BRAINBOOST INTERACTIVE

Predict Student Performance From Gameplay

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OVERVIEW

- COMPANY MISSION
- PLAYER DATA
- MODEL SELECTION
- MODEL TUNING
- NEXT STEPS

THE MISSION

Create educational games that dynamically update based on predicted student performance.

Predict test performance based on student's interactions with game.

THE GAME

Jo Wilder and the Capitol Case

Detective game where a clever kid searches for clues to solve various mysteries over 22 levels

18 questions interspersed throughout the game

Passing grade = 13 or more questions correct

THE DATA

23,562 datapoints

16,493 assigned to training dataset
3,534 assigned to validation dataset
3,535 assigned to testing dataset
10 predictor variables

Goal is to maximize true positives and minimize false negatives

PLAYER DATA

TIME

Amount of time spent exploring various scenes in a detective game

CLICKS & HOVERS

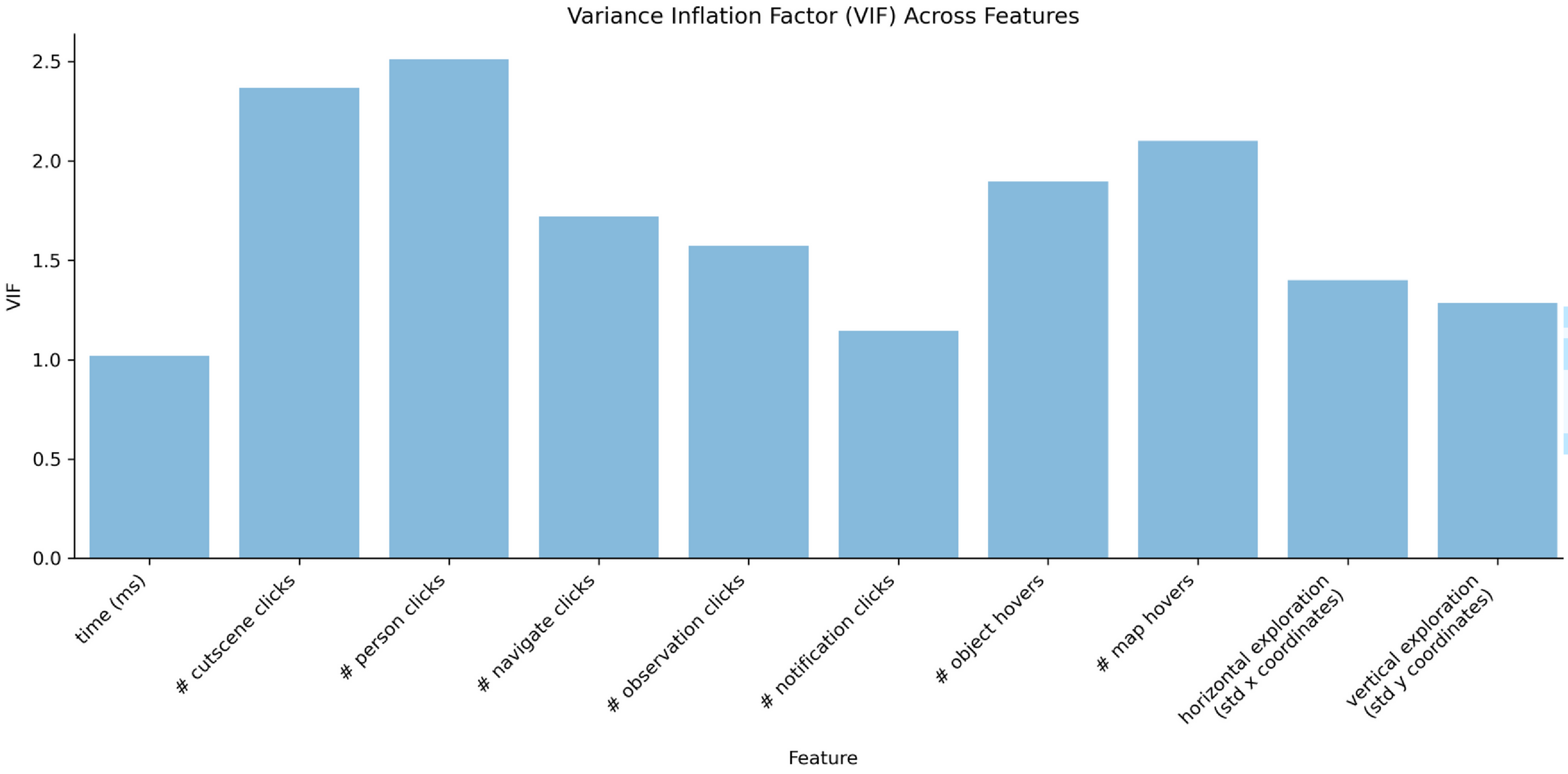
Number of clicks on and hovers over game objects, characters, etc

