

# Perfect Laundry Day

A visual guide for everyday laundry practices,  
enhancing garments longevity

Chay Chayanit Thawaranont  
Parsons School Of Design  
Masters Of Science, Data Visualization Major

# **SYNOPSIS**

Many modern consumers have difficulty understanding traditional laundry care symbols. As a result, it is crucial to redesign and reform the way fabric care is communicated to better suit the needs of contemporary society. By updating the traditional laundry care symbols, we can make the information more accessible and easier to comprehend for modern consumers. This will help to ensure that people are able to properly care for their garments, leading to longer-lasting clothing and a reduced environmental impact. In addition, by providing clearer and more comprehensive information about fabric care, we can increase awareness about sustainable laundry practices and encourage more people to adopt them. Ultimately, the redesign and reform of laundry care communication will promote greater efficiency, convenience, and sustainability in the laundry process.

This project aims to deliver a user-friendly laundry app designed to provide users with a personalized guide on how to wash their clothes properly based on the type of garment they are washing. The app utilizes a comprehensive database of fabrics and garment types to recommend the appropriate water temperature, wash cycle, and detergent type to ensure that the user's clothes are cleaned effectively without damage.

# TABLE OF CONTENT

<b>SYNOPSIS.....</b>	<b>1</b>
<b>TABLE OF CONTENT.....</b>	<b>2</b>
<b>INTRODUCTION.....</b>	<b>3</b>
Laundry practices around the world.....	3
<b>TREATMENT.....</b>	<b>4</b>
CHAPTER 1 : Casualties of not knowing how to take care of garments.....	4
Chapter 1.1 - Economic /Financial cost.....	4
Chapter 1.2 - Environmental cost.....	5
Chapter 1.3 - Personal emotions.....	7
Chapter 2 - Learning from the root cause.....	8
Chapter 2.1 - Understanding the care labels (Set of care labels from countries)..	9
I. Japanese Care Labeling.....	9
II. European Care Labeling.....	13
III. US Care Labeling.....	16
Chapter 2.2 - Understanding the fabric.....	17
Washing Conditions.....	18
Chapter 2.3 - Understanding the care methods and main factors.....	23
I. Wash Liquor Ratio.....	25
II. Wash Liquor Level and Reversing Rhythm.....	26
III. Residual Moisture.....	27
IV. Water Temperature.....	28
V. Washing Times.....	29
Chapter 3 - Perfect Laundry Day Application.....	31
Chapter 3.1 - Building the database.....	31
I. API stored on firebase.....	31
II. Json structure.....	33
Chapter 3.2 - Building the application.....	35
I. Sketch.....	35
II. Stylings.....	36
III. UI design.....	39
Chapter 3.3 - Future Improvements.....	42
<b>CONCLUSION.....</b>	<b>43</b>
<b>BIBLIOGRAPHY.....</b>	<b>45</b>

# **INTRODUCTION**

Laundry is an essential part of our daily lives, and it is crucial to understand the proper techniques and methods to ensure that our clothes are cleaned effectively and safely. The goal of this research study is to investigate the most effective and efficient methods for laundry, taking into account factors such as water temperature, detergent type, fabric type, and machine settings. Through this research, we hope to provide evidence-based recommendations for individuals and households on how to properly launder their clothes, ultimately leading to longer-lasting, cleaner, and more sustainable garments.

## **Laundry practices around the world**

Laundry practices vary widely across different cultures, influenced by factors such as climate, availability of resources, and cultural traditions. This research study aims to investigate how culture impacts the way people do their laundry, with a focus on identifying common practices and understanding how they differ from region to region.

The study will also explore the cultural significance of laundry and how it relates to broader cultural values and beliefs. For example, in some cultures, washing clothes is seen as a communal activity, while in others, it is considered a private task to be done by individuals or households.

Additionally, this research will examine the environmental impact of different laundry practices in different cultures, including the use of water and energy resources, as well as the disposal of laundry wastewater and detergent. The study will investigate how cultural traditions and beliefs impact attitudes towards sustainable laundry practices, such as using eco-friendly detergents or air-drying clothes.

The results of this research will have implications for the development of the 'perfect-laundry-day' app that is tailored to specific cultural needs and preferences. By understanding the differences in laundry practices across cultures, companies can design products and services that are more effective, efficient, and sustainable, ultimately contributing to a more global and diverse understanding of laundry practices.

# **TREATMENT**

## **CHAPTER 1 : Casualties of not knowing how to take care of garments**

### **Chapter 1.1 - Economic /Financial cost**

Mishandling laundry, including improper washing, drying, or storage of clothing, can lead to a variety of issues that result in financial loss or additional expenses. One of the most common ways that mishandling laundry can result in economic loss is through the premature deterioration of clothing. When garments are not washed or dried properly, the fabric can become worn, faded, or stretched, leading to a shorter lifespan for the garment. This means that individuals must replace their clothing more frequently, resulting in additional expenses for new clothing purchases. Another way that mishandling laundry can lead to economic loss is through the damage or staining of clothing. For example, if a garment is not properly washed or dried, it may become discolored or stained, making it unusable or unattractive. This can lead to additional expenses, such as professional cleaning or replacement of the damaged garment.

In addition to economic loss, mishandling laundry can also result in personal financial costs. For example, if a garment becomes damaged or stained, individuals may need to purchase a replacement, resulting in a direct financial cost. Additionally, if a garment is not properly washed or dried, it may become uncomfortable or ill-fitting, leading to additional expenses for alterations or replacements.

The disposal of garments has been a significant economic loss to the fashion industry. It is estimated that the industry incurs a loss of \$500 billion annually due to clothing waste and disposals. Moreover, the disposal of garments has led to environmental degradation, causing negative externalities such as pollution and increased carbon footprint. In turn, this has created a vicious cycle of environmental degradation, leading to increased production of clothing to meet consumer demand. Therefore, it is important to address the issue of garment disposal to achieve sustainable economic growth and mitigate the negative impacts of the fashion industry on the environment. According to

the Ellen MacArthur Foundation, "the value of materials lost each year due to clothing underutilization and the lack of recycling is estimated at \$500 billion" (2017).

Overall, it is clear that mishandling laundry can have significant economic and personal financial costs. To avoid these issues, it is important to learn proper laundry techniques and to take the time to care for clothing properly. By doing so, individuals can avoid premature wear and tear, damage, and staining of their clothing, leading to longer-lasting garments and reduced financial costs over time.

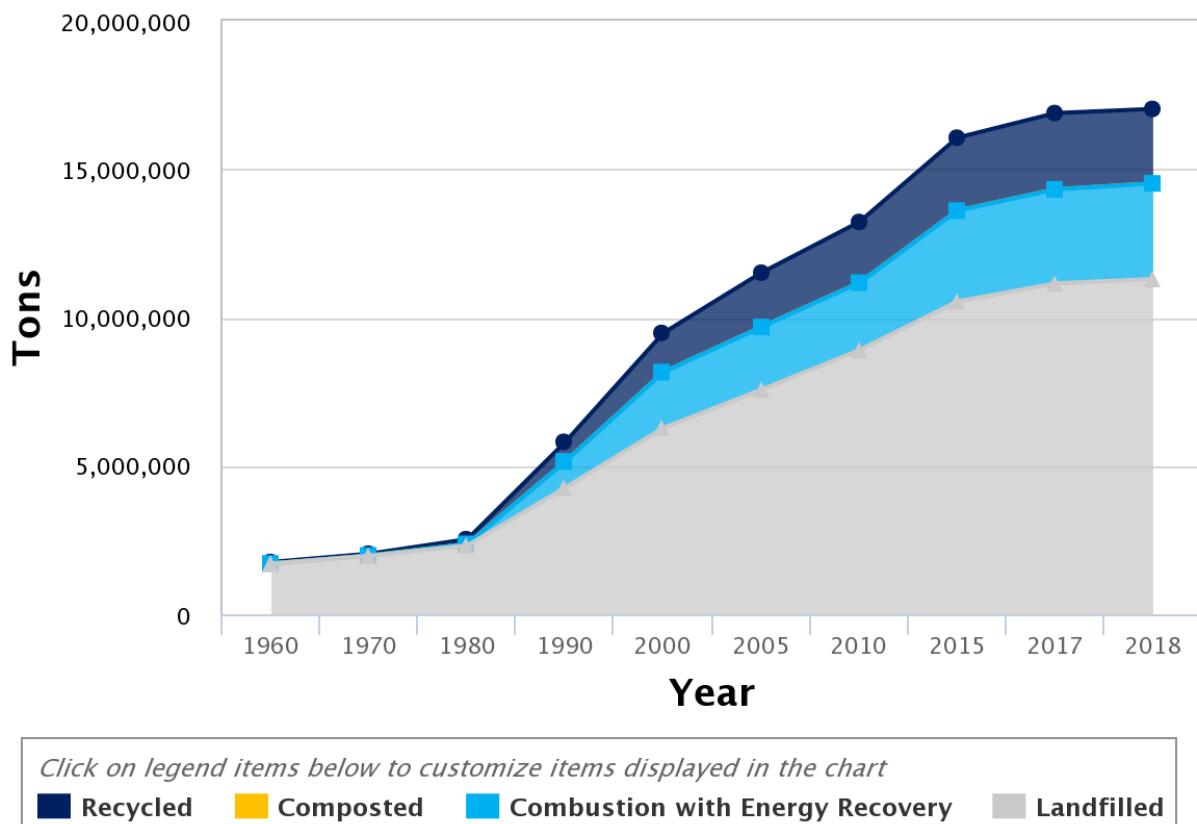
## Chapter 1.2 - Environmental cost

The improper washing, drying, and storage of clothing can lead to increased resource consumption, pollution, and waste, all of which contribute to environmental degradation. One of the most significant ways that mishandling laundry affects sustainability is through water and energy consumption. Washing machines and dryers use large amounts of water and energy, particularly when used improperly. For example, washing clothes in hot water, using high heat settings, and overloading the machine all result in increased energy and water consumption, leading to higher utility bills and a larger carbon footprint. According to a report by the Ellen MacArthur Foundation, "textile production contributes more to climate change than international aviation and shipping combined" (2017). This highlights the urgent need for the fashion industry to address its environmental impact and transition to a more sustainable model.

In addition, mishandling laundry can also result in the release of harmful chemicals and microfibers into the environment. When clothing is washed with harsh detergents or fabric softeners, these chemicals can enter the water supply, leading to pollution and potential harm to aquatic life. Similarly, when synthetic fabrics are washed and dried, they can release microfibers that contribute to plastic pollution in the ocean and harm to marine life.

