IEEE-CIS Fraud Detection Challenge

Comparative Study of SVM and Decision Tree Binary Classification

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***Abstract*—abstract: This report evaluates the performance...**

I. The Fraud-Detection Pipeline

...

1) ...
2) ...
3) ...

II. Exploratory Data Analysis

A. Data Structure Inspection

1) Before any data transformation, we observed the `train` and `test` datasets had a mixture of `float64`, `int64` and `object` types
2) missing values
3) target balance

B. Statistical Summary & Visualizations

Fig. 1. some image here

TABLE I
SOME STATS...

Metric	Value
one	...
two (%)	...
three	...
four	...

C. Findings & Hypotheses

...

...

III. Data Pre-Processing & Cleaning

A. Imputation & Removal

1) ...
2) ...
3) ...

B. Normalize & Scale Features

1) ...
2) ...
3) ...

C. Encoding Categorical Features

1) ...
2) ...
3) ...

IV. Models

intro to the models used

A. Support Vector Machine (SVM) Classifier

Due to the size of the dataset (590,000+ samples), a standard SVM with a non-linear kernel ($O(n^3)$) was computationally infeasible. We opted for a LinearSVC ($O(n)$) to utilize the entire training set. To satisfy the hyperparameter tuning requirement2, we tuned the Regularization parameter (C) and the Loss function (Hinge vs. Squared Hinge) instead of the kernel.

experiment hyperparameters (C, gamma, kernel etc)

cross-validation and validation splits to evaluate performance

results using different hyperparameters

training and test metrics: confusion matrix, precision, recall, F1-score, and accuracy

B. Decision Tree Classifier

experiment hyperparameters (max depth, min samples split, criterion)
cross-validation and validation splits to evaluate performance
results using different hyperparameters
training and test metrics: confusion matrix, precision, recall, F1-score, an

V. Model Comparison

TABLE II
SOME STATS...

Metric	SVM	Decision Tree
one	...	...
two (%)	...	...
three	...	...
four	...	...

a) discuss similarities & differences. use table:

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