Modeling Early Autism Detection in Children

Presented by:
Sandra Lopez Padilla,
Olivier Mizero, Clion Muhoza,
and Kalyan Ghimire

Problem Statement

The Urgency of Early Autism Detection

Diagnosing **ASD** at an early stage remains a challenge due to the wide range of symptom variations and the reliance on expert assessment.

We seek to develop a high accuracy ML tool to solve the challenge.

Prevalence

- Approximately 1 in 36 children (CDC, 2024)
- Higher prevalence in boys than girls
- Increasing rates over the past decades

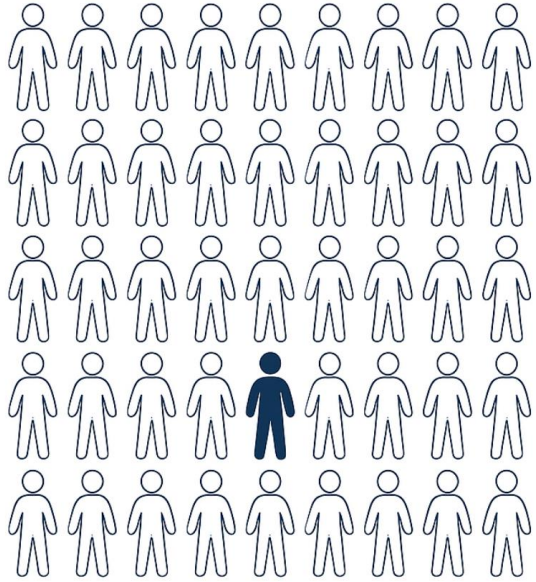


Image created using Craiyon (https://www.craiyon.com/)

Using Machine Learning to Support Early Screening

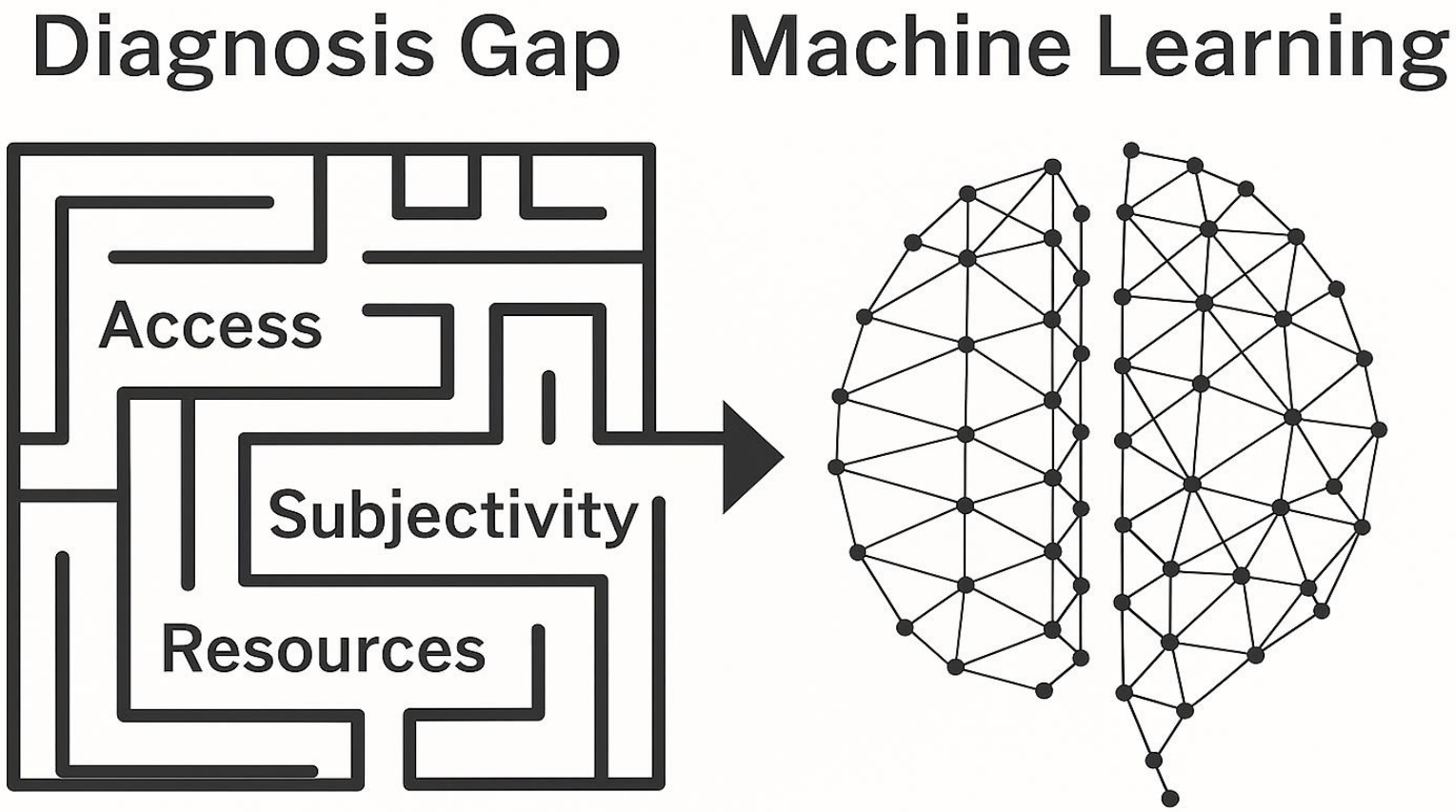
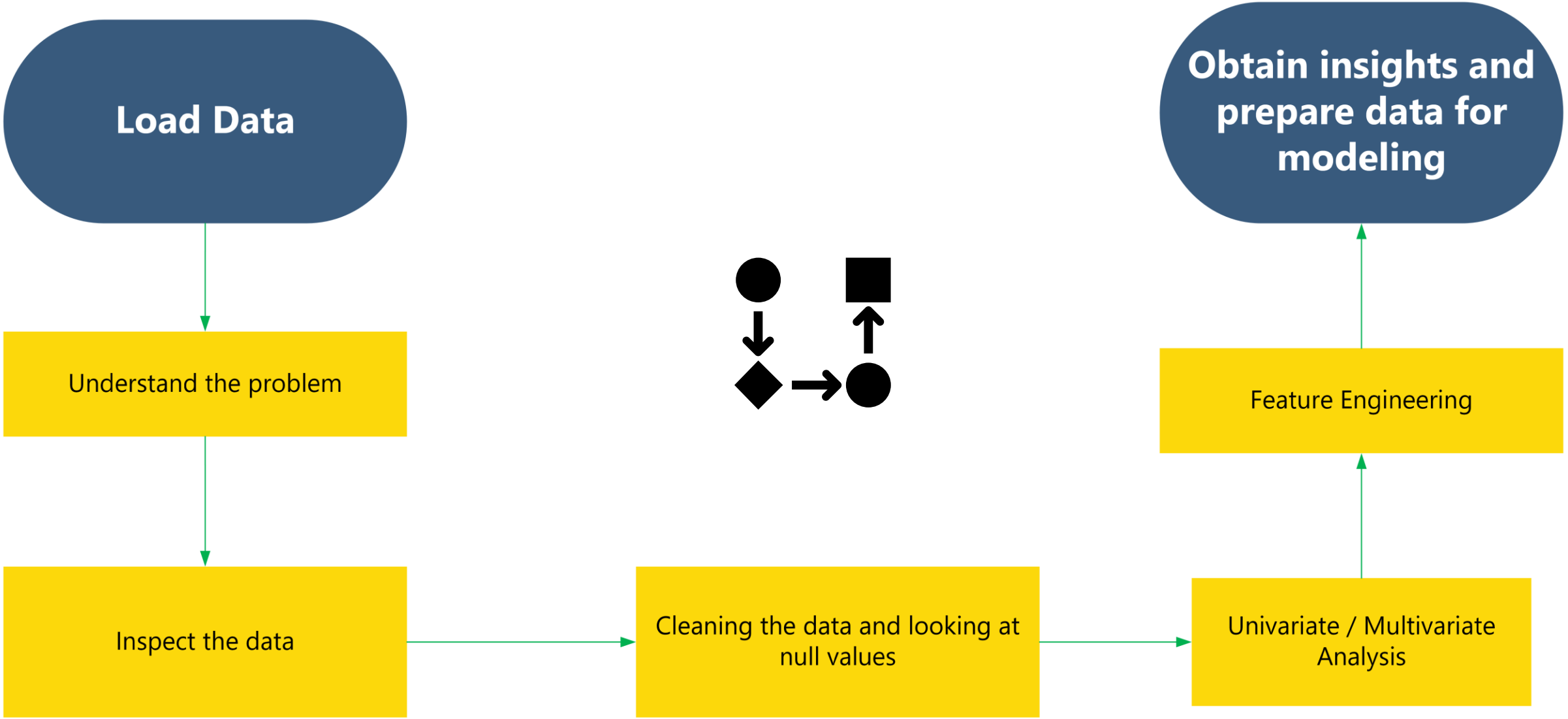


