

Lab 1 – Product Description

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CS410

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04/11/22

Version 1.0

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1. Introduction

NFTs exploded in popularity and market value around Q1 2021, resulting in a year over year growth in volume within NFT marketplaces from less than \$100 million in Q1 2020 to \$1.5 billion in Q1 2021. (Chang, 2021) This growth sustained throughout all of 2021, as volume within NFT marketplaces reached around \$41 billion towards the end of the year. (Collins, 2021) NFTs have no doubt changed the digital art landscape throughout this period of growth; they have become infamously known as a way to counterfeit digital art and sell them for high value. DeviantArt, a well-known art platform, reported that there were 90,000 possible thefts of digital art in December, 2021, which was an increase of 300% from November, 2021. (Beckett, 2022) Adding on to this, roughly 50% of all NFT sales were over \$200 at the beginning of 2022. (Dailey, 2022)

Although more and more digital artwork is being stolen from artists and sold on these NFT marketplaces for profit, there are currently not many solutions that address the needs of these artists. To find out whether or not their artwork has been stolen, they must manually search on NFT Marketplaces. After they discover that their artwork has been stolen, they then must file DMCA takedown requests through the NFT marketplace; a tedious process which needs to be done for each piece of stolen art. Artists then have to manually track the statuses of their takedown requests, along with any information that they contain. This entire process is cumbersome for artists and takes up a lot of time, but Art Guardian provides a solution which aims to automate this process. As the world of NFTs continues to grow and subsequently cause increasing counterfeiting issues, Art Guardian gives artists a way to safeguard their art from being stolen and sold.

2. Product Description

The overall goals of Art Guardian are to streamline and automate the process of removing stolen art from NFT marketplaces for artists. The first objective is to provide artists with a product that automatically searches for artwork that has been stolen and minted on NFT marketplaces. The second objective is to provide artists with an automated process that creates DMCA takedown requests and sends them to NFT marketplaces on their behalf. Finally, the last objective of Art Guardian is to give artists detailed up-to-date information on all of their DMCA takedown requests, which includes a record of all DMCA takedown requests sent and their status. Additional features that Art Guardian aims to provide to artists are: whitelisting capabilities which remove artwork from the automated stolen art search, and tips and tricks to prevent artwork from being stolen and minted as NFTs.

a. Key Product Features and Capabilities

The user interface for Art Guardian is a progressive web application. This type of application is compatible with both mobile and desktop devices, regardless of operating system. This gives artists the ability to upload artwork into a secure database through either option. Art Guardian will then use the uploaded artwork to automatically search for stolen art on NFT marketplaces. This search is done on an interval basis, and each piece of uploaded art is searched once every 30 days. If the user chooses to do so, they can whitelist pieces of their uploaded art from the automatic search. This can be done by selecting which specific uploaded artwork they want to whitelist within the user interface.

If stolen art was found on an NFT marketplace, then Art Guardian will utilize an image matcher to compare stolen art and the artist's artwork. When the image matcher detects a match, Art Guardian will then notify the artists for additional confirmation on whether the stolen art

found is their artwork. Additional confirmation is required to prevent any mismatches from the image matcher. Artwork that has been whitelisted will never invoke this process. Artists can then choose to warrant legal action, which prompts Art Guardian to automatically generate a DMCA takedown request for that piece of stolen art using legal information provided during sign up. This will then require an e-signature from the artist for liability reasons, and prevents people from abusing the system. Once the e-signature has been received, Art Guardian will send the DMCA takedown request to the NFT marketplace on the artist's behalf, which will be monitored and cataloged as an item that the artist can look into for additional details.

