# Predictive model of early pet adoption

Date:
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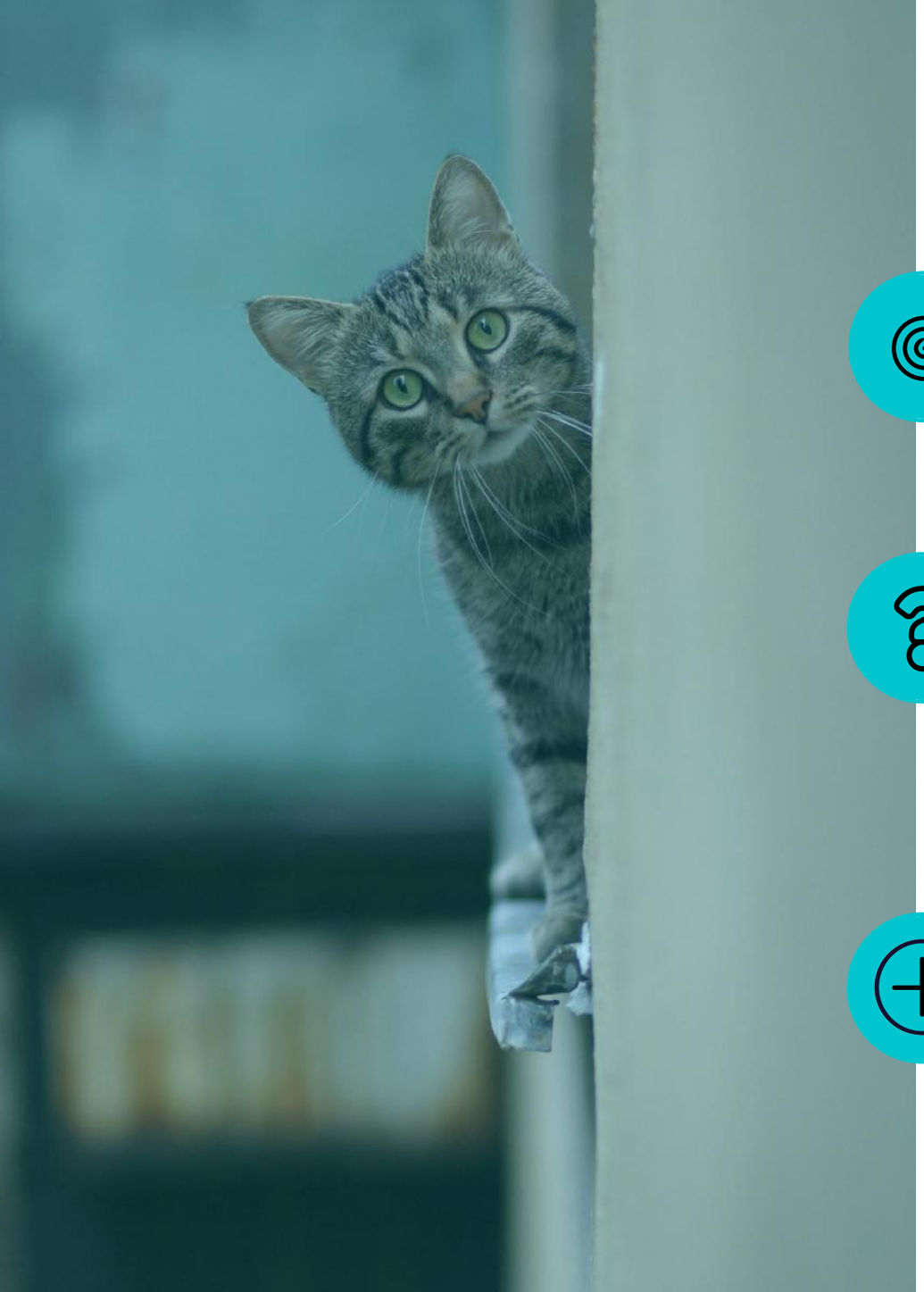
Presented by:
Ali Hijazy



# BUSINESS PROBLEM

## Objective

Predict the likelihood of quick pet adoptions

## Why it matters

- Optimize pet profiles for faster adoption.
- Anticipate duration of pets' stays.
- Efficiently plan resources (food, space, care).
- Reduce animal suffering and euthanization rates.

## Operational Benefits

- Improved profiling: Insights on what makes a profile attractive.
- Efficient Resource Allocation: Predictive info helps shelters prepare in advance.
- Foster System Support: Knowing which pets might take longer to adopt can encourage fostering.

