

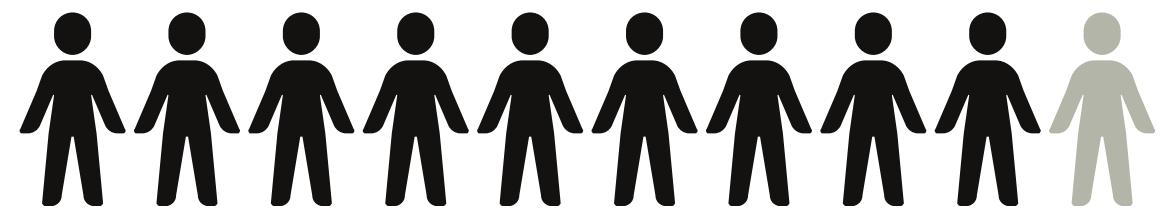
PREDICTING AUTISM

WITH MACHINE LEARNING

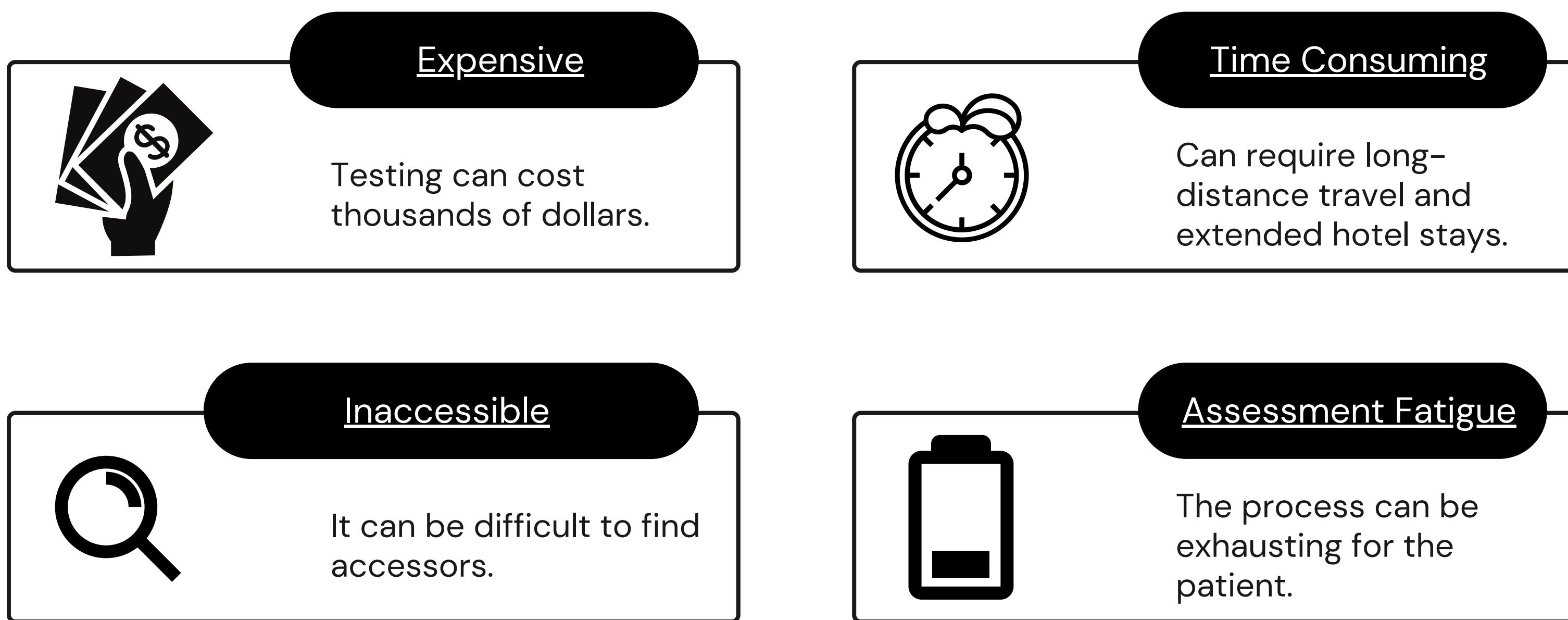
OLIVER ZAGORIN, KAYLA HOWARD, AND ABDULMATEEN OYEDIRAN

WHAT IS AUTISM?

Autism, or Autism Spectrum Disorder (ASD), is a neuro-developmental condition characterized by difficulties in social interaction, communication challenges, and repetitive behaviors. It is a spectrum disorder, meaning it varies in severity and symptoms from person to person by a wide margin.



WHY IS AUTISM TESTING CHALLENGING?



WHY IS TESTING WITH MACHINE LEARNING USEFUL?

Inform Decisions

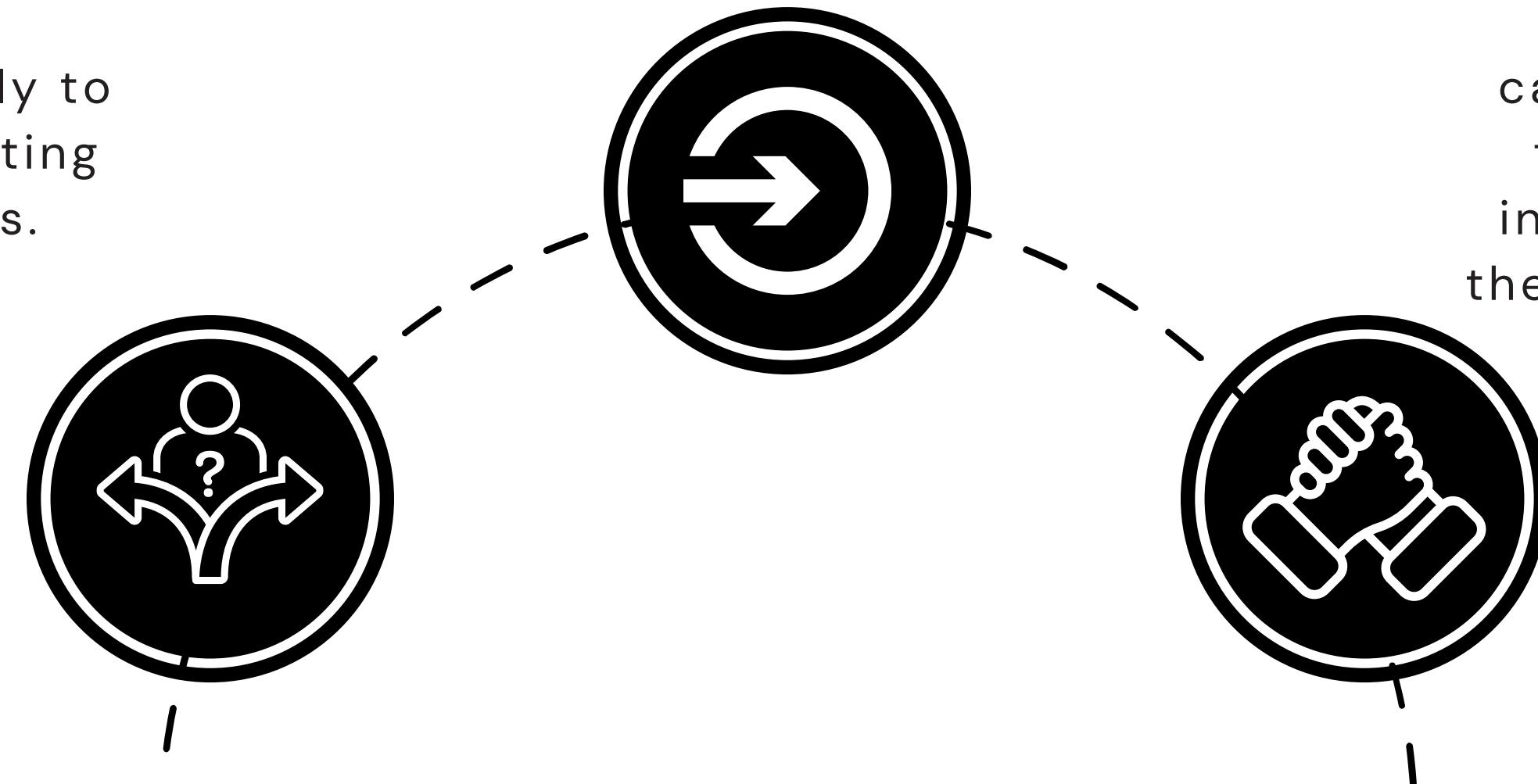
Decide whether to spend the money, time, and effort. Understand what your diagnosis is likely to be before investing in the process.