Mishandling laundry can also contribute to waste generation. When clothing is not properly cared for, it may become damaged, stained, or ill-fitting, leading individuals to dispose of the garment and purchase a replacement. This not only creates additional waste but also contributes to the consumption of resources needed to produce new clothing.

## Textiles Waste Management: 1960–2018



Sources: American Apparel and Footwear Association, International Trade Commission, the U.S. Department of Commerce's Office of Textiles and Apparel, and the Council for Textile Recycling.

The data above are from 1960 to 2018, relating to the total number of tons of textiles generated, recycled, composted, combusted with energy recovery and landfilled.

It is clear that mishandling laundry has a significant impact on sustainability and the environment. To reduce these negative effects, individuals must learn proper laundry techniques and take the time to care for their clothing properly. By doing so, we can reduce our carbon footprint, minimize pollution, and promote more sustainable practices in our daily lives.

## Chapter 1.3 - Personal emotions

Clothing is an essential part of an individual's self-expression, and mishandling clothing can lead to feelings of frustration, disappointment, and stress, ultimately affecting an individual's mental well-being.

One way that mishandling laundry affects emotional values is through the loss of sentimental value. Clothing can hold significant emotional value for individuals, whether it be a cherished item from a loved one or a favorite shirt that holds memories of past experiences. When clothing is mishandled and damaged or stained, it can lead to a loss of this sentimental value, causing feelings of disappointment and sadness.

In addition, mishandling laundry can also lead to stress and frustration. When clothing is not properly cared for, it can become uncomfortable or ill-fitting, leading to physical discomfort and self-consciousness. This can cause stress and anxiety, particularly in social situations where appearance is important.

Moreover, mishandling laundry can also lead to a feeling of overwhelm, particularly for those who struggle with organization or time management. The laundry process involves multiple steps, from sorting to washing to folding and storage. Mishandling laundry, such as overloading the washing machine or leaving clothing in the dryer for too long, can lead to a pileup of laundry and feelings of overwhelm and stress.

The loss of personal belongings or damaged goods can indeed lead to feelings of frustration and distress in individuals. It is a common human response to become emotionally attached to our possessions, and when we lose or damage them, it can evoke a range of negative emotions.

Psychological research has explored the emotional impact of losing personal belongings. Studies have found that individuals may experience feelings of anger, sadness, helplessness, and even grief when faced with the loss or damage of cherished possessions. The intensity of these emotions can vary depending on the significance of the item, the circumstances of the loss, and individual differences in attachment and coping styles.

One interesting finding from a study conducted by Garstka, Schmitt, Branscombe, and Hummert (2004) suggested that individuals may experience a sense of violation or personal threat when their personal belongings are lost or damaged. This can trigger a need to restore a sense of control and order in their lives. The study also found that

individuals may engage in behaviors such as seeking social support or engaging in material replacement to cope with the emotional distress caused by the loss.

In conclusion, it is clear that mishandling laundry can have a significant impact on mental health and emotional values. To reduce these negative effects, individuals must learn proper laundry techniques and take the time to care for their clothing properly. By doing so, we can promote a sense of well-being and satisfaction in our daily lives.

## Chapter 2 - Learning from the root cause

Care labels are an important tool for ensuring the longevity of clothing, but they are often misread or not widely comprehensible to consumers. This is partly due to the sheer number of symbols used by garment manufacturers. There are over 50 symbols used on care labels due to regulation enforcement, which can make it difficult for consumers to understand and properly care for their garments. In addition to the complexity of the symbols, many consumers lack the knowledge and proper guidance necessary to interpret them.

One reason for this lack of understanding is the fact that care labels are often written in multiple languages, making it difficult for manufacturers to provide detailed instructions. This can result in confusion and misinterpretation of the care instructions, leading to improper care and damage to the garment. Furthermore, some symbols may not be intuitive, and consumers may not understand their meaning without proper guidance.

Another factor contributing to the misinterpretation of care labels is the assumption that all clothing can be cared for in the same way. Many consumers believe that they can simply throw all their clothing in the washing machine on the same setting, without regard for the specific care instructions provided on the label. This can lead to shrinkage, color bleeding, and other damage to the garment, ultimately reducing its lifespan.

In conclusion, the misreading and lack of comprehension of care labels can have significant consequences for the longevity of clothing. Consumers need to be educated on the meaning of the symbols and the importance of following the care instructions provided on the label. By doing so, they can ensure that their garments remain in good condition and last for as long as possible.

## **Chapter 2.1 - Understanding the care labels (Set of care labels from countries)**

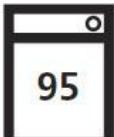
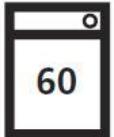
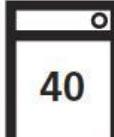
The care labels found on clothing are a universal method of communicating how to properly care for garments. However, despite their widespread use, different countries have their own rules and designs for care labels. This is due to a variety of factors, including cultural differences in clothing care practices, varying environmental conditions, and legal regulations. Understanding the reasons behind these differences can help consumers make informed decisions about how to care for their clothing and ultimately prolong the life of their garments. In this paragraph, we will explore the factors that contribute to the development of country-specific care label rules and designs.

### **I. Japanese Care Labeling**

The Japanese system, like other care labeling systems, must have symbols placed in a specified order. Labels should be designed based on the following convention:

- Symbols should be arranged from left to right according to the following sequence: 1) Washing, 2) Bleaching, 3) Ironing, 4) Dry-Cleaning, 5) Wringing & 6) Drying
- For coloured products which are not usually bleached, the symbol for possibility of chlorine bleached may be omitted
- For products which are not usually ironed, the symbols for ironing may be omitted. (Except 'cannot be ironed')
- For products which can be washed with water, the symbols for dry-cleaning may be omitted. (Except 'cannot be dry-cleaned')
- The symbols should be either in black or dark blue whereas the prohibition symbols are in red and on a white background

## Washing (with water)

Symbols	Instruction
	Machine washable in maximum water temperature of 95°C
	Machine washable at slow water current or gentle hand wash in maximum water temperature of 40°C
	Machine washable in maximum water temperature of 60°C
	Machine washable at slow water current or gentle hand wash in maximum water temperature of 30°C
	Machine washable in maximum water temperature of 40°C
 	Should be washed gently by hand (not machine washable) Cannot be washed with water

## Bleaching

	Chlorine-based bleaching allowed
	Do not use chlorine-based bleach

## Ironing

	Should be ironed at a temperature between 180°C - 210°C
	Cannot be ironed
	Should be ironed at a temperature between 180°C - 210°C
	May be ironed at 180°C - 210°C if a cloth is placed between iron and garment

	Should be ironed at a temperature between 80°C - 120°C
---	--

### Dry Cleaning

	Can be dry cleaned. Use solvent of perchloroethylene or of petroleum based solvent
	Cannot be dry cleaned
	Can be dry cleaned. Use only a petroleum based solvent

### Wrapping

	Wring gently by hand or for a short time by centrifugal hydro extractor
	Cannot be wrung

## Dry

	Hang dry
	Lay flat to dry
	Hang dry in shade
	Lay flat to dry in shade

---

## II. European Care Labeling

### Wash care symbols

	Maximum temperature 95°C Mechanical action normal Rinsing normal Spinning normal
---	---

	Maximum temperature 95°C Mechanical action reduced Rinsing at gradually decreasing temperature (cool down) Spinning reduced
	Maximum temperature 70°C Mechanical action normal Rinsing normal Spinning normal
	Maximum temperature 60°C Mechanical action normal Rinsing normal Spinning normal
	Maximum temperature 60°C Mechanical action reduced Rinsing at gradually decreasing temperature (cool down) Spinning reduced
	Maximum temperature 50°C Mechanical action reduced Rinsing at gradually decreasing temperature (cool down) Spinning reduced
	Maximum temperature 40°C Mechanical action normal Rinsing normal Spinning normal
	Maximum temperature 40°C Mechanical action reduced Rinsing at gradually decreasing temperature (cool down) Spinning reduced
	Maximum temperature 40°C Mechanical action much reduced Rinsing normal Spinning normal Do not wring by hand
	Maximum temperature 30°C Mechanical action much reduced Rinsing normal Spinning reduced Maximum temperature 30°C Mechanical action much reduced

	Rinsing normal Spinning reduced
	Hand wash only Do not machine wash Maximum temperature 40°C Handle with care
	Do not wash Be cautious when treating in wet stage

### Bleaching

	Chlorine-based bleaching allowed. Only cold and dilute solutions.
	Do not use chlorine-based bleach

### Iron

	Iron at a maximum sole-plate temperature of 200°C
	Iron at a maximum sole-plate temperature of 150°C
	Iron at a maximum sole-plate temperature of 110°C Steam-ironing may be risky

	Do not iron Steaming and steam treatments are not allowed
---	--

## Drying

	Tumble dry possible Normal drying cycle
	Tumble dry possible Drying at lower temperature setting
	Do not tumble dry

## III. US Care Labeling

According to the Federal Trade Commission's Care Label rule, care labels may be composed of either words or symbols. Irrespective of whether the content is words, symbols, or both, care instructions appear in the following order:

1. Machine wash / hand wash / dry-clean
2. Washing temperature (hot / warm / cold)
3. Washing machine programme (delicate / permanent press / normal cycle)
4. Bleaching instruction (do not bleach / non-chlorine bleach / chlorine bleach)
5. Drying method (tumble dry / line dry / flat dry / drip dry)
6. Ironing (do not iron / cool iron / warm iron / hot iron)

## 7. Warnings

Source: Care symbols developed by the American Society for Testing and Materials (ASTM)

Chapter 2.2 - Understanding the fabric

Different fabrics require different cleaning methods due to their biochemical reactions to cleaning agents and water. Proper cleaning and care of clothing can extend its life and maintain its quality. The way in which garments are cleaned can significantly impact the appearance, durability, and texture of the fabric. Certain fabrics are more sensitive to heat and moisture than others, while some may be prone to color bleeding or shrinkage.

Understanding the biochemical reactions of different fabrics to cleaning agents and water is important for consumers to ensure the longevity and quality of their clothing. In this paragraph, we will explore the impact of biochemical reactions on fabric care and the importance of selecting the appropriate cleaning methods for different fabrics.

