



# Project Title

Optional Subtitle

Candidate Number: xxxxx <sup>1</sup>

Programme: MSc Data Science and Machine Learning

Supervisor: Nadia Berthouze

Submission date: Day Month Year

<sup>1</sup>**Disclaimer:** This report is submitted as part requirement for the MSc Data Science and Machine Learning at UCL. It is substantially the result of my own work except where explicitly indicated in the text. *Either:* The report may be freely copied and distributed provided the source is explicitly acknowledged

## **Abstract**

Summarise your report concisely.

# Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
1.1	Motivation . . . . .	2
1.1.1	Fast Fashion and its environmental impact . . . . .	2
1.1.2	How important is touch when buying clothes? . . . . .	4
1.2	Objective . . . . .	4
<b>2</b>	<b>Related Work</b>	<b>6</b>
<b>3</b>	<b>Methodology</b>	<b>7</b>
3.1	Dataset . . . . .	7
3.2	Methods . . . . .	7
3.3	Results . . . . .	7
<b>4</b>	<b>Extensions of methodology</b>	<b>8</b>
<b>5</b>	<b>Conclusion</b>	<b>9</b>

# Chapter 1

## Introduction

**Instructions for section:** What is the problem and why is it interesting. State very clearly the problem that you are investigating. If your examiner cannot even understand the first few pages of your thesis, there is no chance that you will obtain a high mark.

### 1.1 Motivation

#### 1.1.1 Fast Fashion and its environmental impact

##### Fast Fashion

‘Fast fashion’ refers to speedily and mass-produced, low-quality clothing that is quickly circulated through high street stores to satisfy the latest trends and maximise consumer demand. Fast fashion garments are cheaply produced and priced and replicate the latest celebrity or catwalk styles [1,2,3].

Fast fashion involves swift design, production, distribution, and marketing. This allows retailers to obtain a larger quantity of assorted designs, and in turn, consumers are presented with a more extensive choice of inexpensive clothing [1,2].

The term ‘Fast fashion’ was first coined in the early 1990s by the New York Times to describe how Zara, the Spanish apparel giant, only took 15 days between designing the garment and selling it in their stores. The most prominent names in the current fast fashion industry include Zara, H&M (Hennes and Mauritz), Uniqlo and Gap. All four apparel manufacturers sold over \$15 billion worth of clothes in the 2021 fiscal year [1,2,4].

As fast fashion relies on cheap and quick production, it promotes overproduction. Fast fashion also encourages overconsumption because consumers are attracted to cheap and trendy clothing that copies current trends compared to relatively expensive, long-lasting items that fall out of style shortly. This toxic system of constantly buying clothing and almost immediately discarding them due to its low quality is the most significant pitfall of fast fashion. As a result, fast fashion harms the environment [2,3].

##### Environmental impact of fast fashion

The environmental impact of fast fashion includes large-scale emission of greenhouse gases, the use of massive amounts of water and energy, and the depletion of non-renewable resources. Fast

fashion is also one of the world's largest polluters.

According to the United Nations Environment Programme (UNEP), textile production accounts for up to 10% of total global carbon emissions (1.2 billion tonnes). This figure is larger than the emissions from all international flights and maritime shipping combined. As per the UN Framework Convention on Climate Change, global carbon emissions are estimated to skyrocket by more than 60% by 2030 [1, 5, 6].

The fashion industry is also the second largest consumer of the world's water supply. Approximately 700 gallons (3182.26 litres) of water is required to produce a single cotton shirt; this is enough water for an individual to drink at least eight cups per day for three-and-a-half years. Roughly 2 000 gallons (9092.18 litres) of water is used to produce a pair of jeans; this is more than enough for one person to drink eight cups per day for ten years. Further, the United Nations Environment Programme (UNEP) discovered that the fashion industry produces 20% of the world's wastewater and that fabric dyeing is the second largest water polluter because the water leftover from the dyeing process is dumped into rivers, streams, and other water bodies. This severely affects marine life and the aquatic ecosystem [1, 7, 8].

Textile production is also highly energy intensive and requires large quantities of petroleum. According to STAND.earth, the largest component of the fashion supply chain still relies on coal for electricity generation and heat used in apparel manufacturing. Burning coal releases greenhouse gases such as carbon dioxide, and such gases are the leading cause of global warming and climate change. Further, the global textile and apparel industry consumes 98 million tonnes of non-renewable resources [1, 13, 14, 15].

Synthetic materials such as nylon, polyester and acrylic are created from fossil fuels and currently comprise over two-thirds of the materials used in the apparel industry. Such materials take over hundreds of years to biodegrade. A 2017 report from the International Union for the Conservation of Nature (IUCN) estimated that 35% of all microplastics (tiny pieces of plastics that never biodegrade) in the ocean came from laundering synthetic textiles like polyester. It is also estimated that microplastics cause up to 31% of plastic pollution in the ocean [1, 7, 12, 13].

There is also massive amounts of monetary and resource wastage resulting from fast fashion. According to Business Insider, 85% of textiles of all textiles go to the landfills each year – this is enough to fill the Sydney harbour each year. Further, the equivalent of one garbage truck full of clothes is dumped in a landfill or burned every second [7, 9, 10, 11].