EXPLORATION

The amount of space explored within each scene

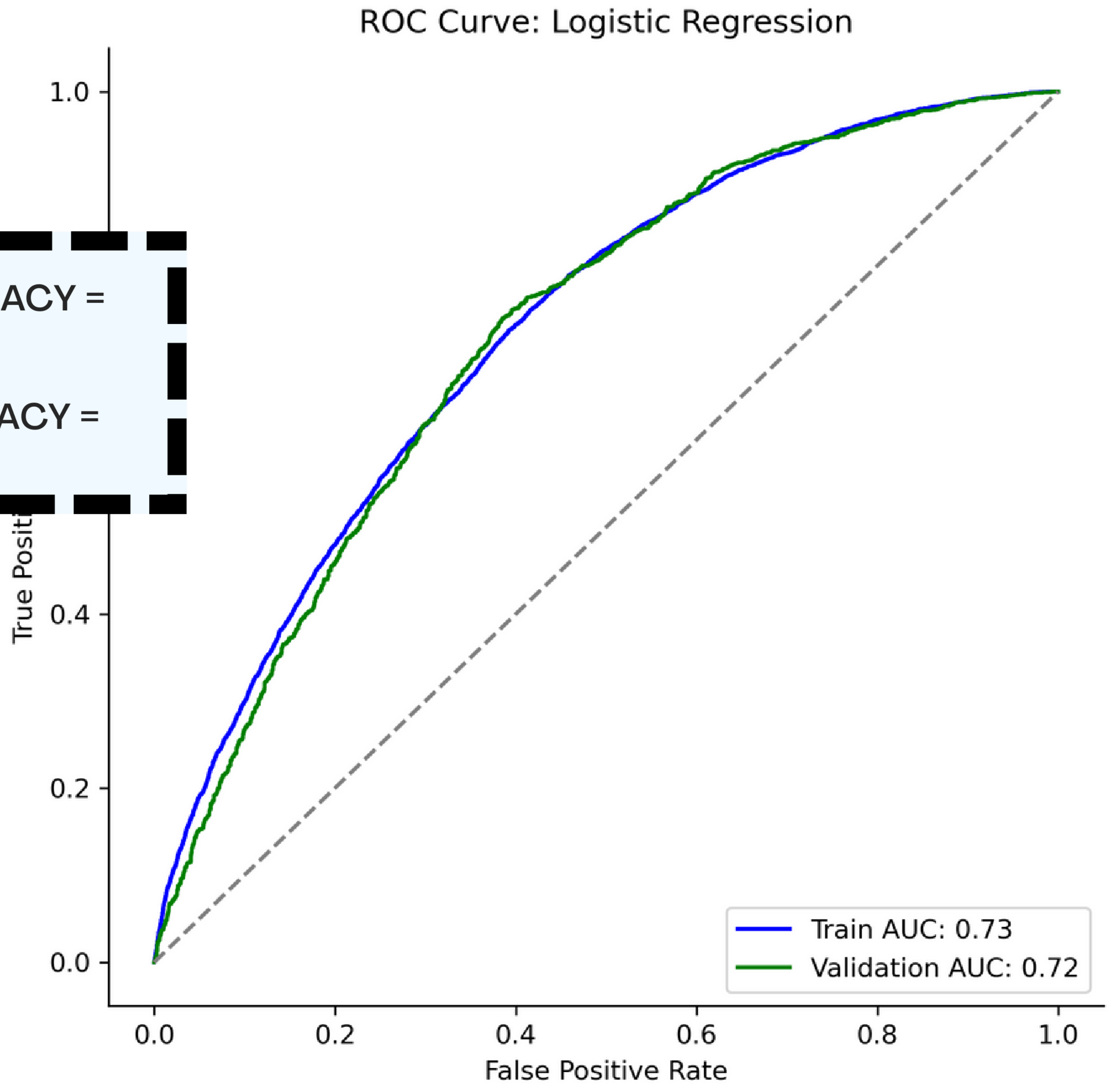
PERFORMANCE

Whether the student scored a passing grade