Cost and Access

Access this tool free from the comfort of your home or classroom, and from regions where diagnostic professionals are not available.

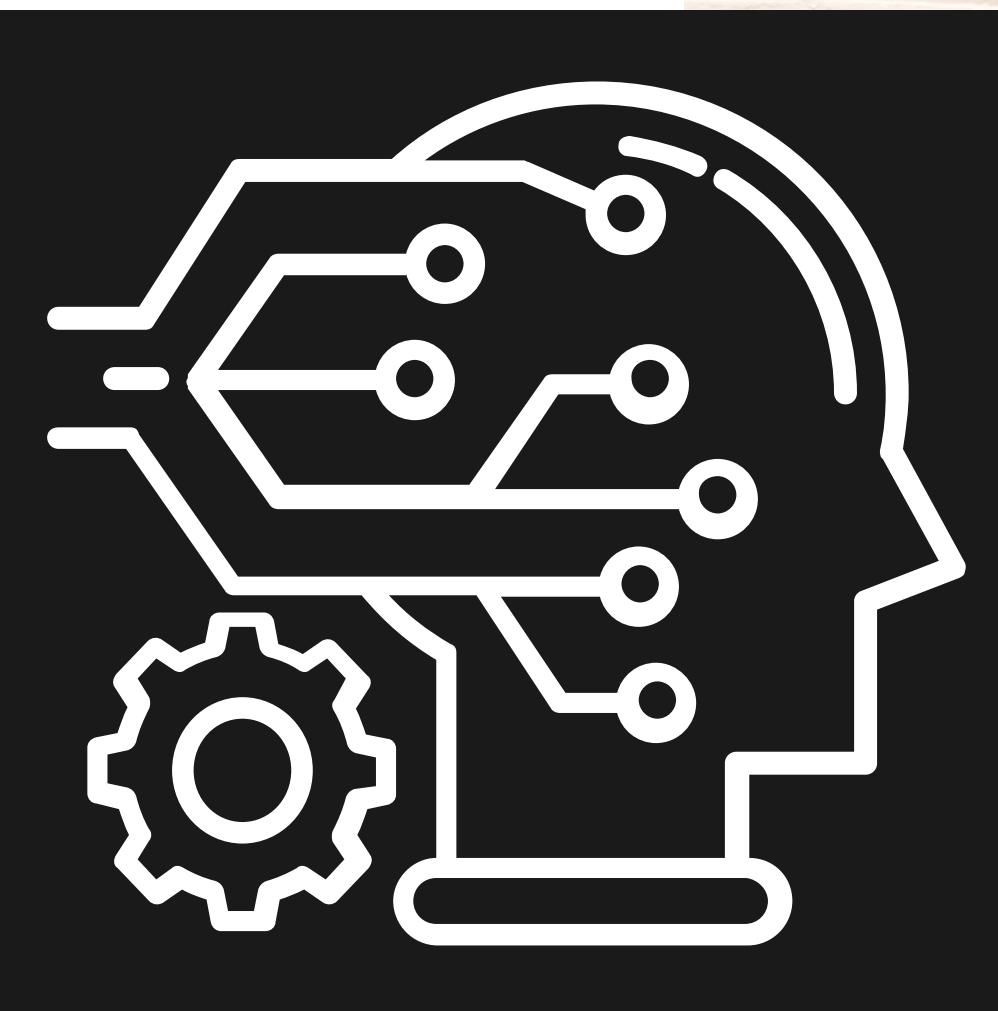
Support

Empower adults and individuals who are not seeking accommodations. This can be a powerful tool to support introspection and therapy, and inform clinical interventions.



MACHINE LEARNING

- Allows computers to make informed predictions.
- This is done by feeding the computer data, from which it can identify patterns.
- Performance is improved over time, as the computer "learns."
- Very good at handling complex relationships.
- Machine learning models scale easily.
- Can identify non-linear relationships.
- Effective when rule-based systems would be impractical



INTRODUCTION

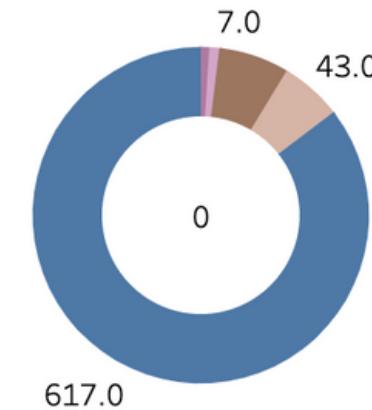
- Predicting Autism based on the responses to the Autism Spectrum Quotient (ASQ) test.
- ASQ is a psychological self-assessment questionnaire.
- The algorithm will also consider race/ethnicity and birth information.
- This test can help people to gain insights into the likelihood that an individual has Autism.
- We elected to use Logistic Regression and Neural Network Modeling (Resampling)



