

Outfit Cataloguer: A Digital Wardrobe Assistant

CS4991 Capstone Report, 2023

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ABSTRACT

Clothing production and the fast fashion industry are a large source of water waste, pollution, and carbon emissions. The industry is supported by consumers who buy new clothes frequently. Outfit Cataloguer is a web application designed to help end users utilize their full closet. This is accomplished in the app by allowing users to upload images of their clothing and apply attributes to them, such as color, formality, and type. The uploaded items can then be filtered by attributes and combined into outfits. The goal of this project is for users to construct and wear outfits that make use of a wider range of their closet, reducing their need to buy new clothing. This aim could be supported further by implementing a machine learning algorithm to automatically build outfits based on their previously built outfits.

1. INTRODUCTION

“Across nearly every apparel category, consumers keep clothing items about half as long as they did 15 years ago. Some estimates suggest that consumers treat the lowest-priced garments as nearly disposable, discarding them after just seven or eight wears.” (Remy et. al., 2016). This quote highlights one of the issues with the rise of fast fashion, defined by Oxford Languages as, “inexpensive clothing produced rapidly by mass-market retailers in response to the latest trends.”

In addition to treating clothes as disposable goods, consumers are also buying

clothes at a much higher replacement rate. This is due to two recent developments: clothing production has become cheaper and more streamlined; and retailers have used this increased production to release collections more frequently. Consumers are now able to afford more clothes because of the cheaper prices of fast fashion, and they also feel the need to buy clothing more frequently because of rapidly changing fashion trends.

The environmental impacts of the clothing industry are substantial. There is not sufficient technology or demand for recycling clothing, so approximately 85% of it ends in landfills or incinerators each year (Geneva Environment Network, n.d.). Even if there were sustainable methods for recycling clothes, production alone accounts for 10% of anthropogenic carbon emissions, 20% of wastewater pollution, and 60% of the materials used are plastic. It is safe to say that the world would greatly benefit from less aggressive clothing production.

Outfit Cataloguer seeks to satisfy users’ desire to buy more clothes by utilizing a greater percentage of their wardrobe. When a user inevitably tires of clothes they have been wearing or wants to freshen their closet, they could visit Outfit Cataloguer and quickly try dozens of different outfit combinations that they may never have thought of. Using this as an alternative to shopping and supporting the fast fashion industry, or worse, disposing of clothes before their lifespan ends, will be better for the environment and users’ wallets.

2. RELATED WORKS

The inspiration for this project came largely from the 1995 movie *Clueless* (Heckerling). In one scene, Cher, the movie's main character, uses a computer to help her select an outfit. Cher's clothes are all saved to this computer, so she can cycle through her options to visually see how tops and bottoms will pair. The program also notifies Cher of "mismatches" when it determines a pairing is not fashionable. This is where the project goal of allowing users to save clothes and create outfits originated.

Though this idea started to make finding new and interesting outfits easier, after I conducted research on the clothing industry, I realized that Outfit Cataloguer could combat the carbon footprint of the fast fashion industry. In fact, another app was recently released for this purpose. Whering is a mobile app that also takes inspiration from *Clueless* (Chan, 2021). As stated on their website home page, Whering can "catalog your clothes, create unlimited outfits, get styling suggestions & shop more mindfully." (Whering.co.uk, n.d.).

While these features are very similar, Outfit Cataloguer is designed to be more accessible to lower income users. To have users "shop more mindfully," Whering suggests sustainably sourced clothing items it thinks the user might like. These items are very expensive and not in the budget for many middle- to lower-income users. Because Whering only suggests clothes in a high price range, those who cannot afford the clothing from this app are likely to be dissuaded from using it.

There are several other similar mobile apps that have been released in wake of Whering, some of which require paid subscriptions. To ensure that it is accessible to all, Outfit Cataloguer is free to use.

