

# Prediction Pets Adoption

## Overview

This project uses machine learning techniques to address the challenge of predicting pet adoption outcomes. It utilizes Gradient Boosting and Artificial Neural Networks (ANN) to predict adoption likelihood based on key attributes. The primary goal is to optimize these models for accuracy and evaluate their comparative performance. Additionally, we analyze the factors influencing adoption outcomes, providing data-driven insights that could assist shelters and pet organizations in improving their processes.

## Key Objectives:

- Build and optimize Gradient Boosting and ANN models.
- Compare the performance of both models using key metrics.
- Provide insights into the features most influential in predicting pet adoption.

## Dataset

The dataset contains the following key fields:

- **Pet Attributes:** Characteristics such as breed, age, size, and health condition.
- **Owner Attributes:** Information about potential adopters.
- **Adoption Outcome:** Target variable indicating whether a pet was adopted.

## Methodology

### Data Preprocessing

- Cleaning and imputing missing values.
- Feature scaling and encoding categorical variables.
- Splitting the dataset into training and test sets.

### Model Building

- **Gradient Boosting:** Implemented using frameworks like XGBoost or LightGBM.
- **Artificial Neural Networks (ANN):** Built using TensorFlow/Keras.

## Optimization

- Hyperparameter tuning for both models using grid search or Bayesian optimization.
- Evaluation metrics: Accuracy, Precision, Recall, F1-Score, and ROC-AUC.

## Comparison

Visual and quantitative comparisons of Gradient Boosting and ANN performance.

## Results

- Model performance metrics for both Gradient Boosting and ANN.
- Feature importance analysis to understand the drivers of adoption predictions.