# DATASET

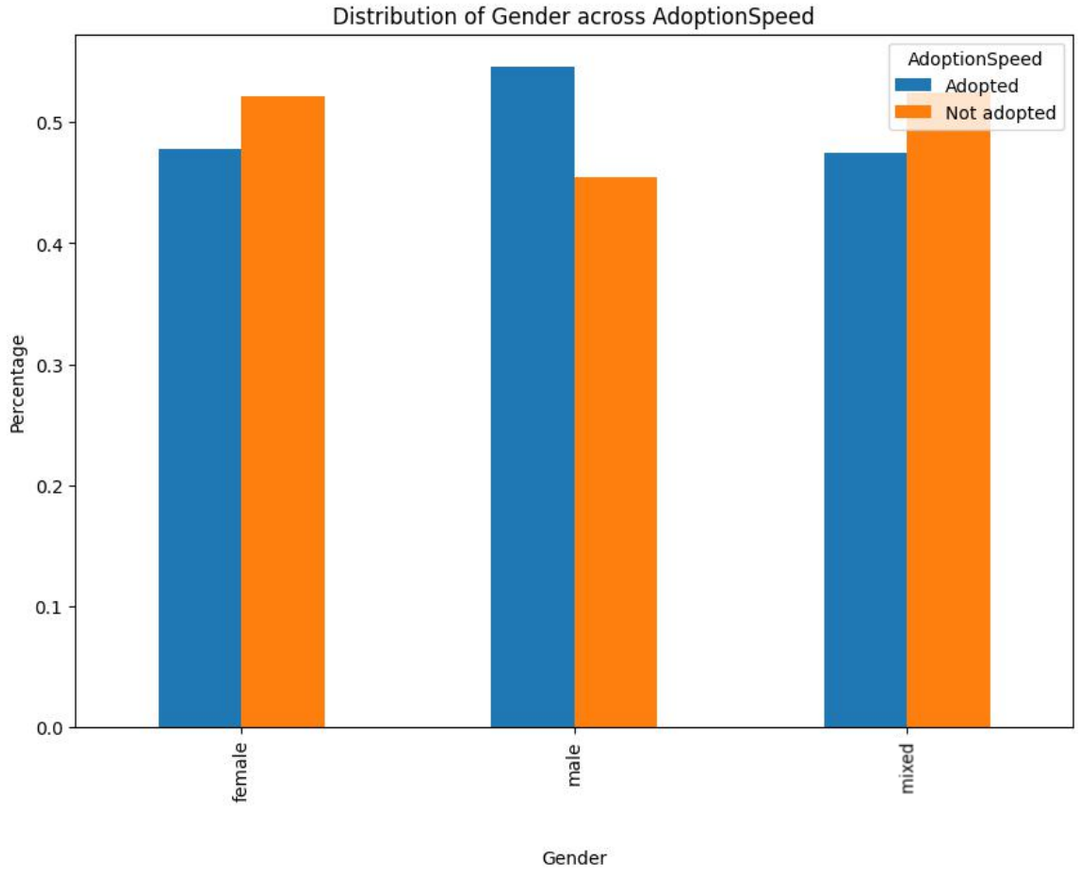
petfinder

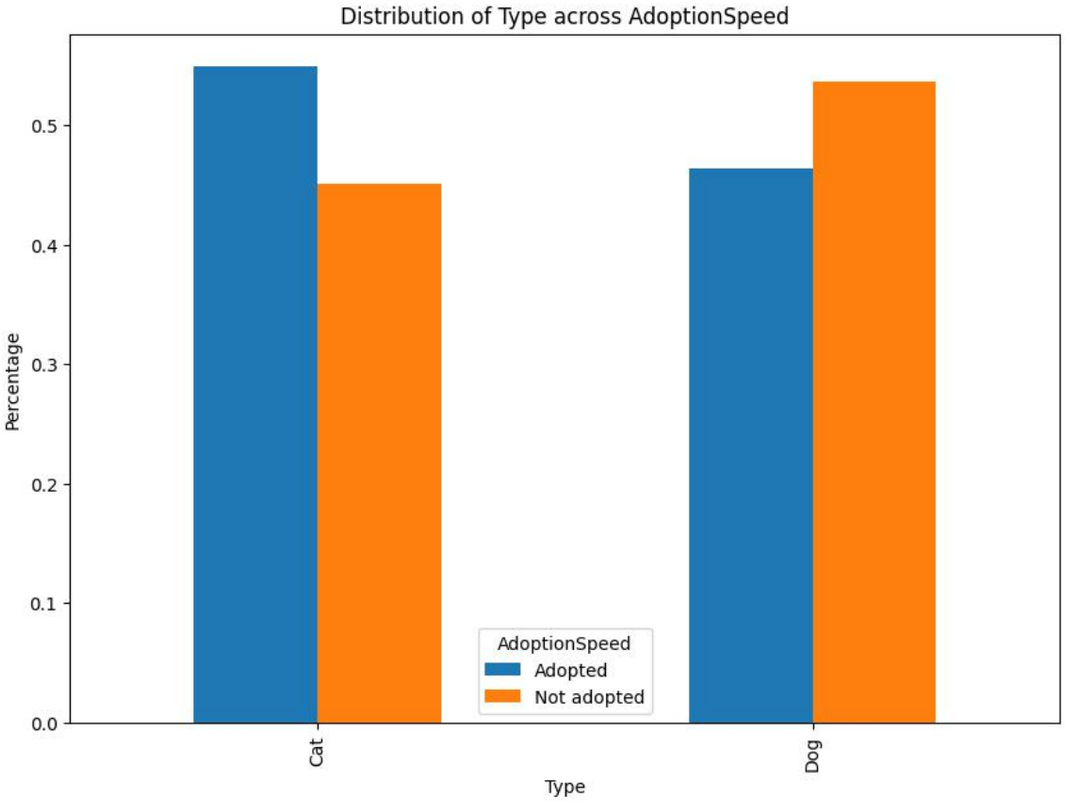
- Type
- Age
- Breed
- Sex
- Color
- Size
- Fur
- Health
- Sterilized
- Vaccinated
- Dewormed
- Fee
- Photos
- Videos

Target variable:
Adoption Speed

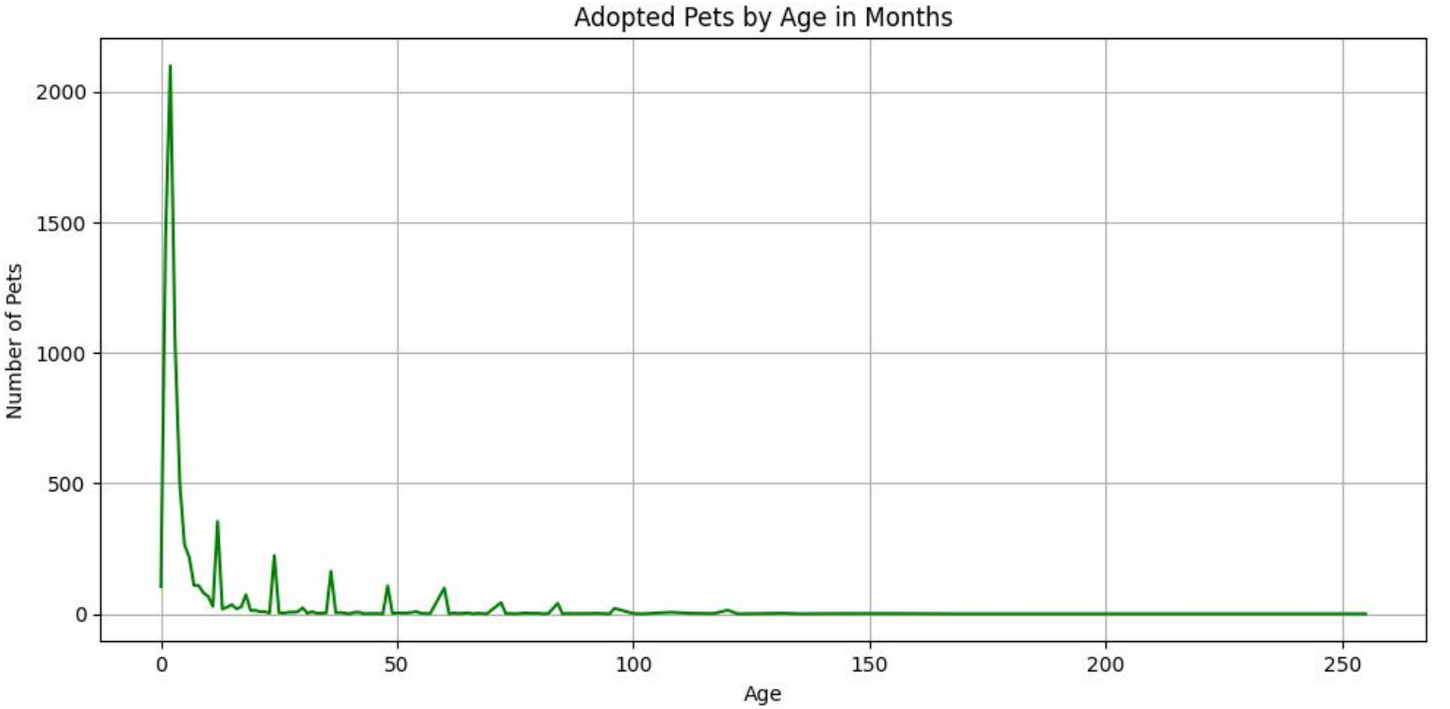
- 1: Adopted within a month: 7537
- 2: Not adopted within a month: 7456

