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Verification of the authenticity of bullion coins with a mobile application based on frequency analysis using an artificial neural network

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Counterfeiting of bullion coins is a serious issue for collectors, dealers and investors, highlighting the need for reliable and accessible authentication tools. This research presents a mobile application designed to authenticate bullion coins using audio analysis, offering an innovative and convenient solution. The app uses autoencoders, a form of artificial neural network, trained on spectrograms created from audio recordings of real coins being struck. These spectrograms capture unique frequency patterns, which the neural network analyses to recognise the acoustic signatures of authentic coins. Tests show that the application achieves high accuracy in distinguishing genuine coins from counterfeits, advancing non-destructive authentication methods. It offers practical benefits by allowing users such as collectors and dealers to instantly verify coins without special tools, increasing confidence in transactions. However, the performance of the application relies heavily on the quality of the audio recording, which can be affected by background noise or device limitations. The training dataset, while detailed, may not yet cover all coin types or counterfeit variations, which could reduce its effectiveness in some cases. Future efforts should aim to improve the application by expanding the dataset and incorporating additional data, such as weight or visual checks, to improve accuracy and versatility.

Author: GRYCZKA, Tomasz

Presenter: GRYCZKA, Tomasz

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