DESCRIPTIVE STATISTICS

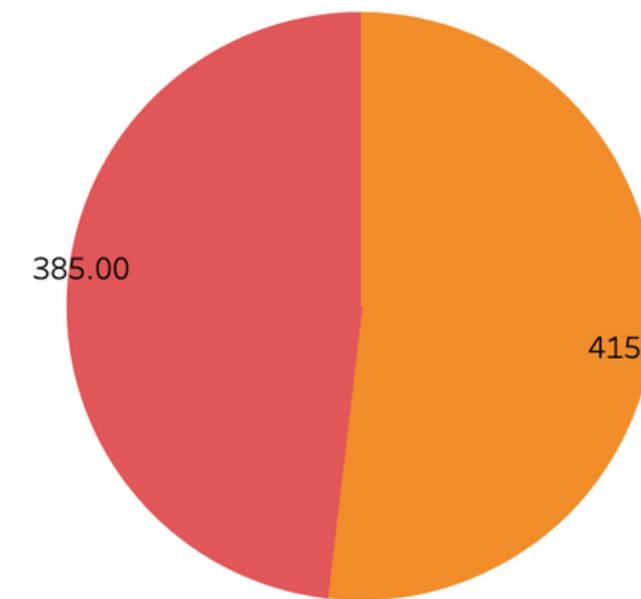
Breakdown of who submitted the Test

Measure Names
test taker Health care professi...
test taker Others
test taker Parent
test taker Relative
test taker Self



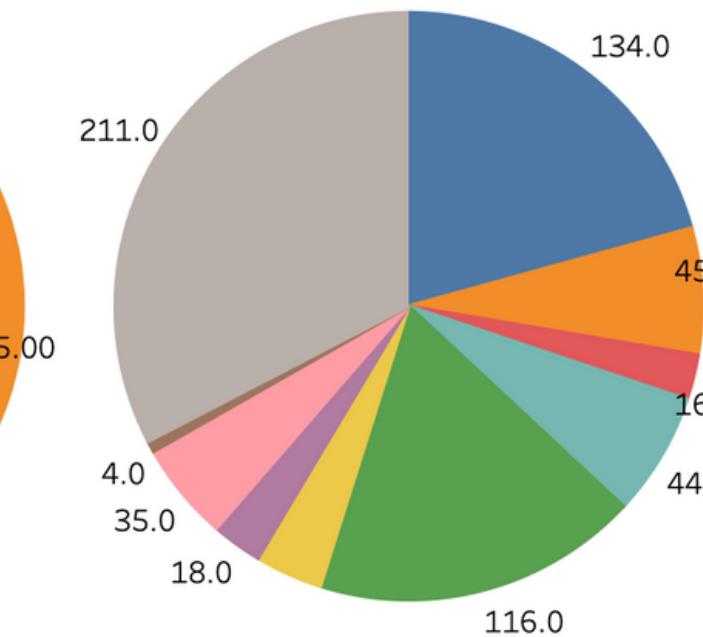
Breakdown of Sex in the Response

Measure Names
Gender F
Gender M



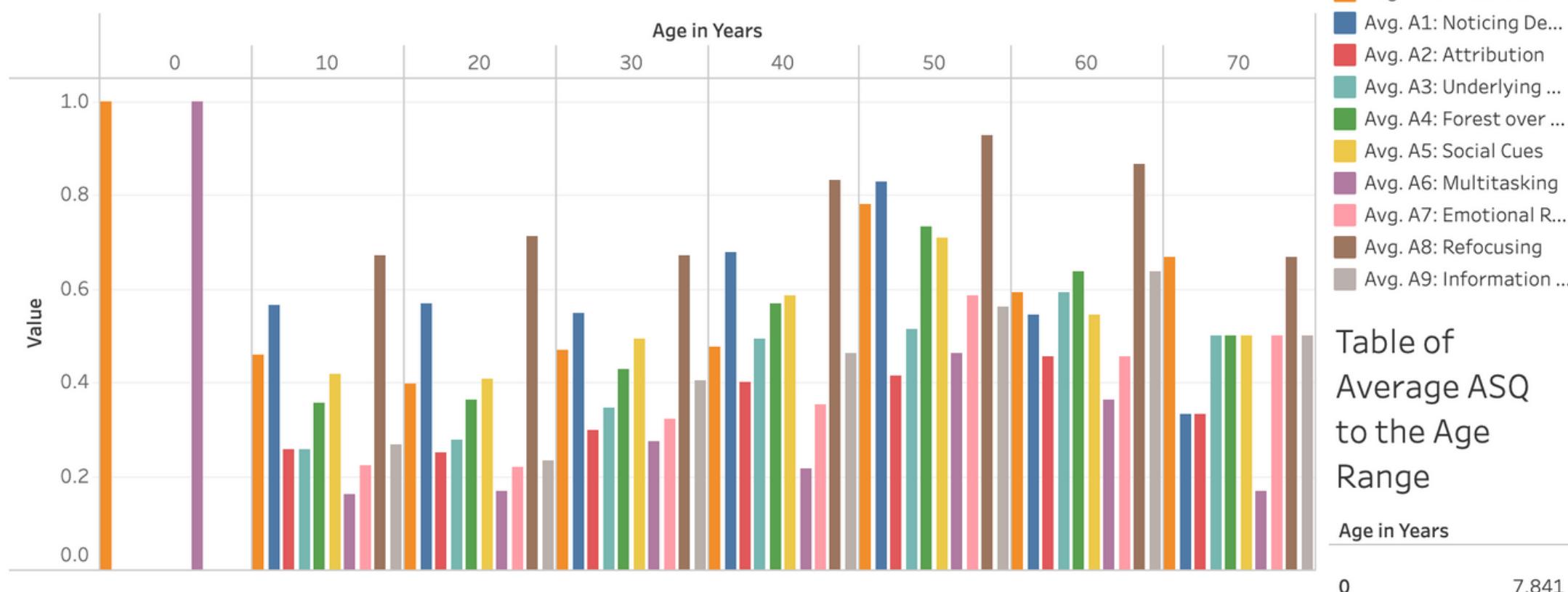
Breakdown of Ethnicities in the Survey

Measure Values
647.0
Measure Names
ethnicity Asian
ethnicity Black
ethnicity Hispanic
ethnicity Latino
ethnicity Middle Eas...
ethnicity Others
ethnicity Pasifika
ethnicity South Asian
ethnicity Turkish
ethnicity White-Euro...