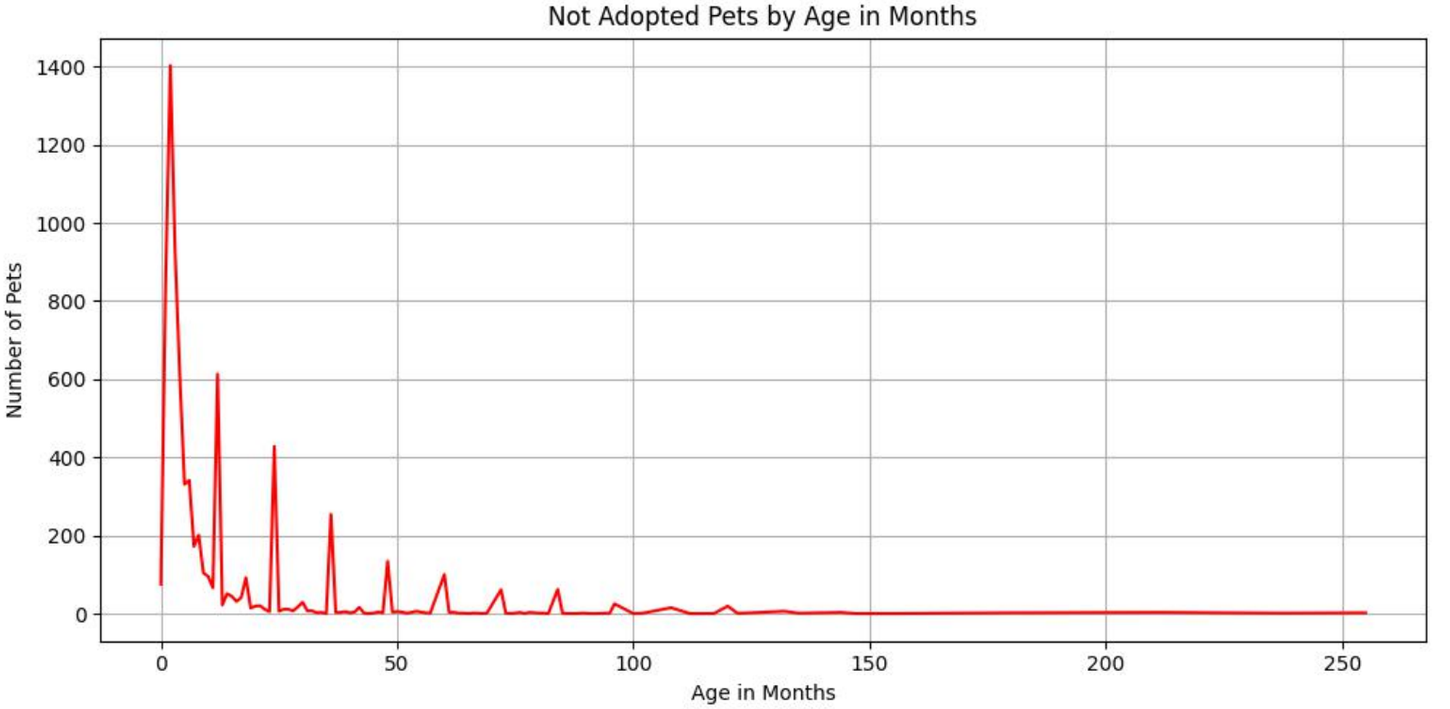
# EDA


Distribution of Gender across AdoptionSpeed
AdoptionSpeed
Adopted
Not adopted
Percentage
0.0
0.1
0.2
0.3
0.4
0.5
female
male
mixed
Gender


Distribution of Type across AdoptionSpeed
AdoptionSpeed
Adopted
Not adopted
Percentage
0.0
0.1
0.2
0.3
0.4
0.5
Cat
Dog
Type

# EDA


Adopted Pets by Age in Months
Number of Pets
Age
0
500
1000
1500
2000
0
50
100
150
200
250

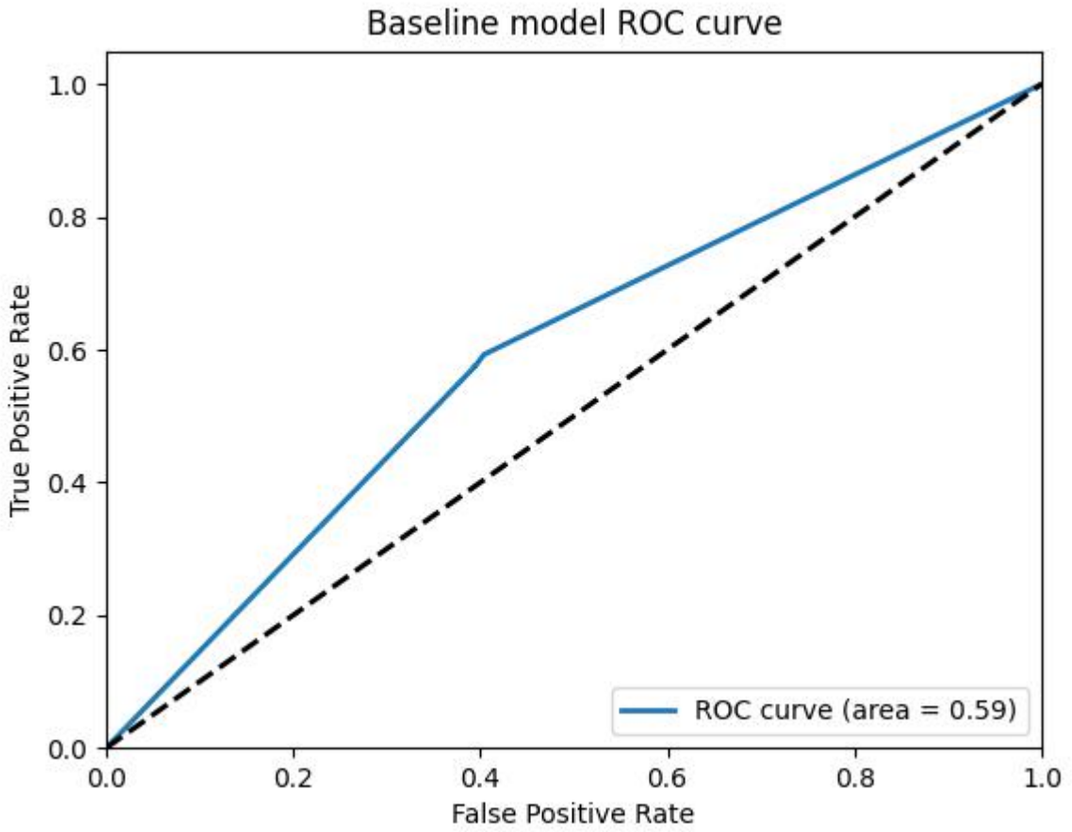

Not Adopted Pets by Age in Months
Number of Pets
Age in Months
0
200
400
600
800
1000
1200
1400
0
50
100
150
200
250

