Lab 2 – Art Guardian Product Specification

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1. Introduction

The non-fungible token (NFT) market has grown considerably over the past few years. The estimated worth of the NFT market was around 41 billion dollars by the end of 2021, which was a substantial increase from its worth of 100 million dollars in 2020 (Dailey, 2022). Unfortunately, the lack of regulation in the NFT market space has allowed people to mint NFTs of artists' work without their permission and make a profit. DeviantArt, which is a popular art hosting platform, has sent over 90,000 notifications to users that their art had been minted (Beckett 2022). Artists that want to takedown these illegal NFTs will have to manually fill out a Digital-Millennium Copywrite Act (DMCA) request, which can be a time-consuming process, especially if multiple works of art have been stolen. Art Guardian is a solution to this problem because it not only detects stolen art on NFT marketplaces, but also automates the DMCA generation and sending process for taking down fraudulent NFTs.

1.1 Purpose

Art Guardian is a web application that will automatically detect fraudulent NFTs that use stolen artwork, generate DMCA requests, and send DMCA requests to the marketplace. The intended users for art guardian are digital artists who want to protect their art from being sold on NFT marketplaces. Artists will use Art Guardian by uploading images of their artwork to the application, and then Art Guardian will monitor the NFT marketplace for their art. If a piece of stolen artwork is detected, Art Guardian will notify the artist and automatically generate a DMCA takedown request. If the user confirms that the artwork is theirs, then they can sign and send the DMCA takedown request to the marketplace. Art Guardian will only send the DMCA takedown request to the marketplace on behalf of the artist. If the NFT marketplace chooses to ignore the DMCA takedown request, then Art Guardian will take no further legal action.

1.2 Scope

The main objective of Art Guardian is to streamline the process of removing stolen artwork from NFT marketplaces for artists. It will do this by automatically detecting fraudulent NFTs, generating DMCAs, and sending DMCAs to the offending marketplace. Artists that use Art Guardian will feel more confident in posting their art online, knowing that their art is protected. The Art Guardian prototype will allow users to create accounts and have access to all the basic account features. Users will have access to profile settings from which they can change information about their account, such as email or username. The art upload system will be available, which allows users to upload images of their artwork that they want Art Guardian to protect. The prototype will have a notification system, which will notify users if their art has been found on the NFT marketplace. Users will also have access to the art library page, in which they can view and edit art that they have uploaded. Other main features that will be in the prototype are the stolen art detection system and the automated DMCA generation.

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1.3 Definitions, Acronyms, and Abbreviations

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

Blockchain: a decentralized, immutable, public ledger 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

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

AWS Amplify: an AWS service for building full-stack web applications

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

Amazon DynamoDB: 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

Stripe API: programming interface for verifying a user's identity

OpenCV: open-source computer vision library for Python

Gmail 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 version control system

JavaScript: a general-purpose programming language 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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1.5 Overview

The rest of the product specification details the architecture of the protype, prototype functions, and external interfaces. The section about the architecture of the prototype shows and explains the major functional components and their interactions with each other. The prototype functions section summarizes the major functions of the prototype and how that compares with the real-world product. Lastly, the external interfaces section provides details about the software, hardware, and user interfaces for the prototype

2. General Description

The Art Guardian prototype will be a web application, which users can access through a web browser. The prototype will demonstrate the core features of stolen NFT artwork detection and automation of sending and creation of DMCA takedown requests. The prototype will also be capable of basic user account functionality, such as notifications, art upload, art library, and account creation.

2.1 Prototype Architecture Description

The Art Guardian prototype will have most of the same major functional components. As seen in Figure 1, the only components that will be either partially implemented or eliminated art the user ID verification API, user information database, and Gmail API.

