**Aim: propose a novel machine learning approach to estimate people’s sensations as well as their liking of the textile being touched**

**Preliminary information**

**EMG**

* Electromyography (EMG) **measures muscle response or electrical activity in response to a nerve's stimulation of the muscle**
* **EMG** is a technique used to evaluate and record the electrical activity produced by skeletal muscles
* The test is used to help detect neuromuscular abnormalities. During the test, one or more small needles (also called electrodes) are inserted through the skin into the muscle.

**EMG Rectification**

EMG Rectification is **the translation of the raw EMG signal to a signal with a single polarity, usually positive**

**IMU data**

An **inertial measurement unit** (**IMU**) is an electronic device that measures and reports a body's [specific force](https://en.wikipedia.org/wiki/Specific_force), angular rate, and sometimes the [orientation](https://en.wikipedia.org/wiki/Orientation_(geometry)) of the body, using a combination of [accelerometers](https://en.wikipedia.org/wiki/Accelerometer), [gyroscopes](https://en.wikipedia.org/wiki/Gyroscope), and sometimes [magnetometers](https://en.wikipedia.org/wiki/Magnetometer).

The 2 common ways of representing IMU data

1. Euler angles
2. Quaternion

* Both euler angles and quaternions are used to represent rotations
* Euler angles are "degree angles" like 90, 180, 45, 30 degrees. Quaternions differ from Euler angles in that they represent a point on a Unit Sphere (the radius is 1 unit). You can think of this sphere as a 3D version of the Unit circle you learn in trigonometry. Quaternions differ from Euler angles in that they use imaginary numbers to define a 3D rotation.

|  |  |
| --- | --- |
| **Euler Angles** | **Quaternion** |
| Euler angles encode a single rotation as 3 sequential rotations | Quaternions encode a single rotation around an arbitrary axis |
| Easier to interpret as it is closer to normal angles | Complex interpretation |
| More susceptible to sensor noise | Less susceptible to sensor noise |
| **Gimbal lock\* occurs** | **Avoids gimbal \*lock** |
|  | Easier for computational purposes (for the computer) and more efficient |

**\*Gimbal lock** is the loss of one [degree of freedom](https://en.wikipedia.org/wiki/Degree_of_freedom_(mechanics)" \o "Degree of freedom (mechanics)) in a three-dimensional, three-[gimbal](https://en.wikipedia.org/wiki/Gimbal" \o "Gimbal) mechanism that occurs when the axes of two of the three gimbals are driven into a parallel configuration, "locking" the system into [rotation](https://en.wikipedia.org/wiki/Rotation" \o "Rotation) in a degenerate two-dimensional space.

Refer **A Tutorial on Euler Angles and Quaternions by Moti Ben-Ari** for more info regarding euler angles and quaternions <https://www.weizmann.ac.il/sci-tea/benari/sites/sci-tea.benari/files/uploads/softwareAndLearningMaterials/quaternion-tutorial-2-0-1.pdf>

**Quaternions**

Text, letter

Description automatically generated

Unit quaternions, known as versors, **provide a convenient mathematical notation for representing spatial orientations and rotations of elements in three dimensional space**.

**Motivation**

Include sections on

1. Importance of touch when purchasing clothes and textiles
2. Internet shopping and the toll it takes on the environment – link it to how consumers can’t touch what they are buying

**Section 1 :**

Studies confirm that consumers heavily rely on their tactile experience when purchasing textiles.