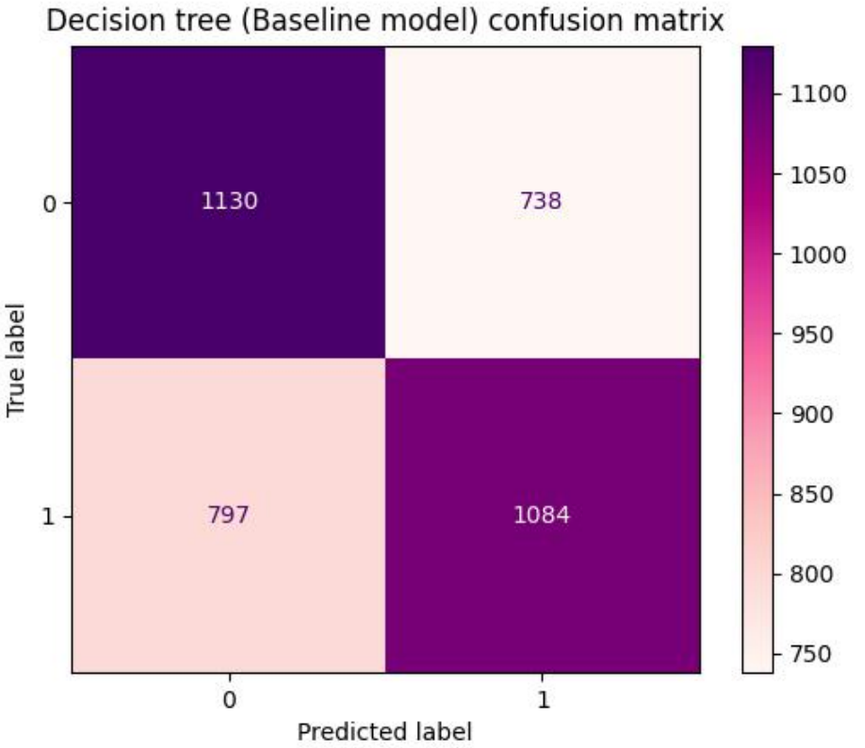
MODELS

# Decision tree (Baseline model)

ACCURACY ON TRAIN DATA: 0.99

ACCURACY ON TEST DATA: 0.59



MODELS

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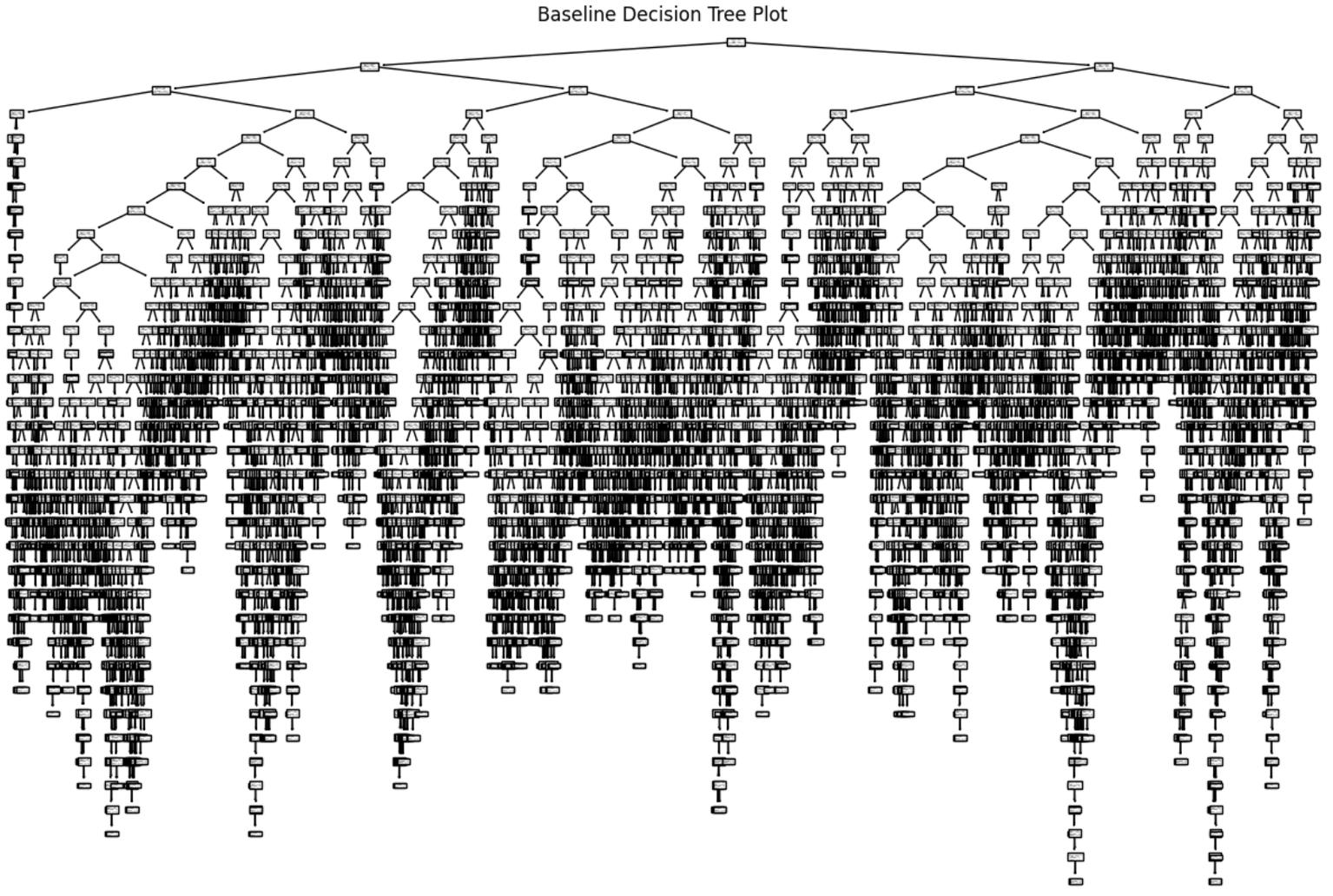
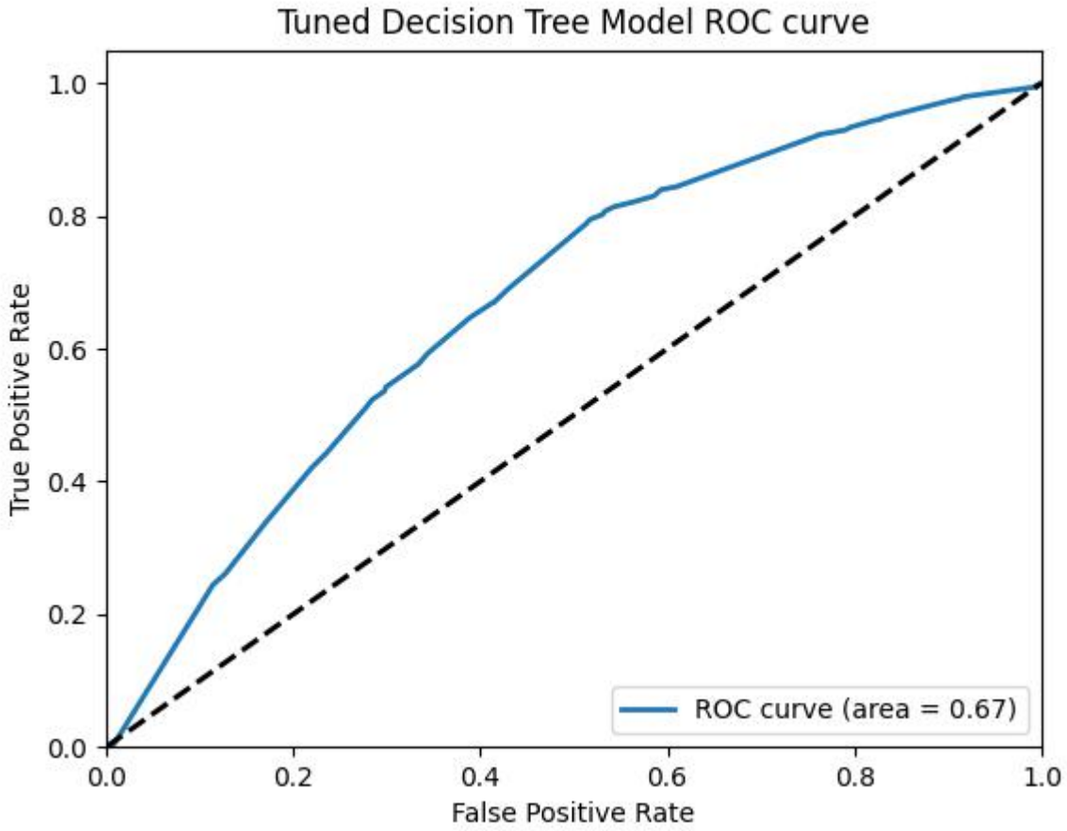