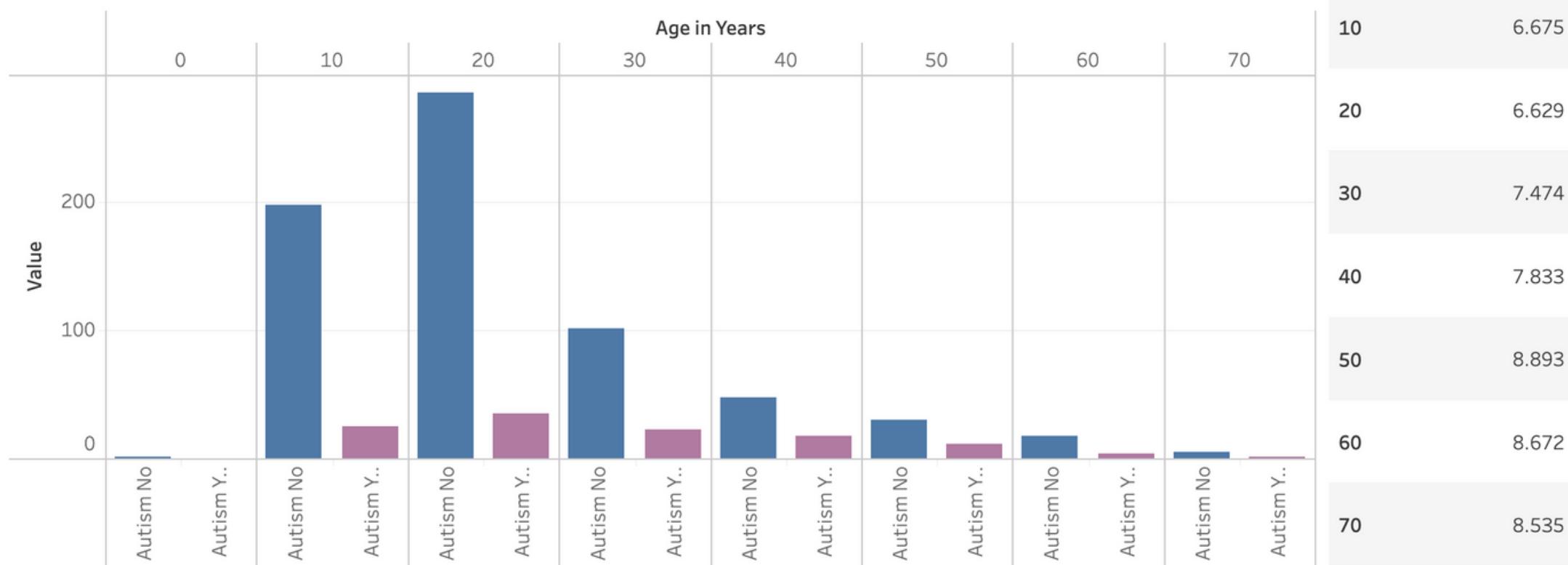


DESCRIPTIVE STATISTICS

Comparing Age Range to the Average Test Score.



Number of People Diagnosed with Autism versus Without per Age Range



Measure Names

- Avg. A10: Intention A...
- Avg. A1: Noticing De...
- Avg. A2: Attribution
- Avg. A3: Underlying ...
- Avg. A4: Forest over ...
- Avg. A5: Social Cues
- Avg. A6: Multitasking
- Avg. A7: Emotional R...
- Avg. A8: Refocusing
- Avg. A9: Information ...

