1. Overall Web Tool Architecture:

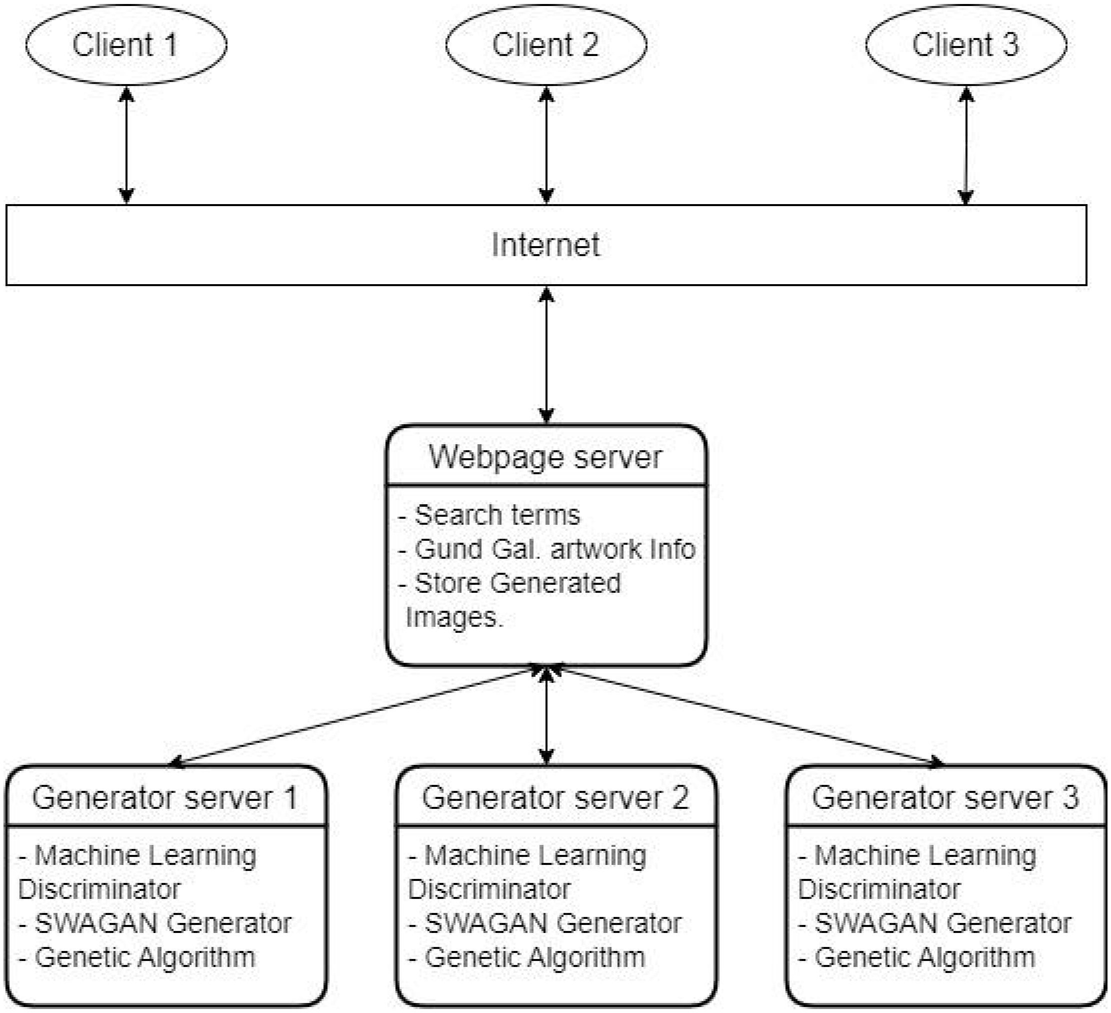

Figure 1: Overall Web Tool Architecture

Clients will access our tools via the internet, where we have two servers that will interact with the clients. The first server is the front end web page server, which includes the input requests like search terms as well as artwork info, and stores the generated images. Through this webpage, clients will be able to make use of the generator server via the internet, which contains the machine learning components needed for art creation. Instead of having just one generator server, we will have three servers, which allow for up to 3 users using the web tool at the same time.

2. User Interface Architecture:

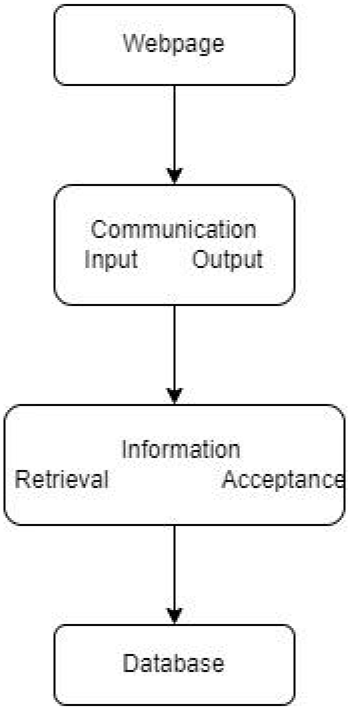

Figure 2: User interface architecture.