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Figure 1

Art Guardian Major Functional Component Diagram
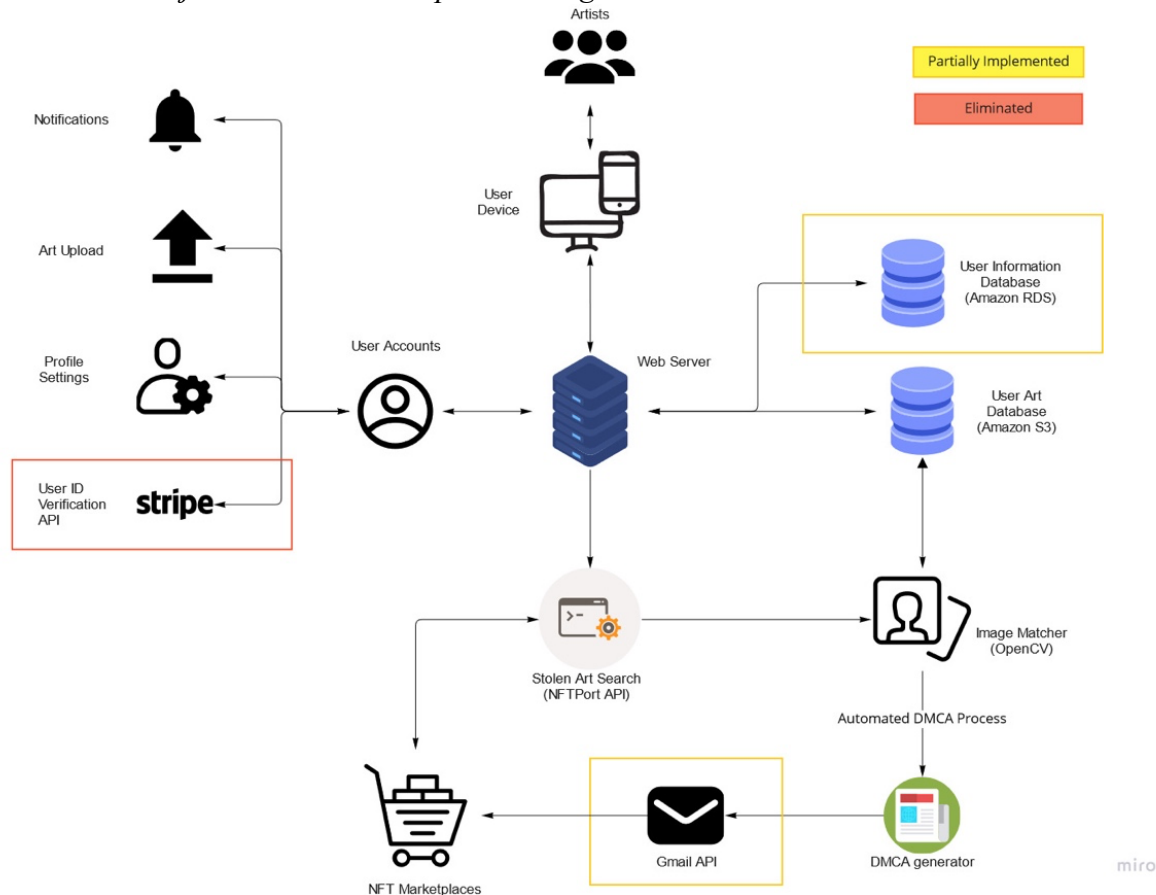
The web server component hosts the web application and acts as a central hub for which

all the other components will interact through. Artists will connect to the web application

through a browser on their user device, such as a laptop or desktop, and from there they can

access their user account. The user accounts component has several sub-components. In the

prototype, these components will be the notification, art upload, and profile settings components.

The notifications component alerts users to the detection of stolen art on NFT marketplaces and

DMCA status. The art upload system is how Art Guardian will get the art from users that want

protection. The profile settings component is how users will edit information in their accounts.