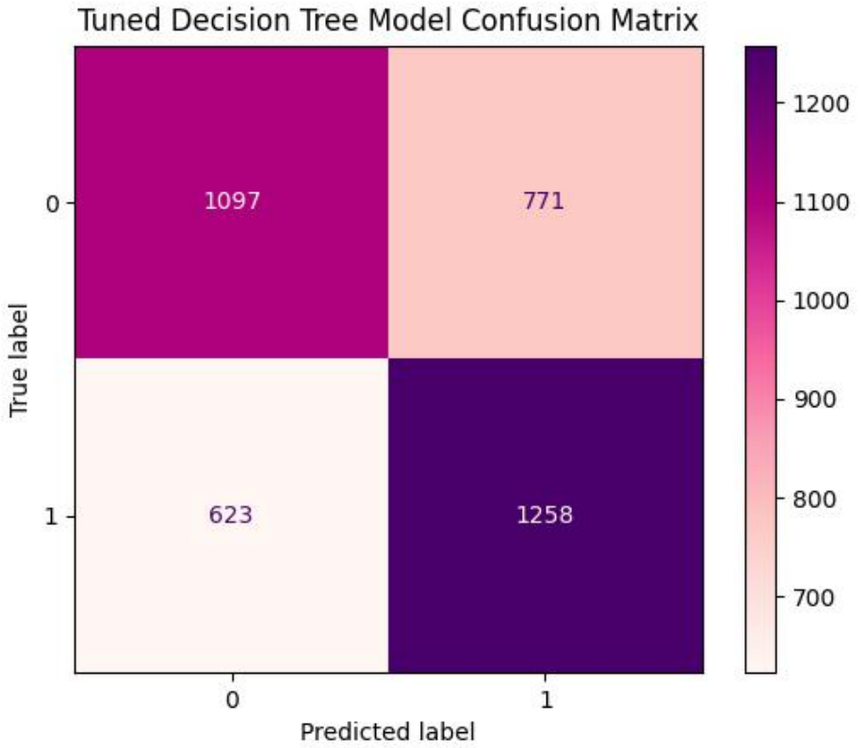
# MODELS

## Tuned decision tree

ACCURACY ON TRAIN DATA: 0.65
ACCURACY ON TEST DATA: 0.63

USING GRIDSEARCHCV
BEST HYPERPARAMETERS:
CRITERION: GINI
MAX_DEPTH: 6
MIN_SAMPLES_LEAF: 4
MIN_SAMPLES_SPLIT: 2
SPLITTER: BEST



MODELS

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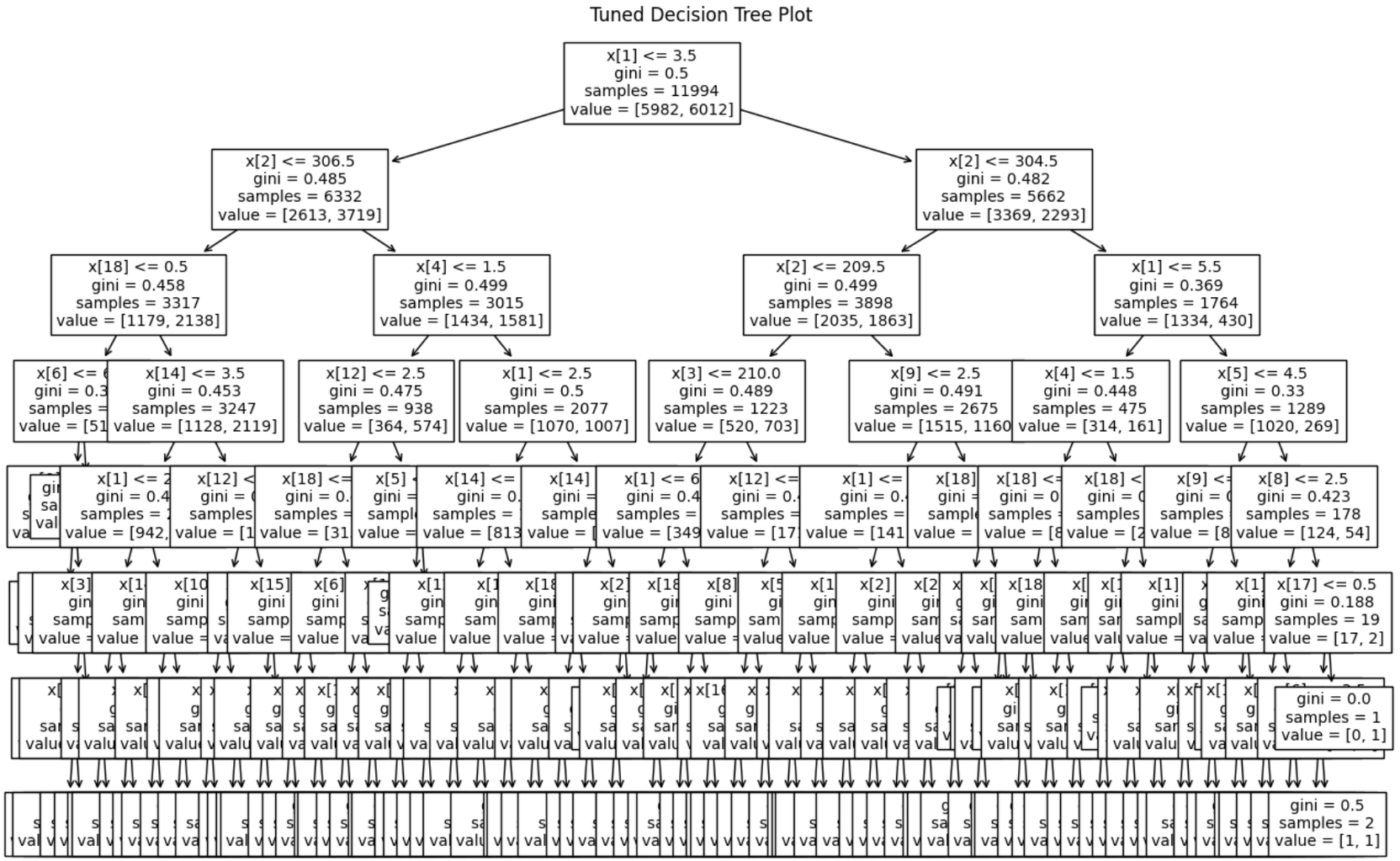
ACCURACY ON TRAIN DATA: 0.65