Table of
Average ASQ
to the Age
Range

Age in Years

0 7.841

10 6.675

20 6.629

30 7.474

40 7.833

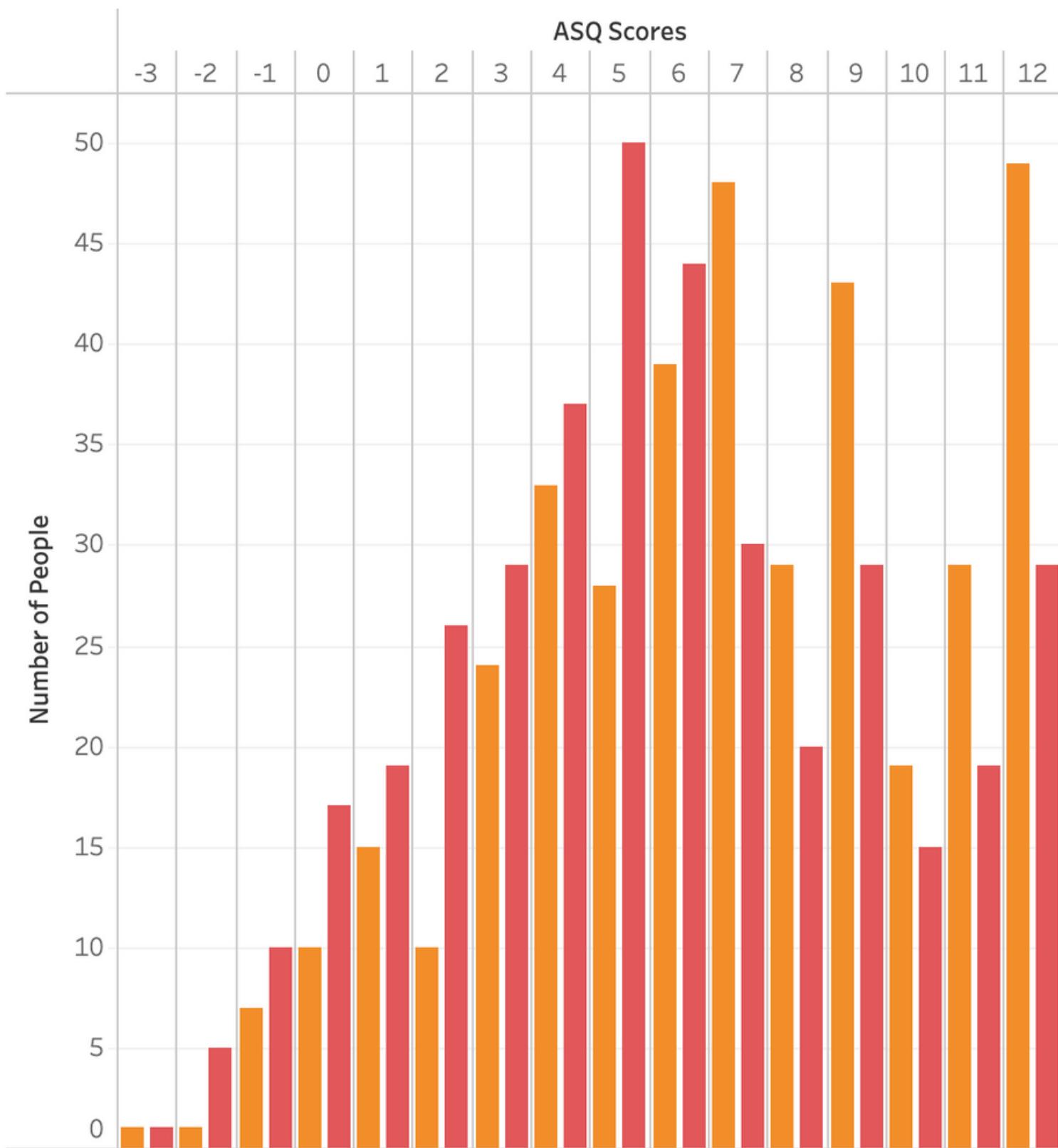
50 8.893

60 8.672

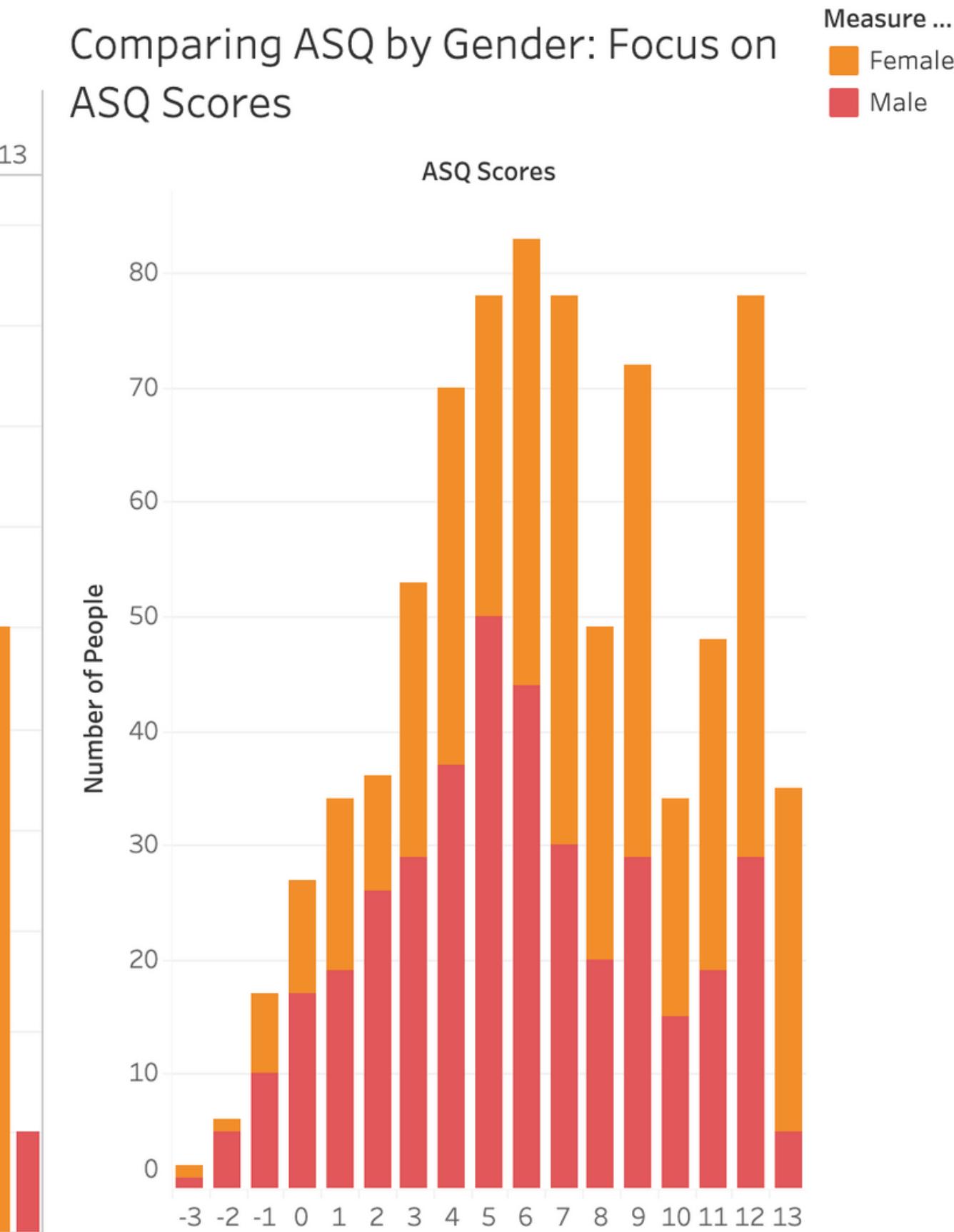
70 8.535

DESCRIPTIVE STATISTICS

Comparing ASQ by Gender: Focus on Gender

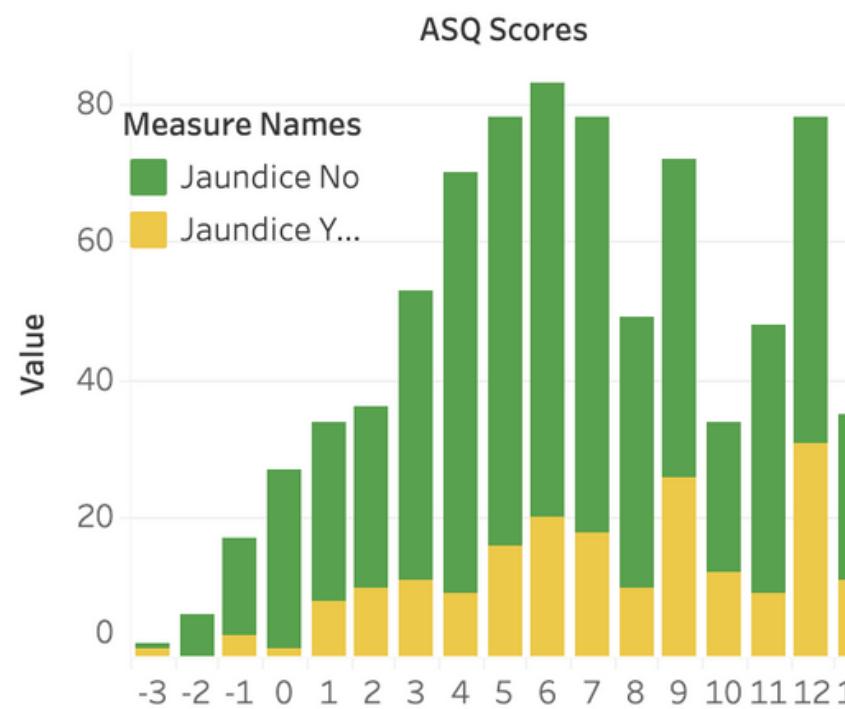


Comparing ASQ by Gender: Focus on ASQ Scores

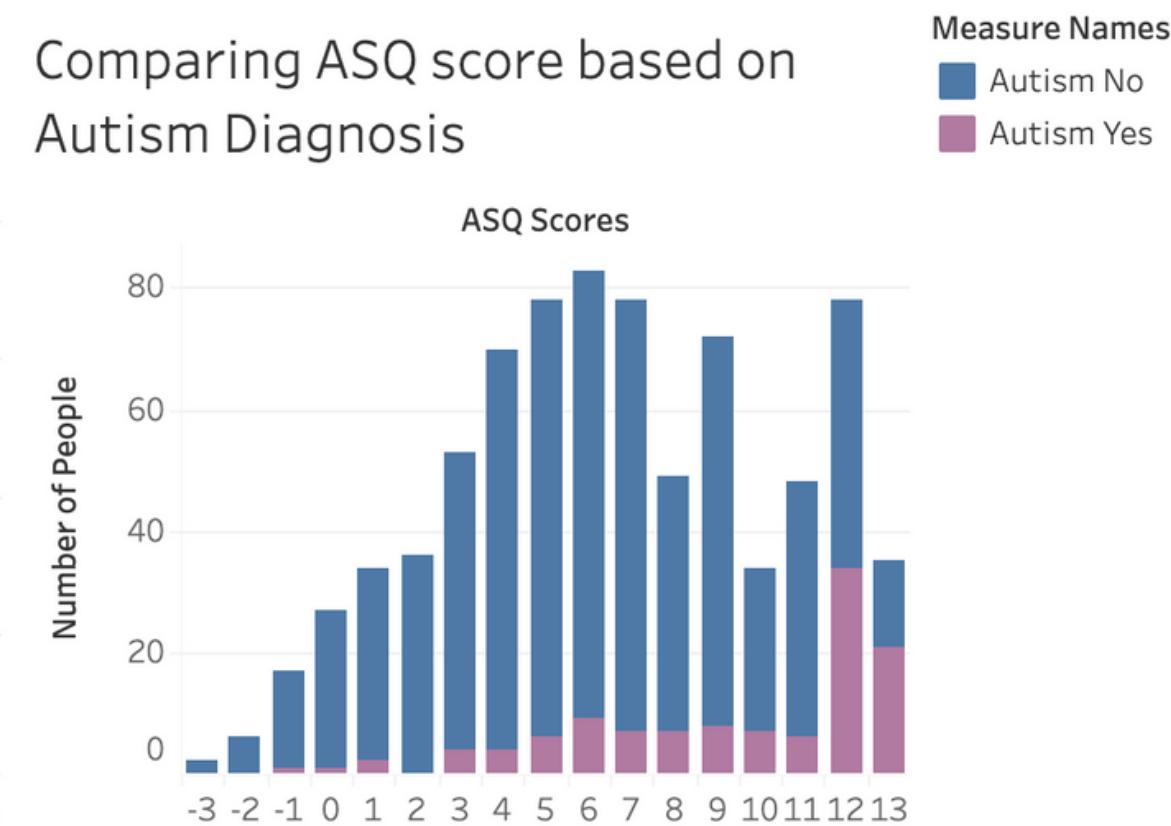