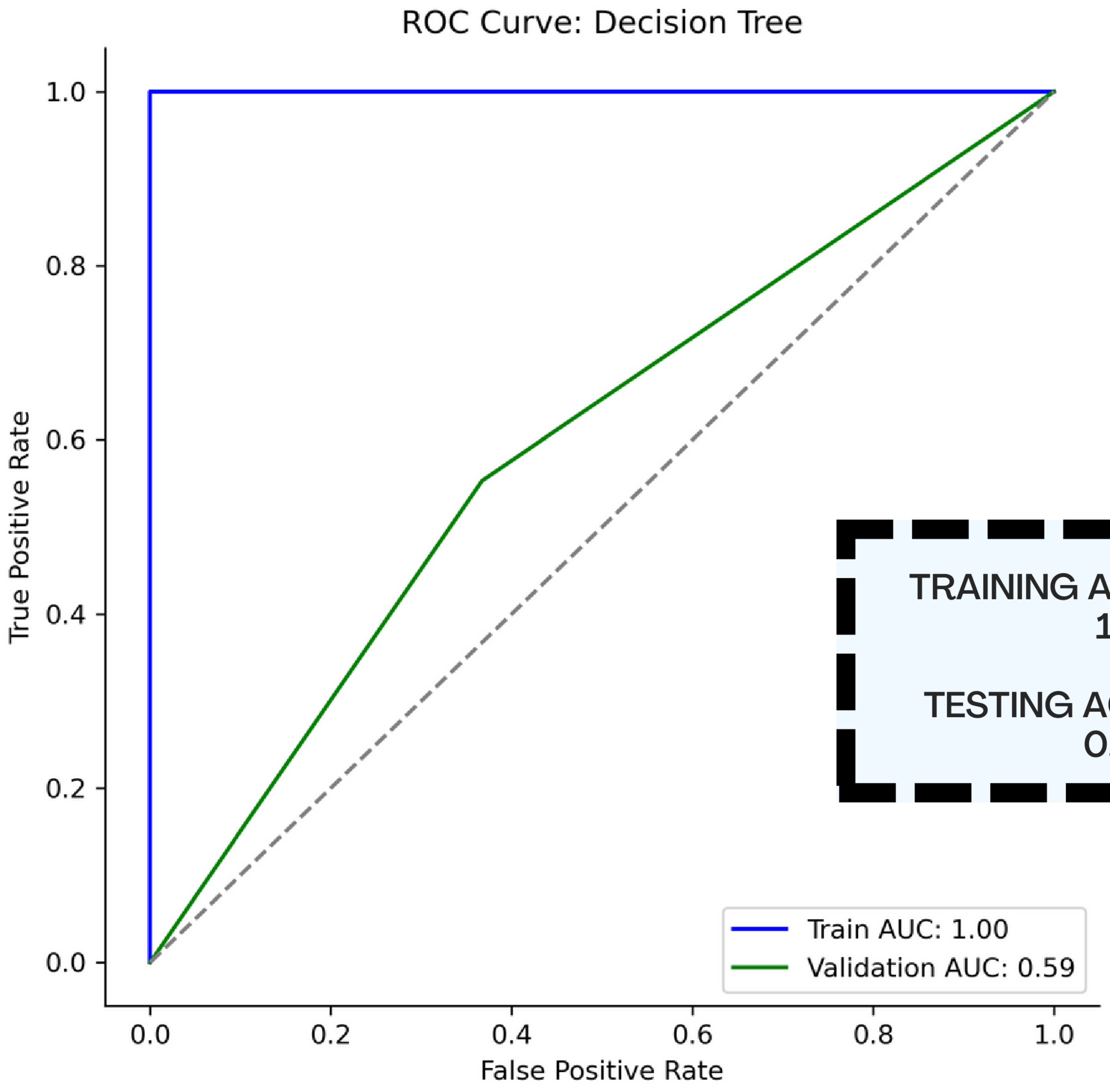
FEATURE ENGINEERING

BASELINE MODELS



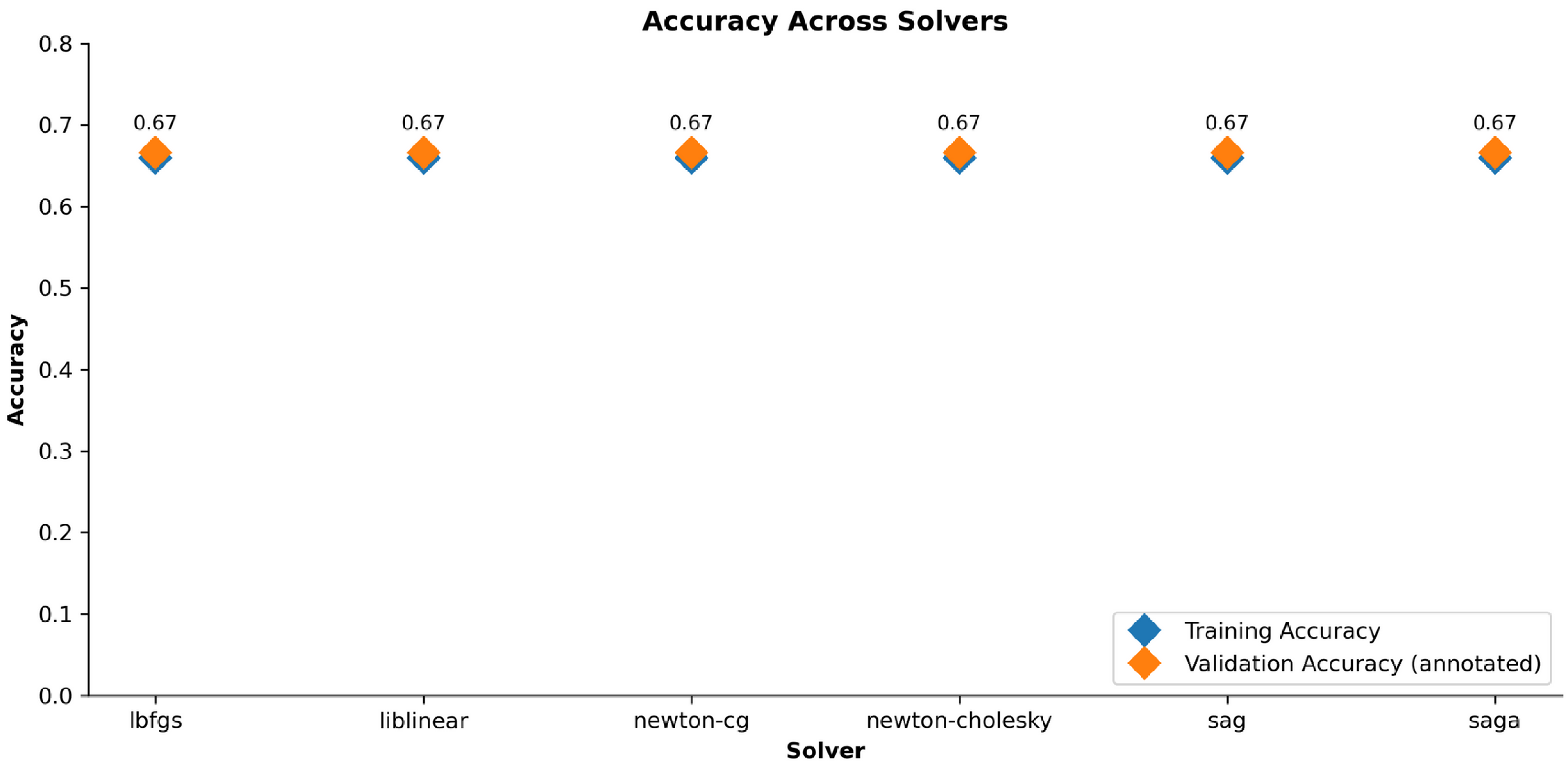
TRAINING ACCURACY = 0.67

TESTING ACCURACY = 0.66

