WIRE-Wallet: Web3 Integrated Reputation Engine for Ethereum Wallets

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Introduction

The rise of scams in Web3 and DeFi has increased the need for wallet-level trust evaluation.

Existing tools are reactive (e.g., Etherscan tags) or opaque (e.g., Webacy).

We propose WIRE-Wallet, a lightweight and interpretable trust scoring system using Ethereum on-chain behavior.

Unlike static blacklists, WIRE generalizes to unseen wallets using behavioral signals.

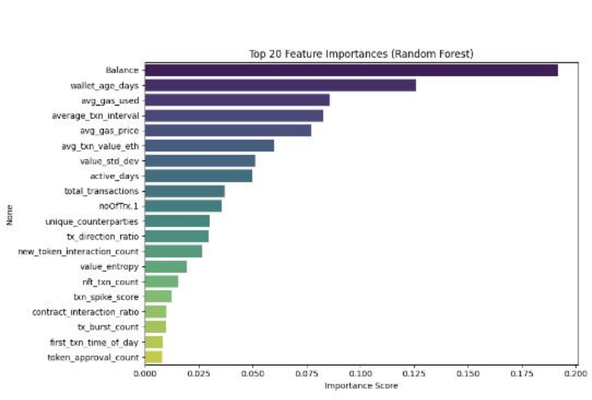
The goal is to offer credit-score-like transparency for Web3 identities.

Materials and methods

Used Gradient Boosting Regressor, optimized with GridSearchCV.

Engineered 29+ on-chain behavioral features including:

- wallet_age_days
- active_days
- sudden_activity_spike

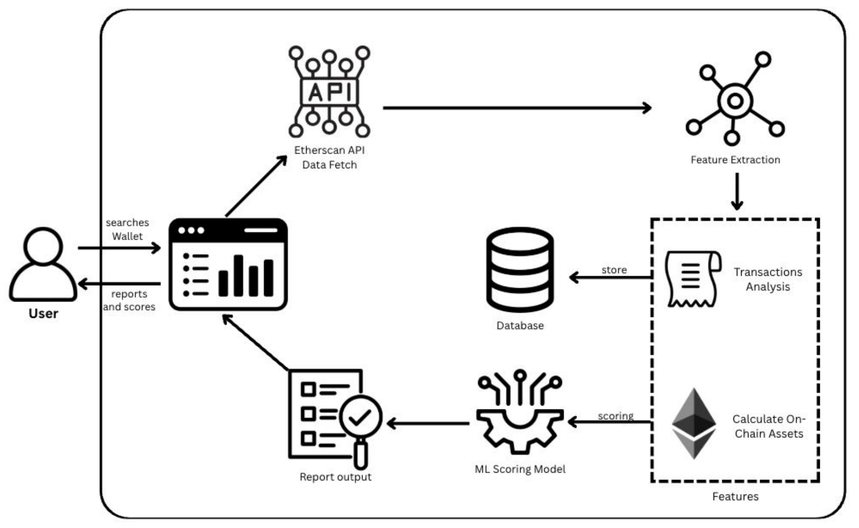


Overview

Uses on-chain behavioral features (e.g., wallet age, entropy, self-transfer ratio) to detect suspicious activity.

Applies a Gradient Boosting Regressor to assign a 0–100 trust score to any Ethereum wallet.

Supports phishing prevention, sybil defense, and will integrate threat intel (e.g., CryptoScamDB).

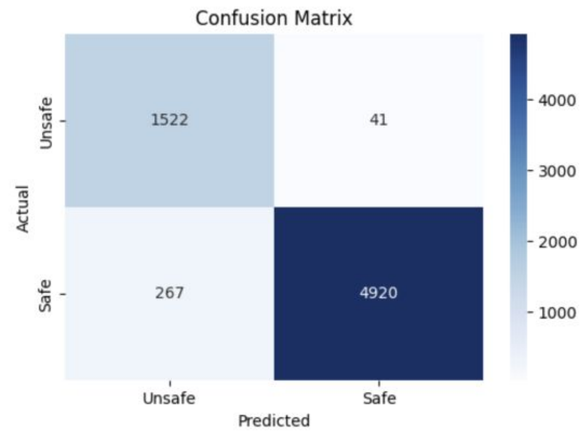


Key Results

Trained on 26,999 labeled wallets; tested on 6,750 unseen wallets.

Regression Metrics: MAE = 6.76, R^2 = 0.82

Classification: Accuracy = 95.4%, ROC-AUC = 0.99



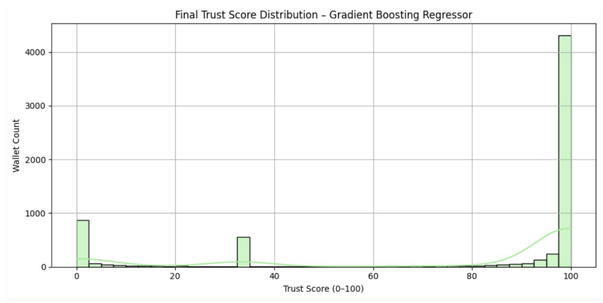
Case Study (Misclassified Phishing Wallet)

- Etherscan: Phishing
- Webacy: High Severity
- WIRE-Wallet: Score = 88.75 (Safe)

Led to plan for integrating threat intelligence blacklists.

Conclusions

WIRE-Wallet delivers interpretable, score-based risk detection using public on-chain data. Unlike Etherscan (reactive) or Webacy (opaque), it proactively flags Sybils and rug pulls. Phishing support is planned. Achieved AUC ≈ 0.98.



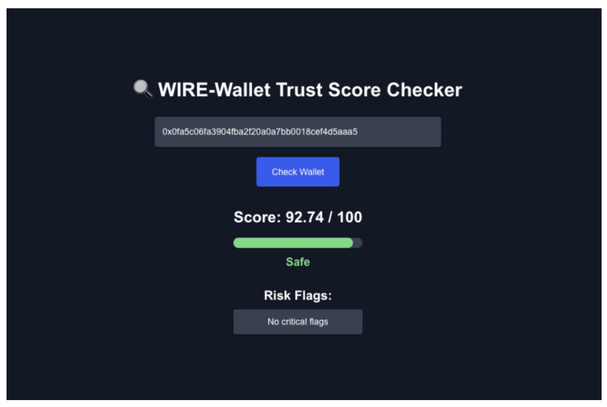
Model assigns scores (0–100), forming distinct clusters:

0–20: Malicious wallets

30–50: Suspicious / ambiguous

90–100: Likely safe

These clusters support high separability (ROC-AUC ≈ 0.98) and reduce false positives.



Interactive Dashboard

Users can check wallet scores on a live ReactJS + FastAPI app. The interface includes:

- Score + confidence label
- Risk flag summary

Designed for researchers, dApps, and auditors.

Data Sources

33K+ Ethereum wallets

- Etherscan API
- CheckCryptoAddress
- Kaggle Ethereum Labels
- ETH-Labels (GitHub)
- Pymmdrza Rich Lists

Future Work

- Expand features to 100+ on-chain signals
- Integrate real-time threat intelligence: CryptoScamDB, Chainabuse
- Detect MEV bots via pattern recognition
- Extend support beyond Ethereum (e.g., Polygon, BNB)

Conclusion

WIRE-Wallet presents a transparent, interpretable, and effective trust scoring model. It outperforms reactive systems and lays the groundwork for secure onboarding in Web3 ecosystems.