## **Washing Conditions**

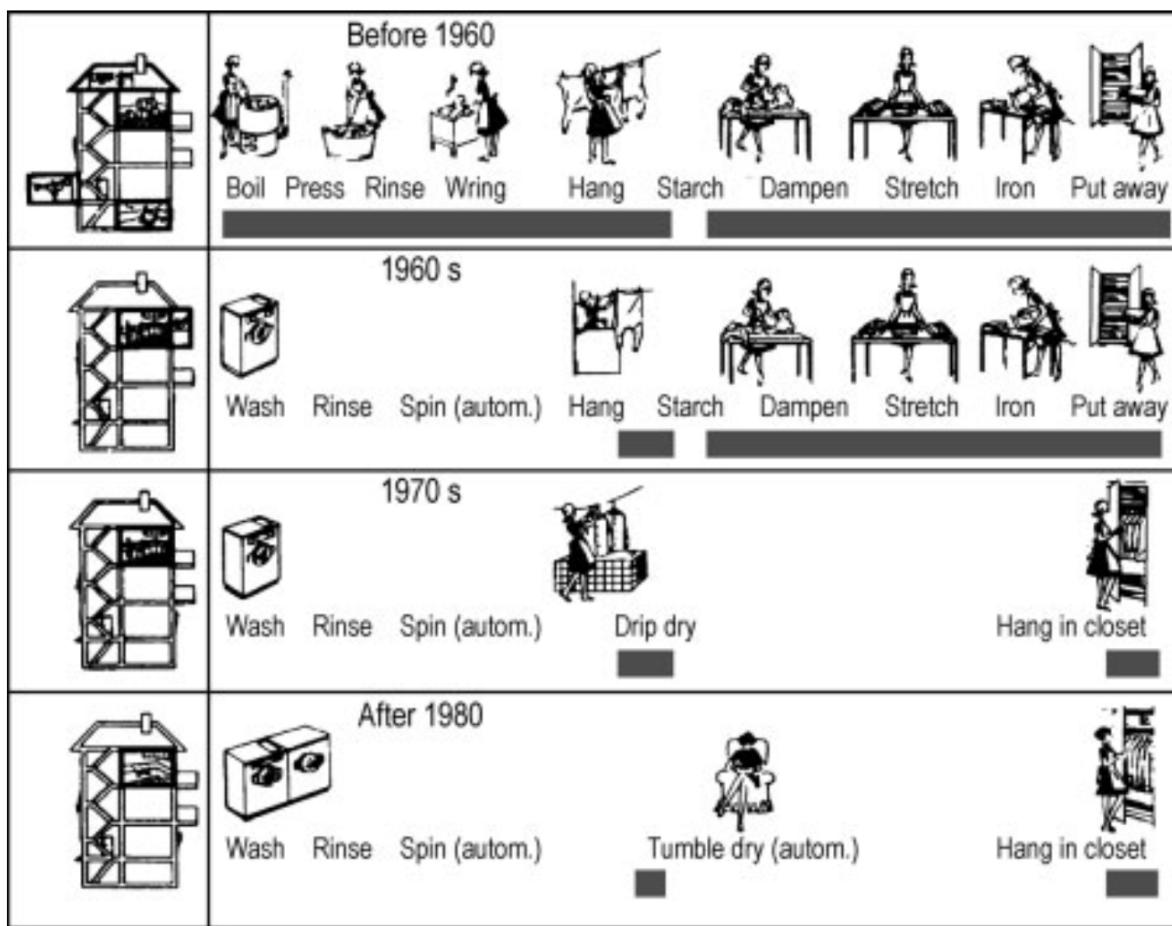
The care and laundering of washable woven and knitted fabrics depend on whether they are washed at home, in a launderette, or by professional laundry services. The distribution of laundry practices varies considerably from country to country. For instance, in Germany, the majority, approximately 90%, of household laundry is typically done at home using horizontal-axis drum-type machines. This trend is common in Europe as well, where the percentage of households with washing machines is high, leading to a significant portion of laundry being carried out within the household.

The prevalence of home laundering can be attributed to the convenience and efficiency provided by modern automatic washers. These technological advancements have significantly reduced the effort required to complete the laundry process. Furthermore, the emergence of wash-and-wear fabrics has further simplified the laundering routine. With wash-and-wear fabrics, the finishing work associated with a load of laundry is often minimal and involves tasks such as folding and storing the washed and dried articles.

The increasing popularity of home laundering in countries with high washing machine ownership can be seen as a result of the ease and time-saving benefits these appliances offer. The availability of advanced features, such as programmable settings, specialized cycles, and energy-efficient options, has made it more convenient for individuals to care for their garments within the comfort of their homes. Additionally, the cost-effectiveness of home laundering compared to professional services also contributes to the preference for in-home laundry practices.

In contrast, some individuals opt for launderette or professional laundry services for various reasons. This may include the lack of access to personal laundry facilities, the need for larger-capacity machines to handle bulky items like bedding, or the desire for professional care and expertise for delicate or valuable garments.

Overall, the care and laundering practices of washable fabrics are influenced by factors such as technological advancements in automatic washers, the availability of wash-and-wear fabrics, and personal preferences based on convenience, access to laundry facilities, and the desired level of care for different types of garments. See below picture for more details.



Establishing appropriate washing conditions, such as temperature, time, mechanical input, wash liquor ratio, and detergent selection, requires careful consideration of the specific characteristics of the materials comprising a particular laundry item. The washability of an item can only be accurately determined once it is in its finished state. However, variations in conditions arise depending on whether the washing process takes place at home or in a commercial laundry, including differences in washing and drying times, stress applied during hot-air drying, and the pressure and temperature used for ironing.

Across Europe, white and colorfast cotton fabrics are typically washed using a heavy-duty detergent and a standard machine program, operating at temperatures ranging from 60 to 95°C, with a low wash liquor ratio and a normal level of mechanical input. For non-colorfast cottons, a lower temperature of 40 to 60°C is commonly employed, often using color detergents.

Pastel-colored fabrics often require specialty detergents or heavy-duty detergents specifically designed for colored fabrics, offering the advantage of omitting fluorescent whiteners and bleaching agents.

Woolens and silks are highly sensitive fabrics that require careful consideration when it comes to washing conditions. In many cases, these fabrics are deemed non-washable and are better suited for dry cleaning. The unique surface structure of wool fibers, characterized by their scaly construction, contributes to their propensity to felt when subjected to mechanical action. To mitigate this, wool can be treated with an anti-felting finish before washing, improving its washability. When washing woolens and silks, it is advisable to use low temperatures (maximum 30°C), a high wash liquor ratio, and minimize mechanical agitation. The detergent of choice should be one designed for easy-care fabrics or specifically formulated for wool.

Synthetic fabrics composed of regenerated cellulose fibers, such as rayon staple or artificial wool, typically require a wash temperature of 60°C. However, if the fabrics contain sensitive colors, it is recommended to lower the temperature to approximately 40°C. These fabrics should be washed with a high wash liquor ratio and limited mechanical input. On the other hand, cellulose acetate is generally washed at 40°C.

Pure synthetic fabrics are best laundered using a gentle program with a high wash liquor ratio. A heavy-duty detergent is suitable, preferably designed for easy-care fabrics. In certain instances, a specialty detergent for colored fabrics may be necessary, particularly when dealing with uniformly colored pastels to avoid optical brighteners.

White polyamide fabrics can withstand a wash temperature of 60°C, while colored polyamide fabrics are typically washed at 30 or 40°C. White polyester fabrics are commonly washed at 40 or 60°C, while colored polyesters can only tolerate a wash temperature of 40°C.

Knitwear made of polyacrylonitrile follows a similar washing approach to wool, necessitating cold water or a maximum temperature of 30°C. White polyurethane-containing undergarments can be washed at 40–60°C, while colored items should be washed at either 40 or 60°C, depending on their colorfastness.

A significant portion of the fabrics available in the market today fall under the category of easy-care fabrics, which are often composed of blends containing two or more fiber types that are combined during the weaving or knitting process. These fabric blends are typically treated as easy-care fabrics, warranting the use of a high wash liquor ratio and gentle agitation during laundering. The recommended wash temperatures vary depending on the specific nature and composition of the blend. In general, the laundering conditions align with those applicable to the major constituent fiber. For instance, wool/polyacrylonitrile or wool/polyester blends should always be washed at low temperatures, not exceeding 30°C, to prevent damage to the wool component. On the other hand, permanent-press cotton/polyester blends can withstand a wash temperature of 60°C, ensuring effective cleaning and wrinkle-resistant properties.

Blends that combine different fiber types require careful consideration to ensure the appropriate treatment during laundering. Cotton/wool blends, for example, necessitate a delicate balance between maintaining the softness and breathability of the cotton while safeguarding the integrity of the wool fibers. Typically, a low temperature, gentle wash cycle is recommended to accommodate the wool component, while still effectively cleansing the cotton fibers.

Understanding the composition and characteristics of fabric blends is crucial for determining the optimal laundering conditions. Blends incorporating natural fibers like cotton or wool with synthetic fibers such as polyester or polyacrylonitrile necessitate a tailored approach to ensure proper care and maintenance. By adhering to the recommended laundering guidelines for the dominant fiber type in the blend, individuals can effectively clean and preserve the overall quality of their easy-care fabric blends. It is worth noting that the above recommendations serve as general guidelines, and it is always advisable to refer to the specific care instructions provided by the manufacturer for each fabric blend. These instructions may include additional details regarding wash temperature, cycle duration, detergent selection, and any special considerations that are unique to the particular fabric blend. By following these guidelines and exercising caution during laundering, individuals can ensure the longevity and optimal performance of their easy-care fabric blends.

Items that incorporate multiple types of fabric or yarn, such as linen tablecloths with wool embroidery, cotton shirts with polyamide piping, or jackets featuring an easy-care exterior and a standard rayon lining, require distinct treatment compared to blended fabrics. The same principle applies to materials that incorporate dyes with varying degrees of colorfastness. In such cases, it is crucial to adhere to the washing, drying, and ironing conditions applicable to the most delicate fabric or the least colorfast dye present, even if it constitutes only a small portion of the overall item. For instance, a cotton tablecloth with a minor wool embroidery detail must be treated with the same care as if the entire tablecloth were made of wool.

This approach ensures that the more delicate fabric or less colorfast dye is protected from potential damage during laundering. By adhering to the requirements of the most sensitive component, individuals can avoid potential adverse effects such as shrinkage, distortion, color bleeding, or fading. It is important to note that even if a particular fabric or dye component is present in a small quantity, it can still have a significant impact on the overall outcome of the laundering process.