* An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior by Aradhna Krishna (2012): Claims that tactile interaction products influence the evaluation process and the tendency to by products leading to increased attention on touching in the market <https://www.sciencedirect.com/science/article/abs/pii/S1057740811000830>
* Please touch: Object properties that invite touch by Roberta L. Klatzky and Joann Peck (2012)
* The Influence of Visual and Tactile Inputs on Denim Jeans Evaluation by Osmud Rahman
  + According to Peck and Childers (2003)1, touching a product can increase consumers’ confidence on product evaluation and the tactile input is often used to judge a product’s substance (i.e., stiffness, roughness, softness and smoothness) rather than its macro-spatial aspects (i.e., shape and size, unless the visual judgment is unavailable) (Klatzky, Lederman, & Reed, 19872; Lederman, Thorne, & Jones, 19863). According to a study conducted by Holbrook (1986)4, tactile cues were more influential than visual cues in consumers’ evaluations and perceptions of sweaters. However, the salient effect of tactile cues can vary from one product type to another (McCabe & Nowlis, 20035). For instance, consumers rely more often on tactile inputs when evaluating a jacket with diverse material properties (e.g., temperature, weight and texture) than when assessing a rewritable compact disk with limited textual properties. Therefore, sense of touch is often considered as important criterion for the evaluation of products that varied in their textual properties (Grohmann, Spangenberg, & Sprott, 20076). Given this perspective, it is reasonable to suggest that conscious or unconscious tactile feelings play a prominent role in consumers’ perceptions of clothing.

1 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.

2 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.

3 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.

4 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.

5 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.

6 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.

**Section 2:**

With the development of the internet, purchasing clothes online has become increasingly popular. However, this comes with the caveat that individuals can't touch the clothes they are purchasing. They have to rely on the photos and reviews provided regrading the garment. This method is not always successful and results in a wastage of monetary and energy resources.

Refer <https://www.goodhousekeeping.com/uk/consumer-advice/a30926876/environmental-cost-of-online-shopping-returns/> :

* Online shopping is growing in popularity, with 26% of all retail purchases being made online according to the [Office for National Statistics](https://www.ons.gov.uk/)
* 'Bracketing' — the act of buying products with the intention of sending them back — has become so common that around 30-40% of all clothes bought online are returned according to [Eco-Age.](https://eco-age.com/)

<https://www.shopify.co.uk/enterprise/ecommerce-returns> :

* Consumers returned products worth [$428 billion](https://nrf.com/media-center/press-releases/428-billion-merchandise-returned-2020) in 2020—just over 10% of total retail sales. The National Retail Federation estimates the cost of returns amounts to [$101 billion](https://nrf.com/research/customer-returns-retail-industry).
* D[ata suggests](https://www.retaildive.com/library/rakuten-whitepaper-the-right-fit/) that 20% of online-bought products are returned, compared to just 9% of items bought in a brick-and-mortar store

The Influence of Visual and Tactile Inputs on Denim Jeans Evaluation by Osmud Rahman

* In addition, it is interesting to note that many studies (Citrin, Stem, Spangenberg, & Clark, 20037; Lester, Forman, & Loyd, 20058) on Internet-based retailing demonstrate that the main shortcoming of Internet buying is the inability of the consumer to touch the products, making a holistic evaluation impossible to accomplish through this method of shopping. Consumers may feel frustrated or disappointed if they do not have the opportunity to touch and examine the products (Citrin, Stem, Spangenberg, & Clark, 20039; Peck & Childers, 200310); this is particularly true for those consumers where theneed for touch (NFT) is higher.

7 Citrin, A. V., Stem, D. E., Spangenberg, E. R., & Clark, M. J. (2003). Consumer need for tactile input: An internet retailing challenge. *Journal of Business Research*, *56*(11), 915-922.

8 Lester, D. H., Forman, A. M., & Loyd, D. (2005). Internet shopping and buying behavior of college students. *Services Marketing Quarterly*, *27*(2), 123-138.

9 Citrin, A. V., Stem, D. E., Spangenberg, E. R., & Clark, M. J. (2003). Consumer need for tactile input: An internet retailing challenge. *Journal of Business Research*, *56*(11), 915-922.

10 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.

**Literature Review**

Have 2 main sections for the Lit review

1. Explain how people express emotions through touch and the different types of emotions expressed through touch
2. How is this this knowledge used to inform ML techniques (automatic recognition, feature base etc)

* See if there is anything that uses Deep Learning in particular
* ML community has used the psychology (how we express emotions, how we change our muscle activity) to inform the design of features

Section 2:

Machine Learning algorithms such as K-Nearest Neighbours (KNN), Support Vector Machines (SVMs), Linear Discriminant Analysis (LDA), Random Forests and Multi Layer Perceptrons can be used for automatic recognition. However, such methods have the downside that features must be explicitly hand crafted)

For Deep Learning models, feature extraction is a part of the model process. Further, the results produced using DL methods were much better than when traditional ML methods were used

Idea: Use an ML/ DL model for automatic gesture recognition. Use the rating to see if the gesture is good/ bad.

