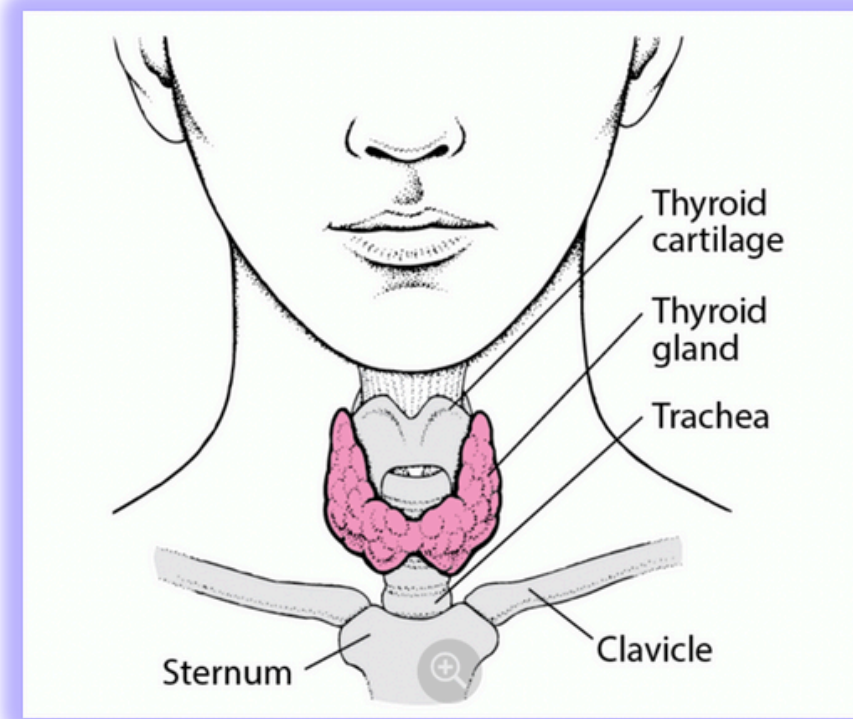


THYROID DISEASE DETECTION USING MACHINE LEARNING



A DATA-DRIVEN APPROACH

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ABSTRACT

- **Thyroid gland plays a major role in maintaining the metabolism of human body. Data mining in health care industry provides a systematic use of the medical data.**
- **Thyroid diseases are most common today. Early changes in the thyroid gland will not affect the proper working of the gland.**
- **By the early identification of thyroid disorders, better treatment can be provided in the early stage thus can avoid thyroid replacement therapy and thyroid removal up to an extent.**

Problem Statement:

- **Thyroid disorders, including hypothyroidism and hyperthyroidism, are common and can lead to severe health complications if not diagnosed early.**
- **Traditional diagnostic methods are time-consuming, expensive, and often require specialized expertise.**
- **The growing volume of medical data calls for automated, scalable, and accurate solutions to assist in thyroid disease detection.**

Objective:

- **Develop a robust machine learning model to automate the classification of thyroid conditions (normal vs. hypothyroid).**
- **Enhance diagnostic accuracy by leveraging advanced data preprocessing and algorithm optimization.**
- **Minimize false positives and false negatives, ensuring reliable predictions for healthcare use.**
- **Provide an efficient framework for deployment in real-world healthcare applications.**

PROPOSED METHOD

- **In the proposed method, we are performing Data pre-processing step, in which feature engineering, feature selection, feature scaling steps are performed and then we are doing model building and performance testing.**
- **We are using different classification algorithms to classify the thyroid disease type.**

Key Features:

- Binary and categorical columns.
- Demographic details (e.g., sex, age).
- Medical indicators (e.g., TSH, T3, TT4 levels).

Target:

- Classification as hypothyroid or normal.