To facilitate understanding and aid in the appropriate care of various fibers, the following table provides a summary of the washability considerations for different fiber types:

Fiber Type	Washability
Wool	Generally hand wash
Cotton	Machine washable
Silk	Gentle hand wash
Linen	Machine washable
Polyester	Machine washable
Acrylic	Machine washable
Nylon	Machine washable
Rayon	Hand wash or dry clean
Blends	Follow care instructions for the most delicate component

By consulting this table and referencing specific care instructions for each fiber type, individuals can make informed decisions about the appropriate washing method for their multi-fabric or multi-dye items. This knowledge empowers individuals to preserve the integrity, longevity, and appearance of their cherished garments and household textiles, ensuring that they withstand the rigors of laundering while maintaining their original beauty and functionality.

This table below also provides further information.

**Table 54.** Washability of textiles

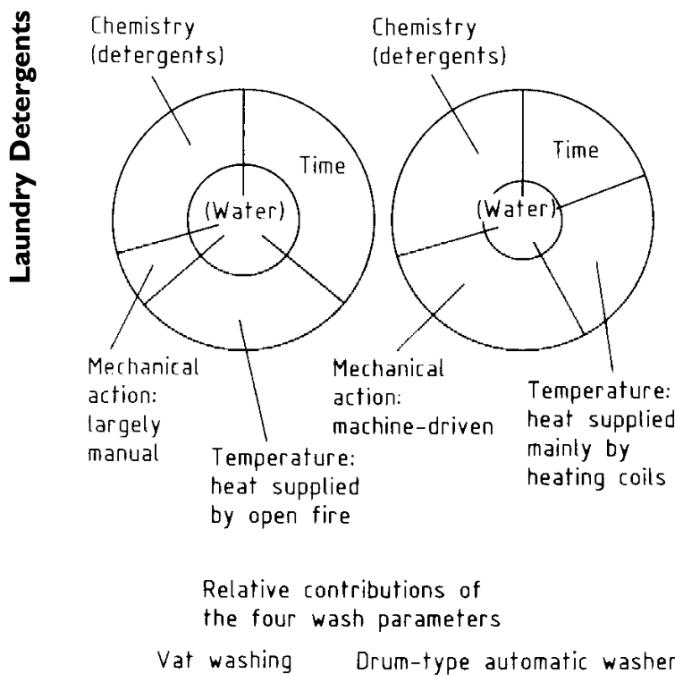
Fibers	White		Colored		Pastel colored	
	Temperature, °C	Bath ratio *	Temperature, °C	Bath ratio *	Temperature, °C	Bath ratio *
<b>Natural fibers</b>						
Cotton	95	low	40, 60, or 95 **	low	95 or 60	low or high
Linen	95	low	40, 60, or 95 **	low	95 or 60	low or high
Wool	cold, < 30	high	cold, < 30	high	cold, < 30	high
Silk	cold, < 30	high	cold, < 30	high	cold, < 30	high
<b>Chemical fibers (cellulosics)</b>						
Rayon staple	60	high	60 or 40	high	60 or 40	high
Acetate	40	high	40	high	40	high
<b>Chemical fibers (synthetics)</b>						
Polyamide	60	high	30 or 40	high	30 or 40	high
Polyester	30–60	high	30 or 40	high	30 or 40	high
Polyacrylonitrile	cold, < 30	high	cold, < 30	high	cold, < 30	high
Polyurethane	40–60	high	40–60	high	40–60	high

\* Low: bath ratio 1 : 5 and normal mechanical input; high: bath ratio 1 : 20 to 1 : 30 and decreased mechanical input.

\*\* Colorfast items.

## Chapter 2.3 - Understanding the care methods and main factors

Some garments are often made with delicate fabrics and intricate designs that require specific care and attention to maintain their quality over time. Some garments cannot be washed with just a cold washing setting or normal dry cycle. Improper washing and drying can lead to irreparable damage, causing the garment to lose its shape, color, and overall appeal. In order to properly care for luxury garments, it is important to learn the right washing and drying methods. This includes understanding the recommended water temperature, washing cycle, and type of detergent to use. For example, certain luxury garments may require hand washing or dry cleaning to avoid damage to the delicate fibers and embellishments.



**Figure 111.** Circular laundry chart (Sinner's circle)

In addition, proper storage is also crucial to maintaining the quality of garments. It is important to store these garments in a cool, dry place, away from direct sunlight, to avoid discoloration or fabric degradation. By taking the time to learn the proper caring methods for luxury garments, individuals can ensure that their investment lasts longer and retains its value. This not only saves money in the long run, but it also contributes to sustainable fashion practices by reducing the need for frequent garment replacement.

In the intricate process of washing, careful regulation of four key factors is essential: chemistry, mechanical input, wash temperature, and time. The impact of each factor on the overall wash performance varies, depending on the specific washing techniques employed. A visual representation, known as a Sinner's circle, depicted in Figure 111, illustrates the approximate percentage influence of each individual parameter on the overall washing process.

Within this Sinner's circle, the innermost circle signifies that the effectiveness of these four factors is ultimately attributed to the medium that binds them all together: water. Water acts as the vital solvent and carrier of detergents, facilitating the chemical interactions required for effective cleaning.

In the days when laundry was conducted in open vats, a substantial amount of water was necessary for the process. During this time, the role of mechanical action was

rather limited, and time played a significant role in achieving satisfactory results. However, with the advent of modern washing machines, a considerable increase in mechanical action became feasible. Consequently, the duration of the wash cycle has been notably shortened, as the enhanced mechanical input delivers more efficient cleaning.

It is worth noting that the interplay of these factors is not fixed, but rather dynamic, allowing for adjustments based on specific laundry requirements. For instance, certain fabrics or heavily soiled items may necessitate longer wash times or higher wash temperatures to achieve optimal cleanliness. On the other hand, delicate fabrics or garments with intricate embellishments may require reduced mechanical input and lower wash temperatures to prevent damage. The ability to regulate and balance these factors is essential for achieving desired wash outcomes while safeguarding the integrity and longevity of the items being laundered. Through the advancement of washing technology and a deeper understanding of these factors, individuals can enjoy more efficient and effective laundry processes, saving time and effort without compromising cleanliness.

### I. Wash Liquor Ratio

The term "wash liquor ratio" or "bath ratio" refers to the proportion between the weight of dry laundry in kilograms and the volume of wash liquor in liters. The overall amount of wash liquor necessary for the washing process comprises two components: the quantity absorbed by the laundry, known as bound wash liquor, and the surplus amount that remains unabsorbed, referred to as free wash liquor.

Different washing processes demand varying quantities of wash liquor. Agitator-type washing machines commonly found in North America typically utilize approximately 25 liters of water per kilogram of laundry, resulting in a wash liquor ratio of 1:25. In contrast, Asian pulsator machines typically require a ratio ranging from around 1:20 to 1:15. The advent of modern automatic washers with horizontal-axis drums has introduced a new dynamic to the wash liquor ratio. For cotton fabrics, these machines operate at a low ratio of 1:4, indicating a reduced volume of wash liquor required. However, for easy-care and delicate fabrics, these washers employ higher ratios, reaching values as high as 1:15.

The selection of an appropriate wash liquor ratio plays a vital role in achieving optimal cleaning results while considering the specific fabric types and washing machine technology. The ratio must strike a delicate balance to ensure effective removal of dirt,

stains, and odors, while also preventing excessive mechanical stress or damage to delicate fabrics.

It is important to note that the recommended wash liquor ratios mentioned above serve as general guidelines. Factors such as fabric composition, soiling level, and desired wash outcome may influence the specific ratio needed for a particular laundry load. Additionally, advancements in washing machine technology continue to refine and optimize wash liquor ratios for improved efficiency and resource conservation. By understanding the significance of wash liquor ratios and their variations across different washing processes and fabric types, individuals can make informed decisions when selecting the appropriate wash cycle and machine settings. This knowledge empowers users to achieve effective cleaning results while maximizing the performance and longevity of their garments and textiles.

## **II. Wash Liquor Level and Reversing Rhythm**

In the realm of washing machines, the drum-type washer stands out with its unique programming feature that entails rotating in a reversing manner—initially in one direction and then in the opposite. The mechanical action exerted on the laundry can be adjusted by modifying either the reversal rhythm or the wash liquor level, or even both simultaneously. By employing a low wash liquor level, corresponding to a wash liquor ratio of approximately 1:4, along with a relatively rapid reversal rhythm (such as 12 seconds of rotation followed by 4 seconds of pause), a substantial mechanical effect is induced on the laundry. This intensified action is capable of providing thorough cleaning. In contrast, opting for a higher wash liquor level (with a wash liquor ratio of 1:15) accompanied by a slower reversal rhythm (for example, 4 seconds of rotation followed by 12 seconds of pause) results in a reduced mechanical impact, thus earning the moniker "gentle cycle."

The selection of wash liquor level and reversal rhythm plays a critical role in determining the degree of mechanical action applied to the laundry during the washing process. By manipulating these parameters, users can customize the washing experience based on their specific needs. When confronted with heavily soiled items or sturdy fabrics, opting for a lower wash liquor level and faster reversal rhythm can deliver more robust mechanical agitation, facilitating effective removal of dirt and stains. On the other hand, when dealing with delicate fabrics or garments that require more gentle treatment, selecting a higher wash liquor level and slower reversal rhythm ensures a milder mechanical action that safeguards the integrity of the textiles.

The "gentle cycle" mode, characterized by higher wash liquor levels and slower reversal rhythms, is particularly suited for delicate fabrics or garments with intricate detailing, as it minimizes the risk of damage or distortion. This mode is designed to strike a delicate balance between cleanliness and fabric preservation, providing individuals with peace of mind when laundering their most delicate and cherished items.

The specific reversal rhythm and wash liquor ratios mentioned above are representative examples and may vary across different washing machine models. Manufacturers continually refine and optimize these parameters to cater to various fabric types and user preferences. Understanding the impact of reversal rhythm and wash liquor level on the mechanical action imparted to the laundry, individuals can make informed decisions when selecting the appropriate washing cycle. This knowledge empowers users to achieve desirable cleaning results while taking into account the unique requirements of their garments, ultimately prolonging their lifespan and maintaining their pristine appearance.

### **III. Residual Moisture.**

Residual moisture, a crucial aspect of the laundering process, refers to the quantity of water that remains within the laundry after draining and spinning cycles. It is quantified as a percentage relative to the mass of air-dried laundry, providing valuable insights into the moisture content of the garments.

