Lab 1 - Product Description

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1. Introduction

The distribution of art is how one can showcase the art for sale, and in today's landscape that distribution can be done digitally. A new form of digital art distribution called a Non-fungible Token (NFT) has risen in popularity as in 2021, with the NFT market reaching a value of forty-one billion dollars (Business Insider, 2022). An NFT is a digital certificate for a piece of digital art that is created and stored on the blockchain to signify ownership of said art (BBC, 2021). A NFT can be sold for a large sum of money as the musician Grimes was able to sell some of her art for more than six million dollars (BBC, 2021). With how lucrative the NFT market is in terms of turning a profit, there are bound to be people who desire that profit. The main obstacle for them is getting digital artwork to mint their NFT to sell to an audience. While some people create their own art to mint NFTs out of them, others steal pre-existing artwork created by other people to mint and sell NFTS. The art platform DevaintArt has sent out ninety-thousands alerts of possible NFT art theft, with the number of alerts doubling from October to November of 2021 to three hundred percent more alerts from November to December of 2021.

If an artist has their art stolen and used to create an NFT, what can they do about it? The artists would have to find the infringing NFT and submit a Digital Millennium Copyright Act (DMCA) takedown to remove said NFT. This includes knowing the legal process and filling out the right documents for submission, which artists may not have the time or knowledge to do correctly. This issue is further quantified if more than one piece of their art is stolen. Art Guardian is an application that exists to help artists find infringing NFTs and send DMCAs to said NFTs. Art Guardian is a progressive web application that allows a user to upload their art to the application so that the app can monitor NFT marketplaces for infringing art NFTs. Once a stolen art NFT has been found, the application would generate a DMCA takedown request that requires the user's e-

signature to approve. Once the DMCA is approved, then the DMCA is sent to said marketplace to notify them of the NFT in hopes removing the NFT. This is a solution that would simplify and hasten the protection of the user's art.

2. Product Description

Art Guardian is a progressive web app where users upload their artwork into the database. The artwork has top be the user's original art, any violation will of this rule is punished accordingly. Once the art is uploaded, the application will monitor popular NFT marketplaces for any NFT that is minted using artwork without the artist's permission. The application will not add watermarks to the user's art as that changes the integrity of the art. The application is also unable to prevent the act of minting of an illegitimate NFT beforehand, it only focuses on the created NFT afterwards.

2.1 Key Product Features and Capabilities

Art Guardian allows the user to upload their art into the database for NFT marketplace monitoring. An NFT with stolen art is found using an image matching algorithm that compares what art was uploaded to the database to the art used for the NFT. Once a stolen art NFT is found, the application will send the user a notification about the NFT. Once the user requests a DMCA takedown, the application will generate a DMCA and send it via email to NFT marketplace with the infringing NFT. If the marketplace does not comply, then it is up to the user to pursue further legal action. A user will also be able to whitelist any NFT they minted themselves so that their NFT is exempt from marketplace monitoring.

A profile on Art Guardian will contain the user's legal information so that the user's identity is verified and the DMCA can be generated with the information. The profile will also link to the

user's art account for verification that the art uploaded is their art. All DMCA requests that have been sent and or in-progress are stored in the database. The application will monitor and update the progress of their DMCA, and if the user chooses to pursue further legal action, the application will provide them with the necessary information. The application will also provide a "Tips and Tricks" and "FAQ " section to provide references for defense against illegitimate NFT minting and troubleshooting.

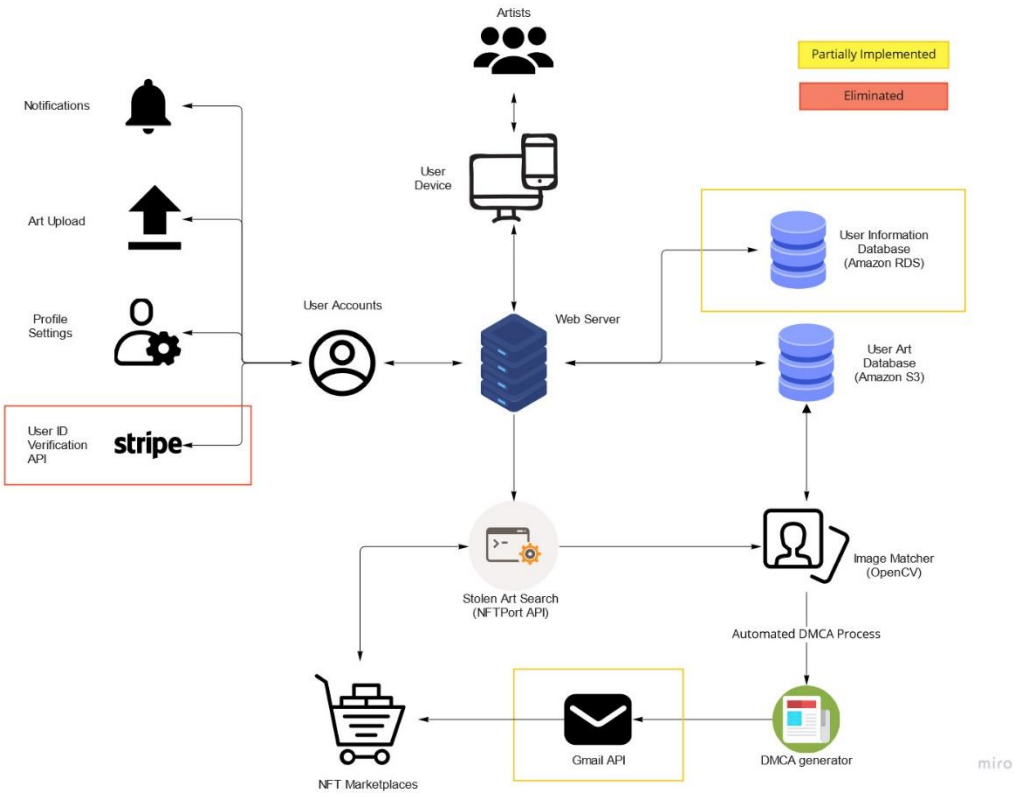
2.2 Major Components (Hardware and Software)