3. PROJECT DESIGN

Below is an overview of the implementation details of Outfit Cataloguer, including system architecture, predicted client needs, and major challenges.

3.1 Review of System Architecture

Outfit Cataloguer has four main pages: add clothes, view clothes, create outfit, and view outfits. The "Add Clothes" page allows users to upload an image of a clothing item, assign attributes to it, and upload it to their digital wardrobe (Figure 1). The "View Clothes" page displays all the clothing items that have been uploaded and allows the user to edit them. The "Create Outfits" page lets users search for and add clothing items to a new outfit, assign attributes to it, and upload it to their wardrobe (Figure 2). The "View Outfits" page displays all the saved outfits and allows the user to edit them.

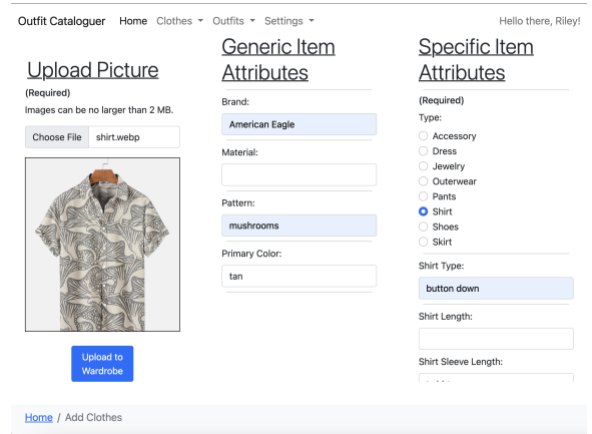


Figure 1. Screenshot from "Add Clothes" Page

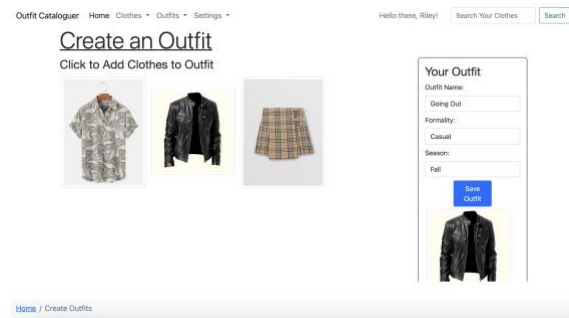


Figure 2. Screenshot from "Add Outfit" Page

Outfit Cataloguer was built in PHP and JavaScript. The images for clothing are stored on the user's device, and all other data is stored in a SQL database hosted on Google Cloud Platform (GCP). The website is currently being served on Apache through XAMPP.

3.2 Requirements

Below is an enumerated list of expected client requirements and the features built to satisfy them.

1. Requirement: Users should have profiles that can be logged into so their uploaded articles and outfits are saved.
Implementation: Upon visiting Outfit Cataloguer, a user can create an account with their name, email, and password. Returning users can log in with their email and password.
2. Requirement: Users should be able to upload their clothes and attributes to find them later.
Implementation: Users can upload clothes if they visit the "add clothes" page. An image of the clothing can be added as well as brand, material, pattern, primary color, type, and attributes specific to that type. After uploading, users can search for pieces on the "view clothes" page using any of the attributes they assigned.
3. Requirement: Users should be able to create outfits and save them.
Implementation: Going to the "create outfits" page will display all the articles that the user has added. Clicking on one of the items will add it to their working outfit. Users can also add an outfit name, formality, and season as outfit attributes.
4. Requirement: Users should be able to edit their uploaded clothes and outfits.
Implementation: The user's uploaded clothing and outfits can be viewed at the "view clothes" and "view outfits" pages respectively. Clicking on one of them will take the user to the "upload clothes" or

"upload outfits" page with all of the info for that item or outfit loaded into the page. The user can then edit and save the image or attributes.

3.3 Project Challenges and Solutions

Because I was relatively inexperienced in web app development at the time of the project, there were a few difficulties during the creation of Outfit Cataloguer. These, along with their solutions, are listed below.

