

# Novel Smart Algorithms used to Assist and Encourage STEM Group Participation among members with Autism Spectrum Disorders

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## **Rationale:**

It is well-known that individuals with an autism spectrum disorder (ASD) experience significant difficulties in understanding the emotions of others in conversation. This issue is exacerbated when such individuals seek job-placement. Although 77% of individuals with ASD express an interest to work, only 16% have found jobs. This is significantly less than the 47% employment rate for other disabilities.

Since ASD is unique to each individual, personalized therapy will be efficacious in improving the lives of affected individuals. Recent research has focused on using computational techniques in order to help such individuals. In particular, game-based therapy has been identified as a route to better personalize and improve ASD therapy. The societal impact of this research is that it will greatly benefit the ASD community, as well as the therapist by offering more detailed information into the specific areas in which the individual needs more personalized therapy.

**Research Questions:** Can smart algorithms be used to help individuals with ASD better understand social and emotional cues when working in small groups? Can a theoretical model of group interactions be used to give a framework that can be modelled computationally?

**Hypothesis:** Smart algorithms can be used to assist individuals with an ASD better recognize emotional and social cues.

**Engineering goals:** To create an algorithm that is able to provide game-based therapy to an individual with an ASD in order to help improve social skills in small teams. In order to this, a theoretical model will need to be established. This model will need to be agent-based, and it will describe the mechanism by each agent within the therapy game generates outputs. WordNet will then be used to find the similarity in meaning between what the user generates and the expected output.

## **Expected Outcomes:**

This research will present a novel computational approach to personalized ASD therapy. The algorithm is not intended to replace traditional therapy; but rather, enhance it by allowing the therapist to see a more in-depth analysis of the individual's interaction patterns and tendencies to

stay fixated on details. This will allow therapy to directly focus on the individual, and thus making it more effective.

**Procedures:** The procedure will be to create an algorithm that works to provide game-based therapy to an individual with an ASD. The first portion of the program, written in Python, will preprocess a file of words and will use the WordNet library to find the similarity between them. WordNet is an open-source resource offered by Princeton University that can determine the similarity between two words by using pre-formed clusters called synsets, which are grouped together based on common meaning. The next part, which is written in the C++ language, will mimic a therapy game for the individual to use in order to better recognize social and emotional cues in team-based activities. It will use the preprocessed information from the Python program in order to determine the prompts to give to the player.

**Risk and Safety:** This is no risk of safety in this project

**Data Analysis:** Data from Paulus et al. was obtained by the author's request. This data will be used to create data for the algorithm. This process will be done manually, since it consists of breaking individual sentences and storing their labelled components into a text file. This file will be used by the algorithm as part of the data structures used for therapy.

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No changes were made to this research plan