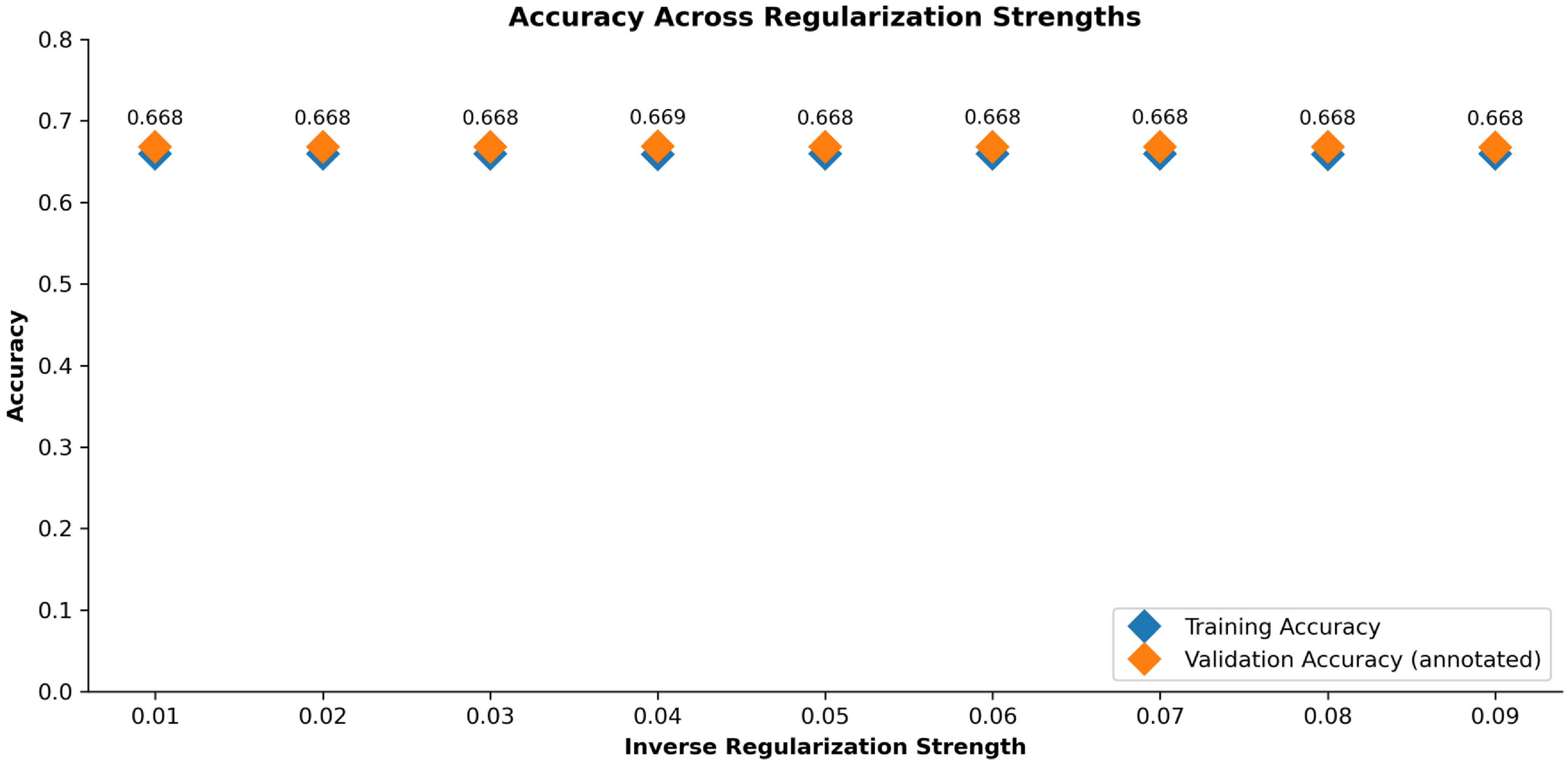


TRAINING ACCURACY = 1.0

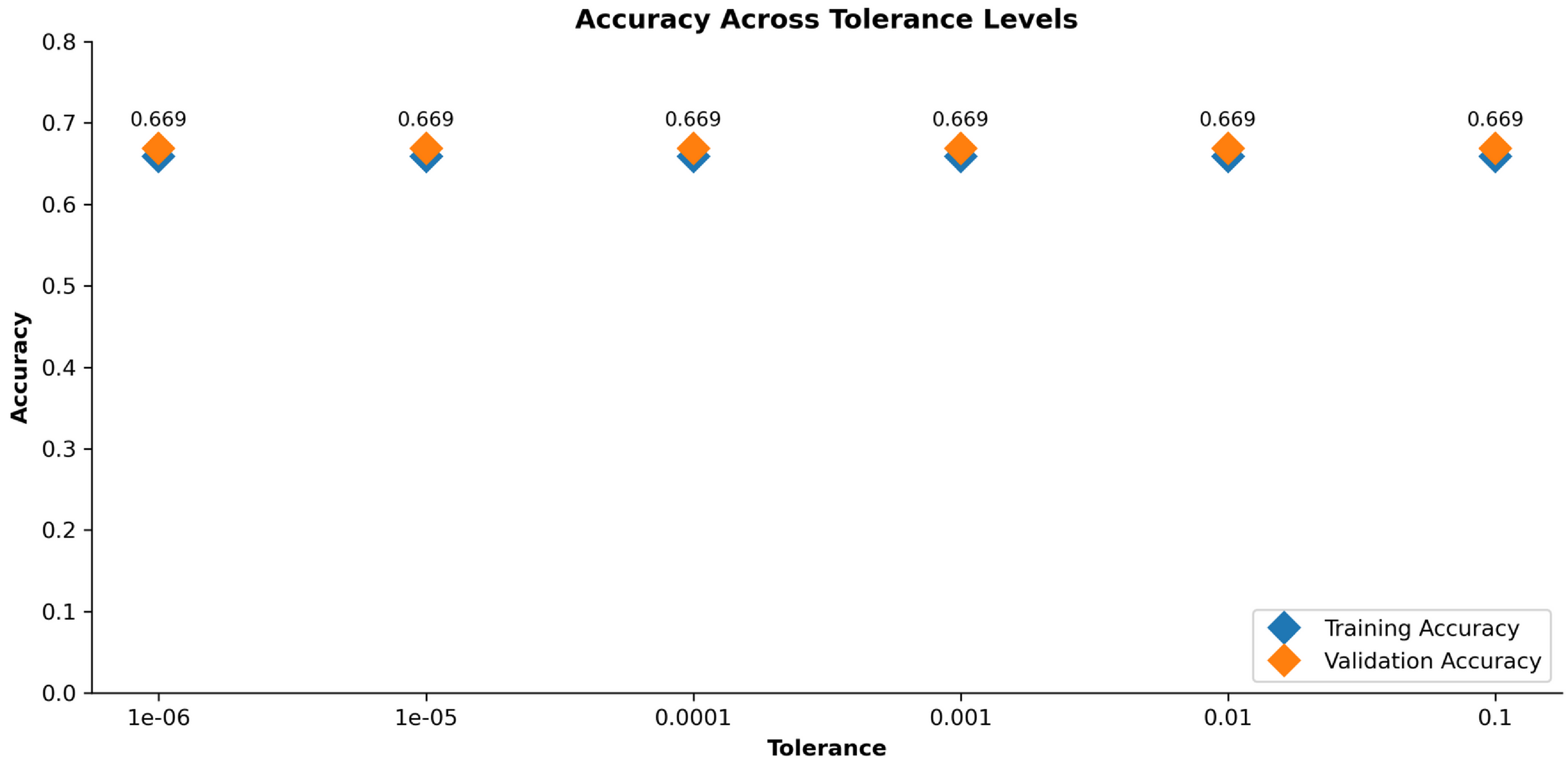
TESTING ACCURACY = 0.55



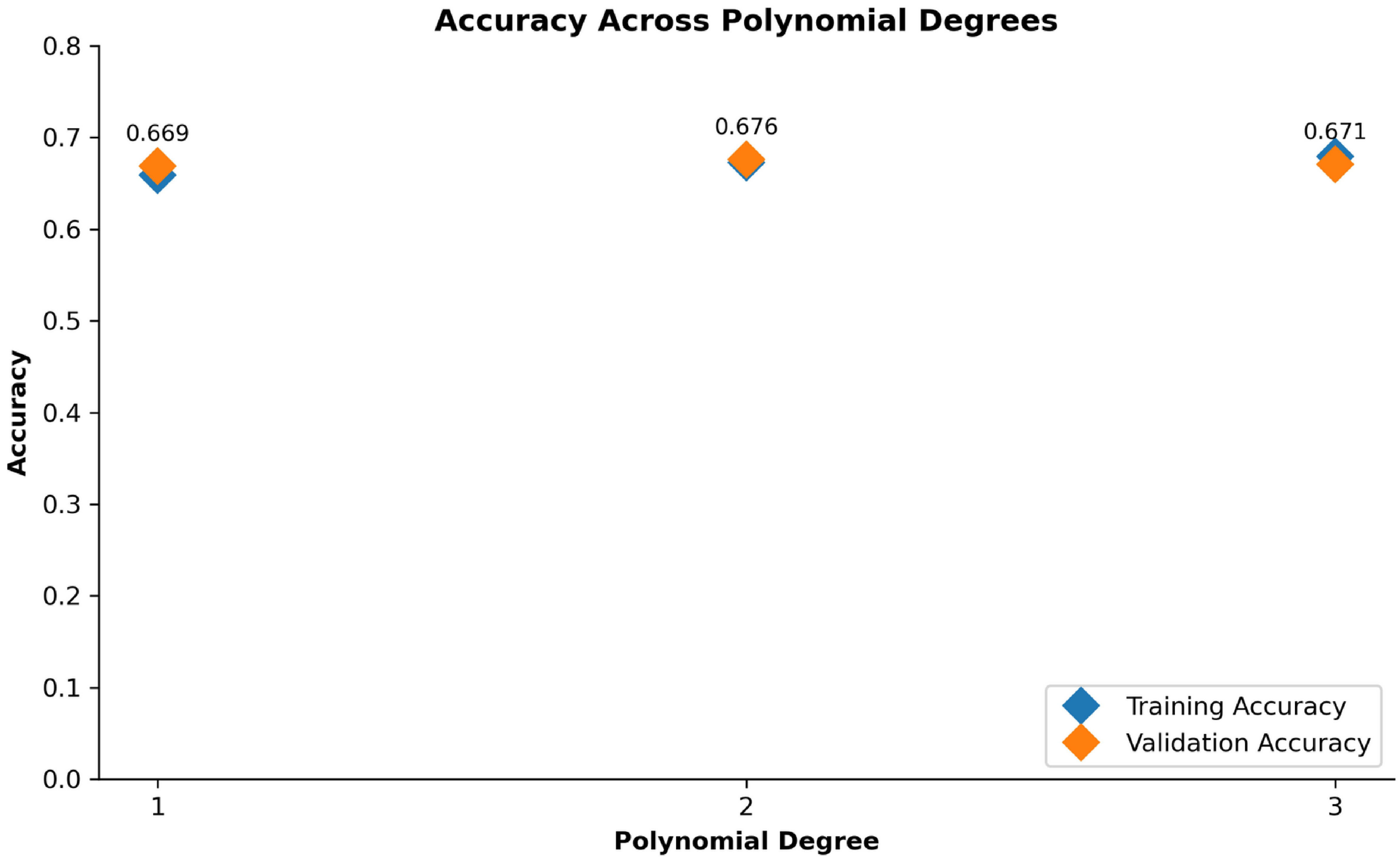
HYPERPARAMETER TUNING