When utilizing a vertical drum specifically designed for separate spin drying, the laundry can undergo high rates of rotation, reaching approximately 2800 revolutions per minute (rpm). As a result, residual moisture levels in cotton loads typically range from around 40% to 50%. The centrifugal force generated by the high-speed spinning effectively extracts a significant amount of water from the garments, reducing their moisture content. In contrast, automatic drum-type machines, commonly found in households, employ spin drying mechanisms with lower rates of rotation, typically ranging from 400 to 1800 rpm. These machines exhibit varying levels of residual moisture depending on the specific speed setting and laundry load characteristics. For cotton fabrics, residual moisture levels can range from 100% to 45%, reflecting the ability of the machine to effectively extract moisture through centrifugal force.

The variation in residual moisture levels can be attributed to the differences in spinning capabilities and technologies employed by different types of washing machines. Vertical drum spin dryers, dedicated to separate spinning, are specifically designed to maximize water extraction through high-speed rotation. In contrast, automatic drum-type machines balance the need for moisture removal with considerations such as fabric care and energy efficiency, resulting in lower rotational speeds and corresponding residual moisture levels.

Understanding the residual moisture levels is essential in planning subsequent steps of the laundry process, such as ironing or air drying. Higher residual moisture indicates that garments will require more time to air dry or may necessitate extended ironing durations to achieve desired results. Conversely, lower residual moisture levels indicate reduced drying times and potentially less effort during ironing.

While cotton fabric's residual moisture levels have been discussed here, other fabric types may exhibit different levels due to their inherent properties and construction. Additionally, advancements in washing machine technology continue to refine spin drying capabilities, offering users more control over residual moisture levels and optimizing the balance between water extraction and fabric care. By being aware of the residual moisture levels associated with different types of washing machines and their impact on fabric drying, individuals can make informed decisions regarding the subsequent steps in the laundry process. This knowledge enables users to achieve optimal results while maintaining the quality and longevity of their garments.

#### **IV. Water Temperature**

Across Europe, clothing is commonly laundered within a broad temperature spectrum, ranging from 30°C to 90°C. In contrast, other regions, such as North America, typically employ much lower temperatures, reaching around 55°C. Similarly, Asia and South America tend to utilize even colder temperatures, typically limited to 25°C, with exceptional cases reaching 40°C.

The preference for higher wash temperatures in Europe, which persisted for many decades before the 1980s, was largely driven by tradition and the deep-rooted belief that clothes could only be deemed truly clean if they were boiled during the washing process. However, shifting trends in the industry have led to a change in attitude, driven by the growing popularity of colored and permanent-press fabrics, the need for energy conservation, and the advent of advanced multifunctional heavy-duty detergents specifically formulated for effective cleaning at lower temperatures, as discussed in Section 4.1. As a result, the prevailing washing temperature in Europe has now settled at around 40°C.

Conversely, North America and Japan have long adhered to lower washing temperatures, with several factors influencing this practice. In particular, the use of chlorine-containing bleaches has played a significant role, as it offers hygienic benefits at lower temperatures. Consequently, the majority of the world's population residing in

regions such as Asia, Latin America, and Africa typically wash their clothes using tap-water temperature, commonly referred to as cold water.

The transition towards lower washing temperatures reflects a broader global shift in laundry practices, driven by factors such as environmental consciousness, fabric advancements, and the desire for optimal energy efficiency. Additionally, advancements in detergent formulations and washing machine technologies have facilitated effective cleaning at lower temperatures, further contributing to the widespread adoption of cooler washing methods.

While variations in washing temperatures persist worldwide, it is essential to note that different fabric types and laundry loads may necessitate specific temperature requirements to ensure optimal cleaning and care. Adhering to recommended temperature guidelines based on fabric composition and garment care labels helps maintain the quality, colorfastness, and longevity of clothing items. As laundry practices continue to evolve and innovative solutions emerge, striking a balance between effective cleaning, energy efficiency, and fabric care remains a priority. By understanding the diverse temperature preferences and their underlying reasons across different regions, individuals can make informed decisions when laundering their clothes, promoting sustainable practices while achieving satisfactory cleaning results.

## V. Washing Times.

The customary wash times exhibit significant variations between Europe, North America, and Japan, primarily due to differences in washing temperatures and the presence of built-in heating facilities. In Europe, washers are designed to heat water up to 90°C, which consumes a considerable amount of time. It takes approximately 40 minutes to raise the wash liquor's temperature to the desired 90°C, excluding any time dedicated to a prewash phase. In a wash cycle with a prewash, about half of the initial wash liquor is drained once it reaches around 40°C at the end of the prewash, adding an additional 15 minutes to the process.

Drum-type automatic washers typically use the temperature as the controlling variable for determining the wash cycle duration. A higher wash temperature necessitates a longer cycle, while a lower temperature requires less time. To promote energy efficiency, manufacturers have introduced optional "energy-saving cycles" where a lower wash temperature is compensated by extending the wash time. This adjustment ensures that the overall process achieves similar results to a high-temperature wash. By examining

the corresponding Sinner's circle, it becomes apparent that the temperature deficit is balanced by an increase in time and mechanical action.

In contrast, washing machines in the Americas and Asia operate at a considerably faster pace. The wash cycle typically lasts between 8 to 18 minutes, followed by one or two brief rinse cycles. This accelerated approach to washing allows for quicker turnaround times and efficient laundry processing. A detailed comparison of machine washing conditions across Europe, Japan, and the USA can be found in Table 57, which provides insights into the specific parameters and differences in laundry practices among these regions.

These divergent wash times and strategies reflect the varying priorities, technological advancements, and cultural preferences associated with laundry practices worldwide. While Europe emphasizes higher temperatures and extended wash cycles, North America and Japan prioritize efficiency and shorter cycle durations. By understanding these regional variations, individuals can select the appropriate settings and adapt their laundry routines accordingly to achieve optimal cleanliness, energy conservation, and fabric care.

## Laundry Detergents

**Table 57.** Predominant machine washing conditions

Machine type	Europe Front loader (drum)*	Japan Top loader (pulsator)**	USA Top loader (agitator)**
Washing time, min	20–60	5–15	8–18
Amount of water, L	8–15	30–60	75
Bath ratio	4 : 1	10 : 1	25 : 1
Temperature, °C	40–60	5–25	10–40
Water hardness	medium/high	very low	low/medium
Detergent dosage, g/L	5–10	0.5	1–2

\* Horizontal-axis type.

\*\* Vertical-axis type.

## Chapter 3 - Perfect Laundry Day Application

The laundry app is designed to provide users with a personalized guide on how to wash their clothes properly based on the type of garment they are washing. The app utilizes a comprehensive database of fabrics and garment types to recommend the appropriate water temperature, wash cycle, and detergent type to ensure that the user's clothes are cleaned effectively without damage.

The app's user interface is intuitive and easy to use, allowing users to select the type of garment they are washing, from delicate fabrics like silk to heavy-duty items like jeans. The app then provides step-by-step instructions on how to wash the garment, including water temperature, recommended cycle, and detergent type, as well as additional care tips, such as how to avoid shrinkage or fading.

Users can also create custom profiles for their most frequently washed items, such as their favorite jeans or go-to t-shirts, to save time and ensure that they are washed consistently. The app's features are designed to support the daily routine of laundry, providing users with a reliable tool and guideline to help prolong the life of their garments.

Overall, this laundry app is a valuable tool for anyone who wants to wash their clothes properly and maintain the quality of their wardrobe. By providing personalized and universally comprehensible guidelines, users can confidently and effectively launder their clothes, leading to longer-lasting garments and reduced environmental impact.

### Chapter 3.1 - Building the database

#### I. API stored on firebase

Building a database on Google Firebase using API involves a series of steps to set up, configure, and interact with the database. The process begins by creating a Firebase project- in this case, I have created a project called "Perfect Laundry Day" and enabled the Firestore database service. Next, you need to configure your API credentials and authentication methods to secure access to the database. This typically involves generating a private key or token to authenticate API requests.

Once the initial setup is complete, you can start defining the structure of your database by creating collections and documents. Collections act as containers for multiple related documents, while documents store the actual data in key-value pairs. You can organize your data hierarchically, allowing for efficient querying and retrieval. Here below is the interface of my collection. The collection that I have created is for 'Sign-up' information, where it will populate the emails and names of the users who have signed up.

The screenshot shows the Google Cloud Firestore interface for a project named 'PerfectLaundryApp'. The 'Cloud Firestore' tab is selected. The left sidebar shows a tree structure with 'perfectlaundryapp' at the root, followed by 'signups', then a specific document ID 'vtt47z81ldP5T0iSjWqA'. This document has two fields: 'email' with the value 'Test@gmail.com' and 'name' with the value 'Test'. The top right corner features a 'More in Google Cloud' dropdown menu with icons for help, edit, and notifications.

Additionally, Firebase provides real-time data synchronization, which allows you to receive live updates whenever the data in the database changes. This is particularly useful for building real-time applications that require instant updates and collaboration.

## II. Json structure

When user manually or scan the clothing label and the app reads the data, it will store the information in the following json structure format:

```
{  
    "items": [  
        {  
            "name": "Favorite-Winter-Sweater",  
            "desc" : "Cute sweater I bought while traveling to Europe last summer!",  
            "color": "colors",  
            "fabric_comp": ["47% Polyester", "47% Cotton", "5% Nylon", "1% Elastane"],  
            "wash_instruction": "-",  
            "bleach_instruction": "-",  
            "iron_instruction": "-",
            "dry_instruction": "-",
            "dryclean_instruction": "-",
            "handwash_instruction": "-",
            "image": "acneSweater.jpg"  
        }  
    ]  
}
```

The given JSON structure represents the information of each clothing item in a structured format. The "items" array contains objects that represent individual clothing items. Each item object consists of various properties that describe the item in detail.

The "name" property represents the name or title of the clothing item, such as "Favorite-Winter-Sweater." The "desc" property provides a description or additional information about the item, like a note mentioning it was bought during a trip to Europe.

The "color" property indicates the color(s) of the item. It can be a single color or an array of colors.

The "fabric\_comp" property is an array that specifies the fabric composition of the clothing item. It lists the percentages of different materials used, such as polyester, cotton, nylon, and elastane.