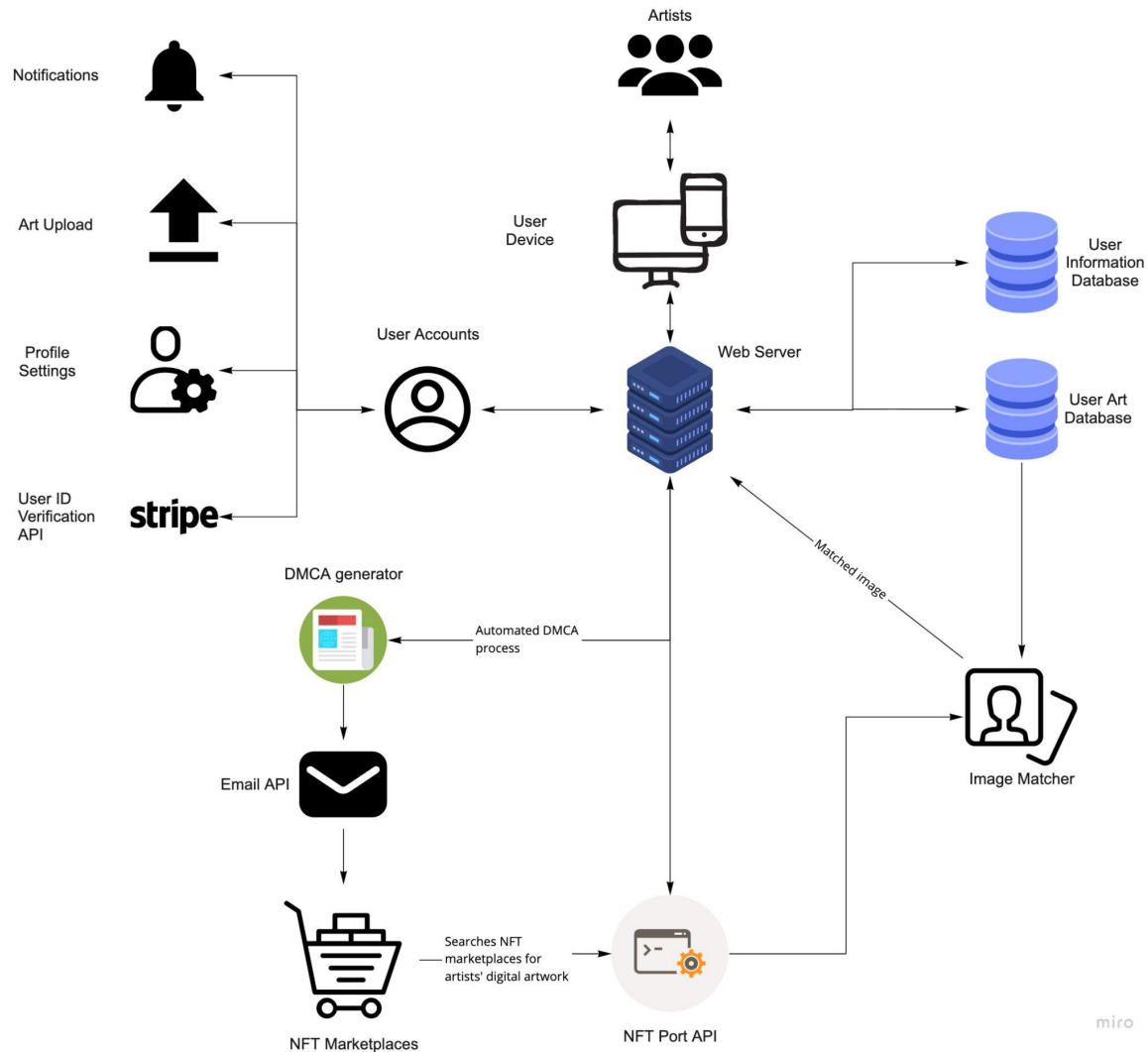
There are currently not many potential competitors that provide the solution that Art Guardian has. One notable competitor, however, is DeviantArt, which also provides capabilities to automatically search for stolen artwork on NFT marketplaces and also utilize their own image matcher to compare the user's artwork and the stolen art. However, DeviantArt does not generate any DMCA requests or sends them to NFT marketplaces on the user's behalf. Consequently they also don't monitor or catalog DMCA take requests. DeviantArt is also not built on a progressive web application, so compatibility regardless of operating system is not available.

As an additional feature, tips and tricks are also provided to the artist. This includes information such as how the NFT minting process works, how certain NFT marketplaces handle stolen artwork, etc. Most of the tips and tricks will focus on providing the artist information on how to protect their art from being stolen and minted as NFTs. For instance, Art Guardian will suggest how to create effective watermarks. Another example would be that Art Guardian will inform the artist on methods that stolen art minters may try to use to spoof image matching algorithms and other stolen art detection software, and how to prevent that from happening.

b. Major Components (Hardware/Software)

The user interface for Art Guardian supports any modern computer device that can run a web standards compliant browser. Art Guardian's user interface will be built primarily using languages such as HTML, CSS, JavaScript, etc. Frameworks and supersetts of JavaScript will also be used, such as React Native or TypeScript. Art Guardian will also use the NPM package manager to manage dependencies, and Node.js for JavaScript runtime. The primary development environment for all major components of Art Guardian, aside from database development, will be in Visual Studio Code.

Signing up requires the Stripe API for legal verification reasons. The NFTPort API will be primarily used for searching for stolen artwork on NFT marketplaces. The image matcher for Art Guardian will be developed in Python, relying heavily on OpenCV. The DMCA generator will be written in JavaScript and will create pre-filled DMCA takedown requests. The Gmail API will be used to send the DMCA takedown requests to the NFT marketplaces.

Figure 1*Art Guardian Major Functional Component Diagram*

3. Identification of Case Study

Art Guardian is a solution developed specifically for commissioned artists, aiming to prevent their artwork from being stolen and minted as NFTs, and subsequently sold for profits. Art Guardian will allow commissioned artists to upload their artwork into a secure database, which will be used to automatically search for stolen artwork on NFT marketplaces. Image

matching, along with confirmation from the commissioned artist, will be used to certify that the searched artwork is actually stolen. A DMCA generator will be used to automatically fill out DMCA takedown requests using the legal information provided by commissioned artists during sign up and will be sent via email on the Artist's behalf.

The future goals of Art Guardian involve including any digital artist who would use it as a solution against their art being stolen and minted as NFTs for sale. This also includes major art platforms that are interested in using the product as a way of safeguarding artists and their artwork on their platforms. Another possible future customer would be NFT marketplaces themselves, as they also require a solution to prevent stolen art from being sold as NFTs.

4. Product Prototype Description

- a. Prototype Architecture (Hardware/Software)**
- b. Prototype Features and Capabilities**
- c. Prototype Development Challenges**

5. Glossary

- **NFT:** Non Fungible Token.
 - Non-fungible means unique, indivisible, and irreplaceable.
 - NFTs are a certificate of ownership stored on a blockchain that links to a file.
- **Blockchain:** An immutable ledger that anyone can validate.
- **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.
- **DMCA (Digital Millennium Copyright Act) Takedown :** A process in which the owner of copyrighted content requests the removal of the infringing content from the internet or platform.
- **Art Platform:** A website in which users can post their digital art.

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