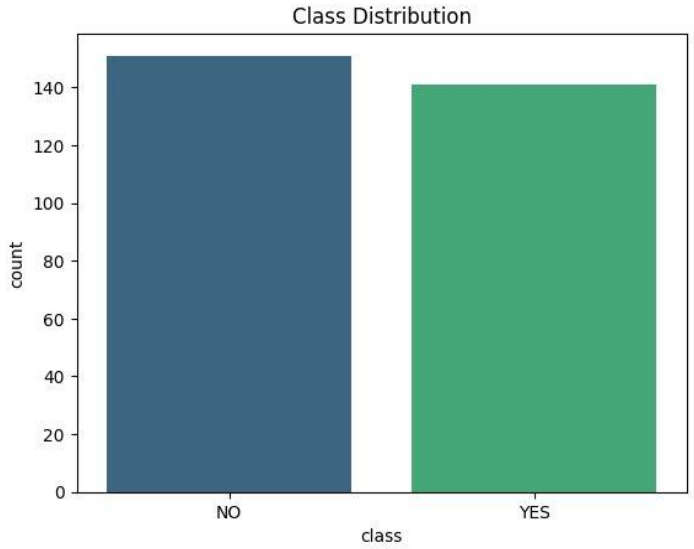
Image created using Craiyon
(https://www.craiyon.com/)

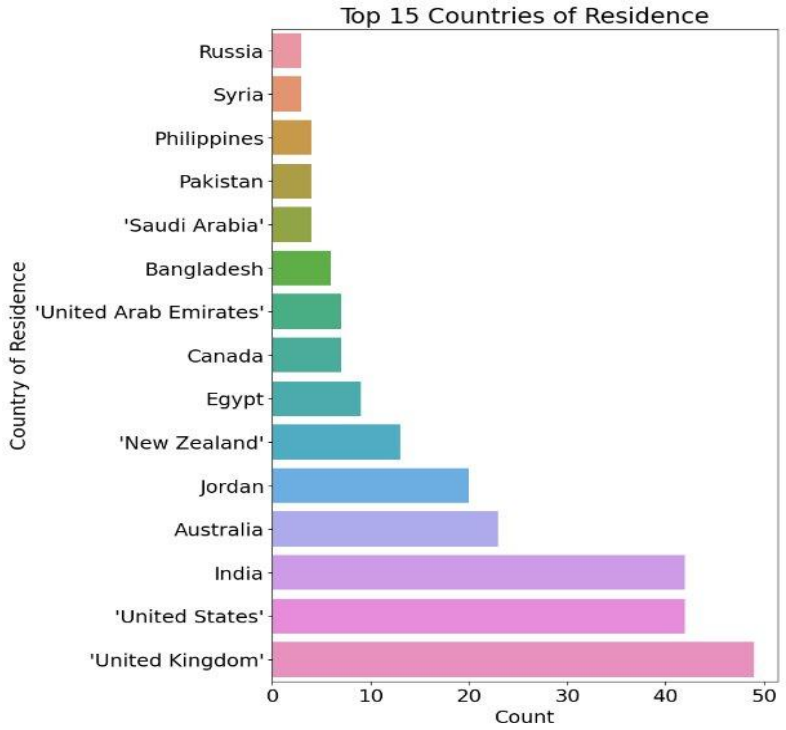
Exploratory Data Analysis (EDA)