DATASET

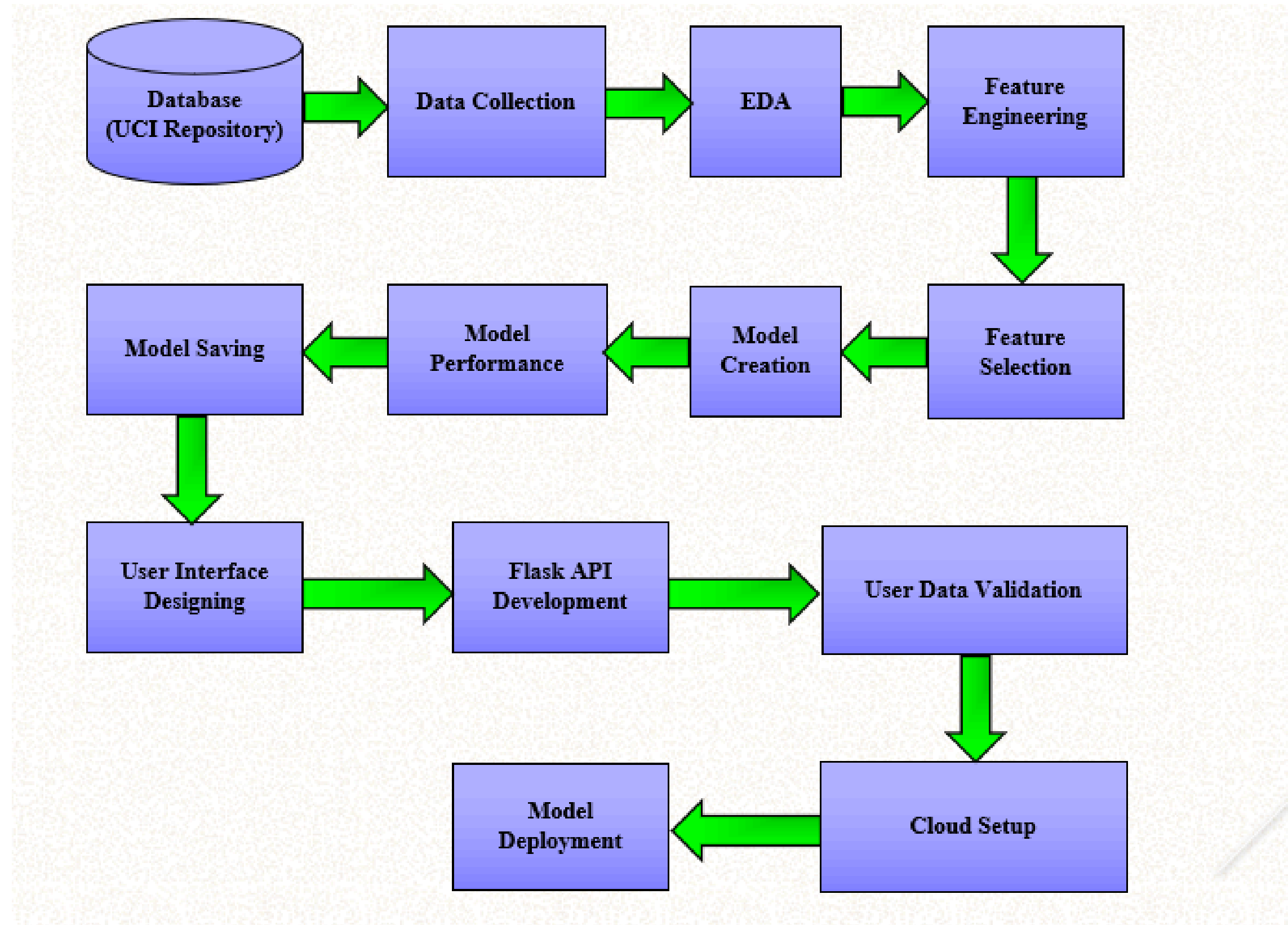
HYPOTHYROID.CSV



DATASET INCLUDES

- **Thyroid Disease Dataset taken from UCI Machine Learning Repository:**
URL: <https://archive.ics.uci.edu/ml/datasets/thyroid+disease>
- **Total patients = 2800**
- **Healthy Subjects = 2503**
- **Abnormal Subjects = 297**
- **Numerical Features:** age, TSH, T3, T4U, FTI
- **Categorical Features:** sex, on_thyroxine, query_on_thyroxine, on_anti_thyroid_medication, sick, pregnant, thyroid_surgery, l131_treatment, query_hypothyroid, query_hyperthyroid, lithium, goitre, tumor, hypopituitary, psych, labels