DESCRIPTIVE STATISTICS

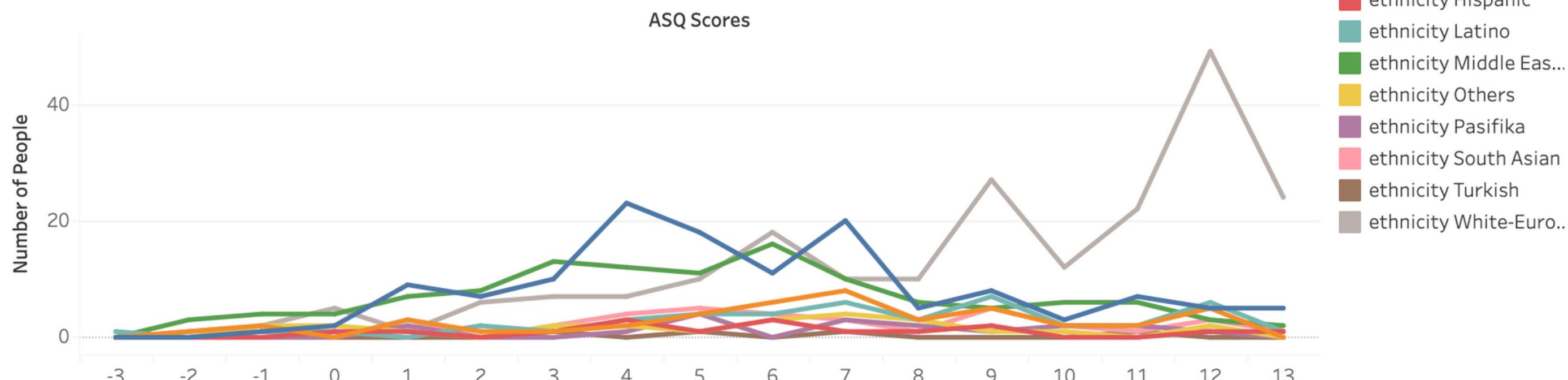
Jaundice and ASQ Presentation



Comparing ASQ score based on Autism Diagnosis



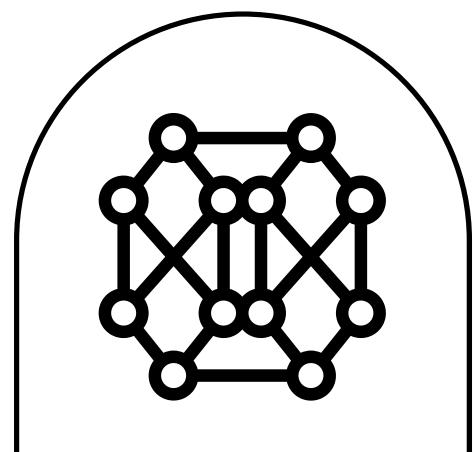
Comparing ASQ score based on Ethnicity



MODELS

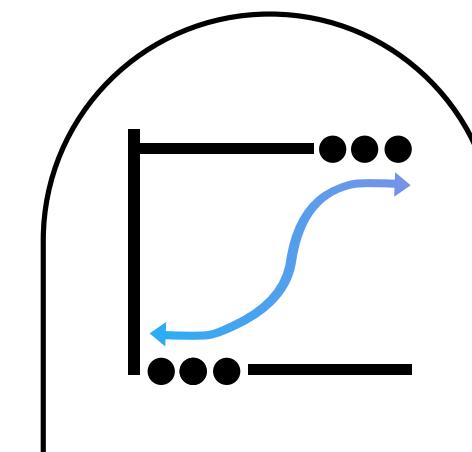
Neural Network

- Standard Analysis
- Optimized Analysis
- Random OverSampling Optimized Analysis