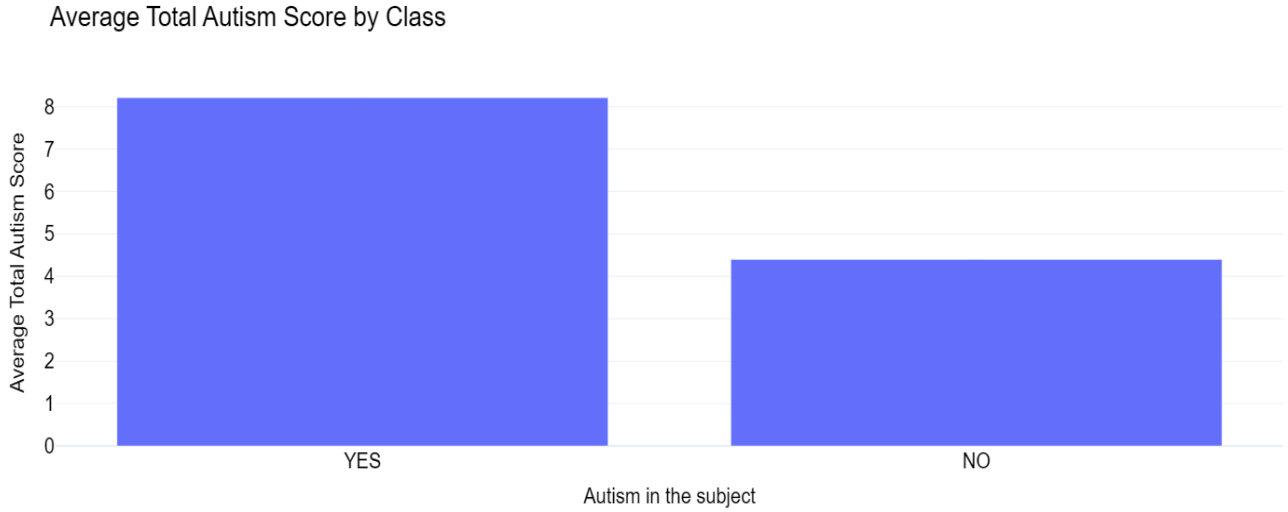
EDA Workflow



Data Visualization

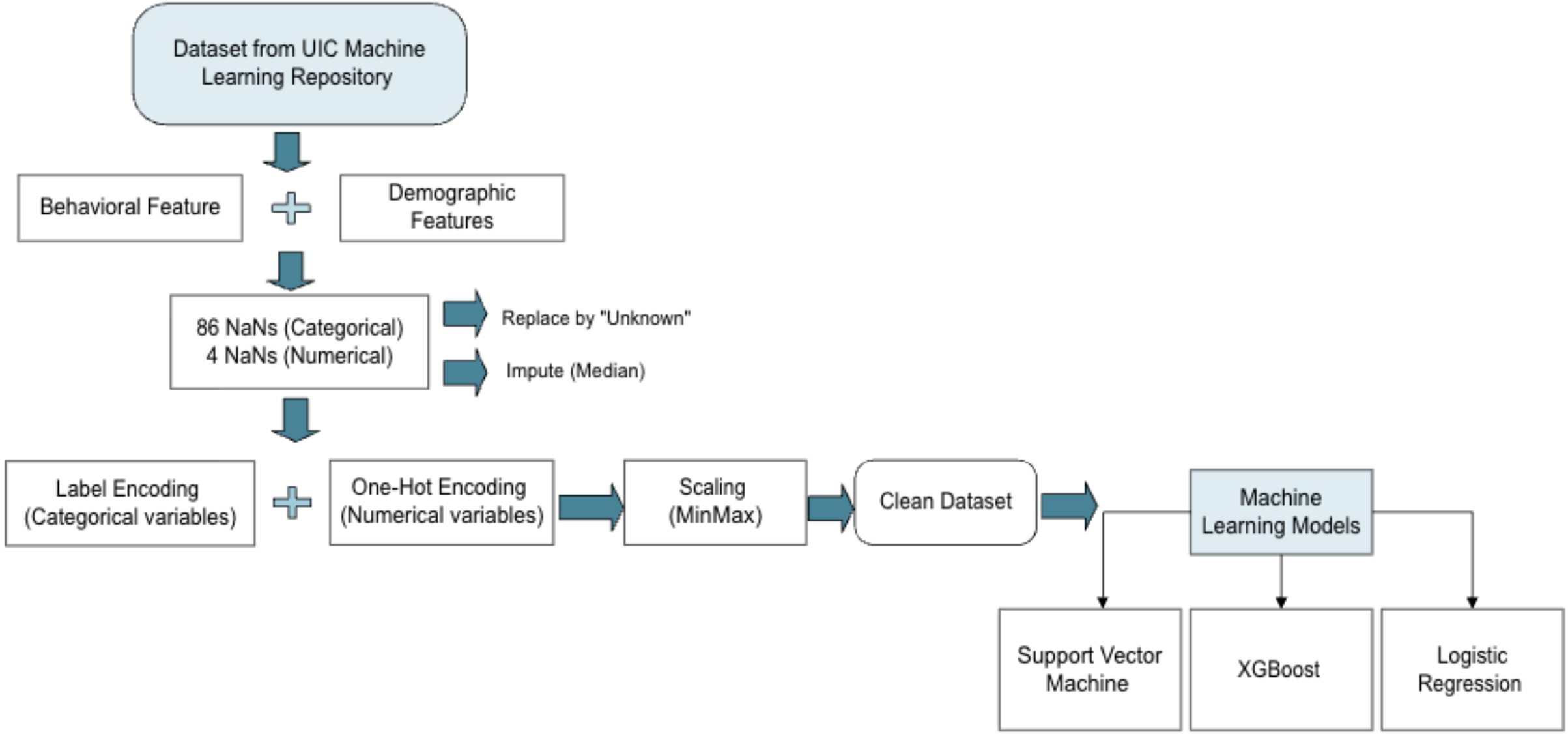




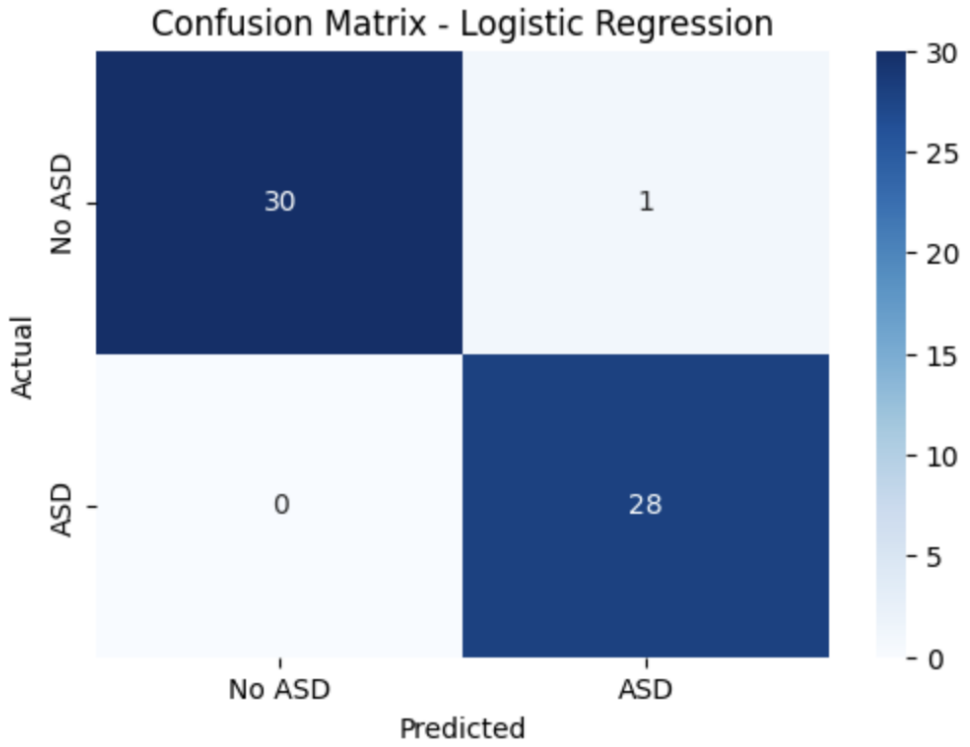


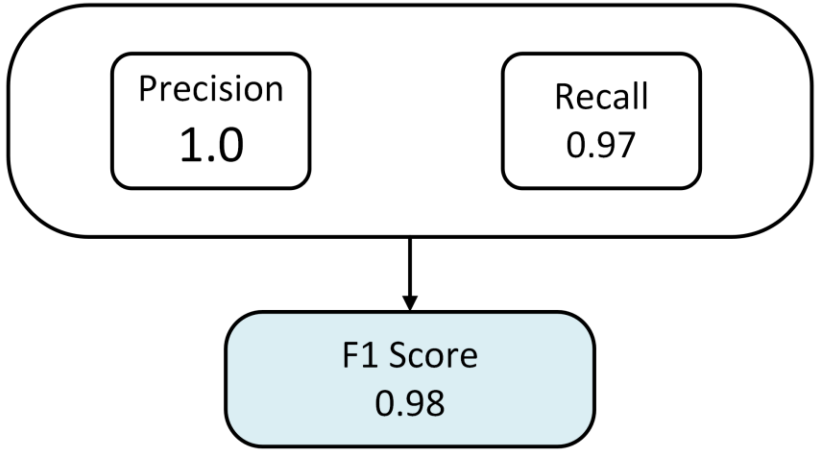