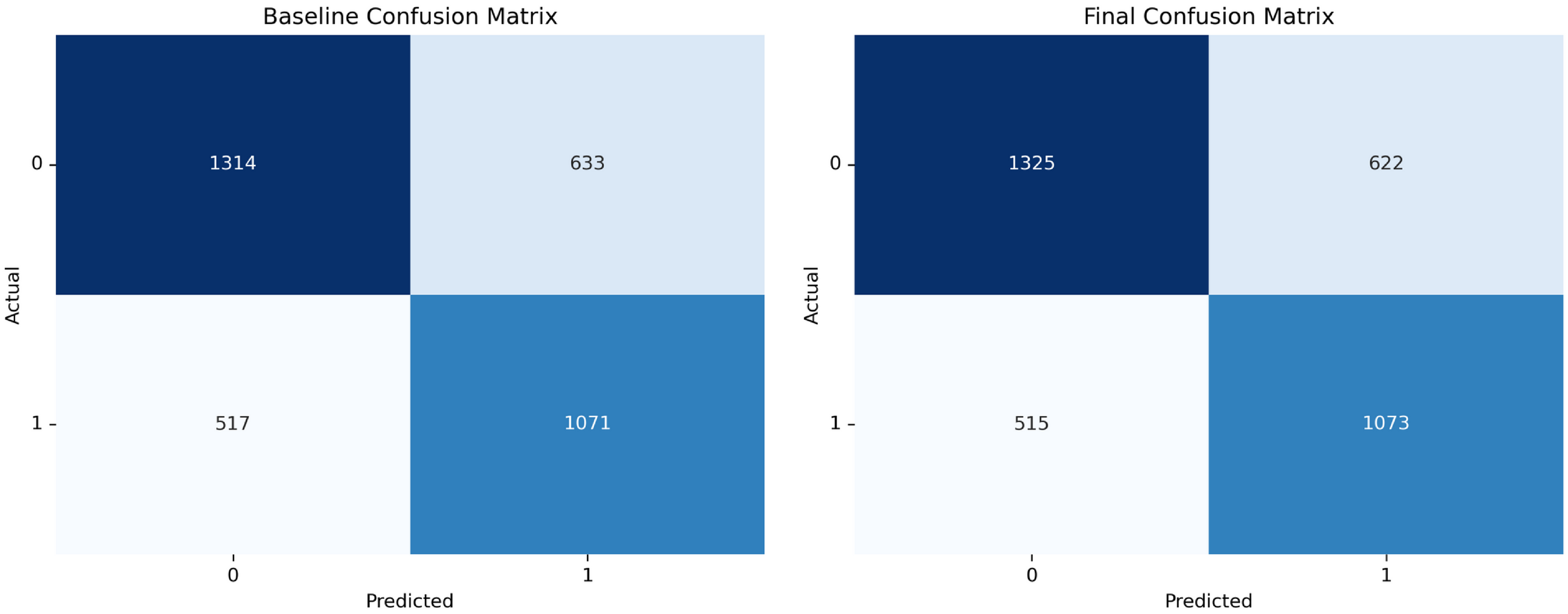
HYPERPARAMETER TUNING



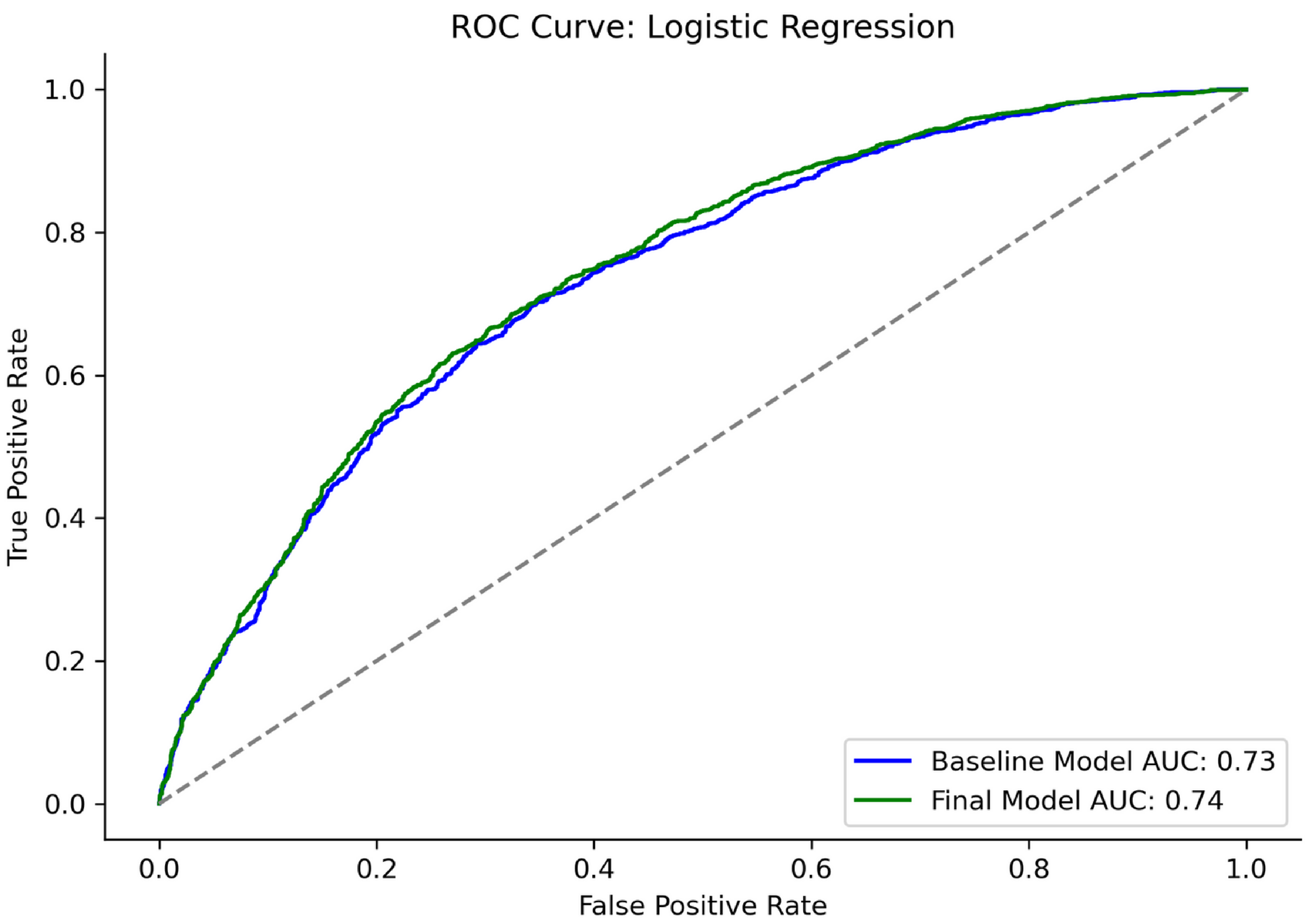
HYPERPARAMETER TUNING



HYPERPARAMETER TUNING