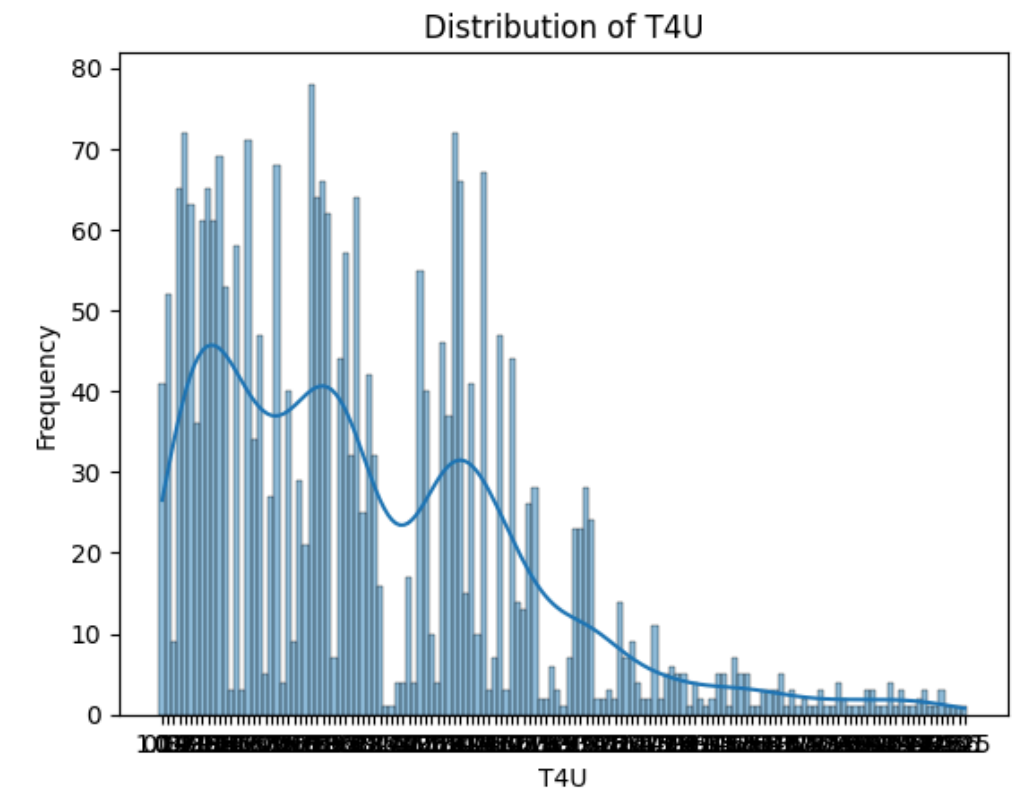
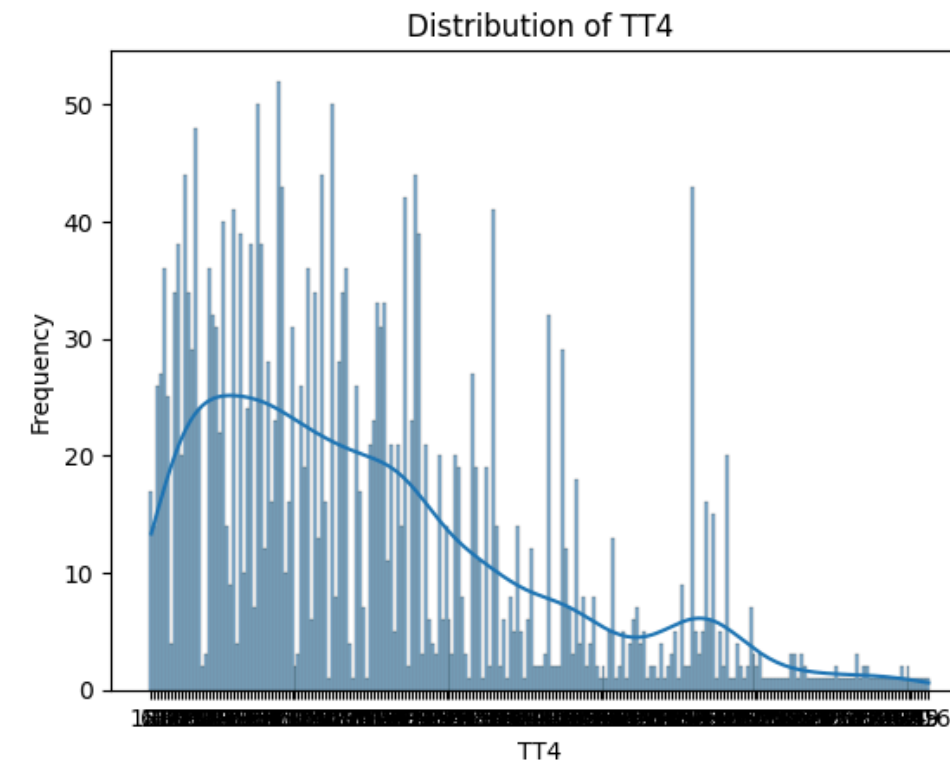