Model Development

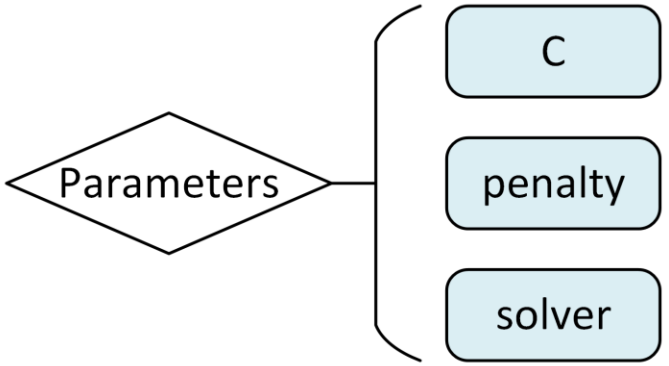
Model Development Workflow



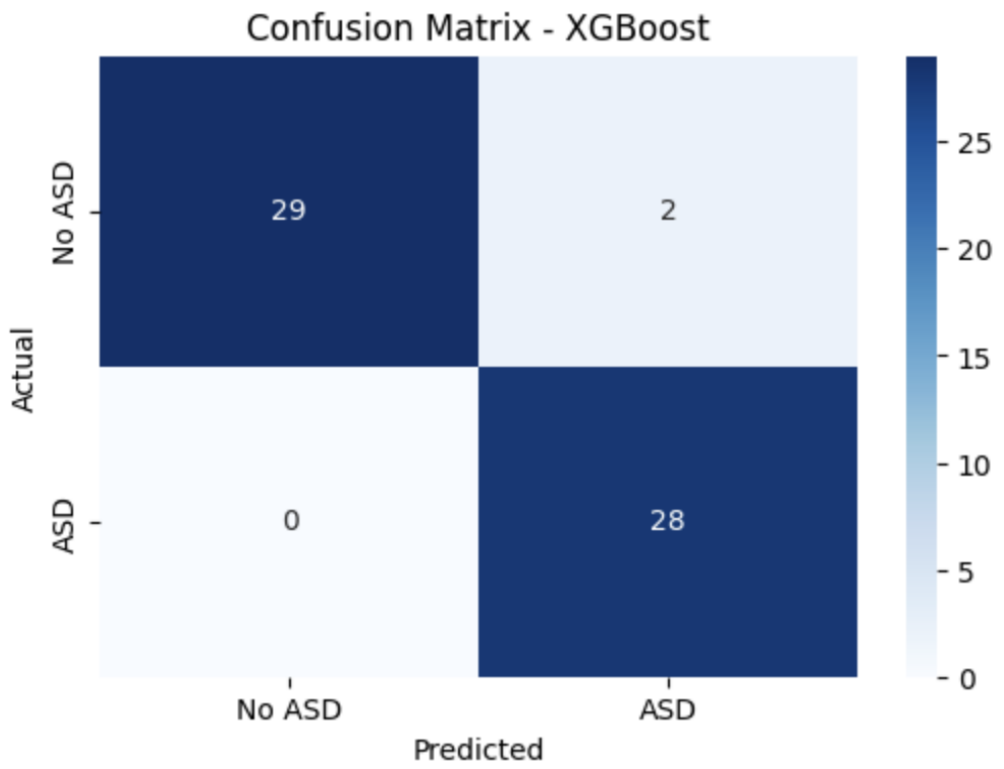
Logistic Regression Had Only 1 No-ASD Misclassification