Baseline Confusion Matrix
1314
633
517
1071
Actual
Predicted
0
1
Final Confusion Matrix
1325
622
515
1073
Actual
Predicted
0
1

FINAL MODEL



BASELINE ACCURACY = 0.657

FINAL ACCURACY = 0.679

FINAL MODEL

RECOMMENDATIONS

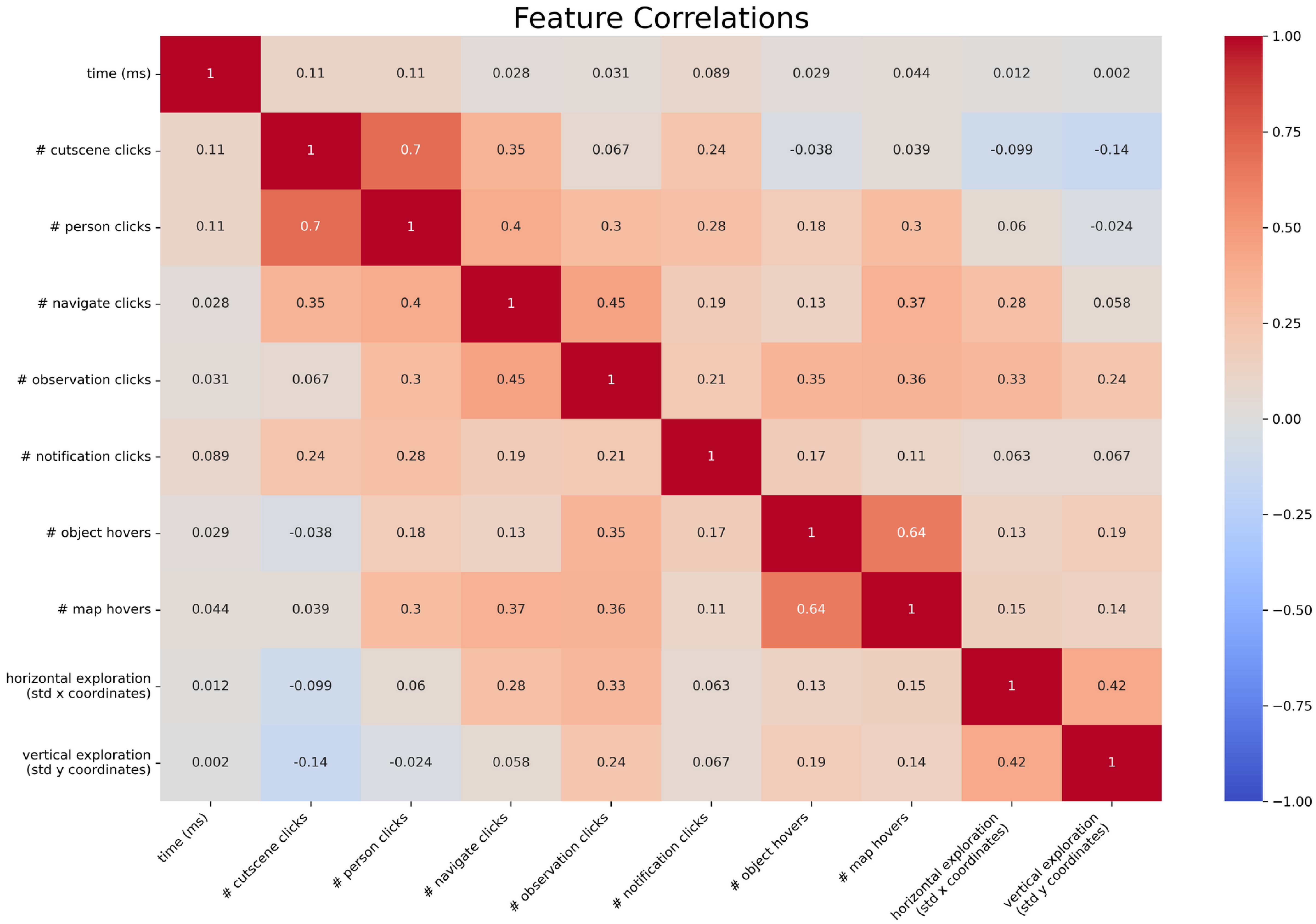
INCLUDE TIME SERIES

Time series modeling may have more predictive power than logistic regression.

