Lab 1 – Art Guardian Product Description

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CS 410, Spring 2022

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2 May 2022

Version 2

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1. Introduction

The popularity of NFTs has drastically increased within the past few years. By the end of 2021, the NFT market had an estimated worth of 41 billion dollars, which is a significant increase from its estimated worth of 100 million dollars in 2020 (Dailey, 2022). These NFT markets do not have many regulations on what can be minted as NFTs, which has caused an art theft problem within the digital art community. Digital artists are having their artwork minted as NFTs without their permission and then sold on these marketplaces. There is evidence that this problem is only getting worse. DeviantArt, an art hosting platform which tracks fraudulent NFTs, reported that the number of alerts, that notified users if their art had been minted as an NFT, doubled from October and November last year, and they have sent over 90,000 alerts in total (Beckett, 2022). If artists find their art stolen on a NFT marketplace they will have to manually fill out a DMCA request and send it to the marketplace. They will have to repeat this process each time they find stolen artwork. Currently, there is no automated process for digital artists to search for stolen art and send DMCA requests to the NFT marketplace.

The solution to this problem is Art Guardian. Art Guardian constantly monitors popular NFT marketplaces for stolen art and sends DMCA requests to take down the fraudulent NFTs. With Art Guardian, digital artists can protect their art from being sold on NFT marketplaces without their permission and stop thieves from profiting off their work. Art guardian automates all the difficult parts of keeping a user's art off the NFT marketplace such as stolen art detection and the DMCA process.

2. Art Guardian Product Description

Art Guardian is a progressive web application that automatically finds solen art and sends DMCA takedown requests to NFT marketplaces to remove fraudulent NFTs. Users can protect their art by uploading their art to the application. Once the art is uploaded, Art Guardian will scan the NFT marketplaces for the art and notify the user if their art has been minted as an NFT. If their art is on the NFT marketplace, Art Guardian will also generate a DMCA request which can be sent to the NFT marketplace.

2.1. Key Product Features and Capabilities

Users can access Art Guardian through a web browser or mobile application on iOS or Android. They will first have to create an account with Art Guardian. Since DMCAs are a legal issue, the identity of the user must be correct, which is why Art Guardian has an identity verification system, and users must connect their art accounts to make sure that they are a legit artist. After creating an Art Guardian account, users can upload their original art to the art database. Art Guardian uses the art in this database and image matching to detect stolen art on the NFT marketplace. If users wish to allow their art on NFT marketplaces, then they can whitelist their art, which will bypass our stolen art detection system. Also, users can see all their uploaded art within their art library.

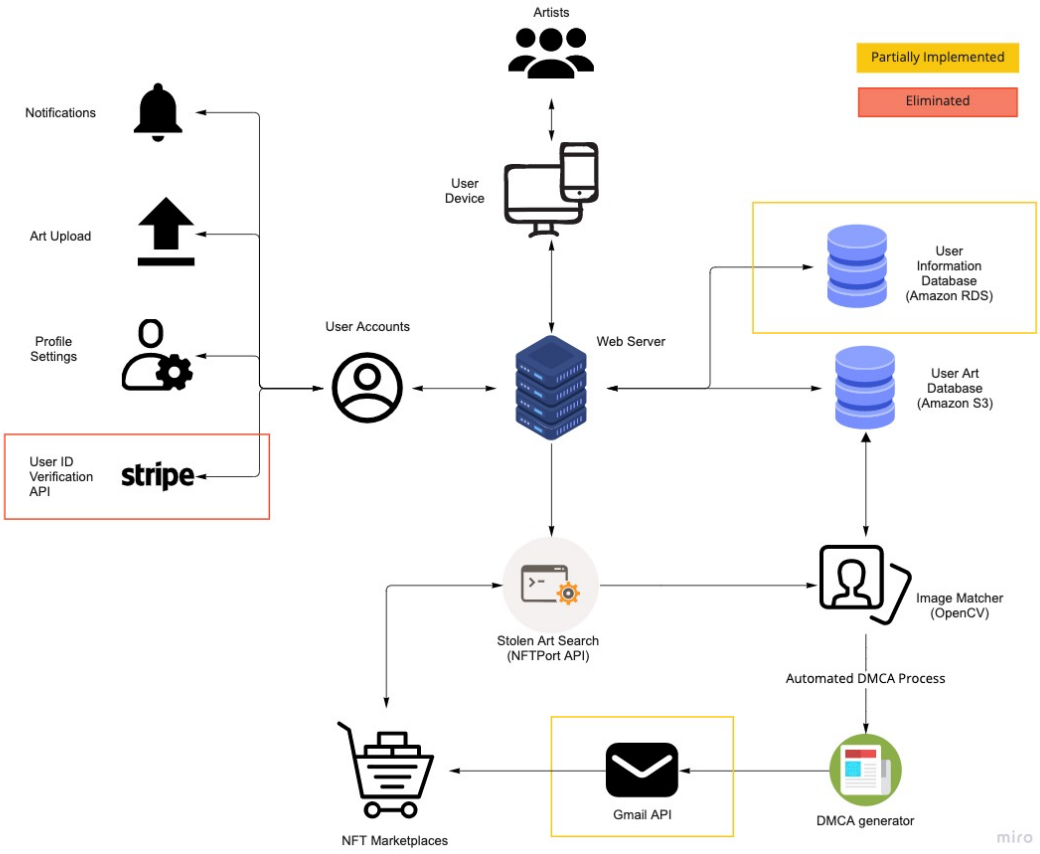
Once Art Guardian detects a piece of stolen art, it creates a pre-filled DMCA takedown request based on the user's information. Users can send this DMCA request after verifying that the stolen art is their own. After the DMCA request is sent, users can monitor the status of the request. All DMCA requests are stored in a database, so users can obtain information about previous DMCAs if needed. Art Guardian's notification system will alert users when their art is