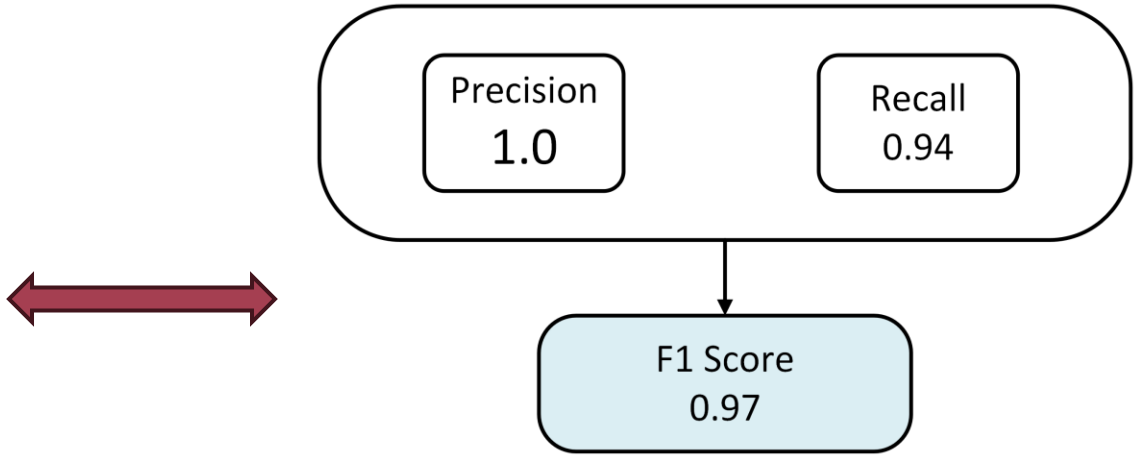


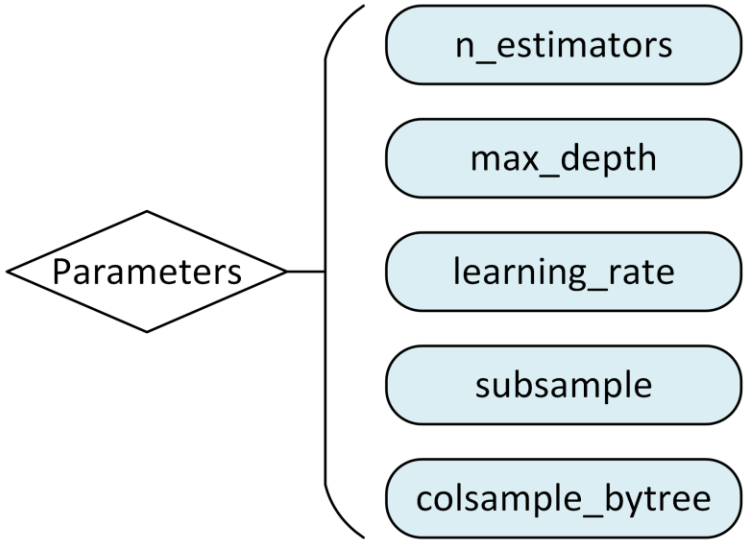




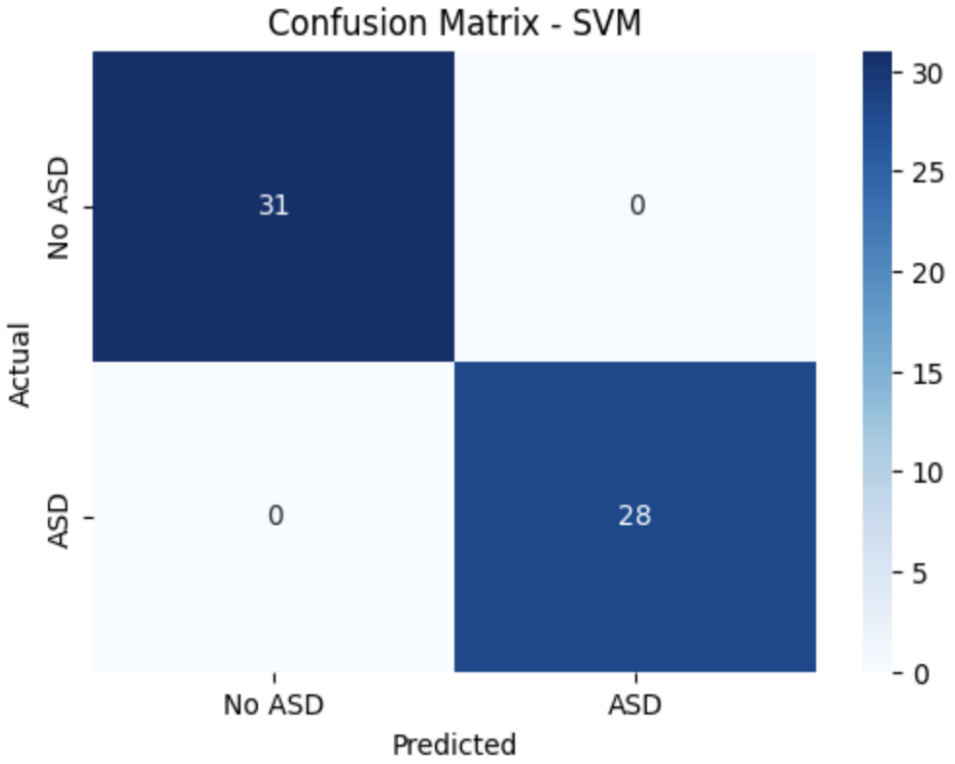
XGBoost Had 2 No-ASD Misclassification

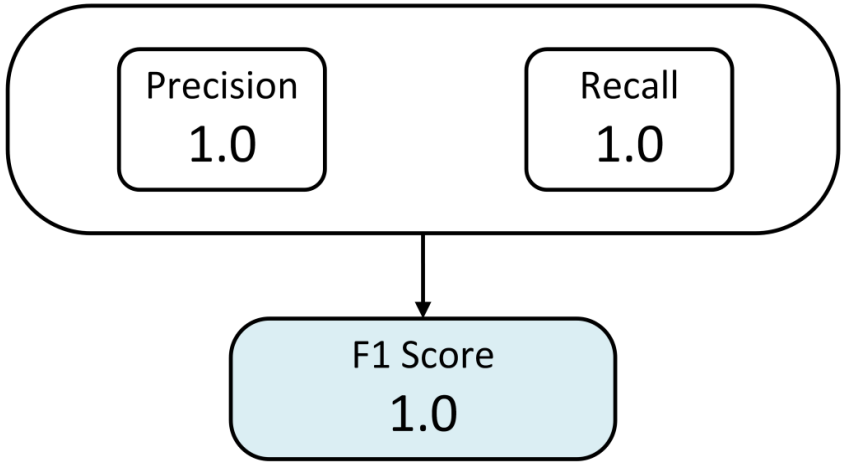


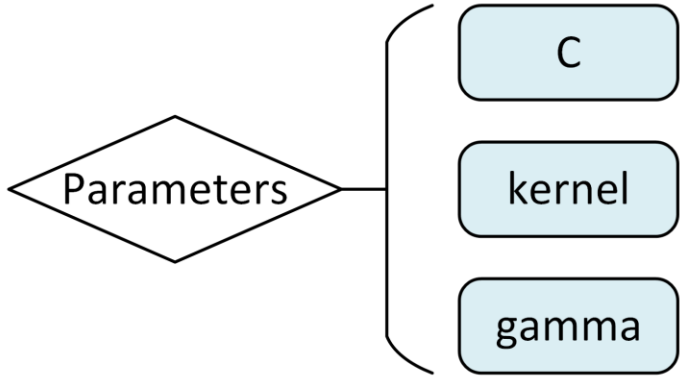




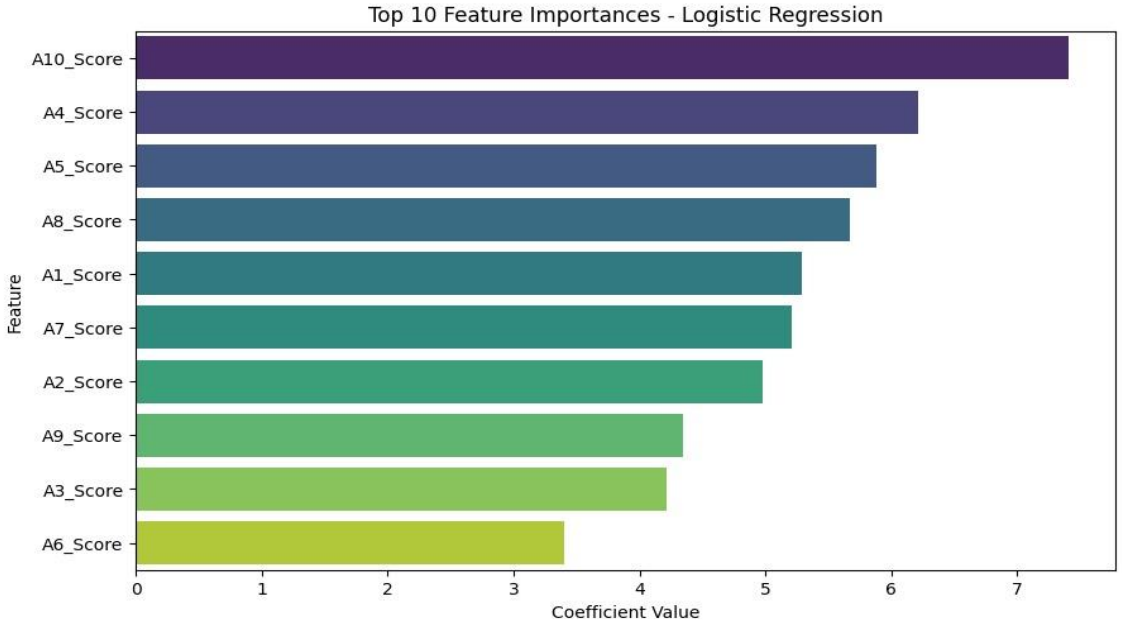
Support Vector Machine (SVM) Had Best Performance