Idea use PCA/ LDA for feature extraction, manually performing feature extraction

Chaeheon\_song – Gets people to explain how they touch, so we can learn the different features that represent a pleasurable touch. Makes you think about what features a machine learning project should use to distinguish something that is pleasurable from a textile perspective

Papers for section 1

Chaeheon\_song – Gets people to explain how they touch, so we can learn the different features that represent a pleasurable touch. Makes you think about what features a machine learning project should use to distinguish something that is pleasurable from a textile perspective

xue may – Shows how by changing the way you touch you change the perception you get

Psychology HCI – Social touch 2006 and 2009

Helps you understand how we interpret touch

If you were doing facial expression recognition thesis, you may have a part of your lit review about how humans express emotions (smile, psychology that identifies how to move the muscles)

Recognising affect from touch in video games Yuan Gao, Nadia Bianchi-Berthouze, and Hongying Meng. 2012.

Understand what is state of the art in automatic recognition in touch – what’s the next step

Use quaternions as they were more stable – why ask nadia to explain this

Rectification – Shift everything to positive

Normalisation – Shift the signal with mean 0, cos different participants may be applying different strengths so we want to remove the variation between participants

Focus on paying attention to

2 ways to represent IMU data

When we work with continuous signals (movement, noise etc – anything temporal) we work with moving windows

Use moving window, overlapping windows

Discuss in future work – variable sensors have the problem of losing data for various reasons

Overview

Fast fashion and its environmental impact

1. <https://earth.org/fast-fashions-detrimental-effect-on-the-environment/>
2. <https://earth.org/what-is-fast-fashion/>
3. <https://goodonyou.eco/what-is-fast-fashion/>
4. <https://www.statista.com/statistics/242114/sales-of-the-leading-10-apparel-retailers-worldwide/>
5. <https://www.bloomberg.com/graphics/2022-fashion-industry-environmental-impact/>
6. <https://unfccc.int/news/fashion-industry-un-pursue-climate-action-for-sustainable-development>
7. <https://www.businessinsider.com/fast-fashion-environmental-impact-pollution-emissions-waste-water-2019-10?r=US&IR=T>
8. <https://waste2fresh.eu/dye-pollution-in-the-textile-industry/>
9. <https://www.unep.org/news-and-stories/story/putting-brakes-fast-fashion>
10. <https://unece.org/fileadmin/DAM/RCM_Website/RFSD_2018_Side_event_sustainable_fashion.pdf>
11. <https://www.wri.org/blog/2019/01/numbers-economic-social-and-environmental-impacts-fast-fashion>
12. <https://portals.iucn.org/library/node/46622>
13. <https://www.stand.earth/sites/stand/files/standearth-fashionforward-roadmaptofossilfreefashion.pdf>
14. <https://www.switch-asia.eu/resource/make-fashion-circular/>
15. <https://www.commonobjective.co/article/the-issues-energy>
16. https://europeandme.eu/the-human-cost-of-cheap-fast-fashion-8-years-after-rana-plaza/

**‘Fast fashion’ refers to speedily and mass-produced, low-quality clothing that is quickly circulated through stores to meet 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].**

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

**The Fast fashion model involves high-speed 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].**

**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 continuously buying clothing and almost immediately discarding them due to its low quality is one of the most significant pitfalls of fast fashion. As a result of immense overproduction and overconsumption, fashion is one of the world’s largest polluters [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), more than international flights and shipping combined. As per the UN Framework Convention on Climate Change, this number is 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, and roughly 2 000 gallons (9092.18 litres) of water is used to produce a pair of jeans. 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. 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].**

**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**

**Talk about tactile experience when shopping**

The production of making plastic fibres into textiles is an [energy-intensive process](https://pdfs.semanticscholar.org/b2de/106e5e0f33478eea88c4592cf0fb63bae7eb.pdf) that requires large amounts of petroleum and releases volatile particulate matter and acids like hydrogen chloride. Additionally, cotton, which is in a large amount of fast fashion products, is also not environmentally friendly to manufacture. Pesticides deemed necessary for the growth of cotton presents health risks to farmers. 1.