#### **Other detrimental effects of fast fashion**

There is also a significant human cost resulting from fast fashion. Garment workers in the global South pay a large price so fast fashion brands can keep their profit margins high and price tags low. Garment workers are paid well below the liveable wage and are forced to work long, strenuous hours in abysmal conditions. An Oxfam 2019 report discovered that 0% of Bangladeshi and 1% of Vietnamese garment workers earned a living wage. Nine of 10 Bangladeshi workers starve because they cannot afford food, and three-quarters cannot afford medical treatment. In Vietnam, more than half of workers cannot afford medical treatment, and three-quarters of workers cannot afford to make ends meet in general. Garment workers are often forced to work 14 to 16 hours a day, seven days a week. The devastating Rana Plaza collapse in 2013, which killed 1134 people and injured 2500 others, is a testament to the unacceptable working conditions in the fashion industry. Employees usually work without ventilation and inhale toxic substances such as fibre dust or

blasting sand. Accidents, fires, injuries, and diseases frequently occur on apparel production sites. [16, 17, 18]

Animals are also adversely affected by fast fashion. The toxic dyes and microplastics released into waterways are ingested by animals, most often resulting in their deaths. Using animal products such as leather, fur, and wool directly risks animal welfare [3].

### 1.1.2 How important is touch when buying clothes?

Multiple studies have revealed that consumers heavily depend on affective touch and tactile experience when purchasing clothes. According to [19], affective touch is defined as tactile processing with a hedonic or emotional component; in short, it is the emotional aspect of touch.

According to Peck and Childers (2003)[20], touching a product can increase consumers' confidence in product evaluation. Further, tactile input is used more often to judge a product's substance (stiffness, roughness, softness and smoothness) compared to its macro-spatial aspects (shape and size, unless visual judgment is unavailable) (Klatzky, Lederman, Reed, 1987[21]; Lederman, Thorne, Jones, 1986[22]). According to a study conducted by Holbrook (1986)[23], tactile cues were more influential than visual cues in consumers' evaluations and perceptions of sweaters. However, the main effect of tactile cues may vary from one product type to another (McCabe & Nowlis, 2003[24]). For instance, consumers rely more on tactile inputs when evaluating a jacket with various material properties (e.g., temperature, weight and texture) than when assessing a rewritable compact disk with limited textual properties. Therefore, the sense of touch is often considered an essential criterion for evaluating products that vary in their textual properties (Grohmann, Spangenberg, Sprott, 2007[25]). Given this perspective, it is reasonable to suggest that conscious or unconscious tactile feelings play a prominent role in consumers' perceptions of clothing.

With the expansion of fast fashion and the development of the internet, online clothes shopping is becoming increasingly popular. However, this comes with the caveat that individuals cannot physically touch the clothes they purchase. Many studies on internet-based retailing (Citrin, Stem, Spangenberg, Clark, 2003; Lester, Forman, & Loyd, 2005) demonstrate that the main shortcoming of online shopping is the inability of the consumer to touch the products. Therefore, it may be impossible to accomplish a holistic evaluation of the product using this method of shopping. Further, consumers may feel frustrated or disappointed if they do not have the opportunity to touch and examine the products (Citrin, Stem, Spangenberg, Clark, 2003; Peck Childers, 2003); this is particularly true for those consumers where the need for touch (NFT) is higher.

## 1.2 Objective

The long-term aim of this project is to build a chatbot that helps reduce fast fashion's impact. The chatbot aims to transform clothes shopping into a multi-sensory, reflective and recognition-based experience. Firstly, the chatbot will ask individuals to touch new clothes, engage with the fabric, **reflect** on whether they like the garment and if they will wear it. Secondly, the chatbot will have stored information such as what clothes the individual has in their cupboards, what their favourite and most worn clothes are and what type of clothes they like. Based on this data, the chatbot

will look at the cloth the individual is looking at and **recognise** if the individual likes it and will wear it.

Past studies have discovered and confirmed that consumers rely heavily on affective touch and tactile experience when purchasing clothes. Therefore, developing a method to comprehensively understand what an individual experiences when touching a textile, how they feel after touching it, and if they like it may help to reduce the impact of fast fashion. Therefore, this study proposes a novel machine learning approach to estimate people's sensations and their liking of the textile being touched.

## Chapter 2

# Related Work

Describe here work that is connected to your thesis. This should include references to published work. There is no fixed rule, but I would expect a student to have read around 50 published research papers and reference them in a thesis.

This project builds on the work of xxxxx.

### Lili's project

The aim was twofold:

1. Identify if the captured electromyography (EMG) and motion data can be used to detect what property an individual is assessing.
2. Identify if the hand motion data is able to predict the given property ratings

Electromyography (EMG) and motion data captured from both hands via wearable sensors can be used to automatically detect what property a person is assessing.

Tactile



## Chapter 3

# Methodology

Describe your method in detail and with great clarity, distinguishing it from other works (if it is indeed a novel idea). It is very important to clearly motivate your method. Describe the results of your method here in this chapter.

