Comparison of Big Data Storage Solutions with the Hybrid Blockchain Architecture

ABSTRACT

This project introduces an automated coin classification system built based on the Swin Transformer, a cutting-edge deep learning model. By processing both obverse and reverse coin images and incorporating physical metadata like weight and diameter, the system enhances classification accuracy. It is designed to handle real-world variations in coin conditions, offering a robust and scalable solution applicable to both modern and ancient coins. The system supports numismatic research and cultural heritage preservation by providing precise and adaptable classification across diverse coin datasets.

METHODOLOGY

The coin classification process begins with a series of preprocessing steps to ensure image consistency and quality. These include normalization, denoising, lighting correction, and resizing, which standardize the images for further analysis. Feature extraction techniques such as Gabor filters, Local Binary Patterns (LBP), contour analysis, and Fourier transforms are used to capture critical coin features, including textures, edges, and shapes [1].

To improve model robustness, various data augmentation techniques were used to simulate real-world conditions like scratches, corrosion, tarnishing, and varied lighting. These augmentations help the model handle coins in different states of preservation and environmental conditions [2].

The Swin Transformer model, which processes images hierarchically, captures both fine and large-scale features of the coin images [3]. The model also integrates physical metadata, such as the coin's weight and diameter, which enhances classification precision.

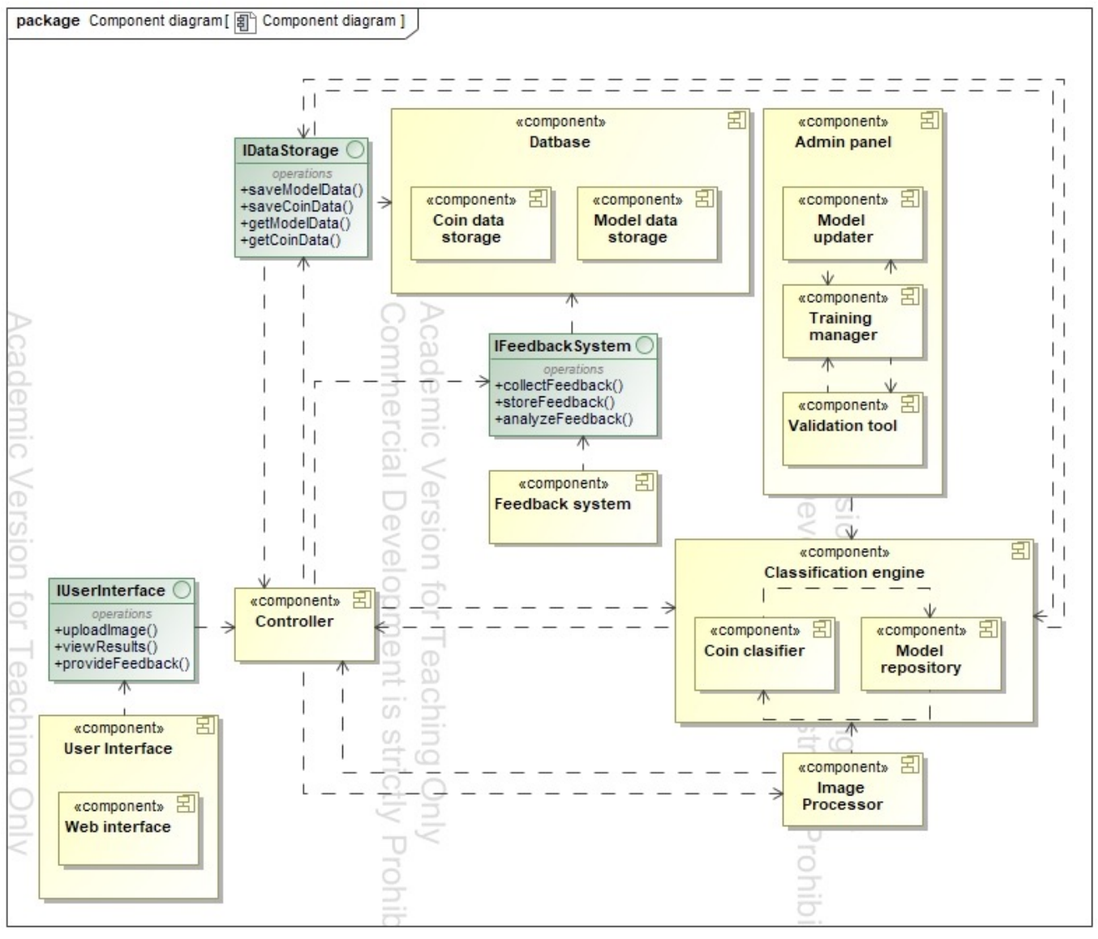
Ancient Rome, Denarius, Silver, c 91 – 91 BC

Q Pomponius Musa of Astronomy, minted 66 BC

William III (1674-1702), Five Guineas

RESULTS

The results of the model demonstrate high accuracy in classifying both ancient and modern coins. The combination of Swin Transformer architecture with comprehensive preprocessing and metadata integration allows the system to handle worn, corroded, and even noisy images with precision. The system's robustness and adaptability make it suitable for large-scale applications in numismatic research and artifact preservation, providing a reliable and scalable solution.



CONCLUSIONS

By integrating the Swin Transformer model with advanced preprocessing techniques, this project offers an effective solution for the automated classification of coin images. Rather than replacing human expertise, this tool is designed to assist experts by enhancing the classification process through collaboration between technology and human insight. It automates the initial stages of classification, allowing experts to focus on more nuanced analyses and interpretations that require human judgment. Future work could involve expanding the model's capabilities to classify a wider variety of coins and exploring real-time applications in museums or cultural heritage institutions.

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