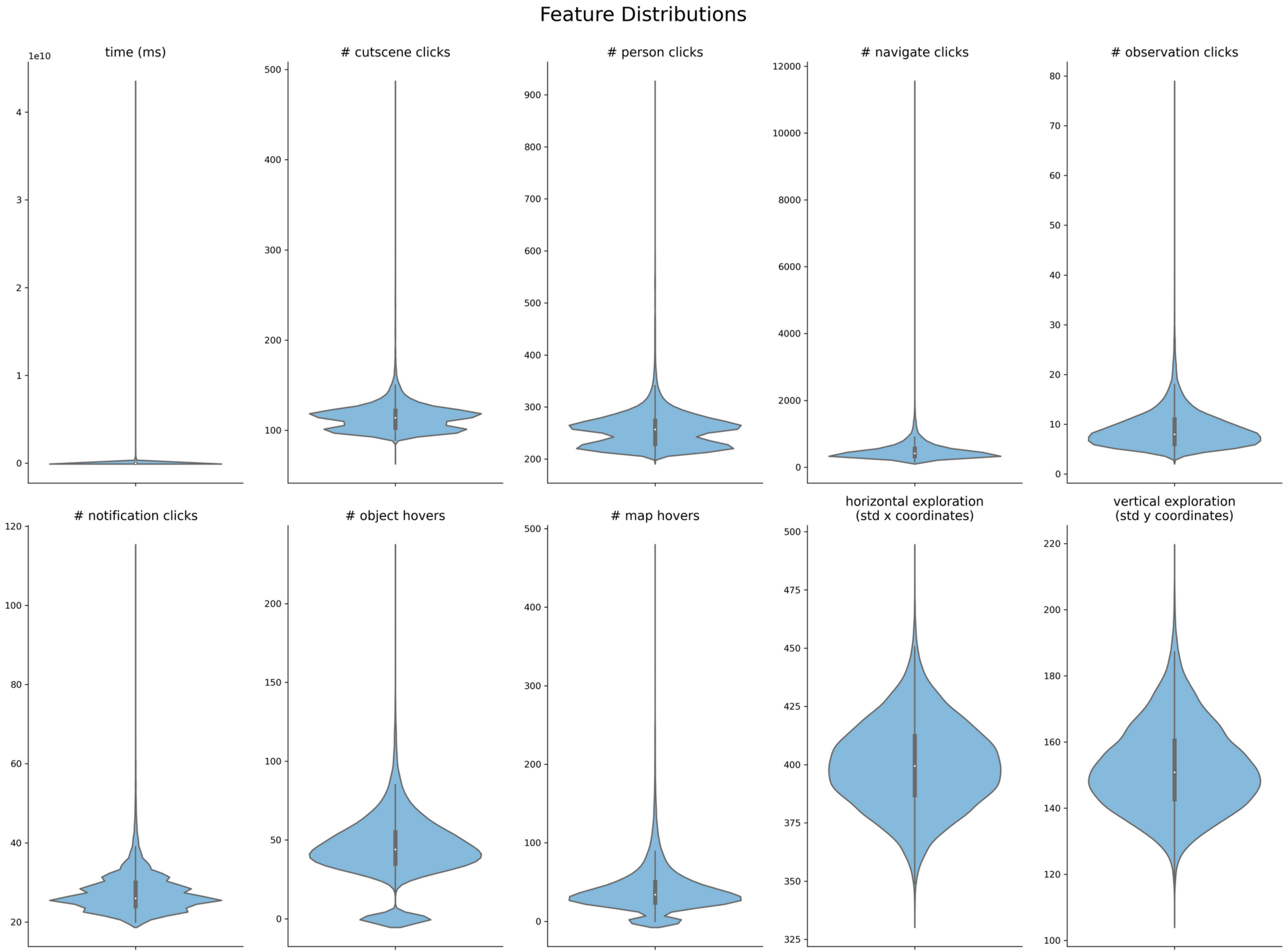
INCLUDE DEMOGRAPHICS

Features may have interactions with demographic variables (e.g., age, reading level).

THANK YOU!



Feature Correlations
time (ms)
cutscene clicks
person clicks
navigate clicks
observation clicks
notification clicks
object hovers
map hovers
horizontal exploration (std x coordinates)
vertical exploration (std y coordinates)
1 0.11 0.11 0.028 0.031 0.089 0.029 0.044 0.012 0.002
0.11 1 0.7 0.35 0.067 0.24 -0.038 0.039 -0.099 -0.14
0.11 0.7 1 0.4 0.3 0.28 0.18 0.3 0.06 -0.024
0.028 0.35 0.4 1 0.45 0.19 0.13 0.37 0.28 0.058
0.031 0.067 0.3 0.45 1 0.21 0.35 0.36 0.33 0.24
0.089 0.24 0.28 0.19 0.21 1 0.17 0.11 0.063 0.067
0.029 -0.038 0.18 0.13 0.35 0.17 1 0.64 0.13 0.19
0.044 0.039 0.3 0.37 0.36 0.11 0.64 1 0.15 0.14
0.012 -0.099 0.06 0.28 0.33 0.063 0.13 0.15 1 0.42
0.002 -0.14 -0.024 0.058 0.24 0.067 0.19 0.14 0.42 1
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00


Feature Distributions
time (ms)
1e10
cutscene clicks
person clicks
navigate clicks
observation clicks
notification clicks
object hovers
map hovers
horizontal exploration
(std x coordinates)
vertical exploration
(std y coordinates)