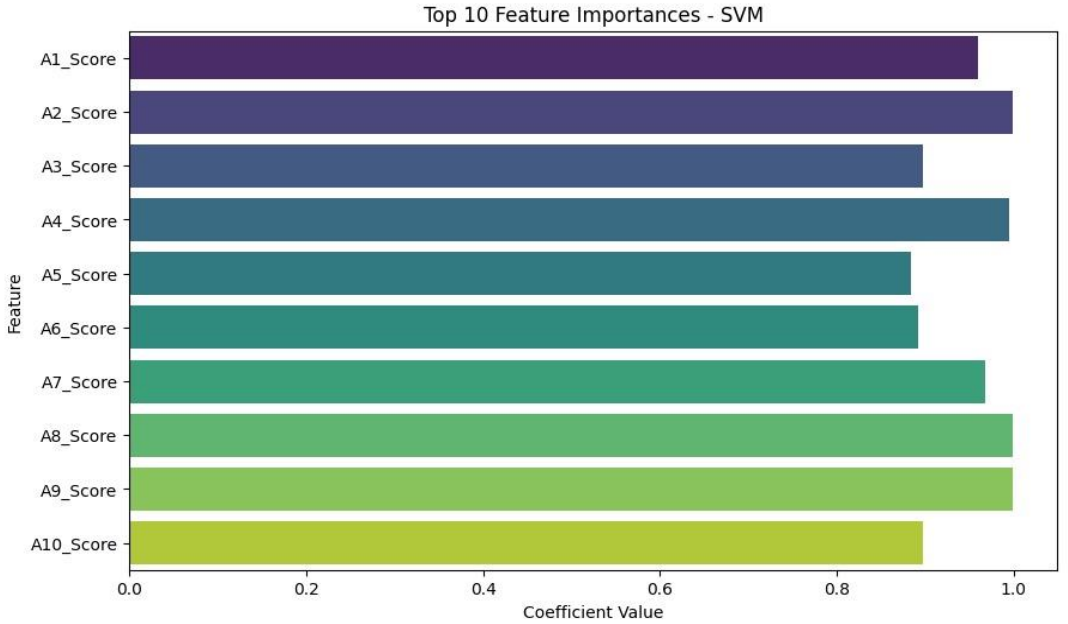




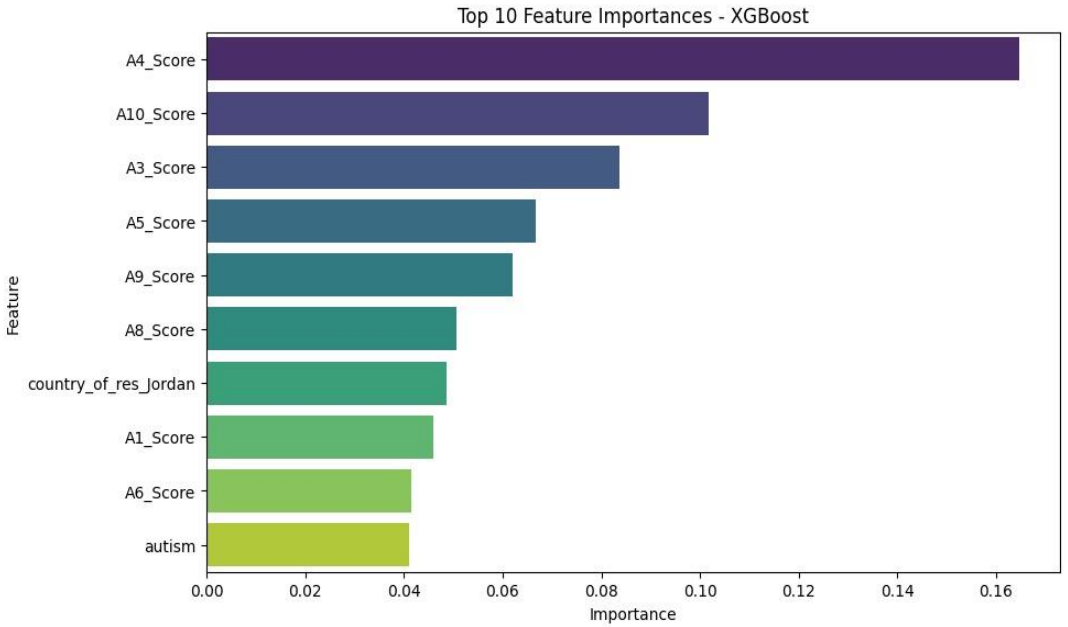


Behavioral Responses Outperformed Demographic Features



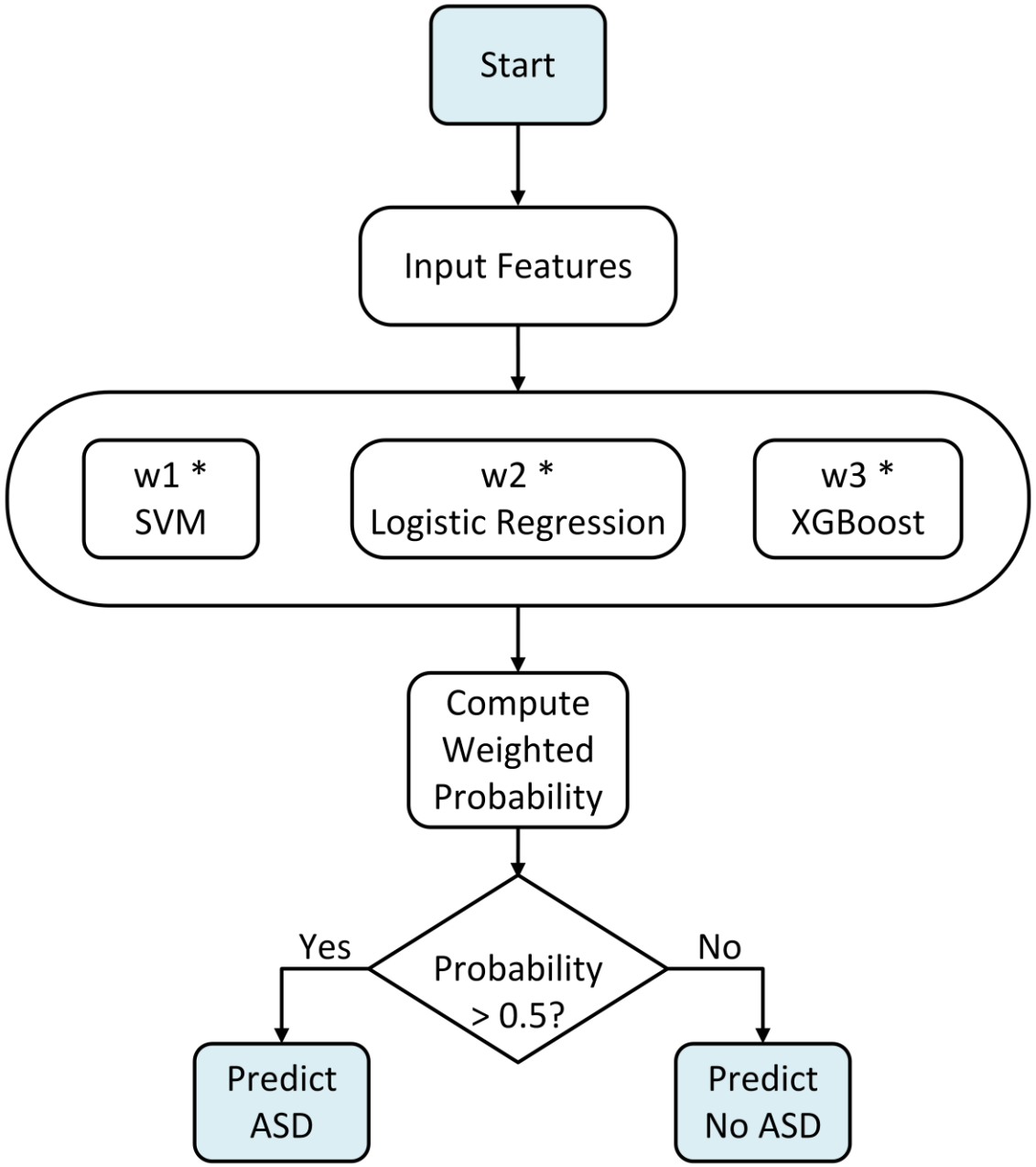


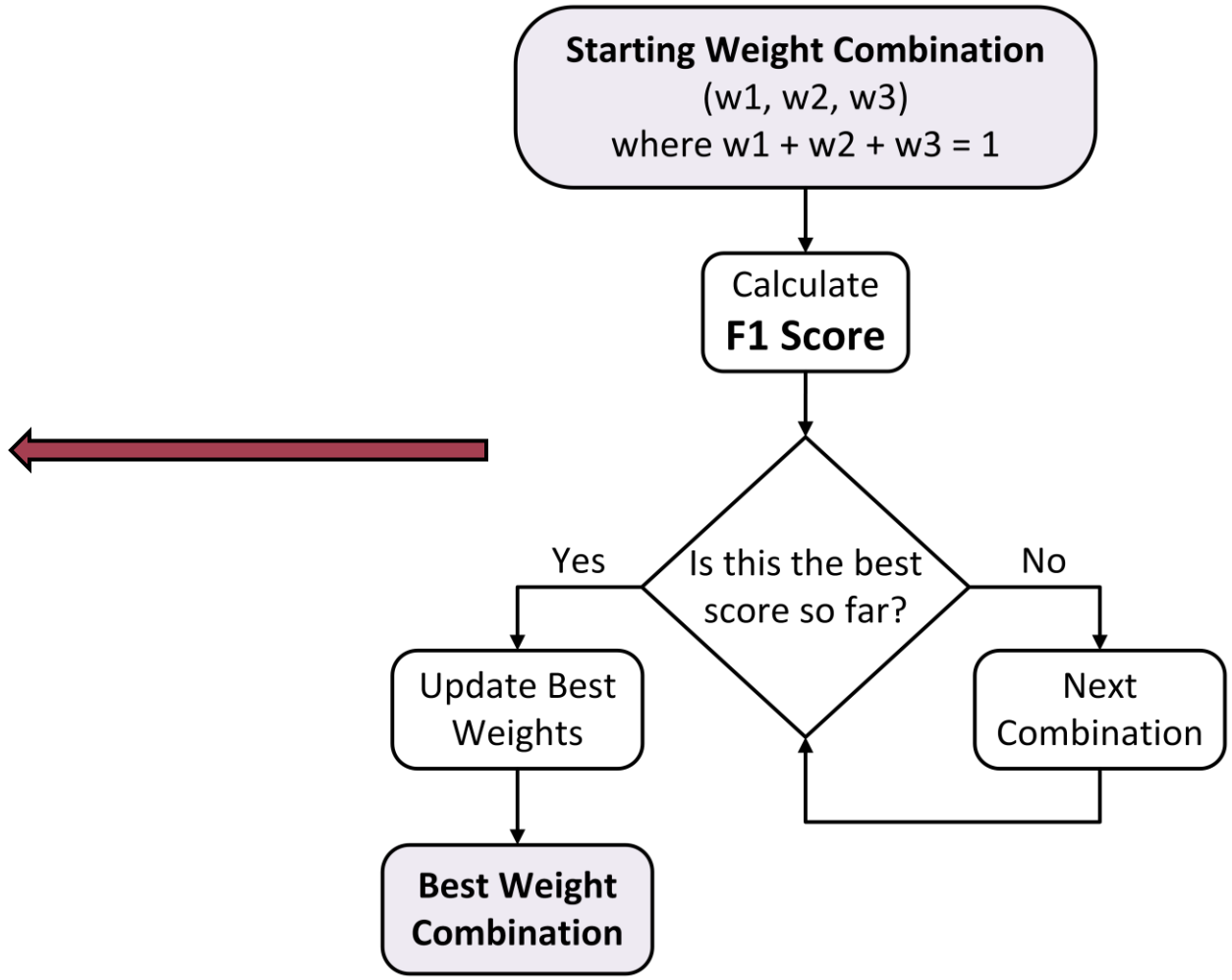
- **A1_Score:** S/he often notices small sounds when others do not
- **A2_Score:** S/he usually concentrates more on the whole picture, rather than the small details
- **A3_Score:** In a social group, s/he can easily keep track of several different people's conversations
- **A4_Score**: S/he finds it easy to go back and forth between different activities
- **A5_Score:** S/he doesn't know how to keep a conversation going with his/her peers
- **A6_Score:** S/he is good at social chit-chat
- **A7_Score:** When s/he is read a story, s/he finds it difficult to work out the character's intentions or feelings
- **A8_Score:** When s/he was in preschool, s/he used to enjoy playing games involving pretending with other children
- **A9_Score:** S/he finds it easy to work out what someone is thinking or feeling just by looking at their face
- **A10_Score:** S/he finds it hard to make new friends