1) The top layer is a browser-based user interface.
2) The second layer provides the user interface functionality that is delivered through the web browser. It includes components to allow users to make some input requests to the system and checking components that ensure that the right output is provided.
3) The third layer implements the functionality of the system and provides components that implement stored information and import, export of data from other databases, and report generators that create composite images.
4) Finally, the lowest layer, which consists of a commercial database management system, provides transaction management and persistent data storage.

3. Admin Interface Architecture:

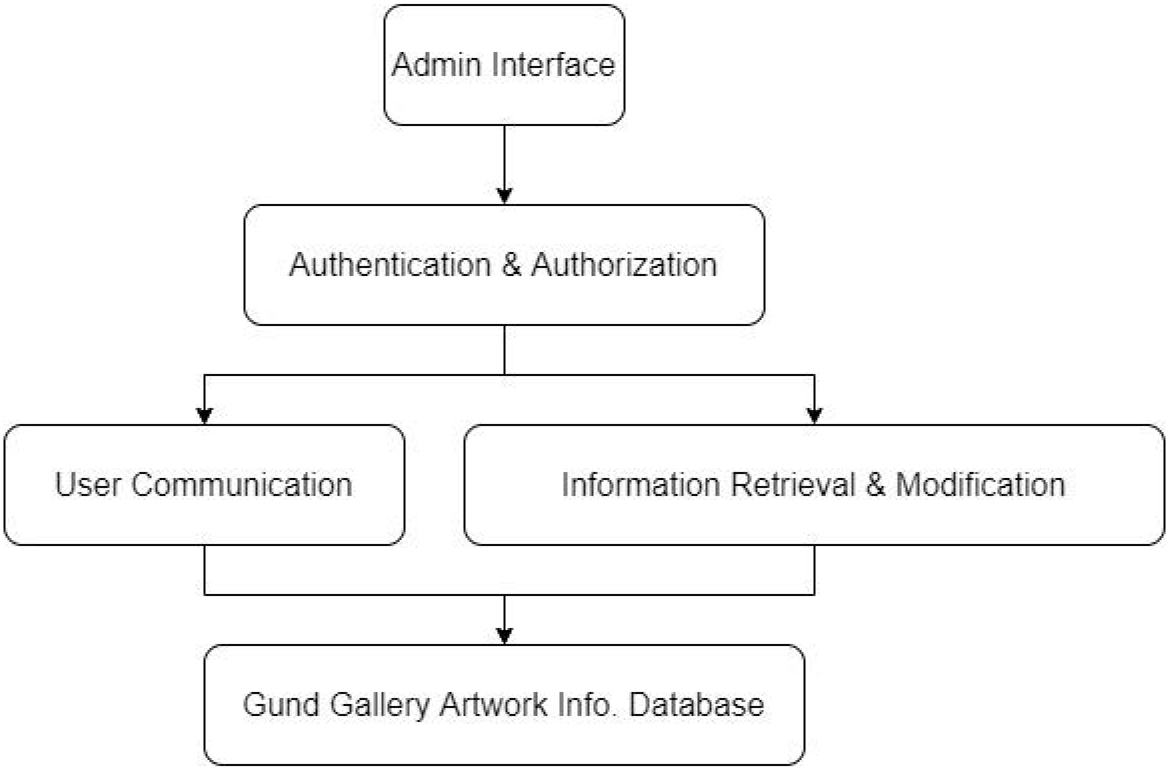
Admin Interface
Authentication & Authorization
User Communication
Information Retrieval & Modification
Gund Gallery Artwork Info. Database

Figure 3: Admin interface architecture

The admin interface is the interface that allows the administrator to make changes to the system and retrieve information from the system.

1. First there is the admin interface, where an admin is asked to log in to see in the system.
2. Secondly there is an authentication and authorization process where a trust relationship is built between the server and client, knowing that the admin truly does have the rights to be in the admin portal
3. After building a trust relation between the admin and the server, the admin can then communicate with the system with special rights. They can pull information from the system and modify, e.g. change certain pictures in the database, and communicate with other parts of the system that might otherwise not be accessible.
4. The changes that are made in the system are then parsed onto the gund gallery artwork information system where the changes are implemented. Thus, permanent and useful changes can be instigated from the admin interface.