### **Environmental impacts of fast fashion**

~~And therein lies the problem. The fast fashion model drives consumers to continuously purchase cheap clothing and discard them quickly due to its poor quality, which are significantly more susceptible to wear and tear. This cycle of buying and discarding creates a huge environmental problem, with the world accumulating mountains of textile and clothing waste every day, most of which are not biodegradable.  2.~~

~~According to~~[~~Business Insider~~](https://www.businessinsider.com/fast-fashion-environmental-impact-pollution-emissions-waste-water-2019-10)~~, fashion production comprises 10% of total global carbon emissions, as much as the European Union.~~ ~~It dries up water sources and pollutes rivers and streams, while 85% of all textiles go to dumps each year.~~ Even washing clothes releases 500 000 tons of microfibres into the ocean each year, the equivalent of 50 billion plastic bottles. 1.

~~According to the~~[~~UN Framework Convention on Climate Change~~](https://unfccc.int/news/fashion-industry-un-pursue-climate-action-for-sustainable-development)~~, emissions from textile manufacturing alone are projected to skyrocket by 60% by 2030.1.~~

The time it takes for a product to go through the supply chain, from design to purchase, is called a ‘[lead time](https://pdfs.semanticscholar.org/b2de/106e5e0f33478eea88c4592cf0fb63bae7eb.pdf)’. In 2012, Zara was able to design, produce and deliver a new garment in two weeks; Forever 21 in six weeks and H&M in eight weeks. This results in the fashion industry producing obscene amounts of waste.1.

~~Water - The environmental impact of fast fashion comprises the depletion of non-renewable sources, emission of greenhouse gases and the use of massive amounts of water and energy. The fashion industry is the second largest consumer industry of water, requiring about~~[~~700 gallons~~](https://www.businessinsider.com/fast-fashion-environmental-impact-pollution-emissions-waste-water-2019-10)~~to produce one cotton shirt and 2 000 gallons of water to produce a pair of jeans.~~[~~Business Insider~~](https://www.businessinsider.com/fast-fashion-environmental-impact-pollution-emissions-waste-water-2019-10#fashion-causes-water-pollution-problems-too-textile-dyeing-is-the-worlds-second-largest-polluter-of-water-since-the-water-leftover-from-the-dyeing-process-is-often-dumped-into-ditches-streams-or-rivers-19)~~also cautions that textile dyeing is the world’s second-largest polluter of water, since the water leftover from the dyeing process is often dumped into ditches, streams or rivers.1~~.

**Microplastics** - Furthermore, brands use synthetic fibres like polyester, nylon and acrylic which take hundreds of years to biodegrade. A [2017 report](https://portals.iucn.org/library/node/46622) from the International Union for Conservation of Nature (IUCN) estimated that 35% of all [microplastics](https://earth.org/are-microplastics-harmful/) – tiny pieces of non-biodegradable plastic – in the ocean come from the laundering of synthetic textiles like polyester. 1.

According to the documentary released in 2015, [The True Cost](https://truecostmovie.com/learn-more/environmental-impact/), the world consumes around 80 billion new pieces of clothing every year, 400% more than the consumption twenty years ago. The average American now generates 82 pounds of textile waste each year. The [production of leather](https://truecostmovie.com/learn-more/environmental-impact/)requires large amounts of feed, land, water and fossil fuels to raise livestock, while the tanning process is among the [most toxic](https://www.hungertv.com/editorial/the-environmental-impact-of-the-leather-industry/) in all of the fashion supply chain because the chemicals used to tan leather- including mineral salts, formaldehyde, coal-tar derivatives and various oils and dyes- is not biodegradable and contaminates water sources. 1.