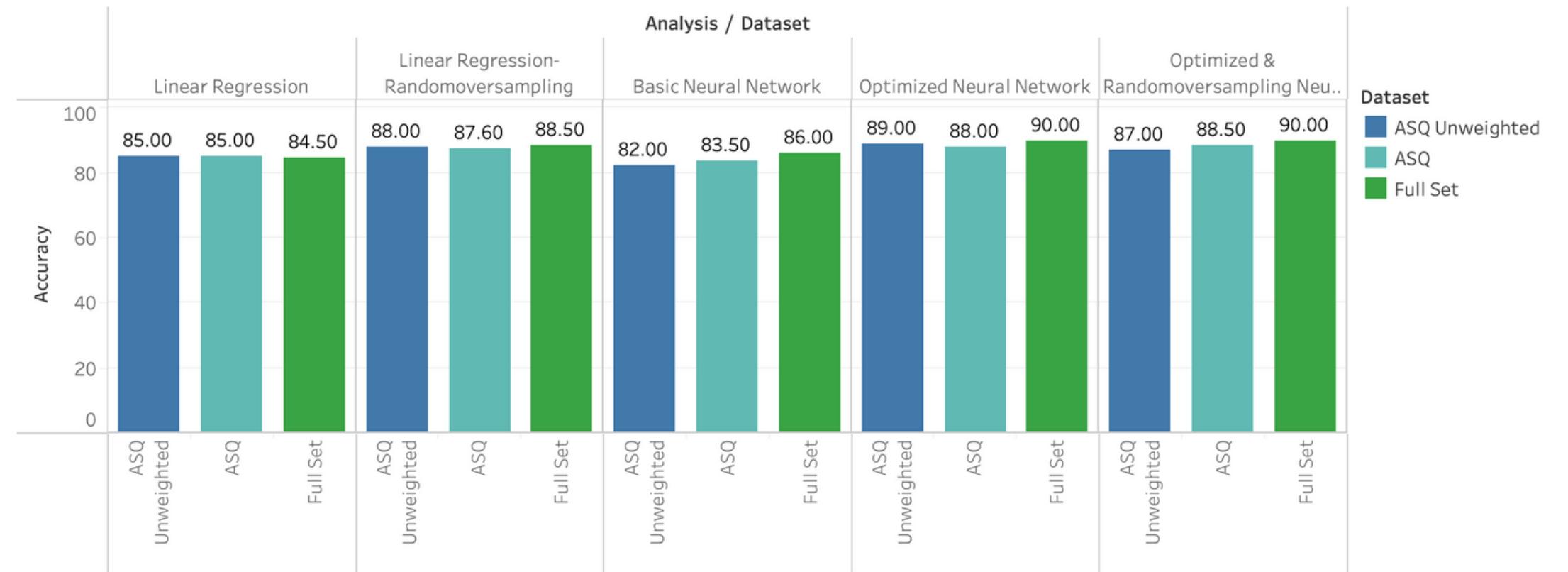
Logistic Regression

- Standard Analysis
- Random OverSampling Analysis

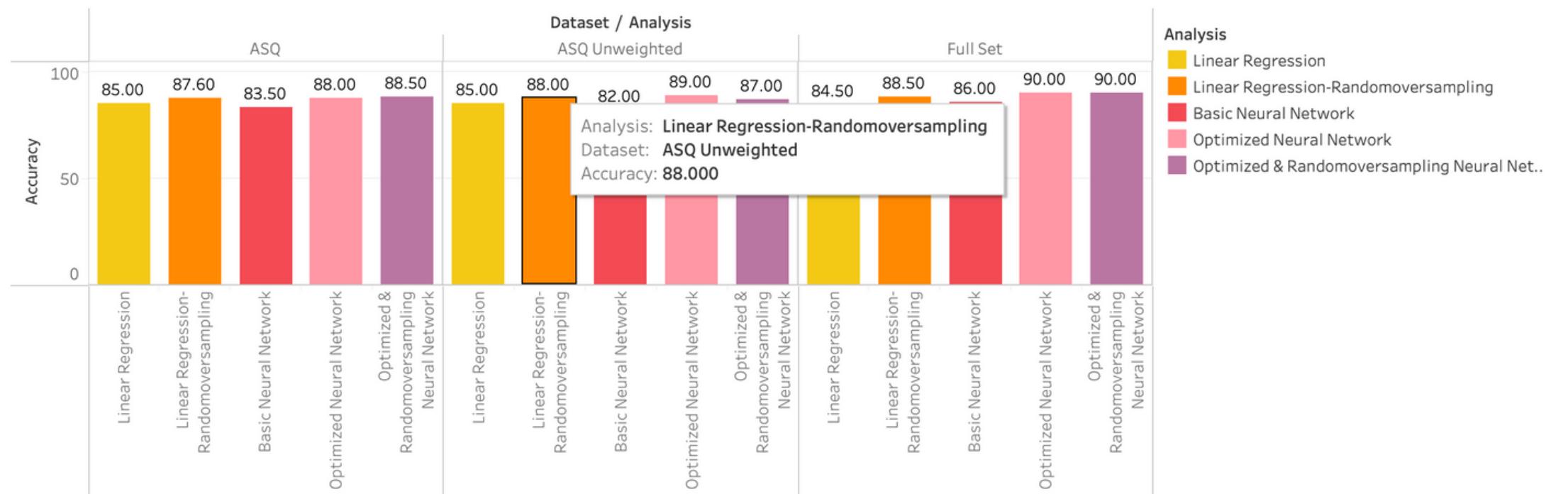


ACCURACY

Accuracy of Model by Analysis



Accuracy of Model by Dataset



IMPACT OF MODEL

Teachers

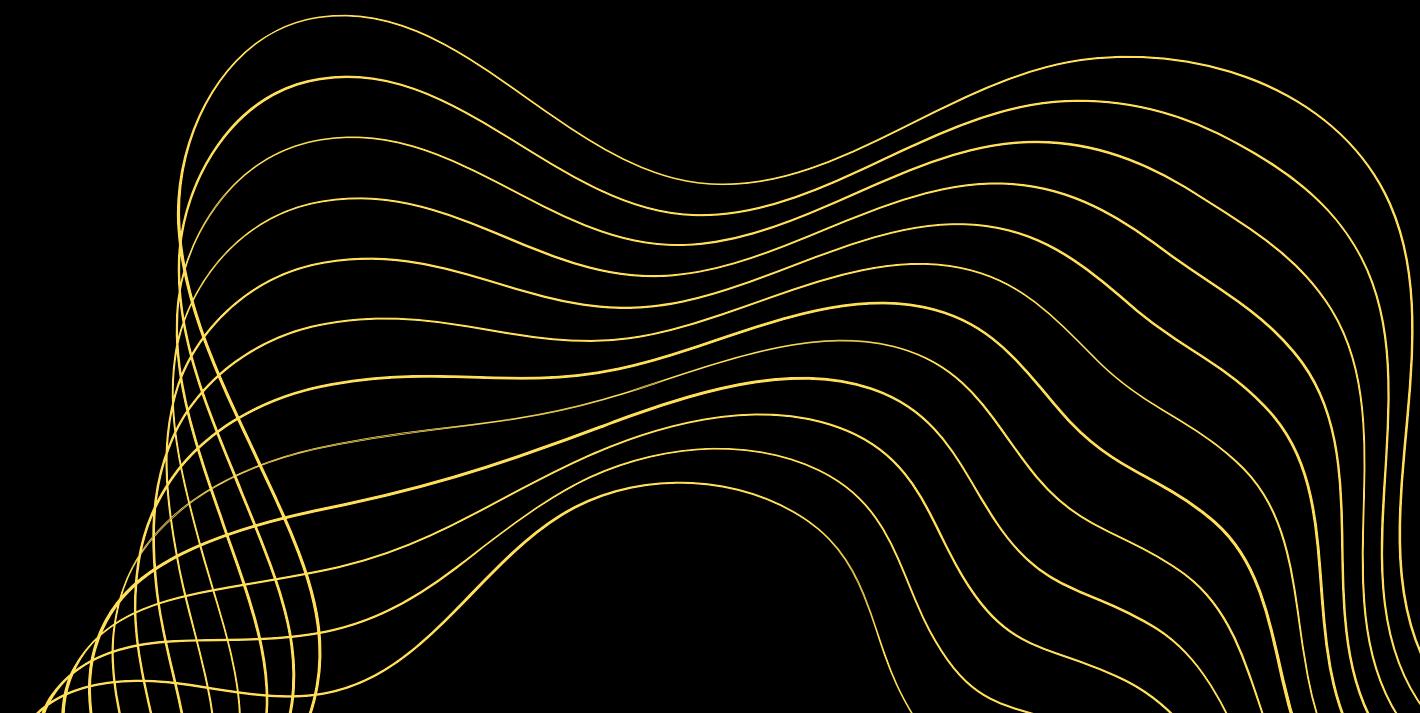
Striving to optimally support
every student.