Research and Development (R&D)

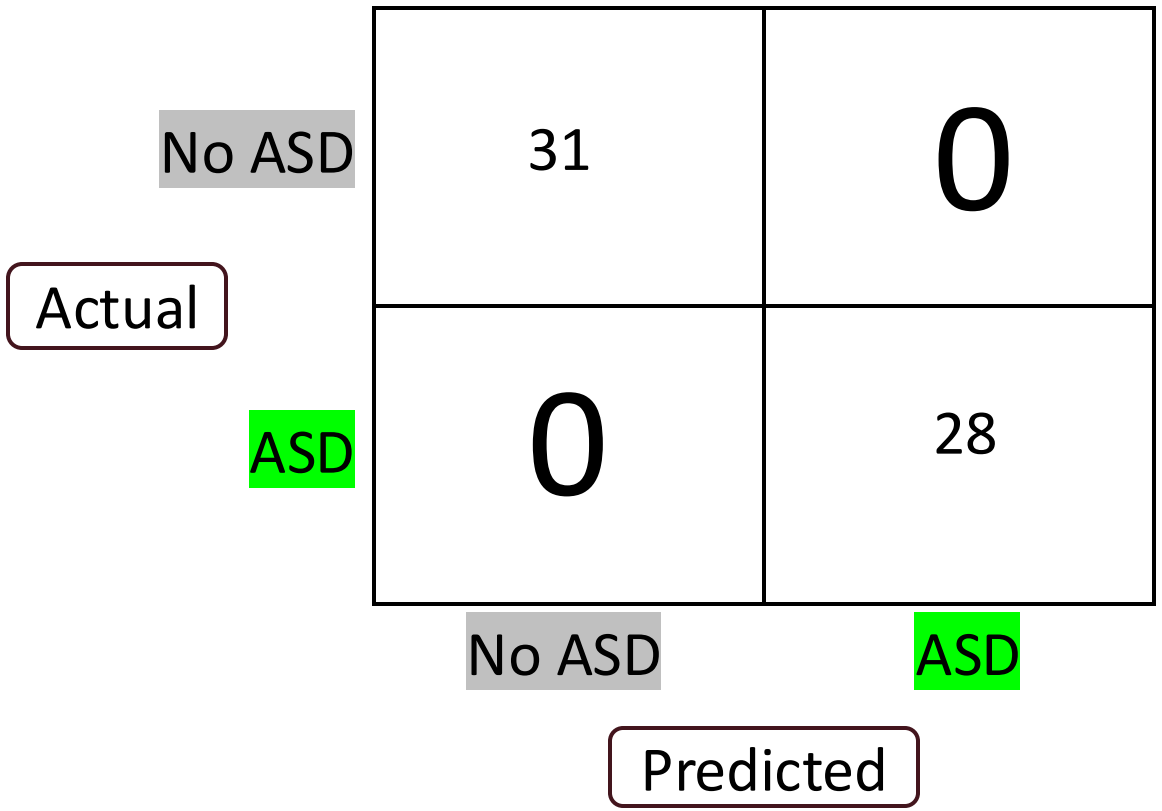
Beyond Model Selection: Weighted Ensemble Evaluation

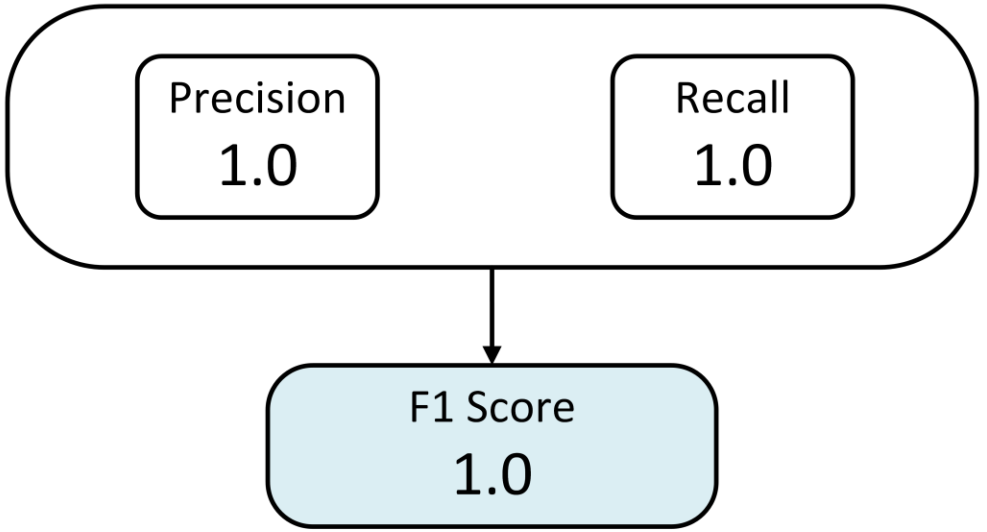




w1, w2, w3: weights for the 3 models
ASD: Autism Spectrum Disorder

Combining Three Weighted Models Proved Robust and Error-Free





Zero ASD Misclassification
Zero No-ASD Misclassification

Smart Screening: A Data-Driven Dashboard for Early ASD Detection

Autism Prediction, Please fill the form below

Age

10 − +

Does He/She Notices small sounds that others do not?

yes

Does He/She concentrate on the whole picture than small details ?

yes

Can he/she easily keep track of several peoples conversations?

yes

Can He/She can easily switch activities ?

no

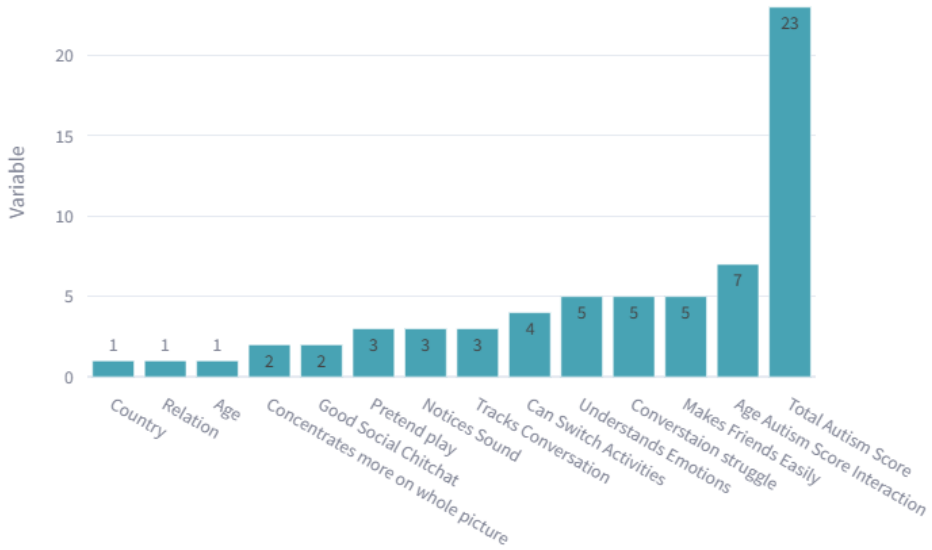
He/she doesnt know how to keep a

Deploy

Autism prediction

Feature Importance

Feature Importance; What features do matters most?