**Energy** - The production of making plastic fibres into textiles is an [energy-intensive process](https://pdfs.semanticscholar.org/b2de/106e5e0f33478eea88c4592cf0fb63bae7eb.pdf) that requires large amounts of petroleum and releases volatile particulate matter and acids like hydrogen chloride. Additionally, cotton, which is in a large amount of fast fashion products, is also not environmentally friendly to manufacture. Pesticides deemed necessary for the growth of cotton presents health risks to farmers. 1.

To counter this waste caused by fast fashion, more [sustainable fabrics](https://www.beeco.green/blog/clothing-fabrics-sustainability/) that can be used in clothing include wild silk, organic cotton, linen, hemp and lyocell. 1.

People around the world have increasingly become more aware and conscious of their carbon footprint and impacts on the environment, especially in light of global warming and the worsening effects of the climate crisis. The fashion industry, and in particular, fast fashion companies, have come under the spotlight for its contribution to global waste and climate change. But what exactly is fast fashion? 2.

Globally, an estimated [92 million tonnes of textiles waste](https://globalfashionagenda.com/wp-content/uploads/2017/05/Pulse-of-the-Fashion-Industry_2017.pdf) is produced every year and that number is expected to soar up to 134 million tonnes a year by 2030. 2.

But textile waste is not the only environmental impact to come out from the fashion industry. Meeting the excessively high demand of clothing, especially the production of synthetic fibres, requires huge amounts of energy. The fashion industry accounts for nearly up to 10% of global carbon emissions, which is more than [both the aviation and shipping sectors combined](https://unfccc.int/news/un-helps-fashion-industry-shift-to-low-carbon), and nearly 20% of global wastewater, or around 93 billion cubic metres from textile dyeing, according to the [UN Environment Programme](https://www.unep.org/news-and-stories/story/putting-brakes-fast-fashion). 2.

Despite this, fast fashion companies and retailers have no real interest or incentives to change its current business model when it’s proven to be so profitable so far. Furthermore, manufacturers cut production costs even more by using synthetic and chemically treated materials rather than organic ones in order to lower prices and encourage more consumption. 2.

Global consumption of clothing has been exponentially increasing, and the fast fashion industry isn’t going away anytime soon. Since 2000, clothing sales have doubled from 100 to 200 billion units a year. At the same time, the average number of times an item was worn decreased by 36% overall.  2.

Much like the argument to switch to a [plant-based diet](https://earth.org/veganism-land-use/) to help reduce deforestation and carbon emissions, it is up to consumers to actively choose to avoid fast fashion brands, and to support more sustainable and socially conscious labels in order to alleviate the devastating environmental impacts of the industry.  2.

## **What is fast fashion?**

## **How did fast fashion happen?**

To understand how fast fashion came to be, we need to rewind a bit. Before the 1800s, fashion was slow. You had to source your own materials like wool or leather, prepare them, weave them, and then make the clothes. 3.

The Industrial Revolution introduced new technology—like the sewing machine. Clothes became easier, quicker, and cheaper to make. Dressmaking shops emerged to cater to the middle classes. 3.

Many of these dressmaking shops used teams of garment workers or home workers. Around this time, sweatshops emerged, along with some familiar safety issues. The first significant garment factory disaster was when a fire broke out in New York’s Triangle Shirtwaist Factory in 1911. [It claimed the lives of 146 garment workers, many of whom were young female immigrants](https://fashionista.com/2016/06/what-is-fast-fashion). 3.

By the 1960s and 70s, young people were creating new trends, and clothing became a form of personal expression, but there was still a distinction between high fashion and high street. 3.

In the late 1990s and 2000s, low-cost fashion reached a peak. Online shopping took off, and fast-fashion retailers like [H&M](https://directory.goodonyou.eco/brand/h-and-m), [Zara](https://directory.goodonyou.eco/brand/zara), and [Topshop](https://directory.goodonyou.eco/brand/topshop) took over the high street. These brands took the looks and design elements from the top fashion houses and reproduced them quickly and cheaply. With everyone now able to shop for on-trend clothes whenever they wanted, it’s easy to understand how the phenomenon caught on. 3.