detected on the NFT marketplace and when the DMCA request has been approved or denied. Art Guardian also provides a section on tips and tricks for protecting one's digital art against theft.

2.2. Major Functional Components

Users can use Art Guardian through the browser or a mobile application on iOS or Android. The mobile application uses the React Native framework, which allows it to run on both iOS and Android, and it is written in the JavaScript programming language. The Art Guardian website provides all the same functionality as the mobile site, and it uses the React front-end framework, JavaScript, HTML, and CSS. Git and GitHub are used for version control during the development process. The user devices connect with a web server, which is powered by AWS. The web server connects with all the APIs and databases, as seen in Figure 1.

Figure 1 - Art Guardian Major Functional Component Diagram



The databases that will store the user information and original art use Amazon Relational Database Services and MySQL. These technologies organize the data and aid in the retrieval of information from the databases. The user information database stores information about the user's information, profile settings, and DMCA history. User accounts are verified through Stripe, which is a user ID verification API. The NFT Port API is used to search for art on the NFT marketplace. The image matcher uses template matching to compare art found on the NFT marketplace with the art in the art database. Then, it sends the matched image back to the web server which starts the DMCA process. The image matcher uses the OpenCV library for template matching. The automated DMCA process uses a custom DMCA generator, which creates DMCAs based on the user and the stolen art. The DMCA is sent to the NFT marketplace as an email by using the Gmail API.

3. Identification of Case Study

The targeted users are commissioned artists and NFT artists. Commissioned artists would get the most benefit since they have a larger monetary incentive to protect their art from being sold without their permission. These artists can protect their art by uploading it to Art Guardian, which will search the NFT marketplace for their art, and alert them if it is found. Then, they can send an automatically generated DMCA request to prevent the sale of their art on the NFT marketplace. Art Guardian also provides these artists with tips on how to prevent any further theft of their art. These artists will feel more at ease knowing that they now have an easy process of removing their art from the NFT marketplace. NFT artists will benefit from Art Guardian, since they know that the NFTs they are selling are not using stolen art.

A case study group for Art Guardian is ODU art students. ODU art students can provide valuable feedback on the Art Guardian prototype, since they are most similar to digital artists.

Students will be able to upload their art to the prototype. Art Guardian allows the students to check if their art has been minted as an NFT and is being sold on the NFT marketplace without their permission. Feedback from this group is especially valuable, since it gives insight into how artists will use and critique features such as the art library, art upload, and notification system. While Art Guardian is currently targeting commissioned artists and NFT artists, in the future, Art Guardian will expand to meet the needs of all digital artists and possibly non-digital artists, who do not want images of their art being sold as NFTs.

4. Art Guardian Prototype Description

4.1. Prototype Architecture

4.2. Prototype Features and Capabilities

4.3. Prototype Development Challenges

5. Glossary

NFT: A sellable, tradeable, non-fungible token that exists on the blockchain and represents some form of data

Blockchain: A decentralized, immutable, public database that is split among multiple computers

Art Platform: A site that artists use to publish their art

DMCA (Digital Millennium Copyright Act) takedown: act of taking down a copyrighted work from a website on behalf of the owner of that work

Minting: Using a piece of data, such as an image, to create a unique NFT

NFT Marketplace: website where NFTs are sold

iOS: Apple's mobile operating system

Android: popular mobile operating system based on the Linux kernel

Progressive Web Application: a web application that can offer the features and capabilities of native applications

Amazon Web Services (AWS): Largest provider of various cloud computing services

Amazon Relational Database Service (RDS): cloud-based database service which can work with other AWS services

NFTport API: interface for working with popular NFT blockchains and markets

React: open-source, front-end JavaScript library for creating websites with modern user interfaces

React Native: a JavaScript user interface library that can create apps for iOS and Android

Stripe API: validates a user's identity

OpenCV: open-source computer vision library for Python

Email API: a programming interface for the creation and sending of emails

MySQL: a relational database management system

Git: version control system for tracking software changes

GitHub: online hosting of the git versional control system

JavaScript: programming language that is often used for web development

HTML: markup language for displaying documents in the web browser

CSS: style sheet language that specifies the style and layout of how documents are displayed in a web browser

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