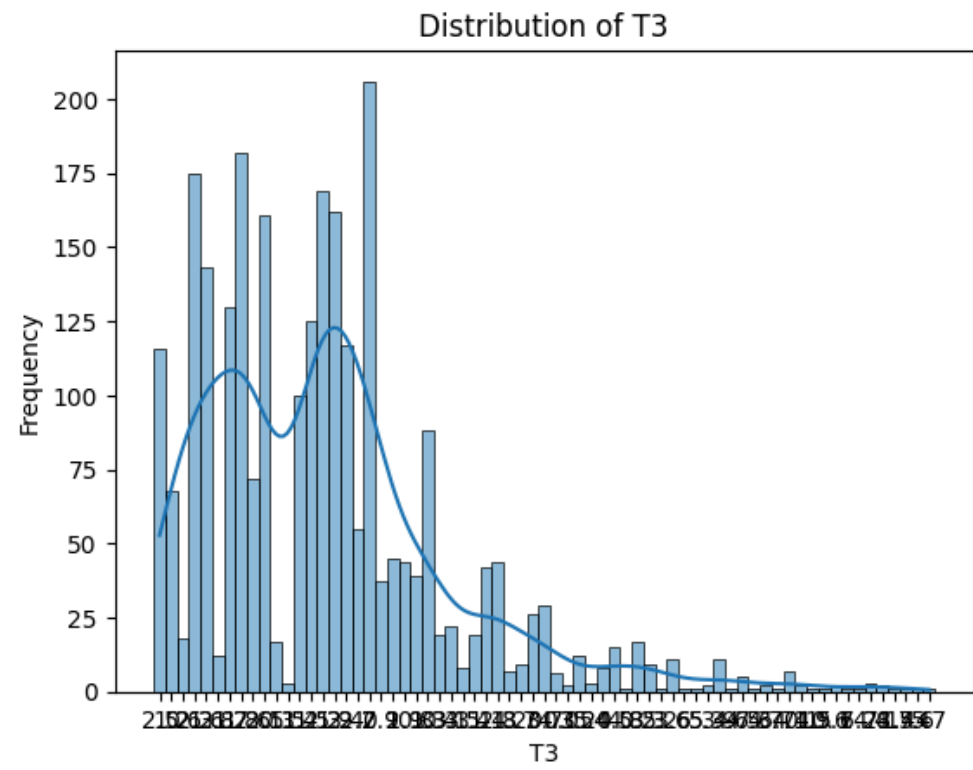
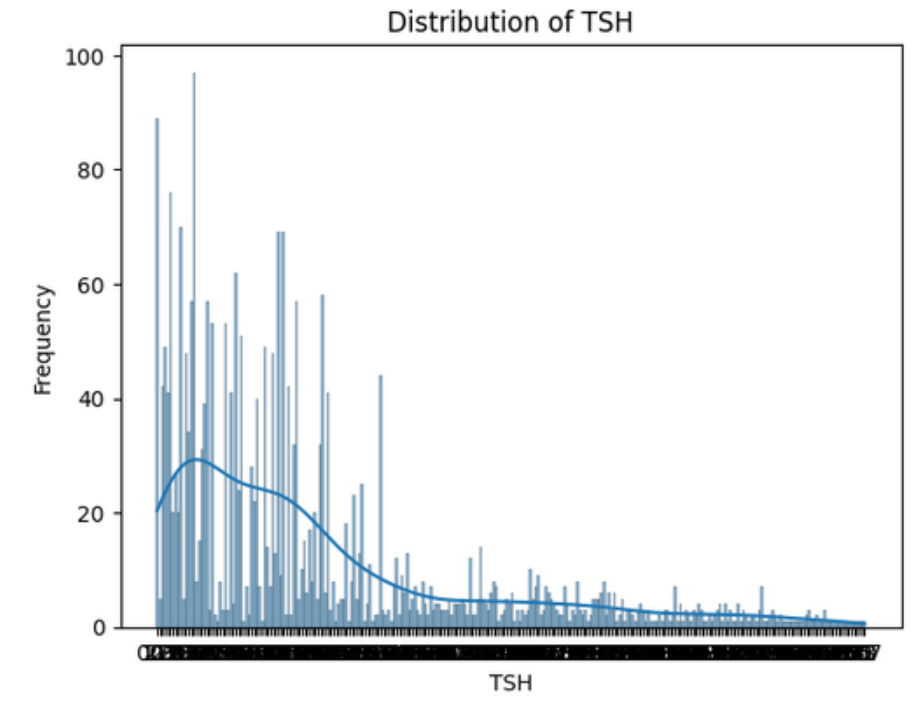