## **Why is fast fashion bad?**

### **Polluting our planet**

[Fast fashion’s impact on the planet is immense](https://goodonyou.eco/fast-fashions-environmental-impact/). The pressure to reduce costs and speed up production time means environmental corners are more likely to be cut. Fast fashion’s negative impact includes its use of cheap, [toxic textile dyes](https://goodonyou.eco/textile-dyes-pollution/)—making the fashion industry the one of the largest polluters of clean water globally, right up there with agriculture. That’s why Greenpeace has been pressuring brands to remove dangerous chemicals from their supply chains through its [detoxing fashion](https://www.greenpeace.org/international/publication/17612/destination-zero/) campaigns through the years. 3.

Cheap textiles also increase fast fashion’s impact. [Polyester](https://goodonyou.eco/material-guide-polyester-2/) is one of the most popular fabrics. It is derived from fossil fuels, contributes to global warming, and can shed [microfibres](https://goodonyou.eco/what-to-do-about-microfibres/) that add to the increasing levels of plastic in our oceans when washed. But even “natural” fabrics can be a problem at the scale fast fashion demands. [Conventional cotton](https://goodonyou.eco/how-sustainable-is-cotton/) requires enormous quantities of water and pesticides in developing countries. This results in drought risks and creates extreme stress on water basins and competition for resources between companies and local communities. 3.

The constant speed and demand mean increased stress on other environmental areas such as land clearing, biodiversity, and soil quality. The processing of leather also impacts the environment, [with 300kg of chemicals added to every 900kg of animal hides tanned.](https://goodonyou.eco/the-hidden-costs-of-leather/) 3.

The speed at which garments are produced also means that more and more clothes are disposed of by consumers, creating massive textile waste. According to some statistics, in Australia alone, [more than 500 million kilos of unwanted clothing ends up in landfill every year](https://www.theguardian.com/commentisfree/2019/aug/27/australia-recycles-paper-and-plastics-so-why-does-clothing-end-up-in-landfill#:~:text=More%20than%20501m%20kg%20of,the%2094m%20kg%20exported%20overseas.). 3.

16 https://goodonyou.eco/impact-fast-fashion-garment-workers/

17 <https://www.oxfam.org.au/what-she-makes/>

18 https://borgenproject.org/fair-fashion-industry/

In addition to the toll that fast fashion imposes on the environment, there is also a human cost involved. Garment workers in the global South pay a large price so that fast fashion brands can keep their profits high and price tags low. Garment workers are not paid enough to live on and are forced to work long hours in abysmal conditions. An[Oxfam 2019 report](https://whatshemakes.oxfam.org.au/wp-content/uploads/2019/02/Made-in-Poverty-the-True-Price-of-Fashion.-Oxfam-Australia..pdf" \t "_blank) found that 0% of Bangladeshi garment workers and 1% of Vietnamese garment workers earned a living wage.  Nine of 10 Bangladeshi workers starve because they cannot afford to feed themselves 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, 7 days a week. The deadly Rana Plaza collapse in 2013 which killed 1134 people and injured a further 2500 others is a testament to the unacceptable working conditions of the fashion industry. Employees usually work with **no ventilation**, **breathing in toxic substances**, **inhaling fiber dust** or blasted sand in **unsafe buildings**. Accidents, fires, injuries, and disease are very frequent occurrences on textile production sites. [16, 17, 18]

Animals are also impacted by fast fashion. The toxic dyes and microfplastics released into waterways are ingested by animals living on both land and in the sea and this will most likely kill them. Using animal products such leather, fur, and wool directly puts animal welfare at risk [3].

As an example, numerous scandals reveal that real fur, including cat and dog fur, is often being [passed off as faux fur to unknowing shoppers.](https://www.theage.com.au/national/victoria/real-fur-from-tortured-dogs-being-sold-as-fake-in-melbourne-s-markets-20191121-p53cw2.html) The truth is that there is so much real fur being produced under terrible conditions in fur farms that it’s become cheaper to produce and buy than faux fur. 3.

