Blockchain Address Risk Scorer Project Report

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1 Executive Summary

The Blockchain Address Risk Scorer is a Python-based desktop application designed to evaluate the risk of cryptocurrency wallet addresses for Anti-Money Laundering (AML) compliance. Built using Tkinter for a modern graphical user interface (GUI), the tool assesses multiple wallet addresses based on transaction volume, number of transactions, and matches against a predefined list of high-risk addresses. Key features include multi-address support, real-time risk scoring, and report generation with ticket tracking. This report details the project's objectives, methodology, implementation, results, challenges, and future enhancements, demonstrating proficiency in Python, GUI development, and blockchain risk analysis.

2 Project Objectives

- Develop a user-friendly GUI tool to assess cryptocurrency wallet risks.
- Enable evaluation of multiple wallet addresses simultaneously.
- Implement a robust scoring algorithm for AML risk categorization (Low/Medium/High).
- Provide functionality to save risk assessment reports as text files.
- Ensure an intuitive, visually appealing interface with comprehensive error handling.

3 Methodology

3.1 Technology Stack

- **Python 3**: Core programming language for logic and GUI implementation.
- **Tkinter**: Standard Python library for creating the graphical interface.
- **OS and Filedialog**: For handling file operations and saving reports.

3.2 Risk Scoring Algorithm

The risk score (0–100) is calculated based on the following criteria:

- Match with known high-risk address: +50 points
- Transaction amount > $5,000: +20 points

- Number of transactions > 100: +15 points

- Average transaction amount < \$100: +10 points

Risk levels are defined as:

- High: Score ≥ 70

- Medium: Score ≥ 30

- Low: Score < 30

3.3 Key Features

- **Multi-Address Evaluation**: Users can add and remove multiple wallet addresses via a listbox.

- **Input Parameters**: Fields for total transaction amount (USD) and number of transactions.

- **Risk Assessment Display**: Real-time results showing score, risk level, and contributing factors.

- **Report Generation**: Saves results with unique ticket numbers to user-specified text files.

- **Enhanced GUI**: Modern design with styled buttons, clear labels, and error pop-ups.

4 Implementation

The project is implemented in a single Python script (`enhanced_gui_address_risk_scorer.py`). Key components include:

- **High-Risk Address List**: A hardcoded list of three wallet addresses for demonstration purposes.

- **RiskScorerGUI Class**: Manages the Tkinter interface, including input fields, a listbox for addresses, and buttons for calculation and saving.

- **Calculate Function**: Processes multiple addresses and displays risk scores, levels, and reasons.

- **Save Report Function**: Exports results to a text file using `filedialog`, with ticket numbers for traceability.

The GUI features a clean layout with a light gray background, green and blue buttons, and a red remove button for intuitive user interaction.

5 Results

The application was tested with the following cases:

- **Test Case 1**: Address `0x1a2b3d4e5f6a7b8d9e0f1a2c3d4e5f6a7c8d0e1f`, \$6,000, 150 transactions

- – Score: 85/100 (High Risk)
- – Reasons: Known risky address, high transaction amount, many transactions
- **Test Case 2**: Address `0x1234567890abcdef1234567890abcdef12345678`, $1,000, 10 transactions
  - – Score: 10/100 (Low Risk)
  - – Reasons: Small average transactions

The tool accurately categorized risks, displayed results in a user-friendly GUI, handled errors via pop-up dialogs, and successfully saved reports to text files.

6   Challenges and Solutions

- **Challenge**: Supporting multiple address evaluations in a single session. **Solution**: Implemented a listbox with add/remove functionality for dynamic address management.

- **Challenge**: Ensuring robust input validation and error handling. **Solution**: Added checks for empty fields, negative values, and duplicates, with Tkinter messagebox pop-ups.

- **Challenge**: Designing an intuitive and visually appealing GUI. **Solution**: Used a modern color scheme, organized layout, and styled buttons for enhanced usability.

- **Challenge**: Saving reports in a user-friendly format. **Solution**: Integrated `filedialog` for flexible file saving and added ticket numbers for traceability.

7   Future Enhancements

- Integrate blockchain APIs (e.g., Chainalysis) for real-time high-risk address updates.

- Expand risk criteria to include transaction frequency and network analysis.

- Add visual indicators (e.g., color-coded risk levels) in the GUI.

- Implement a SQLite database to store and retrieve historical assessments.

- Support customizable GUI themes for improved user experience.

8   Conclusion

The Blockchain Address Risk Scorer is a robust, user-friendly tool that demonstrates proficiency in Python programming, Tkinter GUI development, and AML risk assessment. Its ability to handle multiple addresses, generate detailed reports, and provide a modern interface makes it a valuable prototype for financial compliance applications. The project is extensible, with potential for integration with real-time blockchain data, positioning it as a foundation for advanced FinTech solutions.