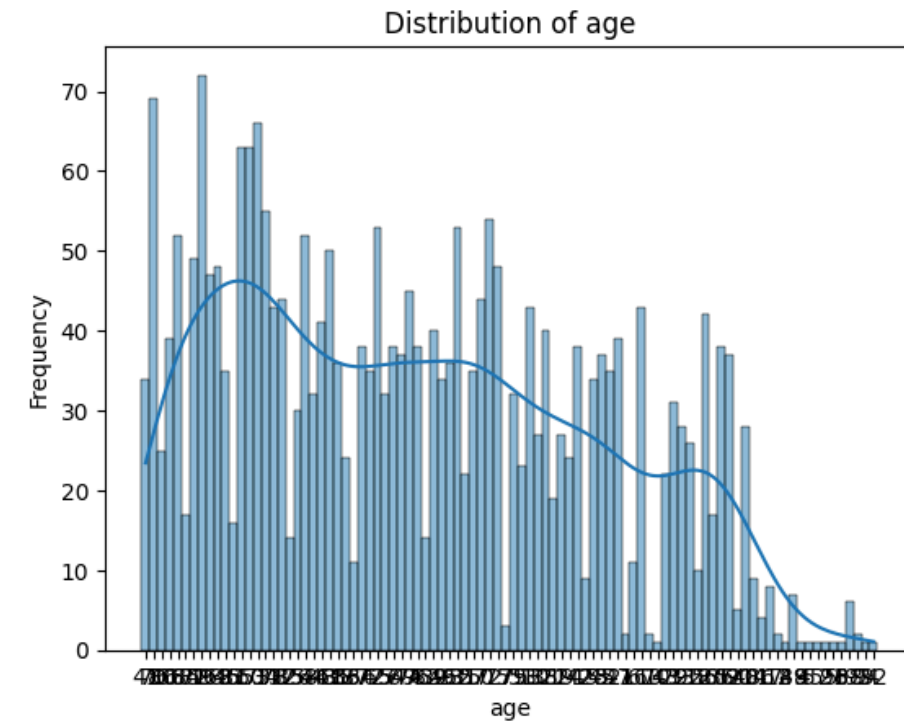
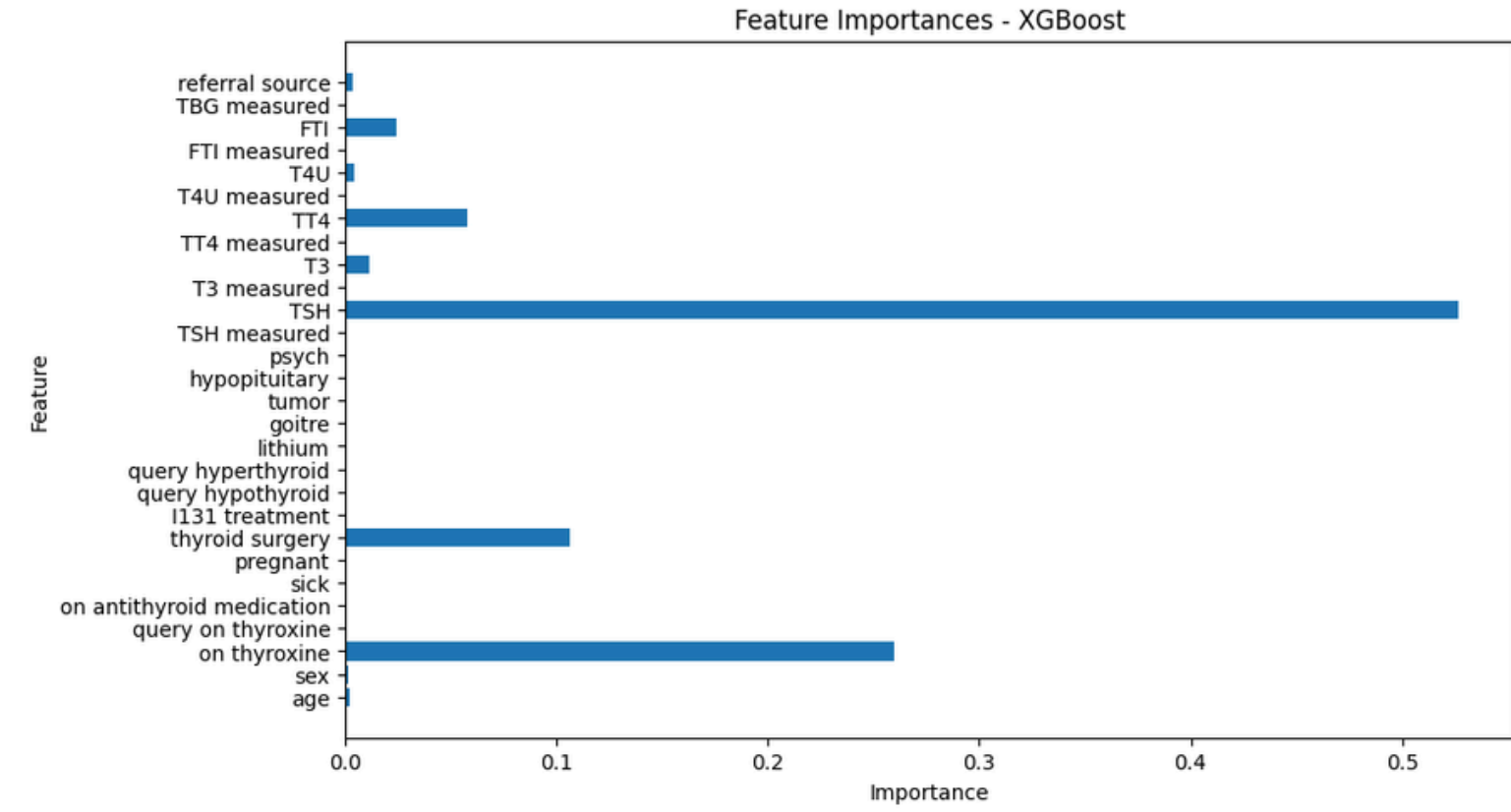
ARCHITECTURE

