Exploring Discourse of Individuals with Autism Spectrum Disorder

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Introduction

Prior work suggests that individuals with Autism Spectrum Disorder (ASD) may use certain linguistic features distinct from Typically Developing (TD) individuals. During a pilot study participants with and without ASD were asked to provide a facilitator with instructions for actions they should take within a cooperative game task [3]. This work explores potential differences in language use, based on transcripts from that cooperative game task.

Objectives

- Develop software for discourse processing.
- Extract features from data subsets (ASD vs. TD) and analyze similarities and differences.

Transcript Pre-Processing

- Semi-automatic utterance boundary insertion.
- Manual speaker indicator, timestamp insertion.

Figure 1: Utterance recognition features.

- Sentence or phrase with a subject and verb;
- Text unit starting with: `AND NOW, AND THEN, SO I/I'LL/I'M, IT'S OK, COULD YOU, THAT'S OK, UM NOW, YEAH, ACTUALLY;`
- `PERFECT, MHM, IT'S ALRIGHT, YEP.`

Figure 2: Average % of disfluencies per utterance.

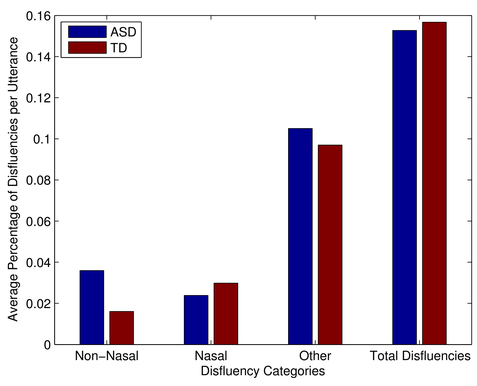
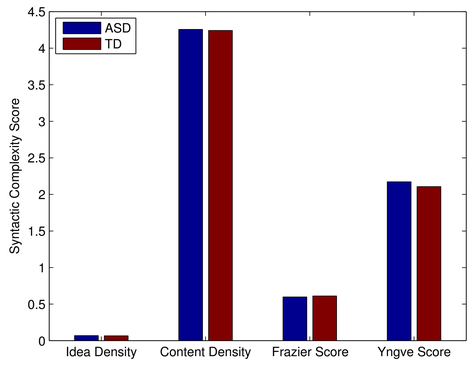


Figure 3: Average syntactic complexity scores.



SPLAT

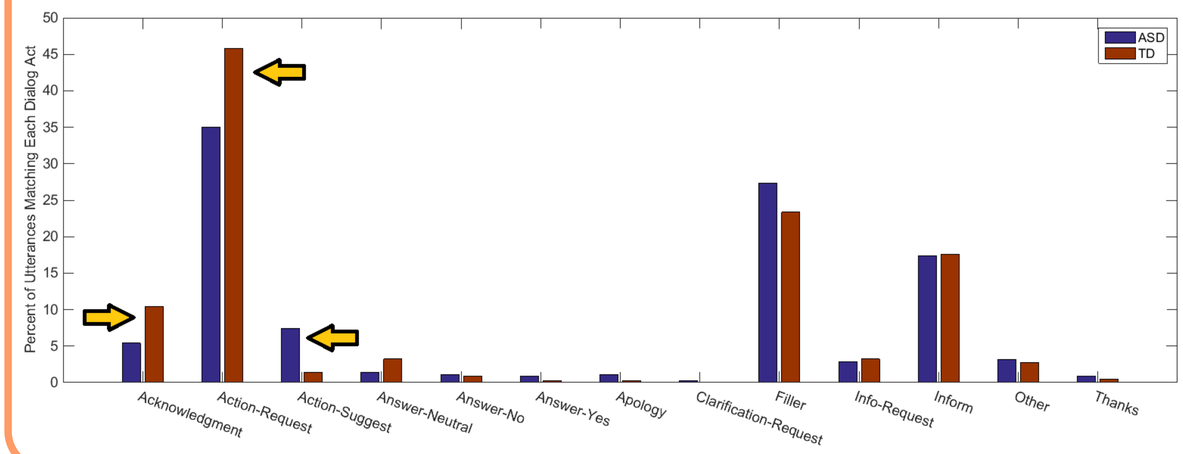
A software application called the Speech Processing & Linguistic Annotation Tool *SPLAT* was developed in Python 2.7 to autonomously annotate and derive linguistic features from the data subsets. SPLAT incorporates functionality from the NLTK [1] library and the Berkeley Parser [4].

Example functionality includes: calculating syntactic complexity, drawing syntactic trees, and inserting utterance boundaries. The development process for SPLAT has been documented in a GitHub repository [2].

Figure 4: An adapted version of Silvia Quarteroni's dialog act taxonomy [5].

Marker	Example
Acknowledgment	S: OH ALRIGHT
Action-Request	S: {SL} OK PUSH THE BLOCK ON TO THE RAMP
Action-Suggest	S: I'D SAY START OUT BY MOVING PAST AND JUMPING OVER...
Answer-Neutral	S: {SL} OK
Answer-No	S: {SL} UM NO I HAVEN'T
Answer-Yes	S: YEAH
Apology	S: OH SORRY SORRY
Clarification-Request	S: {SL} WAS I SUPPOSED TO KEEP MY HEAD STILL
Filler	S: {SL} OK SO
Info-Request	S: IS IT POSSIBLE FOR ANY OF THESE LEVELS TO...
Inform	S: I'M GONNA JUMP UP HERE {SL} AND I'M GONNA PRESS THE LEVER
Other	S: {SL} AND
Thanks	S: ALRIGHT THANK YOU

Figure 5: Percent of utterances for each dialog act.



Conclusion

Disfluencies
The results of a series of unpaired t-tests reveal that there is a strong statistically significant difference in the use of nasal and non-nasal disfluencies between individuals with ASD and those with TD.

Syntactic Complexity
The results of a series of unpaired t-tests reveal that there is no statistically significant difference in syntactic complexity between individuals with ASD and those with TD.

Dialog Acts
The results of a series of unpaired t-tests reveal that there is a strong statistically significant difference for dialog act use between individuals with ASD and those with TD for most of the categories.

Future Work

Further studies relating to disfluency use and dialog act use differences between individuals with ASD and those with TD should be completed. Future studies should involve more data.

In the long term, identifying linguistic differences between ASD and TD individuals may be useful for systems that support medical diagnosis. They may also add insights into differing cognitive patterns.

References & Acknowledgments

[1] `http://www.nltk.org`.
[2] `https://github.com/meyersbs/SPLAT`.
[3] Kathryn Womack et al. Proof of concept study: Analyzing multimodal behaviors of students with autism spectrum disorders. Effective Access Technology Conference, 2014.
[4] Slav Petrov and Dan Klein. Improved inference for unlexicalized parsing. In *HLT-NAACL*, pages 404–411, 2007.
[5] Silvia Quarteroni, Giuseppe Riccardi, Sebastian Varges, and Arianna Bisazza. An open-domain dialog act taxonomy. *Technical Report DISI-08-032*, 2008.

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