The "wash\_instruction," "bleach\_instruction," "iron\_instruction," "dry\_instruction," "dryclean\_instruction," and "handwash\_instruction" properties represent care

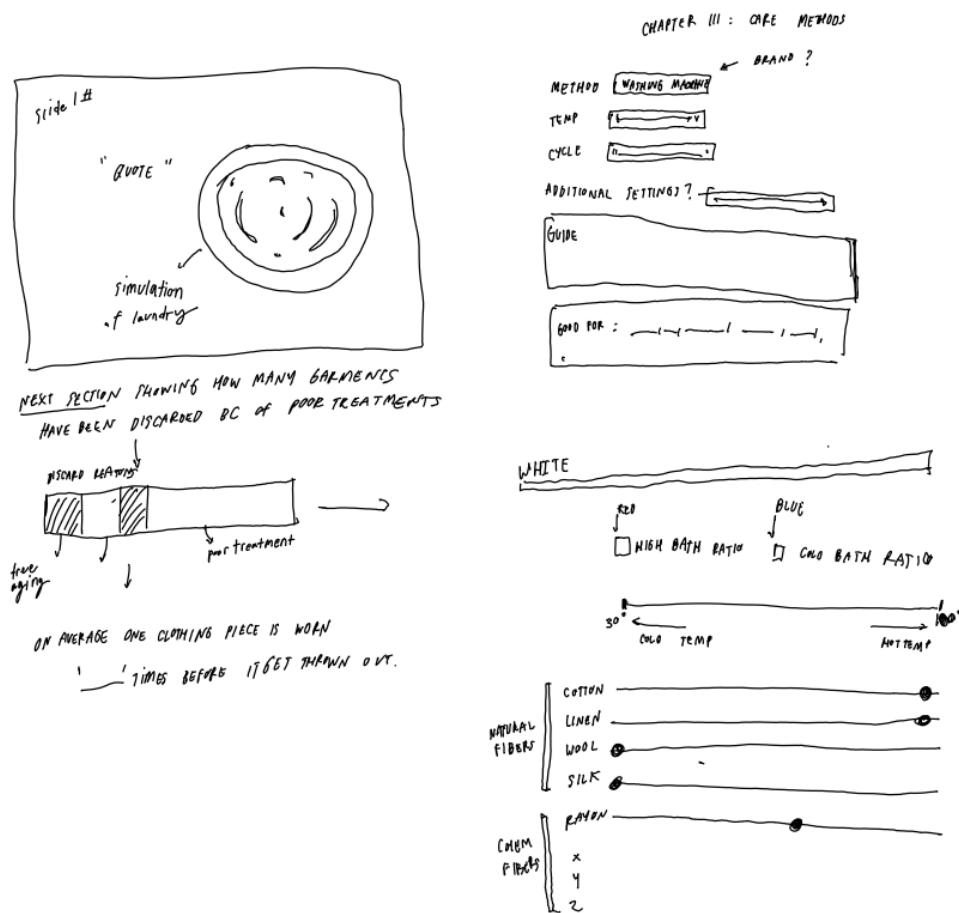
instructions for the item. In this example, they are represented by a hyphen ("-") indicating that specific instructions are not provided.

The "image" property holds the filename or reference to an image file associated with the clothing item, in this case, "acneSweater.jpg."

Overall, this JSON structure organizes the information of each clothing item, allowing for easy retrieval and manipulation of the data in a standardized format.

## Chapter 3.2 - Building the application

### I. Sketch



This photo illustrates the rough sketch and ideation process- as this was the result from the first iteration of my design process.

The creation of the web application began with a meticulous sketch and design process. The initial stage involved brainstorming and ideation sessions to define the app's core features, functionality, and user interface. Sketches were then drawn, capturing the overall layout, key elements, and flow of the application. These initial sketches served as a visual representation of the intended design and provided a foundation for further development.

Once the sketches were finalized, the design process commenced. This involved translating the rough sketches into digital wireframes using design software. The wireframes provided a more detailed and refined structure of the application's layout, showcasing the placement of various components, such as buttons, forms, and navigation menus. Iterations and feedback were integral during this phase to ensure an intuitive user experience and seamless interaction.

After the wireframes were approved, the next step was to apply the visual design elements. This included selecting appropriate color palettes, typography, and visual assets to establish the desired aesthetic appeal. In the case of <https://app.perfectlaundryday.com>, the color inspirations of neon green, black, and white were chosen to convey a modern and agile mood. The typography directions involved utilizing sans-serif fonts, specifically Arimo, for a clean and contemporary look, while serif fonts, such as Marcellus, added a touch of elegance and sophistication.

Overall, the sketch and initial design process played a crucial role in shaping the visual identity and user experience of the web application. It ensured that the final design effectively communicated the app's purpose, usability, and brand image. Through a collaborative effort of sketching, wireframing, and visual design, the foundation for a visually appealing and user-friendly web application was established.

## II. Stylings

The color inspirations used throughout the interface of this website app revolve around a dynamic combination of neon green, black, and white. These colors are strategically chosen to evoke a sense of energy, vibrancy, and modernity. The neon green serves as the primary accent color, injecting a refreshing burst of liveliness into the interface. It catches the eye and draws attention to important elements, such as buttons and notifications, creating a visually stimulating experience.

The black and white color scheme forms the foundation of the interface, embodying a sleek and sophisticated aesthetic. The use of black exudes a sense of elegance and timelessness, while white brings a clean and minimalist feel, enhancing readability and clarity. This combination of colors creates a sharp contrast that further accentuates the neon green accents, creating a visually striking composition.

The overall mood and tone conveyed by these color choices is agile and modern. By departing from traditional laundry-related color palettes, the interface challenges the notion of laundry as a mundane and monotonous task. The vibrant neon green injects a

sense of excitement and energy into the experience, transforming the perception of laundry into something dynamic and engaging. This modern color palette offers users a fresh perspective and a renewed enthusiasm for managing their laundry, making the interface a standout in the realm of household chores. The below photo illustrates the mood & tone and design inspirations for this project.



The typography directions used throughout the interface of <https://app.perfectlaundryday.com> follow a deliberate choice of fonts to enhance readability and establish a sense of hierarchy. The main fonts employed are the sans-serif font Arimo and the serif font Marcellus, each serving a specific purpose within the design.

The use of the sans-serif font Arimo contributes to the overall modern and clean aesthetic of the interface. Its simplicity and streamlined appearance make it ideal for conveying important information and guiding users through the interface. The consistent

application of Arimo across headings, menus, and labels creates a cohesive visual language, ensuring a seamless and intuitive user experience.

In contrast, the serif font Marcellus is strategically employed to add a touch of elegance and sophistication to certain elements of the interface. Its refined serifs and distinctive letterforms make it a suitable choice for titles, subheadings, or any text that requires a more prominent and authoritative presence. By utilizing Marcellus selectively, the interface establishes a clear hierarchy of information, directing users' attention to key sections and providing a visual structure for easy navigation. The implicit hierarchy of fonts, with Arimo as the primary font and Marcellus as the secondary font, ensures a harmonious blend of readability, aesthetics, and information organization. The combination of these fonts not only enhances the overall visual appeal of the interface but also contributes to the clarity and effectiveness of communication within the application.

Quote

# Chapter

Font Name	Marcellus
Font Size	40px
Line Height	50px
Weight	Regular
Letter Spacing	-4%

H1

# Chapter

Font Name	Marcellus
Font Size	40px
Line Height	48px
Weight	Regular
Letter Spacing	-4%

H2

## Your Overview

Font Name	Marcellus
Font Size	16px
Line Height	18px
Weight	Regular
Letter Spacing	0%

H3

### Legend Name

Font Name	Marcellus
Font Size	16px
Line Height	16px
Weight	Semibold
Letter Spacing	3%

Body - Data

\$12,344,289

Font Name	Arimo
Font Size	12px
Line Height	16px
Weight	Regular
Letter Spacing	1%

Body - Paragraph

Here are the latest financial statements from your account to review.

Font Name	Arimo
Font Size	15px
Line Height	18px
Weight	Regular
Letter Spacing	1%

Caption

Please read our terms and conditions to continue.

Font Name	Marcellus
Font Size	9px
Line Height	12px
Weight	Regular
Letter Spacing	0%

### **III. UI design**

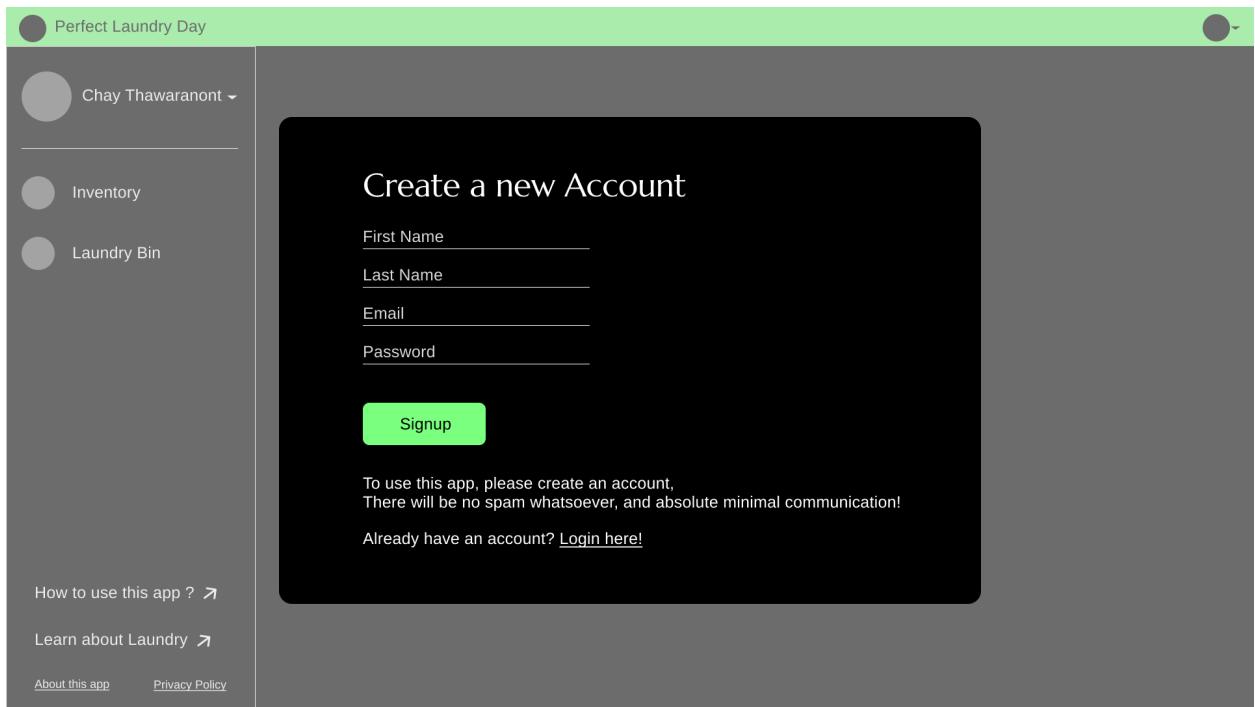
The user interface of the web application (<https://app.perfectlaundryday.com>) is designed with a clean and intuitive layout, offering a seamless experience for users managing their laundry tasks. The interface incorporates a combination of modern design elements and user-friendly features to enhance usability and efficiency.