### 3.1 Dataset

### 3.2 Methods

### 3.3 Results

## Chapter 4

# Extensions of methodology

It is unlikely that everything you tried worked well, so in this chapter you may wish to describe a modified version of your method and the associated results. Explain why you were motivated to try this extension and how you think it might help to address some of the shortcomings of the method in Chapter 3.

## Chapter 5

# Conclusion

Summarise what you have achieved and evaluate honestly if you feel the approach has been largely successful. Explain what could be improved still and perhaps why the method is not working well (if that is the case).

# Bibliography

- [1] R. Maiti Fast Fashion and Its Environmental Impact. <https://earth.org/fast-fashions-detrimental-effect-on-the-environment/>
- [2] O. Lai What is fast fashion? <https://earth.org/what-is-fast-fashion/>
- [3] S. Rauturier What Is Fast Fashion and Why Is It So Bad? <https://goodonyou.eco/what-is-fast-fashion/>
- [4] Sales of major apparel manufacturers and retailers worldwide in the fiscal year 2021. <https://www.statista.com/statistics/242114/sales-of-the-leading-10-apparel-retailers-worldwide/>
- [5] Rachael Dottle and Jackie Gu The Global Glut of Clothing Is an Environmental Crisis. <https://www.bloomberg.com/graphics/2022-fashion-industry-environmental-impact/>
- [6] Fashion Industry, UN Pursue Climate Action for Sustainable Development <https://unfccc.int/news/fashion-industry-un-pursue-climate-action-for-sustainable-development>
- [7] Morgan McFall-Johnsen The fashion industry emits more carbon than international flights and maritime shipping combined. Here are the biggest ways it impacts the planet. <https://www.businessinsider.com/fast-fashion-environmental-impact-pollution-emissions-waste-water-2019-10?r=US&IR=T>
- [8] Dye Pollution in the Textile Industry <https://waste2fresh.eu/dye-pollution-in-the-textile-industry/>
- [9] Putting the brakes on fast fashion <https://www.unep.org/news-and-stories/story/putting-brakes-fast-fashion>
- [10] Fashion and the SDGs: what role for the UN? [https://unece.org/fileadmin/DAM/RCM/Website/RFSD\\_2018\\_Side\\_event\\_sustainable\\_fashion.pdf](https://unece.org/fileadmin/DAM/RCM/Website/RFSD_2018_Side_event_sustainable_fashion.pdf)
- [11] Elizabeth Reichart and Deborah Drew By the Numbers: The Economic, Social and Environmental Impacts of “Fast Fashion” <https://www.wri.org/blog/2019/01/numbers-economic-social-and-environmental-impacts-fast-fashion>
- [12] Julien Boucher and Damien Friot Primary microplastics in the oceans <https://portals.iucn.org/library/node/46622?cookies-complaint=1>

- [13] Fashion Forwards: A Roadmap to Fossil Free Fashion  
<https://www.stand.earth/sites/stand/files/standearth-fashionforward-roadmaptofossilfreefashion.pdf>
- [14] Make Fashion Circular <https://www.switch-asia.eu/resource/make-fashion-circular/>
- [15] The Issues: Energy <https://www.commonobjective.co/article/the-issues-energy>
- [16] Jaclyn McCosker The Impact of Fast Fashion on Garment Workers  
<https://goodonyou.eco/impact-fast-fashion-garment-workers/>
- [17] xx yy <https://www.oxfam.org.au/what-she-makes/>
- [18] HOW OXFAM IS CREATING A FAIR FASHION INDUSTRY  
<https://borgenproject.org/fair-fashion-industry/>
- [19] India Morrison ALE meta-analysis reveals dissociable networks for affective and discriminative aspects of touch <https://onlinelibrary.wiley.com/doi/10.1002/hbm.23103>
- [20] Peck, J., & Childers, T. L. (2003). To have and to hold: The influence of haptic information on product judgments. *Journal of Marketing*, 67(2), 35-48.
- [21] Klatzky, R. L., Lederman, S., & Reed, C. (1987). There's more to touch than meets the eye: The salience of object attributes for haptics with and without vision. *Journal of Experimental Psychology: General*, 116(4), 356-369.
- [22] Lederman, S. Thorne, G., & Jones, B. (1986). Perception of texture by vision and touch: Multidimensionality and intersensory integration. *Journal of Experimental Psychology: Human Perception and Performance*, 12(2), 169-180.
- [23] Holbrook, M. B. (1986). Aims, concepts, and methods for the representation of individual differences in esthetic responses to design features. *Journal of Consumer Research*, 13(3), 337-347.
- [24] McCabe, D. B., & Stephen, M. N. (2003). Effect of examining actual products or product descriptions on consumer preference. *Journal of Consumer Psychology*, 13(4), 431-449.
- [25] Grohmann, B., Spangenberg, E. R., & Sprott, D. E. (2007). The influence of tactile input on the evaluation of retail product offerings. *Journal of Retailing*, 83(2), 237-245.