3.3.1 Challenges

The main challenge for this project was storing the clothing images. Outfit Cataloguer was completed as a database class project, for which there were limited funds for hosting the web application. Using cloud storage to house the images would be too expensive, so the options were reduced to storing them in the database or locally in the host's files.

3.3.2 Solutions

Storing and retrieving images in a database with PHP did not allow for the formatting that I wanted. However, an application being hosted with Apache does not have sufficient permissions to create files on the host's device. This was solved by manually changing the file permissions for the images folder after downloading the source code for the web app.

4. RESULTS

Outfit Cataloguer succeeds in its goal of creating a digital collection of a user's wardrobe. Users can upload and categorize their clothing in a way that makes finding items easy. Putting together outfits is much more efficient. Rather than combing through closets and dressers and trying clothes on, users can search by attributes to find what they are looking for and simply click to add to an outfit.

To determine if users participate in fast fashion less as a result of Outfit Cataloguer,

testing would have to be done. In my personal experience, this app has reduced my want of new clothing by streamlining the process of creating new outfits. I believe that a similar effect could be achieved with other users, however, this requires that they are making an effort to buy less clothing. It is unlikely that a consumer that finds no issue with fast fashion will reduce their clothes shopping while using Outfit Cataloguer. Outfit Cataloguer only makes it easier to feel fashionable with fewer clothing and does not significantly reduce the desire to purchase new clothing.

5. CONCLUSION

At its inception, the purpose of Outfit Cataloguer was to make the process of selecting an outfit faster and easier. However, I quickly realized that it could be harnessed as a tool for reducing fast fashion and consumer waste, both of which have been rising in recent years. Fast fashion has led to high clothing turnover, and without efficient recycling methods, the clothing industry generates a large carbon footprint.

First and foremost, Outfit Cataloguer needed to let users digitize their wardrobe, which would lead to categorization and quick retrieval. Next, I added features so clothing items could be built into outfits and saved. The hope with this feature is that users will save time when trying to find something to wear, either by using the app to make a new outfit or referencing a saved one. With these features and some planned additions, users can achieve a higher utilization of their wardrobe and reduce their need to purchase new clothes.

6. FUTURE WORK

To increase usage of a user's under-utilized clothing, an automated outfit generation feature should be implemented. Machine learning would be required for this feature so that generated outfits matched the user's style. In case the user has not created

many outfits for the machine learning model to be trained on, the model should be trained on public data sets that relate outfits to fashion styles. The model could then make a guess at the user's style and generate outfits using their least used clothing items that align with their style.

Another way to achieve greater wardrobe utilization would be to have a randomization feature, allowing users to create a random outfit from scratch or add a random article to an outfit. Slightly biasing the random choices towards the user's least used clothing could result in the user wearing those clothes more.

REFERENCES

- Heckerling, A. (1995). *Clueless*. Paramount Pictures.
- Nast, C. (2021, April 19). *Cher Horowitz's Virtual Wardrobe Is Totally A Reality With This App*. British Vogue. Retrieved February 24, 2023, from <https://vogue-int-rocket.prod.cni.digital/cher-clueless-digital-wardrobe-app>
- Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). The environmental price of fast fashion. *Nature Reviews Earth & Environment*, 1(4), 189–200. Retrieved February 10, 2023, from <https://doi.org/10.1038/s43017-020-0039-9>
- Remy, N., Speelman, E., & Swartz, S. (2016, October 20). *Style that's sustainable: A new fast-fashion formula* / McKinsey. McKinsey Sustainability. Retrieved February 24, 2023, from <https://www.mckinsey.com/capabilities/sustainability/our-insights/style-thats-sustainable-a-new-fast-fashion-formula>
- Whering. (n.d.). *Your wardrobe, digitised*. Retrieved February 24, 2023, from <https://www.whering.co.uk/>