ACCURACY ON TEST DATA: 0.63

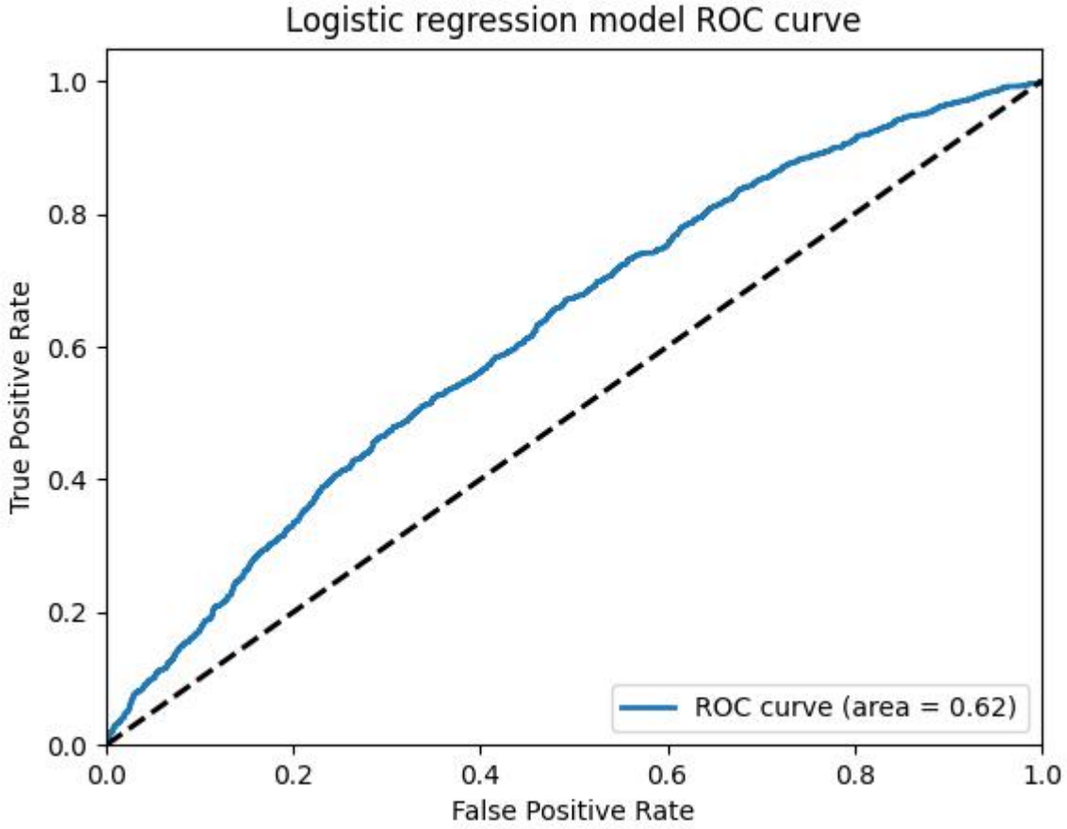


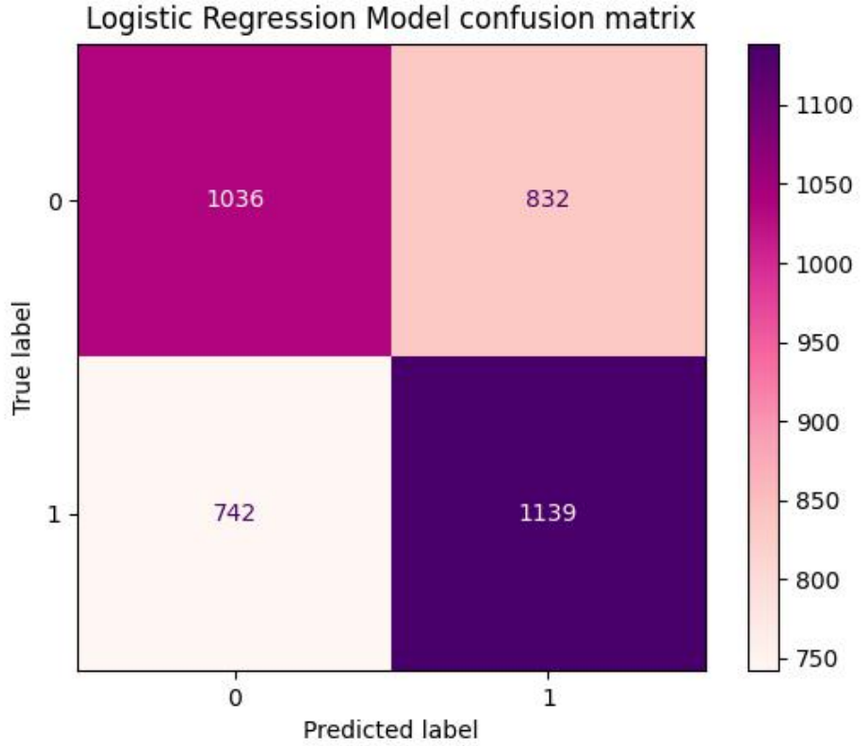
MODELS

# Logistic regression

ACCURACY ON TRAIN DATA: 0.59

ACCURACY ON TEST DATA: 0.58



MODELS

# Tuned logistic regression

ACCURACY ON TRAIN DATA: 0.59

ACCURACY ON TEST DATA: 0.59

USING GRIDSEARCHCV

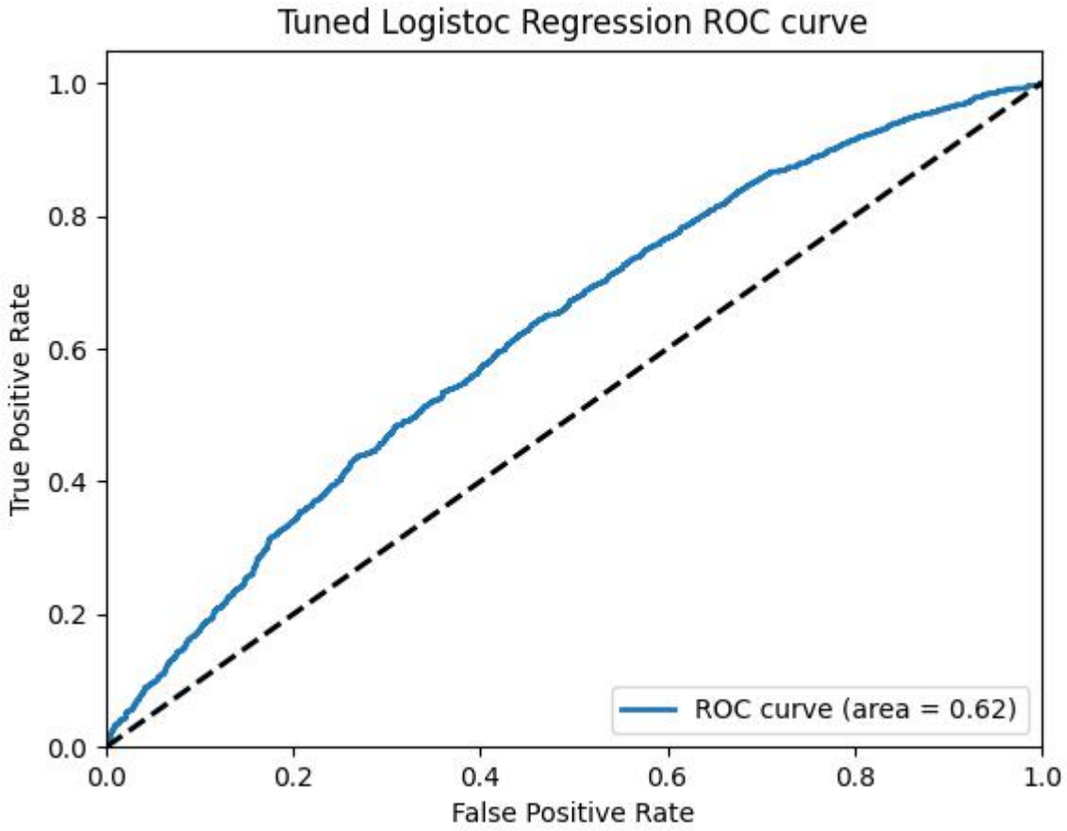
BEST HYPERPARAMETERS:

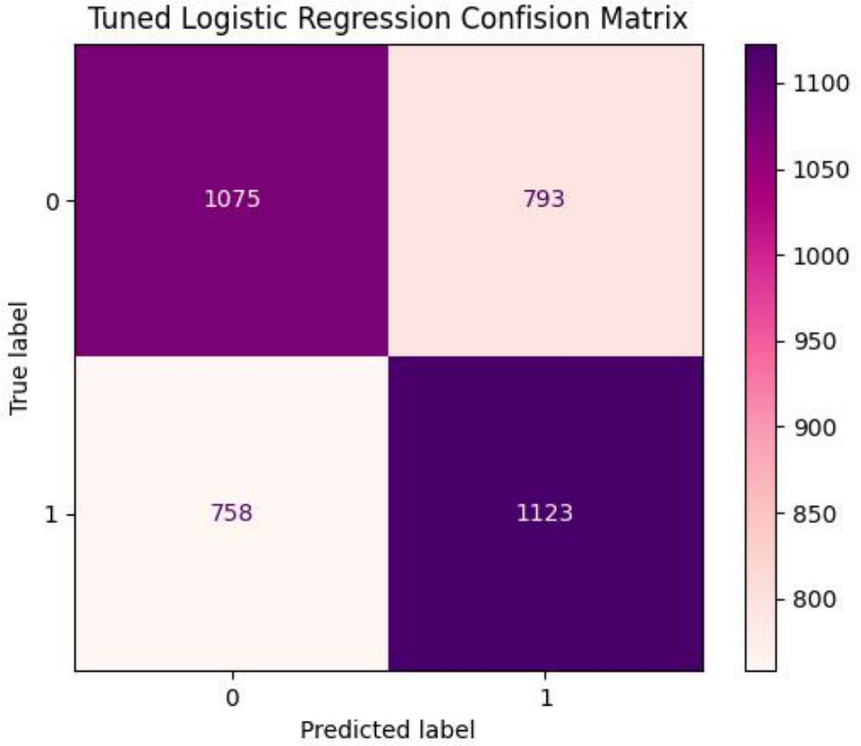
C: 0.01

PENALTY: L2

SOLVER: 'SAGA'

TOL: 1



MODELS

# Refining the Decision Tree

| | Feature | Importance |
|---|---|---|
| 1 | Age | 0.301293 |
| 2 | Breed1 | 0.280473 |
| 18 | PhotoAmt | 0.100192 |
| 14 | Quantity | 0.049627 |
| 3 | Breed2 | 0.048646 |
| 12 | Sterilized | 0.034529 |
| 4 | Gender | 0.029830 |
| 15 | Fee | 0.027520 |
| 9 | FurLength | 0.027414 |
| 5 | Color1 | 0.023370 |
| 8 | MaturitySize | 0.018921 |
| 10 | Vaccinated | 0.012139 |
| 11 | Dewormed | 0.008440 |
| 7 | Color3 | 0.004149 |
| 0 | Type | 0.002889 |
| 13 | Health | 0.002820 |
| 16 | State | 0.002615 |
| 17 | VideoAmt | 0.001938 |

Refitting the tuned model using only these 10 columns

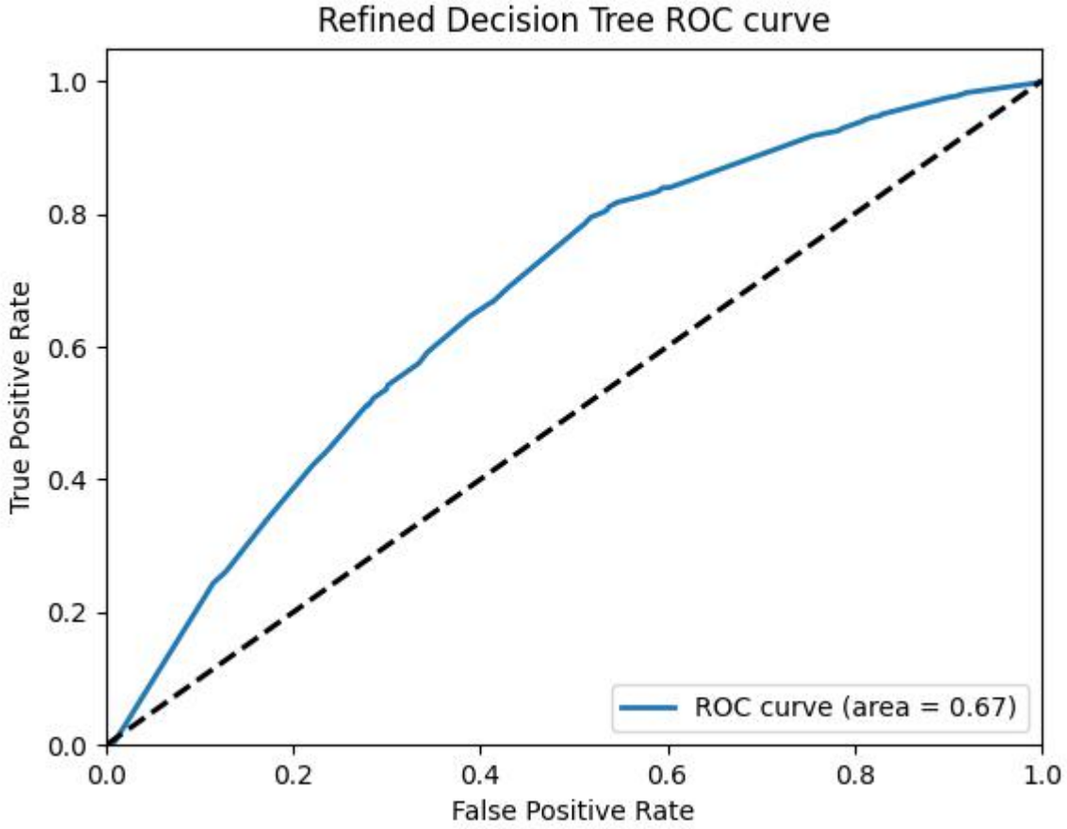
BEST HYPERPARAMETERS:
CRITERION: GINI
MAX_DEPTH: 6
MIN_SAMPLES_LEAF: 4
MIN_SAMPLES_SPLIT: 2
SPLITTER: BEST

