FlexiPlay : Web-based Interactive 3D Cloth Simulation

Graduation Thesis Seminar I
: Research Topic & Method

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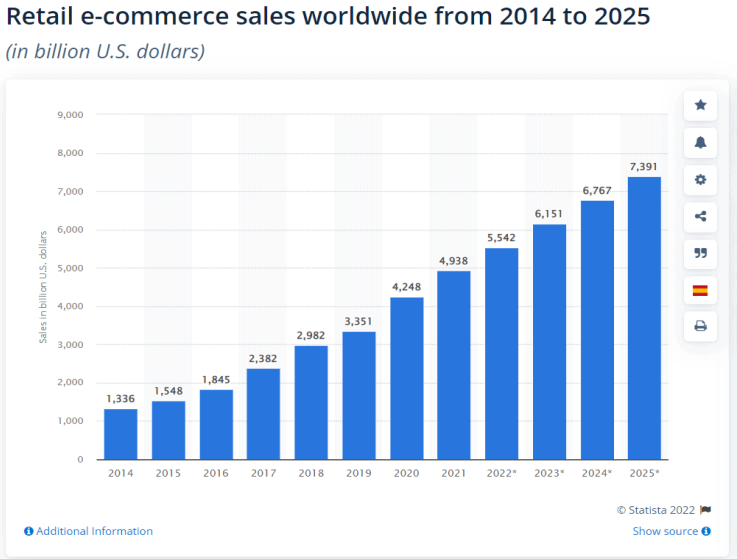
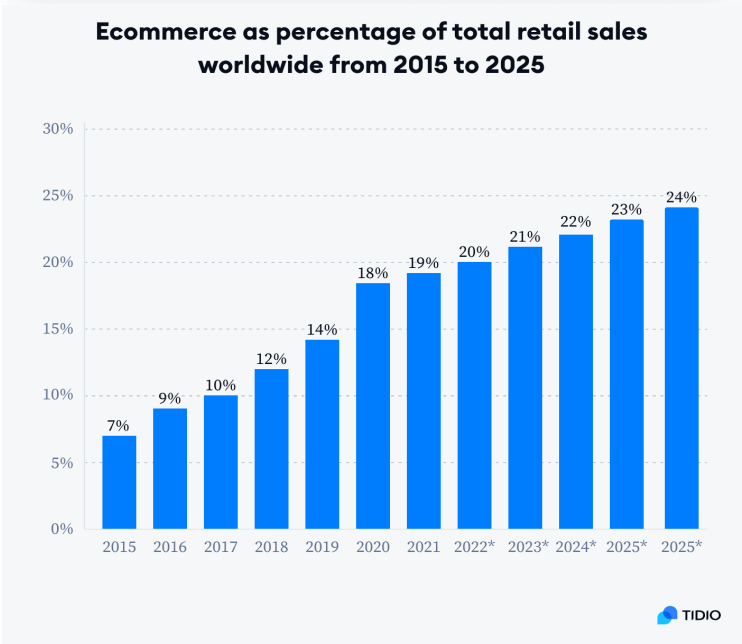
Intro Online shopping lacks tactile product experience





