**FINAL PROJECT: AUTISM SPECTRUM DISORDER – Q-CHAT-10 ANALYSIS**

BDAT 630: Data Visualization

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# INTRODUCTION

Autism, also known as autism spectrum disorder (ASD), “is a complex, lifelong developmental disability that typically appears during early childhood and can impact a person’s social skills, communication, relationships, and self-regulation” (Autism Society, 2022). In 2018, it was found that ASD impacts nearly 1 in 44 children, more than doubling the prevalence found in 2004 of 1 in 125 (MJ, KA, AV, & etal, 2018). As there are barriers to diagnosis for underprivileged communities, it is important to make widely available proper screening tools to aid caregivers to identify any signs of autism, so that early intervention can take place. This analysis will test the efficacy of a dataset containing 704 records of screening results from the Q-CHAT-10, as retrieved from Kaggle (Larxel, 2020). This the Q-CHAT-10 is a short form of the Q-CHAT, or Quantitative Checklist for Autism in Toddlers, screening (Bryant, 2022).

# PURPOSE

ASD has impacted my family directly, so I take great interest in being an advocate for neurodiversity. My oldest son was diagnosed autistic first at age 10, followed by myself at age 35. Knowing that ASD is a highly genetic condition, I had my youngest son tested at age 6 and he also is autistic, along with ADHD. Late diagnoses for my oldest child and myself had a tremendous negative impact in both the social and academic atmospheres.

As such, I have found myself passionate about research and education for both the neurotypical (no developmental differences) and neurodiverse people that I interact with. Analyzing tools such as the Q-CHAT-10 and testing their effectiveness can support ensuring that other people may not have to endure the same hardships my family did through knowledge and information sharing. However, it is important to put useful tools in the hands of caregivers and those with ASD to ensure that it is useful in identifying ASD traits.

# DASHBOARD

Prior to developing the dashboard, I conducted an exploratory analysis of the data, cleaning and formatting it so that the data produced for the analysis are useful. There were several fields or records that would skew the results, so I truncated or updated where applicable. I also developed a predictive model using K-Nearest Neighbors as part of the analysis. From there, three export files were produced of the processed dataset, training dataset and validation dataset. These datasets were then used in the development of an application in R Shiny to display the results.

# USER INFORMATION

Screening early for ASD and providing appropriate diagnosis as soon as possible will ideally allow for early intervention (Thabtah, 2017). Early intervention is critical for supporting those with ASD, as “high quality intervention can improve learning, communication and social skills, as well as underlying brain development” (Thabtah, 2017). This dashboard examines a screening tool outside of the typical Diagnostic and Statistical Manual of Mental Disorders (DSM) methodology used to classify mental disorders in the United States (APA, 2022). The Q-CHAT-10 looks for “red flags” that can identify ASD traits (Allison, Auyeung, & Baron-Cohen, 2012).

# GETTING STARTED

The [Data Dictionary](#_APPENDIX) can assist in understanding the contents of the dataset. The analysis is comprised of the following: User Information, ASD Screening Dashboard, References, and About. To access the Q-CHAT-10 Autism Screening Analysis, select the ASD Screening Dashboard. As you review the data, keep in mind that the outputs are mostly interactive and will populate with the sample criteria selected. A copy of these instructions will be published in the User Information Tab within the app. To change the criteria, follow these steps.

## *Step 1*

After accessing the ASD Screening Dashboard, retrieve the sample population that you would like to view by clicking the drop-down arrow in the “Sample Criteria” section, located under “Select Country:”. Select the country and “Gender:” criteria; the sample data will automatically populate.

## *Step 2*

Conduct your review of the output. There are explanations provided of the output for each visualization provided. Once you’ve set your criteria, the dashboard will not automatically reformat itself. If another sample population needs to be reviewed, simply select new Sample Criteria[[1]](#footnote-1).

## *Step 3*

The Non-Interactive tab displays the predictive modeling analysis. These features help to provide context to the analysis and support the findings.

## *Step 4*

For a conclusion of the analysis, the Findings tab briefly describes the results from the predictive model for your information. Any sources associated with this research are displayed in the References tab.

# DEPLOYMENT

The app was deployed using shinyapps.io and can be found at: <https://tianabryant.shinyapps.io/ASD_Screening/>.

All files used in creation of this app can be located at the following GitHub repository:

<https://github.com/bryantt11/TianaBryant.shiny>

# APPENDIX

Data Dictionary (Thabtah, 2017)

Table

Description automatically generated

Table

Description automatically generated

# REFERENCES

Allison, C., Auyeung, B., & Baron-Cohen, S. (2012, 1 5). *Quantitative Checklist for Autism in Toddlers (Q-CHAT-10).* Retrieved from Embloom: https://www.embloom.com/content/q-chat-10/

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Autism Society. (2022). *What is Autism?* Retrieved from Autism Society: https://www.autism-society.org/what-is/

Bryant, T. (2022, March 3). *Exploring Q-CHAT-10 ASD Screening Data.*

Larxel. (2020, August 17). *Autism Screening on Adults.* Retrieved from Kaggle: https://www.kaggle.com/andrewmvd/autism-screening-on-adults

MJ, M., KA, S., AV, B., & etal. (2018). Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years. *Autism and Developmental Disabilities Monitoring Network*, 1–16.

Thabtah, F. (2017). Autism Spectrum Disorder Screening: Machine Learning Adaptation and DSM-5 Fulfillment. *Proceedings of the 1st International Conference on Medical and Health Informatics*, 1-6.

1. Results will be displayed on the Interactive Visualizations tab. [↑](#footnote-ref-1)