*Everything has a cost, including fast fashion. While many of Europe’s favourite retail fashion brands are cheap for consumers, garment workers in the Global South pay a high price so companies can keep profits high and price tags low. The deadly Rana Plaza fire in 2013 was testament to that. 6th Sense staff writer Martyna Leśniak writes about what happened since the fire – and how an accord drawn up to protect garment workers in the wake of the tragedy is currently set to expire without replacement.*

 1,134 people died, and over 2,500 were injured

### **Exploiting workers**

As well as the environmental cost of fast fashion, there’s a human cost. 3.

[Fast fashion impacts garment workers](https://goodonyou.eco/the-impact-of-fast-fashion-on-women-in-developing-nations/) who work in dangerous environments, for low wages, and without fundamental human rights. Further down the supply chain, [the farmers may work with toxic chemicals](https://goodonyou.eco/human-rights-animal-supply-chains/) and brutal practices that can have devastating impacts on their physical and mental health, a plight highlighted by the documentary “[The True Cost](https://truecostmovie.com/)“. 3.

### **Harming animals**

Animals are also impacted by fast fashion. In the wild, the toxic dyes and microfibres released in waterways are ingested by land and marine life alike through the food chain to devastating effect. And when animal products such as leather, fur, and even wool are used in fashion directly, animal welfare is put at risk. As an example, numerous scandals reveal that real fur, including cat and dog fur, is often being [passed off as faux fur to unknowing shoppers.](https://www.theage.com.au/national/victoria/real-fur-from-tortured-dogs-being-sold-as-fake-in-melbourne-s-markets-20191121-p53cw2.html) The truth is that there is so much real fur being produced under terrible conditions in fur farms that it’s become cheaper to produce and buy than faux fur. 3.

### **Coercing consumers**

Finally, fast fashion can impact consumers themselves, encouraging a “throw-away” culture because of both the built-in obsolescence of the products and the speed at which trends emerge. Fast fashion makes us believe we need to shop more and more to stay on top of trends, creating a constant sense of need and ultimate dissatisfaction. [The trend has also been criticised on intellectual property grounds, with some designers alleging that retailers have illegally mass-produced their designs](https://www.independent.co.uk/life-style/fashion/environment-costs-fast-fashion-pollution-waste-sustainability-a8139386.html). 3.

**What is fast fashion?**

* ~~cheaply, speedily produced~~
* ~~low quality clothing~~
* cheaply priced garments
* ~~copy the latest catwalk or celebrity styles~~
* ~~pumped quickly through stores in order to maximise on current trends/ meet the latest trends~~
* ~~involves the rapid design, production, distribution, and marketing of clothing,~~
* ~~which means that retailers are able to pull large quantities of greater product variety and allow consumers to get more fashion and product differentiation at a low price~~
* ~~rapid design, production, distribution and marketing, allowing brands and retailers to pull large quantities of greater product variety and allow consumers to get more style and product differentiation at a low price.~~

~~The term ‘~~[~~fast fashion~~](https://earth.org/what-is-fast-fashion/)~~’ has become more prominent in conversations surrounding fashion, sustainability, and environmental consciousness. The term refers to ‘cheaply produced and priced garments that copy the latest catwalk styles and get pumped quickly through stores in order t~~o maximise on current trends’. 1.

~~The fast fashion model is so-called because it involves the rapid design, production, distribution, and marketing of clothing, which means that retailers are able to pull large quantities of greater product variety and allow consumers to get more fashion and product differentiation at a low price. 1.~~

~~The term ‘fast fashion’ refers to a large sector of the fashion industry whose business model relies on cheap and speedy production of low quality clothing, which gets pumped quickly through stores in order to meet the latest and newest trends. 2.~~

~~The fast fashion business model involves rapid design, production, distribution and marketing, allowing brands and retailers to pull large quantities of greater product variety and allow consumers to get more style and product differentiation at a low price. 2.~~

However, a system that relies on such cheap and rapid production only encourages excessive consumption as people are inherently attracted to low priced goods, many of which are slaves to the latest trends. For individual consumers, it is also easier and more economic to snatch up cheap clothing that have short life spans compared to splurging on high quality, long lasting items that will very shortly fall out of popularity. 2.