Upon visiting the website, users are greeted with a visually appealing and responsive design that adapts well to different screen sizes, ensuring a consistent experience across devices. The homepage provides a clear navigation menu, allowing users to easily access different sections of the application. The color scheme is well-balanced, with a pleasant combination of ultra-green contrasting with black and white, creating a visually calming atmosphere that aligns with the concept of agile laundry tasks.

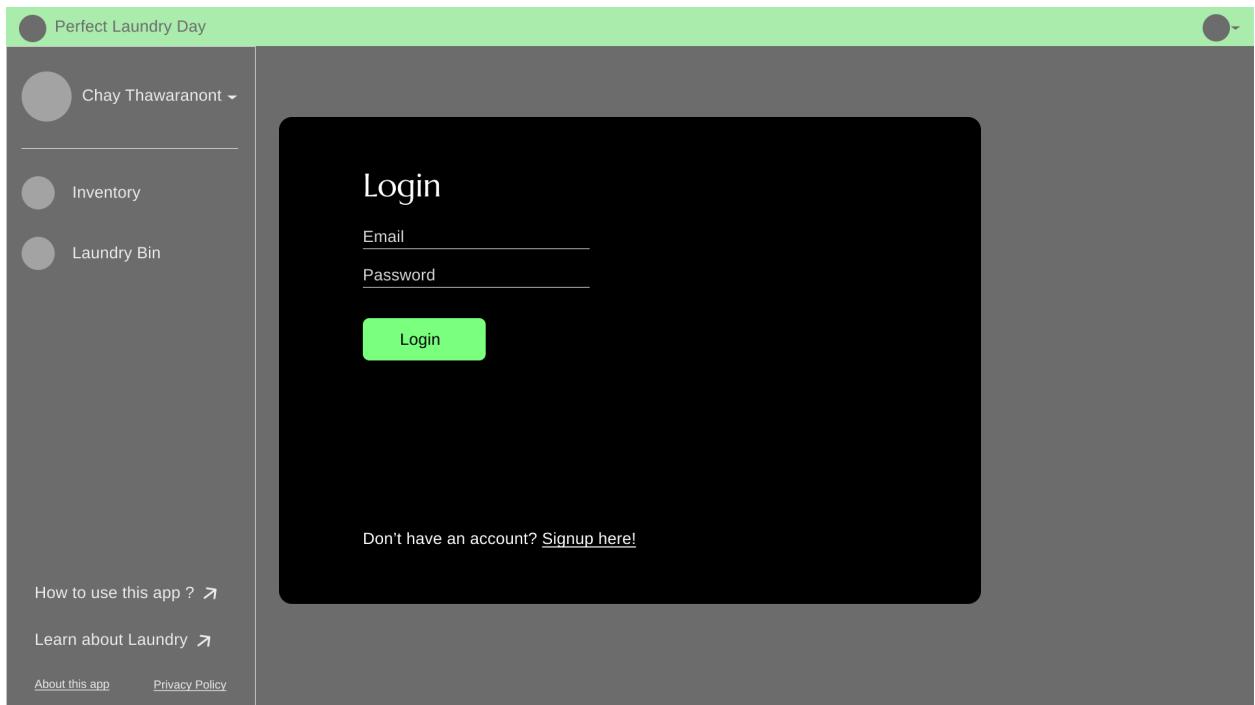
The user interface is divided into logical sections, such as "Inventory" "Laundry Bin" and "More Info," making it effortless for users to find the desired features. The "Inventory" section serves as the central hub, displaying a list of the added clothing items. Users can conveniently add new items, manually specify details like wash cycles and fabric types, and make notes for extra care. The interface provides scan-auto transferred functionality for storing clothing items, making it simple to add them based on the care label instructions.

The settings section offers customization options, enabling users to personalize their laundry preferences, such as temperature settings, detergent choices, and preferred washing machine profiles. Additionally, the interface incorporates helpful tooltips and contextual hints to guide users through various features, ensuring a smooth onboarding experience for new users.

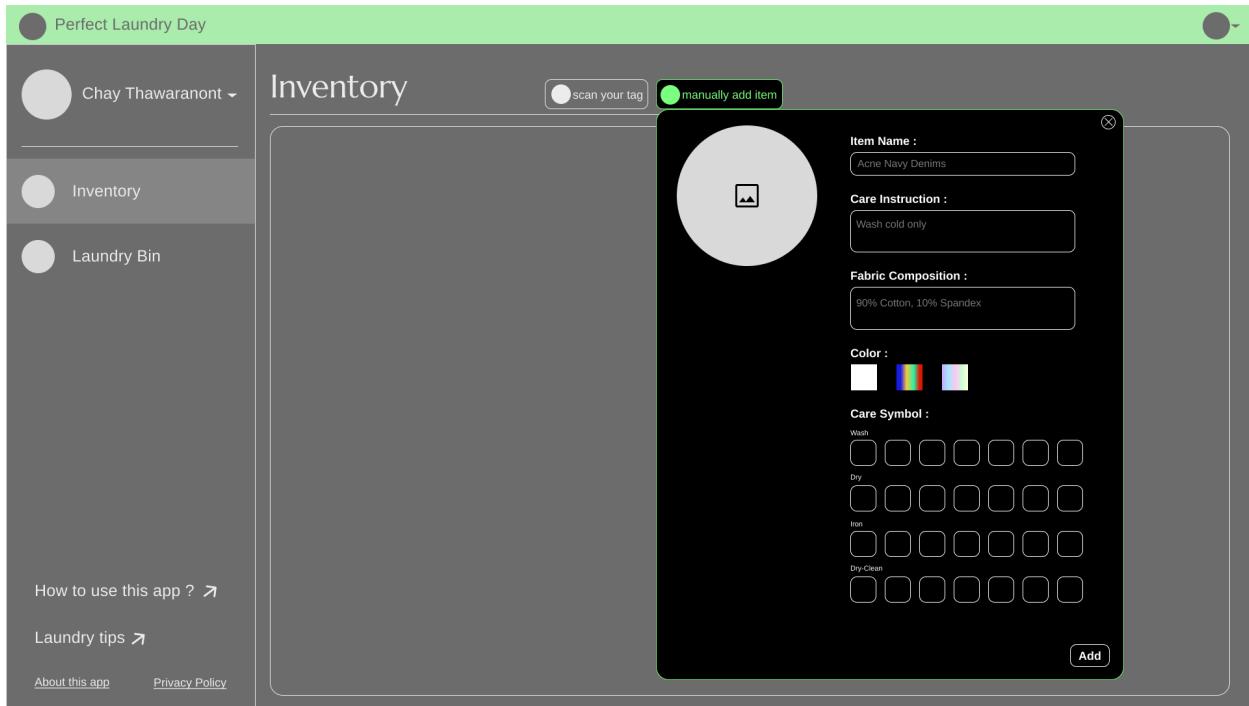
Overall, the user interface of <https://app.perfectlaundryday.com> demonstrates a user-centric approach, combining an aesthetically pleasing design with intuitive functionality. The carefully crafted interface streamlines laundry management, empowering users to efficiently organize and monitor their laundry tasks while providing a delightful user experience.



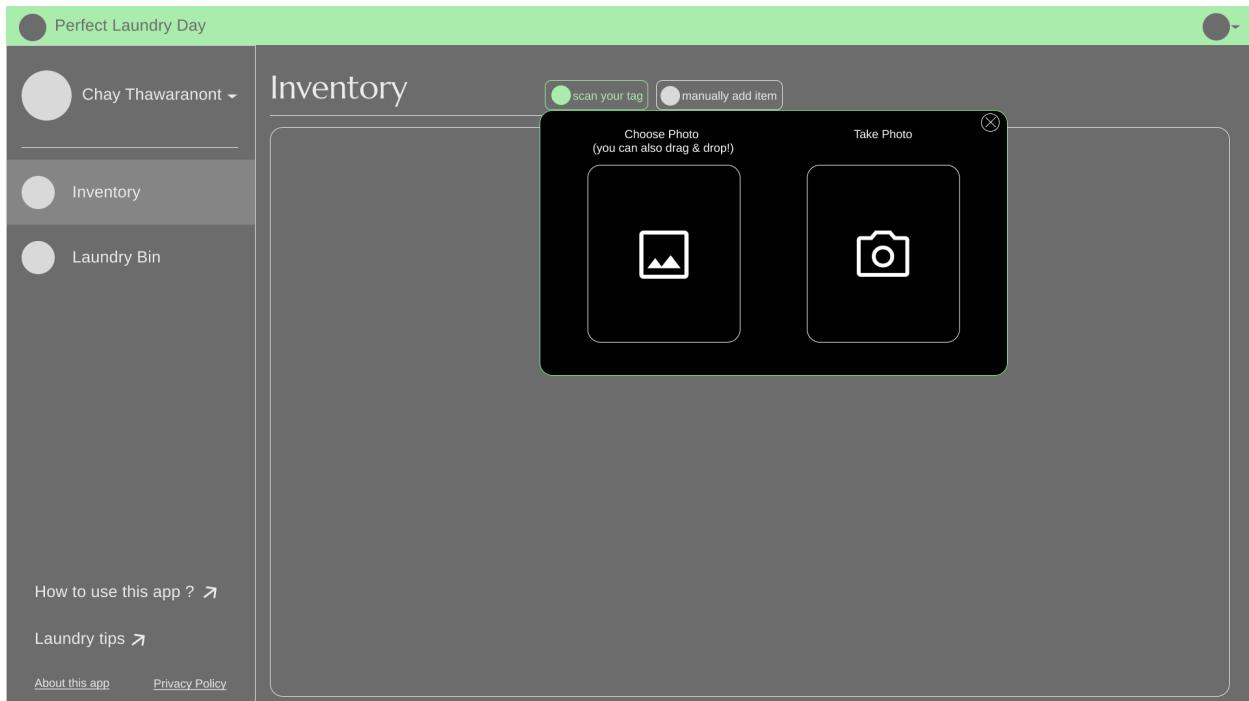
This is the sign-up pop-up window, user creating new account interface.