Model Performance

Autism Prediction App

Predict

Prediction: Your responses indicate that **your child may be showing traits commonly associated with autism spectrum disorder (ASD)**.

Model Confidence: **78.72%**

Note: This is not a medical diagnosis, but a preliminary screening result based on patterns identified by our machine learning model. We recommend consulting a licensed healthcare professional.

Deploy

Autism Prediction, Please fill the form below

Age

10 − +

Does He/She Notices small sounds that others do not?

no

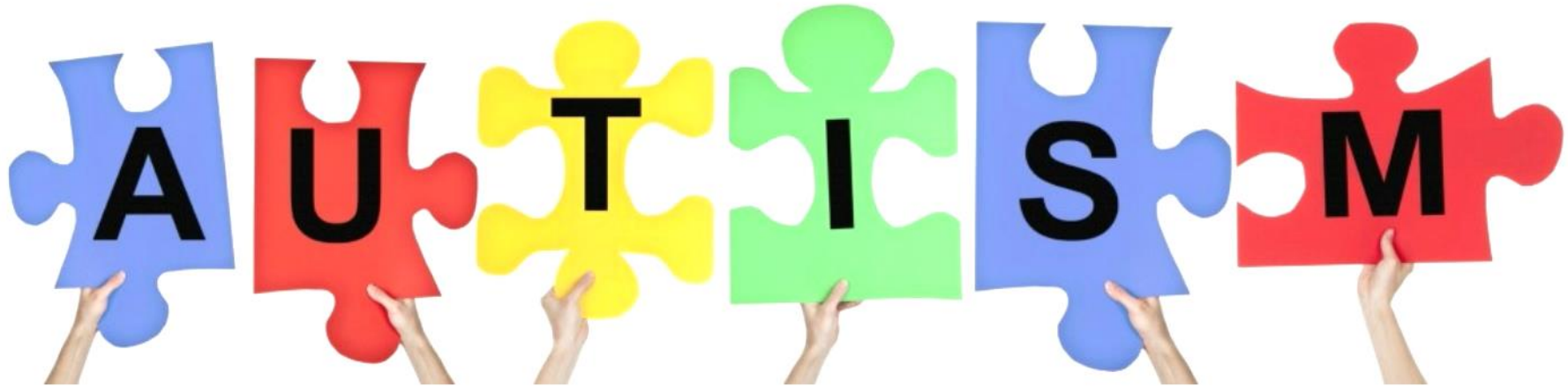
Does He/She concentrate on the whole picture than small details ?

no

Can he/she easily keep track of several peoples conversations?

yes

Can He/She can easily switch activities ?



Autism prediction

Feature Importance

Feature Importance; What features do matters most?

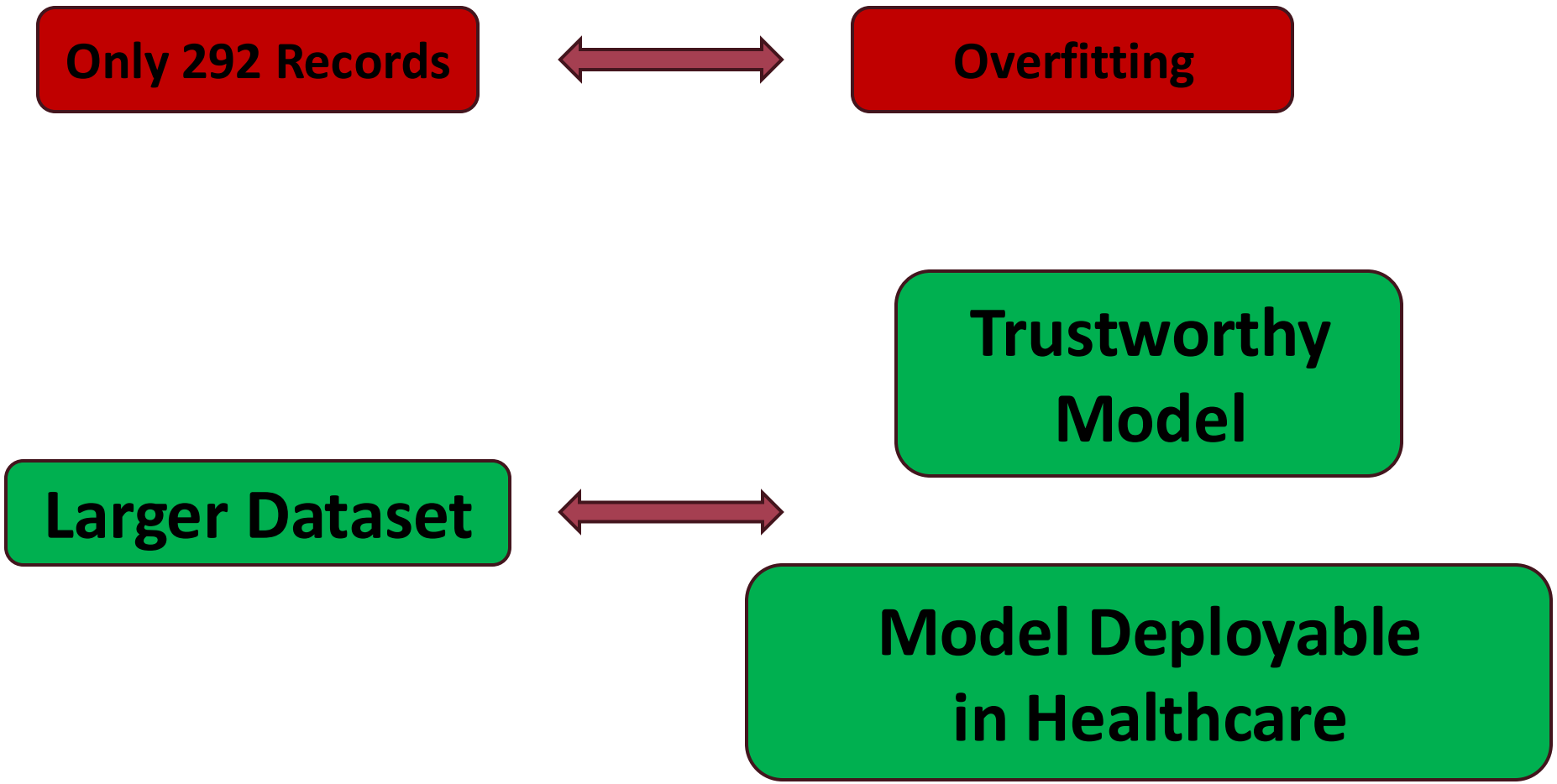
Model Performance

Autism Prediction App

Predict

Final Thought

Biggest Challenge & Opportunity



Early Autism Diagnosis Project Recap

Project Goal

Machine learning for early autism screening using structured behavioral and demographic data

Key Outcomes

- Perfect classification
- Behavioral features dominant
- Weighted ensemble model
- Dashboard prototype

Looking Ahead

- Larger and diverse datasets
- Model explainability
- Real-world clinical integration

Questions?