~~Fast fashion can be defined as cheap, trendy clothing that samples ideas from the catwalk or celebrity culture and turns them into garments in high street stores at breakneck speed to meet consumer demand. The idea is to get the newest styles on the market as fast as possible, so shoppers can snap them up while they are still at the height of their popularity and then, sadly, discard them after a few wears. It plays into the idea that outfit repeating is a fashion faux pas and that if you want to stay relevant, you have to sport the latest looks as they happen.~~ It forms a key part of the toxic system of overproduction and consumption that has made fashion [one of the world’s largest polluters](https://goodonyou.eco/waste-luxury-fashion/). Before we can go about changing it, let’s take a look at the history. 3.

**History of fast fashion**

The term was first used at the beginning of the 1990s, when when Zara landed in New York. “Fast fashion” was coined by the New York Times to describe Zara’s mission to take only [15 days](https://goodonyou.eco/what-is-fast-fashion/#:~:text=When%20Zara%20landed%20in%20New,to%20being%20sold%20in%20stores.) for a garment to go from the design stage to being sold in stores. The [biggest players in the fast fashion world](https://earth.org/fast-fashion-companies/) include Zara, UNIQLO, Forever 21 and H&M. 1.

The term was first coined by the *New York Times* in the early 1990s when Spanish apparel giant Zara arrived in New York, to describe the brand’s mission to take only [15 days](https://goodonyou.eco/what-is-fast-fashion/#:~:text=When%20Zara%20landed%20in%20New,to%20being%20sold%20in%20stores.) for a garment to go from the design stage to being sold in stores. Some of the biggest and most notable fast fashion brands in the world include the likes of UNIQLO, Forever 21 and H&M. 2.

Clothes shopping used to be an occasional event—something that happened a few times a year when the seasons changed or when we outgrew what we had. But about 20 years ago, something changed. Clothes became cheaper, trend cycles sped up, and shopping became a hobby. Enter fast fashion and the global chains that now dominate our high streets and [online shopping](https://goodonyou.eco/5-tips-to-shop-online-sustainably/). But what is fast fashion? Why is fast fashion so bad? And how exactly does it impact people, the planet, and animals? 3.

It was all too good to be true in the oughties. All these stores selling cool, trendy clothing you could buy with your loose change, wear a handful of times, and then throw away. Suddenly everyone could afford to dress like their favourite celebrity or wear the latest trends fresh from the catwalk. 3.

Then in 2013, the world had a reality check when the [Rana Plaza clothing manufacturing complex in Bangladesh collapsed](https://goodonyou.eco/rana-plaza/), killing over 1,000 workers. That’s when consumers really started questioning fast fashion and wondering at [the true cost of those $5 t-shirts](https://goodonyou.eco/ethical-clothing-expensive/). If you’re reading this article, you might already be aware of fast fashion’s dark side, but it’s worth exploring how the industry got to this point—and how we can help to change it. 3.

And therein lies the problem. The fast fashion model drives consumers to continuously purchase cheap clothing and discard them quickly due to its poor quality, which are significantly more susceptible to wear and tear. This cycle of buying and discarding creates a huge environmental problem, with the world accumulating mountains of textile and clothing waste every day, most of which are not biodegradable.  2.

However, fast fashion encourages overproduction and overconsumption. As fast fashion relies on cheap and quick production, it encourages excessive consumption as people are inherently attracted to low priced goods, many of which are slaves to the latest trends. For individual consumers, it is also easier and more economic to snatch up cheap clothing that have short life spans compared to splurging on high quality, long lasting items that will very shortly fall out of popularity. 2.

It forms a key part of the toxic system of overproduction and consumption that has made fashion [one of the world’s largest polluters](https://goodonyou.eco/waste-luxury-fashion/).