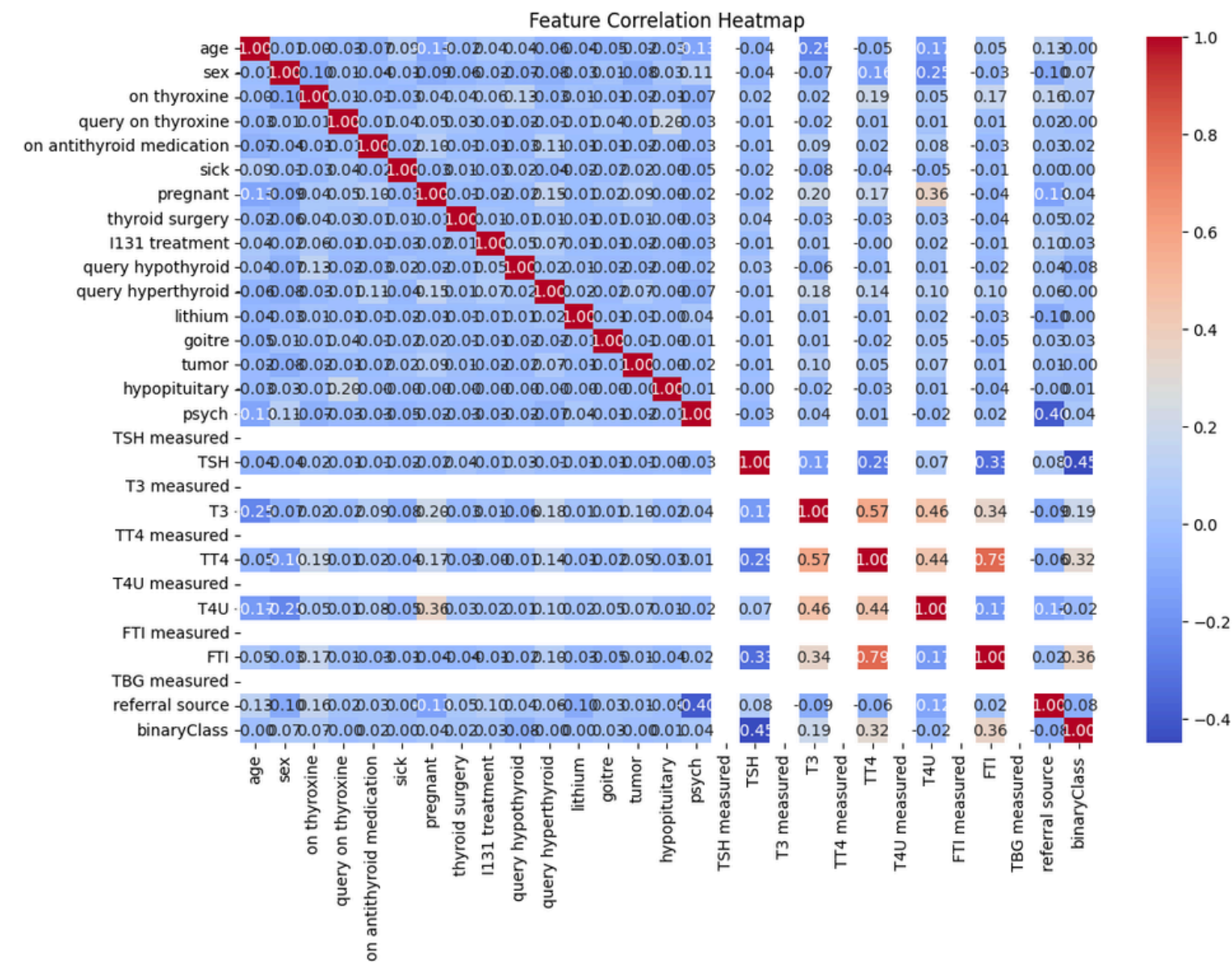
