medicine

Children with autism unanimously struggle to recognize facial expressions, make eye contact, and engage in social interactions. The best-known intervention, applied behavioral analysis (ABA), relies on teaching these skills in a clinician's office, removed from where they will actually be used and relying on artificial tools like flashcards. While this intervention can lead to recoveries in many cases, the therapy is applied inconsistently and often generalizes poorly to situations that go beyond the routines practiced with the limited clinical tools available today. Even when programs are properly administered, their delivery is increasingly bottlenecked as the number of available therapists lags well behind by the number of children in need of care.

The Autism Glass project at Stanford University has developed an artificial intelligence tool for automatic facial expression recognition that runs on smart glasses and delivers instantaneous social cues to people with autism in their natural environment. The computer vision system employs the glasses' outward facing camera to read a person's facial expressions by passing video data to an Android native app for immediate machine learning-based emotion classification. The system then gives the child wearer real-time social cues and records social responses, including the amount of eye contact and level of social engagement. Through a dedicated app, caregivers can then review and discuss auto-curated videos of social interaction captured throughout the day. This brings therapy out of the clinician's office and into the homes of families, enabling caregivers to deliver therapy that generalizes learned skills into everyday life in a scalable fashion.

### Pilot Data & Prototype

In-lab pilot data from 40 children, 20 with autism and 20 typically developing, supports our hypothesis that this system's ability to provide continuous behavioral therapy outside of clinical settings will enable faster gains in social acuity across a range of autism severity and at a developmental age as low as 4. Following this in-lab exploratory work, we launched a participatory design study with 24 families impacted by Autism, allowing them to take the devices home and use them on a daily basis over a period of weeks. This enabled us to optimize the design and develop a behavioral program that puts therapy in the hands of caregivers, either for home family use or as an augmentation to existing ABA therapy. We tracked progress with gold-standard outcome measures and continuously gathered device data. Together with observations of parents and teachers – often blind to treatment – this data suggests that the therapy delivered by our system has potential for dramatic improvement in socialization over traditional therapy and in a way that is more tuned to the child's real world. Our study produced over 9,000 minutes of social video and sensor data, a dataset bigger than any other of its kind and one that has untapped potential for detecting, understanding, and treating the challenges that come with an autism diagnosis.