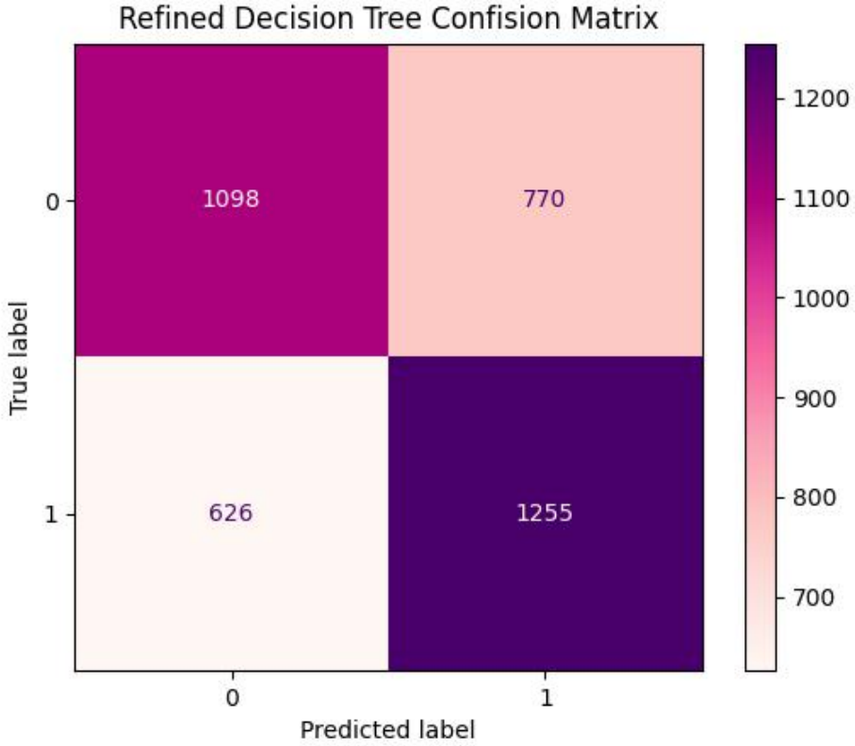
# MODELS

## Refined Decision Tree

ACCURACY ON TRAIN DATA: 0.65
ACCURACY ON TEST DATA: 0.63

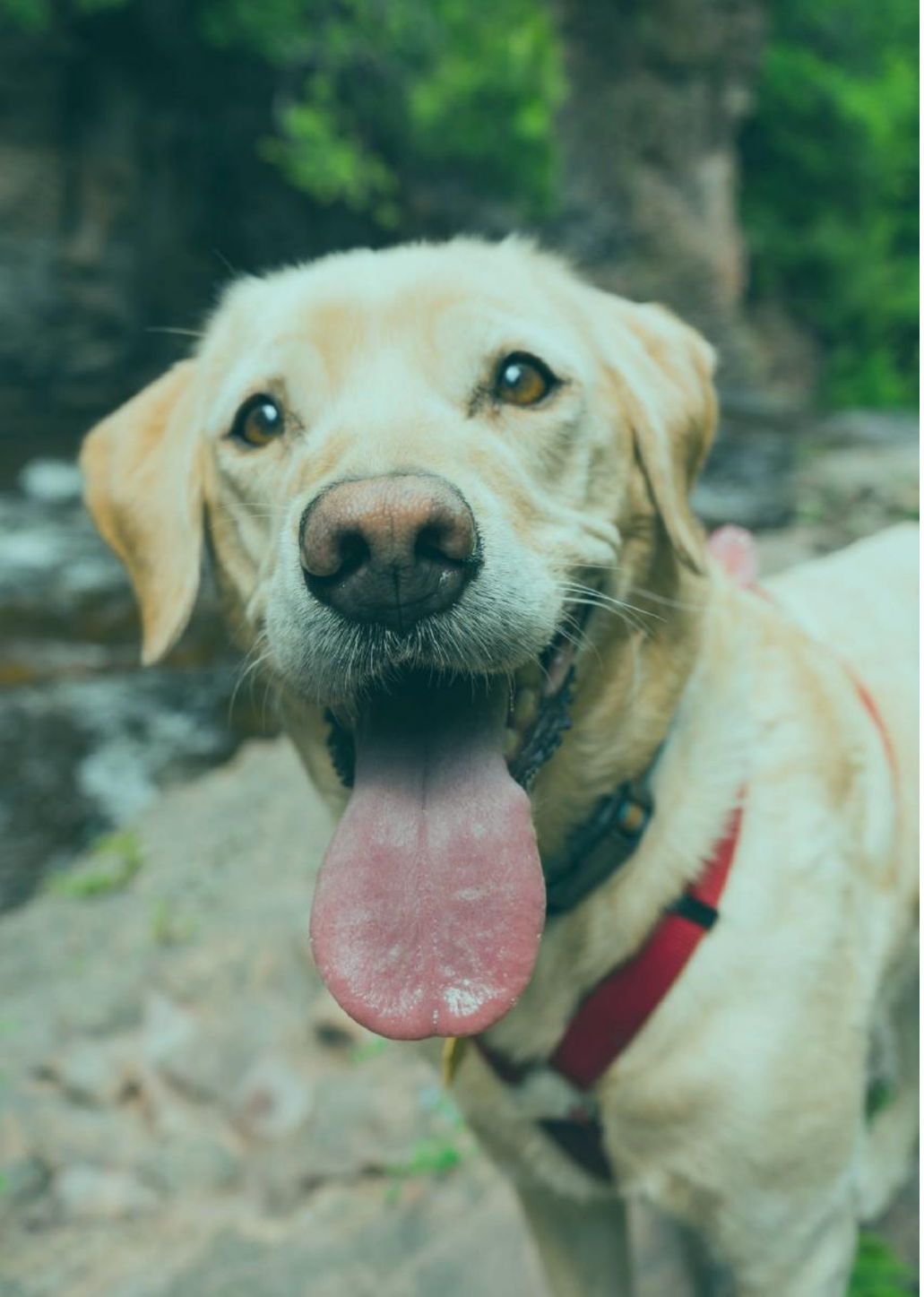
BEST HYPERPARAMETERS:
CRITERION: GINI
MAX_DEPTH: 6
MIN_SAMPLES_LEAF: 4
MIN_SAMPLES_SPLIT: 2
SPLITTER: BEST



# Best performing model

| Logistic Regression | Tuned Logistic Regression | Decision Tree | Tuned Decision tree | Refined Decision Tree |
|---|---|---|---|---|
| **Test: 0.58**<br>**Train: 0.59** | **Test: 0.59**<br>**Train: 0.59** | **Test: 0.59**<br>**Train: 0.99** | **Test: 0.63**<br>**Train: 0.65** | **Test: 0.63**<br>**Train: 0.65** |
| Features used:<br>24 | Features used:<br>24 | Features used:<br>24 | Features used:<br>24 | Features used:<br>10 |



# Recommendations

- Put this model in use to help know in advance the pets that won't be adopted soon. Knowing in advance will help plan for their shelters food etc.

- Give more exposure to the profiles of pets will lower chances of being adopted within a month.

- Try to adjust the profiles of pets with less chances to make them more desirable (adding more and better pictures, videos)

- For next steps: include image processing since the picture of the pet can be a main factor of getting them adopted

Github.com/alihijazy/

Linkedin.com/in/alihijazy/

# THANK YOU