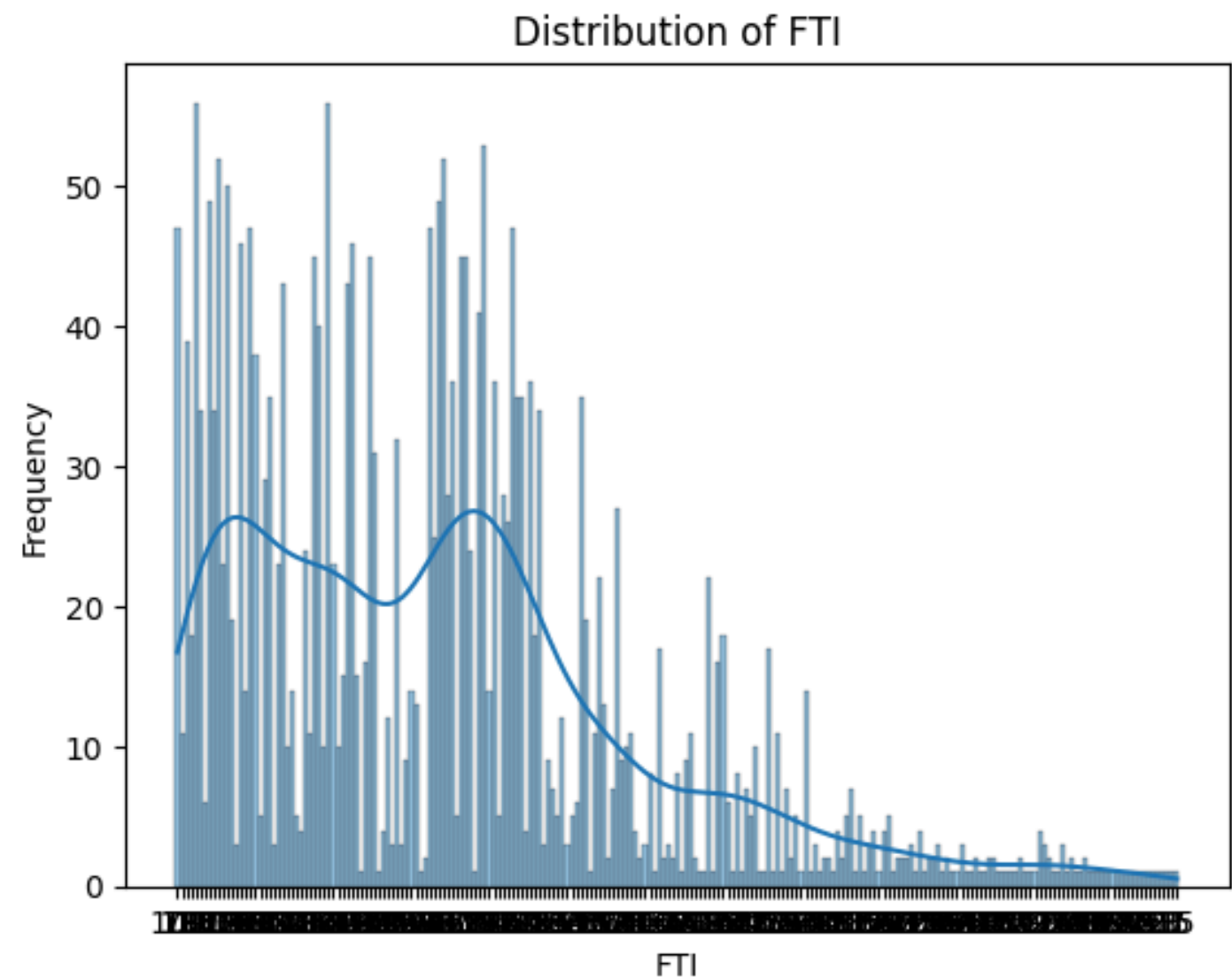