4. Generator Architecture:

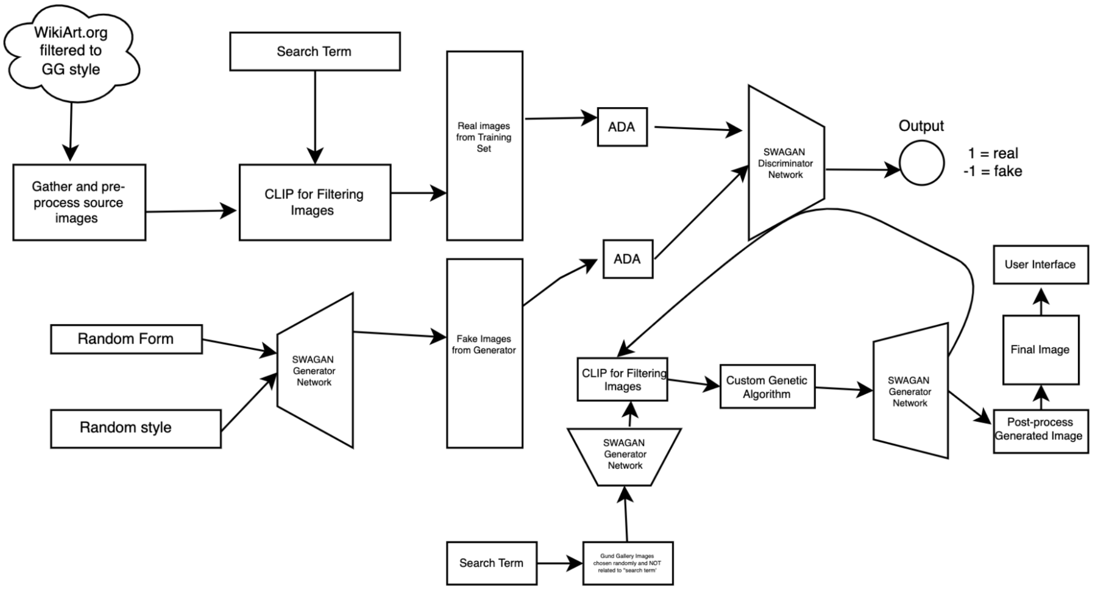
WikiArt.org filtered to GG style
Search Term
Gather and pre-process source images
CLIP for Filtering Images
Real images from Training Set
ADA
SWAGAN Discriminator Network
Output
1 = real
-1 = fake
ADA
Random Form
Random style
SWAGAN Generator Network
Fake Images from Generator
User Interface
Final Image
CLIP for Filtering Images
Custom Genetic Algorithm
SWAGAN Generator Network
Post-process Generated Image
SWAGAN Generator Network
Search Term
Gund Gallery Images chosen randomly and NOT related to "search term'

Figure 4: Art generator interface architecture.
Adapted from “MAGNet: Modern Art Generator using Deep Neural Networks” by Robert A. Gonsalves at: https://towardsdatascience.com/magnet-modern-art-generator-using-deep-neural-networks-57537457bb7 (accessed 03/03/2022).

The generator server will be run on Google Colab because of the high GPU requirement for machine learning and the mutation algorithm. CS Lab will host an webpage server that will receive requests from the user and communicate with the generator server on Googler Collab, fetch the final results from the Google Colab generator server and return resulting pictures onto the web.
The overall architecture of the generator server consists of two parallel pipelines interacting at the discriminator and genetic algorithm points.
From the online art repository WikiArt.org, images related to the Gund Gallery collection will be selected and cropped in three different aspects to generate a base database for the machine learning discriminator.
When the webpage server receives the search term from the user, it will communicate with one of the available generator servers. In the generator server, the search term will be used by CLIP to filter for images related to the search term from the base database. Selected images will be slightly mutated in the ADA to increase visual diversity and fed to the machine learning SWAGAN discriminator along with ADA-diversified fake images created by the SWAGAN generator. Based on the real images from the base database, the SWAGAN discriminator will create an internal algorithm to distinguish between real art pieces within the topic defined by the user’s search term and test that algorithm on the fake art pieces. When the generated algorithm correctly identifies all the fake images, then the discriminator is considered successfully trained.

Once the discriminator is successfully trained, the user’s search term is used in a separate search engine that selects all the artworks in the Gund Gallery collection that are not within the user’s search term. 5 random artwork pieces from that filtered selection are fed into the SWAGAN generator to generate new images that are filtered by CLIP for the best matching images to the search term’s topic and fed to the genetic algorithm. The genetic algorithm mutates the images and feeds them to the SWAGAN generator again, which then crosses the images together and creates hybrid images that are cross-checked with the discriminator. If the images are all rejected by the discriminator, the process circles back to CLIP for filtering, genetic algorithms for mutation and the SWAGAN generator for generation. This cycle is repeated until there is at least one image produced by the SWAGAN generator that is accepted by the SWAGAN discriminator. The accepted images are exported into .jpeg format and delivered to the user interface to return to the user on the web page.