

INTRODUCTION AND MOTIVATION

- **Social interaction deficits**: main symptoms of people diagnosed with autism.
- **Shared Enjoyment**: the “pleasure in interactive participation or conversation”.
- **Laughter**: objective expression of shared enjoyment.
 - Voiced -> positive affect
 - Unvoiced -> social facilitator



RACHEL ECA INTERACTION CORPUS

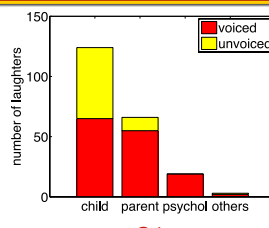
- Recordings of a child interacting with an **ECA (Embodied Conversational Agent)**, Rachel, and his/her parent.
- Designed to encourage children to:
 - Participate in **social interactions**
 - Display their **emotional reasoning abilities**

Subjects	S1	S2
subject description	12-year old boy	6-year old boy
expressive language score	6 years, 7 months	2 years, 9 months

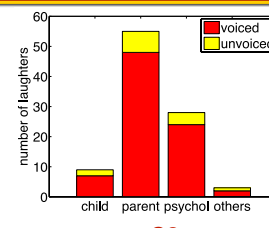


ANALYSIS OF SHARED ENJOYMENT INSTANCES

- **S1**: 189 laughter instances
- **S2**: 82 laughter instances
- Differences in the content of social interactions between the two subjects.



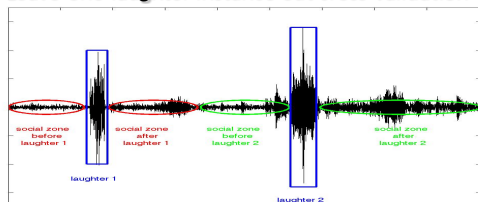
S1



S2

METHODS

- **Social Zones**
 - Areas before/after laughter instances
 - Duration of 2,4,6,8,10 sec
- **Features**
 - Pitch, intensity, 13 MFBs (Mel-Filterbank Coef.)
 - Mean, stand. dev., skewness, kurtosis, 25%, 75% quartile, quartile range
 - Computed over 0.5, 1, 1.5, 2, 2.5 sec.
 - Dimensionality reduction with PCA (Principal Component Analysis)
- **Classifier**
 - Naïve Bayes
 - Leave-one-laughter instance out cross-validation



EXPERIMENTS

- **Socially Relevant Information Retrieval**
 - Project original 120-dimensional feature vector to different PCA components
 - 10 least significant PCA dimensions -> shared enjoyment information
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- Mean classification accuracy of before-laughter social zones for acoustic feature projections on 10-dimensional PCA subsets with decreasing significance.
- **Laughter Classification**
 - 85.2% for S1, 96.5% for S2 (2.5s window)
 - Larger windows -> better results
 - Laughter incidents from S2 more differentiable
 - **Social Zones Classification**
 - 74.4-95.9% for S1, 94.3-99.6% for S2
 - 10 sec -> interval with useful information for predicting social interaction

DISCUSSION AND CONCLUSIONS

- Acoustic patterns of social zones are indicative of the type of shared enjoyment.
- Difference in the ways the studied children engaged in social interactions
- Shared enjoyment instances are more prominent than instances negotiating social subtleties.
- Future directions: examine identity of speaker, lexical content and visual cues of social zones.

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REFERENCES

- Hudenko, et al., “Laughter differs in children with autism,” JADD, 2009.
- Mower, Black, et al., “Rachel: Design of an emotionally targeted interactive agent for children with autism,” ICME, 2011.