DATA PREPROCESSING

Steps Taken:

- **Removed missing values ("?").**
- **Encoded categorical variables using label encoding.**
- **Standardized numerical data.**
- **Handled imbalances with appropriate splitting.**





MACHINE LEARNING MODEL

MODEL USED: XGBOOST CLASSIFIER

- **Random Forest, XGBoost, Decision Tree were produced good result**
- **XGBoost as the best model chosen for training and testing purpose**
- **Model performance evaluated based on Accuracy, Confusion Matrix, Recall**

MODEL TRAINING

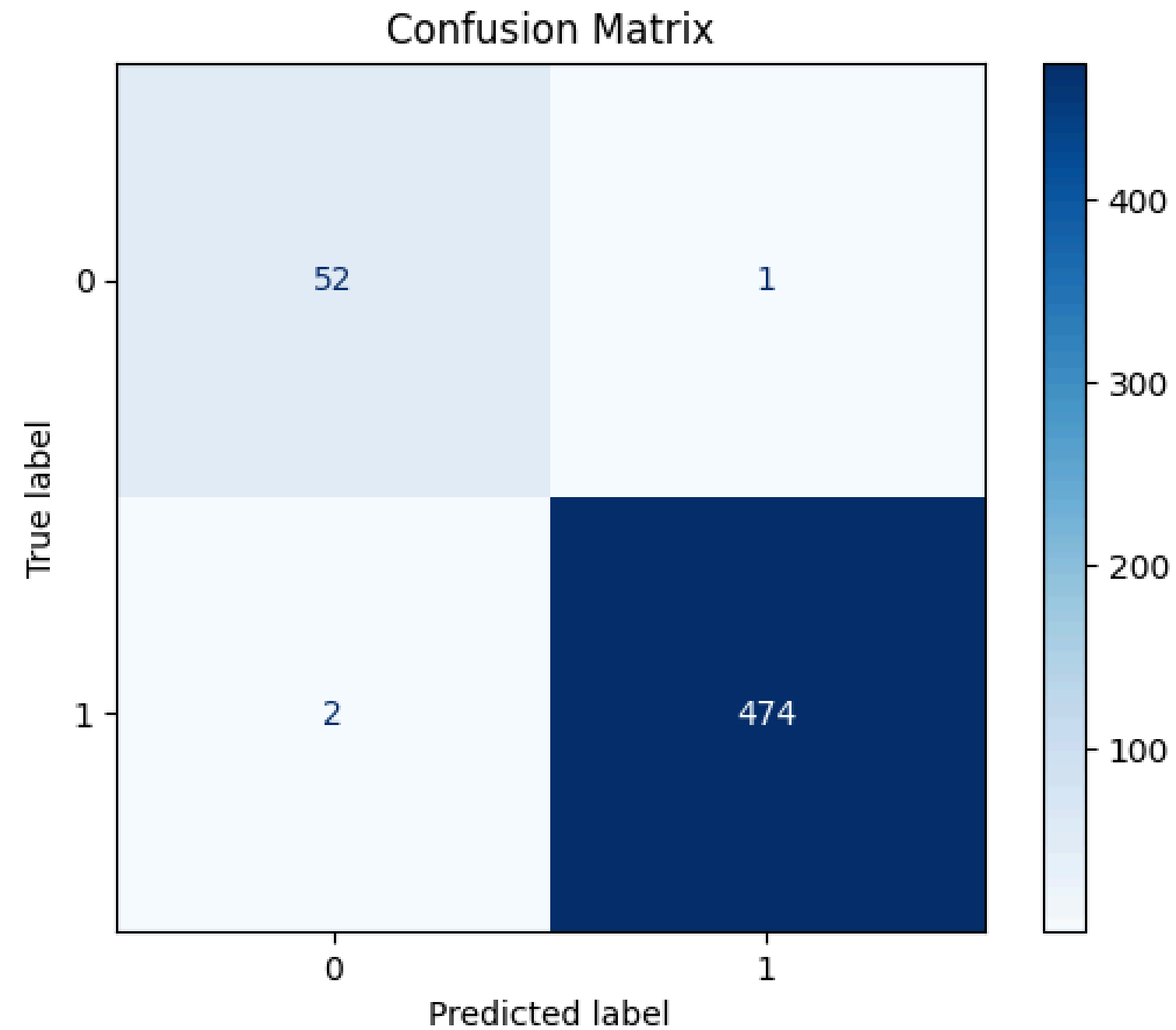
Training Metrics:

- **Accuracy: 99.43%**
- **Precision: 99.79%**
- **Recall: 99.58%**
- **F1 Score: 99.68%**

MODEL EVALUATION

Confusion Matrix

True Positives, True Negatives, False Positives, False Negatives.



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