Parents

Desperate to understand and
empower their children.

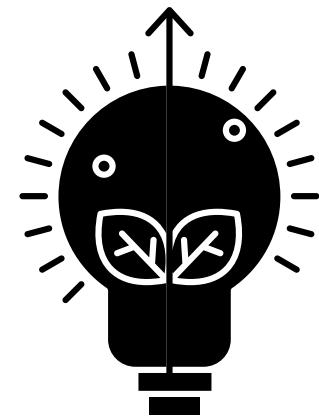
Autistic Individuals

Struggling with self-definition,
acceptance, and integration.



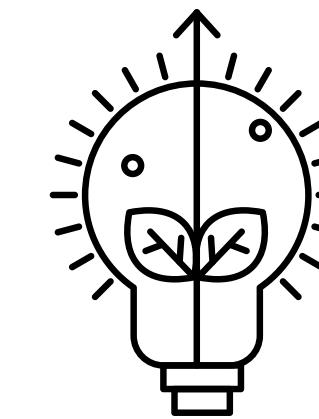
OUTCOMES

Shortcomings

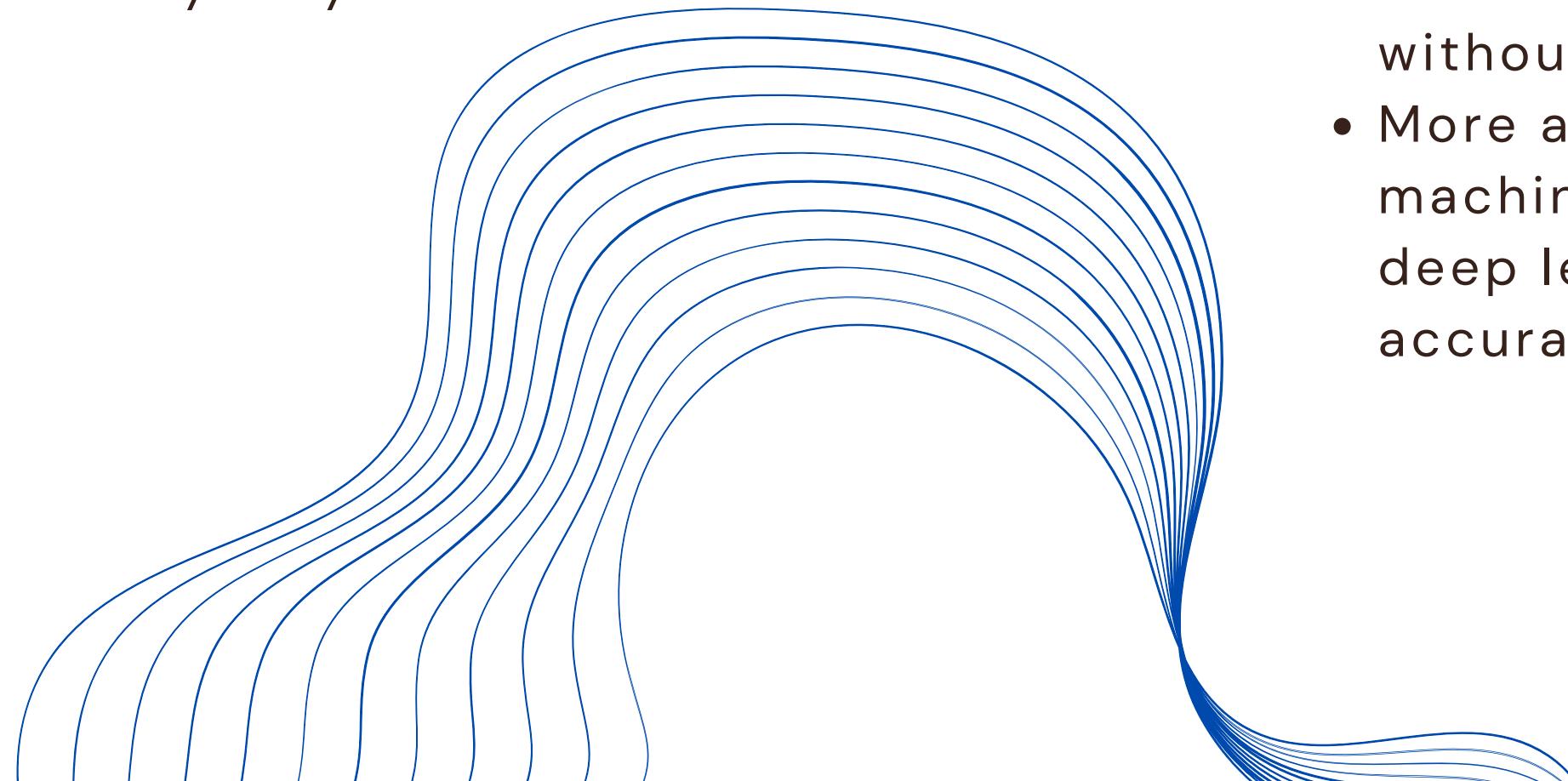


- Limited data
- Not very much data
- Accuracy only at 90%

Next Steps



- Wider dataset (more variables and info on each individual)
- More data (more people with and without autism in the dataset)
- More accurate model (using advances in machine learning, neural networks, and deep learning to achieve greater accuracy)



RESOURCES

The dataset we used is available at the following link:

<https://www.kaggle.com/competitions/autism-prediction/data>.

The Tableau is available at the following links:

https://public.tableau.com/app/profile/abdulmateen.oyediran/viz/Autism_16862643176600/Story1

&

<https://public.tableau.com/app/profile/oliver.zagorin/viz/AccuracyVisualization/Dashboard1?publish=yes>