On the database side, the Art Guardian prototype will have a user information database, using

Amazon RDS, and a user art database using Amazon S3. The user information database will only

be partially implemented, since only mock user data will be used in the prototype. The image

matcher component will use OpenCV to compare art in the database with art that was found on

the NFT marketplaces through the NFTport API. The NFTport API component will scrape the

NFT marketplaces for the art data. The DMCA generator component, will only activate if a

match is found, and then that DMCA will be sent to the marketplace using the Gmail API. The

Gmail API is only partially implemented because in the prototype, emails will be sent to a test

email instead of a real NFT marketplace.

2.2 Prototype Functional Description

Most of the major features of the real-world product will be fully implemented in the

prototype. As seen in Table 1, the only functions that will be partially implemented is DMCA

monitoring, and features from the real-world product such as user verification and DMCA

tracking are not present in the table, since they will be eliminated from the prototype.

Table 1

Prototype Features

Features	Description	Prototype Implementation
Account Controls		
Account Creation	Create account for users to utilize Art Guardian features	Fully Implemented
GUI		
Art Upload	Users upload images of artwork to the database	Fully Implemented
Image Library	Users view the artwork they have uploaded	Fully Implemented
Whitelisting	Remove art previously uploaded to the database	Fully Implemented

Automated Processes		
Marketplace Monitoring	Checks NFT marketplaces periodically for image matching	Fully Implemented
Image Matching	Matches images from NFT marketplaces to images on the database	Fully Implemented
Stolen Art Alert	Send the user notifications of stolen art and DMCA request statuses	Fully Implemented
DMCA Takedown		
DMCA Generation	Generate DMCA takedown notices that are automatically prefilled based on a template.	Fully Implemented
DMCA Filing	Issue generated DMCA takedown notice to the offending NFT marketplace through the Gmail API.	Partially Implemented
DMCA Cataloging	Catalog and monitor all generated DMCA takedown notices.	Fully Implemented

Art Guardian will have all the features that are needed to detect stolen artwork and

automatically generate and send DMCA takedown requests. Marketplace monitoring and image

matching will be fully implemented so that detection of stolen artwork is accomplished. Account

creation will be a fully implemented feature for the prototype. When a user creates an account,

their data will be stored in the user information database. The art upload feature will allow users

to upload art that they want to protect, which will then be stored in the user art database. The

image library feature will pull images from the art database and display them to the user based

on their account. Whitelisting will allow users to choose if they want Art Guardian to ignore a

specific piece of artwork they have implemented. The Art Guardian prototype will periodically

scan NFT markets for stolen art, and if a match is found, then the user will be sent a notification.

The stolen art alert will alert artists if their art has been detected on the NFT marketplace, and

this feature is part of the notification system. DMCA generation and cataloging will be fully implemented; however, DMCA filing will only be partially implemented because the DMCAs will be sent to a testing email rather than a real NFT marketplace.

2.3 External Interfaces

The Art Guardian prototype will use many different hardware, software, user, and communication protocol interfaces.

2.3.1 Hardware Interfaces

Users will be able to connect to Art Guardian using a desktop or laptop machine. The desktop or laptop must be running Windows, MacOS, or Linux.

2.3.2 Software Interfaces

Art Guardian is a web application which will make use of the React Framework for building a modern and simple user interface. The Gmail API will be used for the sending of DMCA takedown requests. In order to match images, the OpenCV library will be used for its image matching detection algorithms. The NFTport API will be used to find art on the NFT marketplace. GitHub and Git version control will be crucial for the development of the prototype since it allows multiple team members to collaborate on the same codebase with minimal conflict. AWS Amplify and AWS RDS will be used to host the web application and provide the database.

2.3.3 User Interfaces

The user will be able to navigate the web application through use of the mouse and keyboard. The monitor must be capable of displaying a resolution of 1280x720 or higher.

2.3.4 Communications Protocols and Interfaces

Since users will communicate with Art Guardian over the internet, HTTPS will be used for

secure and encrypted transfer of data over the internet.

3. Product Requirements

The product requirements will be written in a separate document.

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