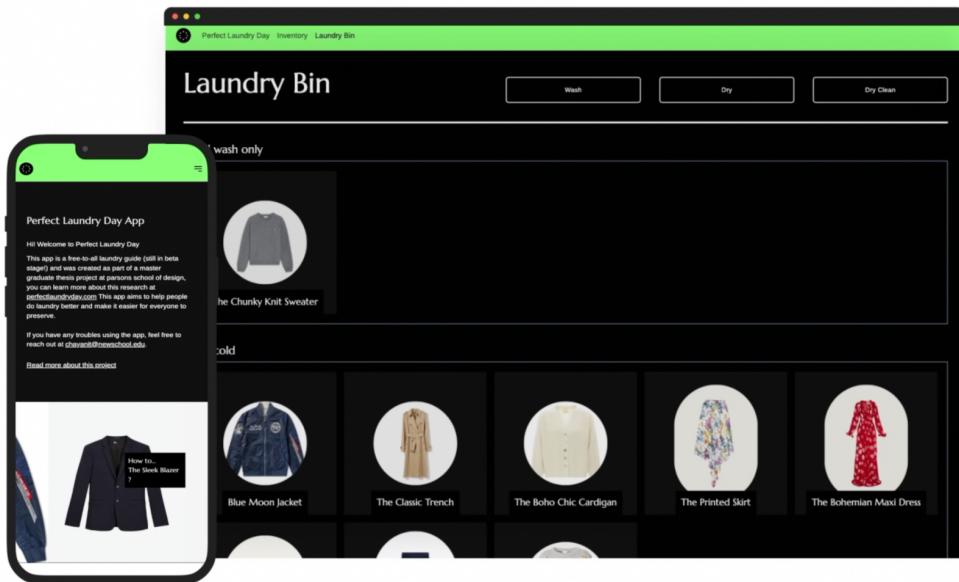
This is the interface showing login window pop-up



Users can easily add the clothing items by manually adding the information.



Another future feature is scanning the care label and taking photo of the clothing items.



Perfect Laundry Day app is also mobile-user friendly. The app functions on both desktop and mobile devices.

### Chapter 3.3 - Future Improvements

For further improvements, the app will provide capabilities that would fulfill users' needs and truly personalized the care process as drawn in the user flow graphic below. One of the notable enhancements is the introduction of care label scanning capabilities. By integrating machine learning models, the app will be able to automatically transfer images of care labels into text, extracting essential information such as fabric composition, washing instructions, and care symbols. This advancement eliminates the need for users to manually input their clothing items into the database, saving them time and effort.

Additionally, the implementation of care symbol recognition will further streamline the laundry management process. With this feature, users can simply capture an image of a care symbol on a clothing item's care label, and the app's machine learning algorithms will instantly identify and interpret the symbol's meaning. This intelligent recognition

system ensures accurate care instructions and eliminates any guesswork or confusion when it comes to handling specific garments. Users can confidently care for their clothing items with precision and avoid any potential damage caused by incorrect washing methods.

Furthermore, to enhance user experience and convenience, the future version of the app will introduce Auth-login functionality. Users will have the option to create an account or sign in using their Gmail account credentials. This seamless authentication process eliminates the need for remembering additional login information, providing a hassle-free and secure login experience. By implementing Auth-login, the app aims to improve accessibility and ensure a personalized experience for each user, with their preferences and laundry history readily available.



## CONCLUSION

In conclusion, the laundry database app has the potential to revolutionize the way we care for our clothing. By providing users with access to a comprehensive database of care instructions, the app empowers consumers to make informed decisions about how to properly care for their clothing, ultimately extending the lifespan of their garments. As technology advances, there is a great opportunity for the app to further improve and expand its features. For example, future iterations could include more tailored content or ability to recognize garment types based on material composition using visual recognition machine learning model.

This would make the app even more personalized and user-friendly, allowing consumers to easily navigate the complexities of caring for their clothing. Furthermore, incorporating sustainability and environmental impact into the app's features could encourage users to adopt more eco-friendly cleaning practices. This would not only benefit the environment but also potentially save users money in the long

run by reducing the need to replace clothing that has been prematurely damaged due to improper care.

Overall, the laundry database app has the potential to make a significant impact on the way we care for our clothing, and the possibilities for future advancements are exciting. With the continued evolution of technology and a growing focus on sustainability, the app is well-positioned to become an essential tool for consumers seeking to care for their clothing in a more informed and sustainable way.

# BIBLIOGRAPHY

1. "Care of Clothes - New School." Accessed March 14, 2023.  
[https://bobcat.library.nyu.edu/primo-explore/fulldisplay?docid=nyu\\_aleph001456294&context=L&vid=NS2-NUI&lang=en\\_US&search\\_scope=default\\_scope&adaptor=Local%20Search%20Engine&tab=default\\_tab&query=any.contains,clothing%20care&offset=10](https://bobcat.library.nyu.edu/primo-explore/fulldisplay?docid=nyu_aleph001456294&context=L&vid=NS2-NUI&lang=en_US&search_scope=default_scope&adaptor=Local%20Search%20Engine&tab=default_tab&query=any.contains,clothing%20care&offset=10).
2. Cotton, Lucy, Adam S. Hayward, Neil J. Lant, and Richard S. Blackburn. "Improved Garment Longevity and Reduced Microfibre Release Are Important Sustainability Benefits of Laundering in Colder and Quicker Washing Machine Cycles." *Dyes and Pigments* 177 (June 1, 2020): 108120.  
<https://doi.org/10.1016/j.dyepig.2019.108120>.
3. "Garment Manufacturing Technology - New School." Accessed March 14, 2023.  
[https://bobcat.library.nyu.edu/primo-explore/fulldisplay?docid=nyu\\_aleph004489798&context=L&vid=NS2-NUI&lang=en\\_US&search\\_scope=default\\_scope&adaptor=Local%20Search%20Engine&isFrbr=true&tab=default\\_tab&query=any,contains,garment%20care&offset=0](https://bobcat.library.nyu.edu/primo-explore/fulldisplay?docid=nyu_aleph004489798&context=L&vid=NS2-NUI&lang=en_US&search_scope=default_scope&adaptor=Local%20Search%20Engine&isFrbr=true&tab=default_tab&query=any,contains,garment%20care&offset=0).
4. Günter Jakobi. *Detergents and Textile Washing: Principles and Practice*. New York, NY, USA: VCH Publishers, 1987.
5. "How to Do Laundry." Accessed March 14, 2023.  
<https://www.nytimes.com/guides/smarterliving/how-to-do-laundry>.
6. "How to Take Care of Your Clothes - T Magazine Guides - The New York Times." Accessed March 14, 2023.  
<https://www.nytimes.com/guides/tmagazine/how-to-take-care-of-your-clothes>.
7. Iqbal Hussain, Muhammad Ather, Babar Khan, Zhijie Wang, and Shenyi Ding. "Woven Fabric Pattern Recognition and Classification Based on Deep Convolutional Neural Networks." *Electronics* 9, no. 6 (June 2020): 1048.  
<https://doi.org/10.3390/electronics9061048>.
8. Kumar, Vijay, Niina Hernández, Michelle Jensen, and Rudrajeet Pal. "Deep Learning Based System for Garment Visual Degradation Prediction for Longevity." *Computers in Industry* 144 (January 1, 2023): 103779.  
<https://doi.org/10.1016/j.compind.2022.103779>.

9. "(PDF) Assessing the Impact of Wash Water Temperature, Detergent Type and Laundering Platform on Basic Clothing Attributes." Accessed March 14, 2023.  
[https://www.researchgate.net/publication/273829746\\_Assessing\\_the\\_Impact\\_of\\_Wash\\_Water\\_Temperature\\_Detergent\\_Type\\_and\\_Laundering\\_Platform\\_on\\_Basic\\_Clothing\\_Attributes?enrichId=rgreq-49a2d7b2e9ff44662a4f15adeffabf4f-XXX&enrichSource=Y292ZXJQYWdlOzl3MzgyOTc0NjtBUzoyMDk1OTUyMDIwNTIxMDAMTQyNjk4Mjc5ODY5Mw%3D%3D&el=1\\_x\\_3&esc=publicationCoverPdf](https://www.researchgate.net/publication/273829746_Assessing_the_Impact_of_Wash_Water_Temperature_Detergent_Type_and_Laundering_Platform_on_Basic_Clothing_Attributes?enrichId=rgreq-49a2d7b2e9ff44662a4f15adeffabf4f-XXX&enrichSource=Y292ZXJQYWdlOzl3MzgyOTc0NjtBUzoyMDk1OTUyMDIwNTIxMDAMTQyNjk4Mjc5ODY5Mw%3D%3D&el=1_x_3&esc=publicationCoverPdf).
10. Tetik, T, RA Yildiz, AR Labanieh, B Yoruk, S Kursun Bahadir, F Kalaoglu, and V Koncar. "Hydrodynamic Modeling of E-Textile Fabric Washing Behavior by the Coupled Eulerian–Lagrangian Method." *Textile Research Journal* 91, no. 9–10 (May 1, 2021): 1117–31. <https://doi.org/10.1177/0040517520973455>.
11. Schmitz, Angelika and Rainer Stamminger. "Usage Behaviour and Related Energy Consumption of European Consumers for Washing and Drying." *Energy Efficiency* 7, no. 6 (12, 2014): 937–954.  
doi:<https://doi.org/10.1007/s12053-014-9268-4>.  
<https://login.libproxy.newschool.edu/login?url=https://www.proquest.com/scholarly-journals/usage-behaviour-related-energy-consumption/docview/1618339928/se-2>.
12. Agarwal, Gaurav, Ludovic Koehl, and Anne Perwvelz. "Simultaneous Influence of Ageing and Softener on Mechanical Properties of Knitted Textiles during Life Cycle of Garment." *International Journal of Clothing Science and Technology* 23, no. 2 (2011): 152–169. doi:<https://doi.org/10.1108/09556221111107342>.  
<https://login.libproxy.newschool.edu/login?url=https://www.proquest.com/scholarly-journals/simultaneous-influence-ageing-softener-on/docview/868250539/se-2>.
13. Ellen Macarthur Foundation, [a New Textiles Economy: Redesigning Fashion's Future](#) (2017)
14. Environmental Protection Agency. (n.d.). EPA.  
<https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data>
15. *Care labels - guide on Care Labeling Systems - apparel: Coats - Coats*. The World's Leading Manufacturer in Thread. (n.d.).  
<https://coats.com/en/information-hub/Care-Labels>