Art Guardian is available on IOS and Android devices and desktop computers. The desktop website is programmed using HTML, CSS, and JavaScript while JavaScript is used for Android and React Native is used for IOS. Art Guardian will use Amazon RDS and AWS for storage and encryption of user data and art. Git is used for version control and team development. The NFT Port API is used to monitor art NFTs on marketplaces, with OpenCV being responsible for image matching using art uploaded from the user. The user's identity is verified using the Stripe API. A DMCA generator will automatically generate DMCAs that is sent via email through the Gmail API. Figure 1 illustrates how the application is built and the ways it communicates with each of its components to perform its designated task.

Figure 1

Art Guardian Major Functional Component Diagram

The figure below shows Art Guardian's Web Server communicating with user account information, the users themselves, the databases used to store user information and art, and the NFT Port API.



3. Identification of Case Study

Art Guardian is intended for use by commissioned artists as their livelihood is dependent on them being able to sell their art. Art theft through the means of NFT minting threatens their livelihood as they aren't receiving the money made from those NFTs being sold.

The case study group that is used for the testing of this application is ODU art students. The students would upload art that the application can use to test image matching. The students will also preview UI and notifications to provide feedback on how to streamline the application to be user friendly.

Art Guardian exists to protect commissioned artists and NFT artists with the eventual goal of expanding protection to all digital artists. It can also be used with art platforms for further protection by integrating the service into the art platform for easy tracking of art posted on there.

4. Art Guardian Prototype Design Description

The Art Guardian Prototype demonstrates the function and feasibility of on an application that allows a user to upload their art so that the system can guard against illicit minting of said art.

4.1 Product Prototype Description

The prototype will demonstrate the Art Guardian web application's ability to have a user create an account, have them upload their art and have the application periodically comb popular NFT marketplaces for infringing NFTs. If an infringing NFT has been found and the user proclaims that the NFT is illicit, then the application will generate a DMCA to send to the marketplace. The application will enable the user to make an account with proper identity verification that will be stored onto our user information database for application access. The

application will also showcase security of the account using a password system and two-factor authentication. The application will then have the account have art uploaded to it to then be stored onto the user art database. The application will then use a stolen art search system to monitor NFT marketplaces. NFTs will be checked using an image matcher algorithm to compare between the uploaded art and the NFT image. If NFT is deemed similar to the original art and the user agrees, the application will use the user submitted information to generate a DMCA on behalf of the user. The DMCA will then be sent via email to the marketplace hosting the infringing NFT.

4.2 Architecture (Hardware/Software)

The prototype requires the user to have a desktop with an Intel Pentium 4 processor or later that is SSE3 capable. The desktop would also need a stable internet connection to brows the internet. The connection needs to be at least 10 Mbps download speed and 1 Mbps upload speed per person. The software required to run the prototype is a Chromium based web browser. Computers with Windows 7 or above, OS EL Captain 10.11 or above, 64-bit Ubuntu 18.04+, Debian 10+, openSUSE 15+, or Fedora Linux 32+ are the recommended operating systems to have the Chromium browser work on.

4.3 Features and Capabilities

As previously mentioned, the Art Guardian prototype allows the user to create an account, upload their art to the account, have to application use the uploaded art to compare to NFTs in various marketplaces, and generate and send a DMCA to the marketplace on the user’s behalf. This to protect the user’s art from being illegally minted by third parties for them to sell on the

marketplace. The user in question would either want to mint the art themselves for their own profit or avoid making NFTs altogether.

4.4 Development Challenges

The development of the Art Guardian prototype will have its share of challenges. One challenge is to ensure that all features of the prototype are implemented by the time of its demonstration. Failure to overcome this challenge will result in the prototype being incomplete, so the team would divide and conquer all aspects of coding and testing to have the prototype finished in a timely manner. Another risk to consider is the need for an NFT for testing the application. The prototype needs an NFT for testing, and this would involve asking an NFT owner for permission to use their NFT for testing or the team would have to create one. There are also risks that can occur during the demonstration of the prototype. The application is reliant on two databases for it to function, so if data were to be corrupted then the prototype can not function as intended. The workaround is to have backups of the data so that in the instance something does corrupt, the data can be recovered immediately to continue the demonstration. A team member may not be able to attend the demonstration, so each team member must understand the way the prototype functions to accommodate for a possible absence. Under the circumstance that a network outage occurs, the application will not function as it is a web application that is also reliant on accessing other resources via the web. A slide show presentation that details the prototype and its functions will be used in this scenario.

5. Glossary

Art Platform - A website in which users can post their digital art

Blockchain - An immutable ledger that anyone can validate

DMCA (Digital Millennium Copyright Act) Takedown - A request sent by the owner of the copyrighted content to remove the infringing content from the internet or platform

Minting - The process in which the files become part of the blockchain

NFT Marketplace - An online platform in which NFTs are minted, sold, and collected

NFT - Non-Fungible Token, a certificate of ownership stored on a blockchain that links to a file

Non-Fungible - Unique, indivisible, and irreplaceable

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