Retail E–commerce sales worldwide

7,391B USD in 2025

E–commerce as percentage of total retail sales worldwide

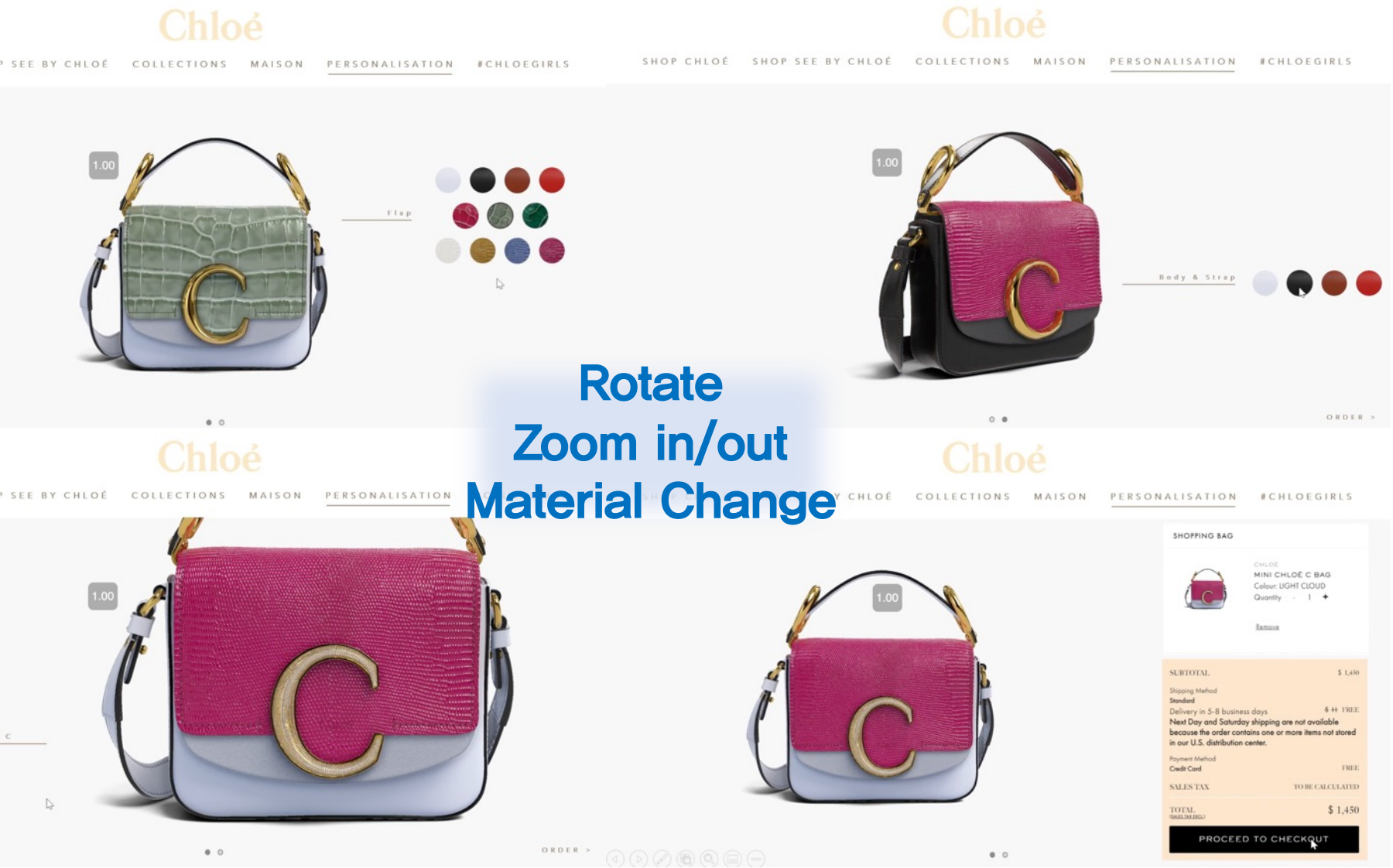
24% in 2025

Most major brands have their own web-shops and there are numerous retailers who focus exclusively on online sales.

While online shopping is convenient and simple, **it cannot replace the actual physical experience of touching the items** you would like to buy.

This often leaves the consumer with doubts about confidence in purchases.

Intro Existing Solutions provide limited interactions



Rotate
Zoom in/out
Material Change

Source : SmartPixels
https://www.smartpixels.fr/

3d model creation

3d scan (photogrammetry)
+ product modeling + render

Maya Unity 3D

+

Render (Web)

<model-viewer>

three.js JS

Intro Examples of Elastic E-commerce products

Elasticity visualization can enhance the shopping experience for a variety of e-commerce products, but it is particularly **valuable for products where fabric and material characteristics**, as well as fit and comfort, **are essential considerations.**

Some types of e-commerce products for which elasticity visualization can make a significant difference are :

Footwear

Shoes and sneakers, especially those with stretchable materials or designs that affect comfort and fit.

Undergarments and Hosiery

Bras, underwear, and shapewear, as elasticity plays a significant role in support and fit.

Tights, stockings, and socks, where elasticity determines how well they stay in place and conform to the legs.

Home Textiles

Bedding, blankets, and towels, where customers may want to understand the feel and durability of the fabric.

Maternity and Baby Products

Maternity wear and baby clothing, where comfort and flexibility are vital for both expectant mothers and infants.

Outdoor Gear

Tents, sleeping bags, and camping gear, where elasticity can impact durability and comfort.

Medical Products

Compression garments and orthopedic braces, where proper fit and support are critical for health and comfort.

Clothing and Apparel

Clothing items such as dresses, jeans, shirts, and lingerie, where the fit, drape, and stretch of the fabric are crucial for customer satisfaction.

Sportswear and activewear, where elasticity and flexibility affect performance and comfort.

Furniture Upholstery

Sofas, chairs, and cushions, where customers may want to visualize how the fabric stretches and conforms to their body.

Smart Clothing and Wearables

Wearable technology integrated into clothing, where elasticity affects the placement and comfort of sensors and devices.

Research Topic

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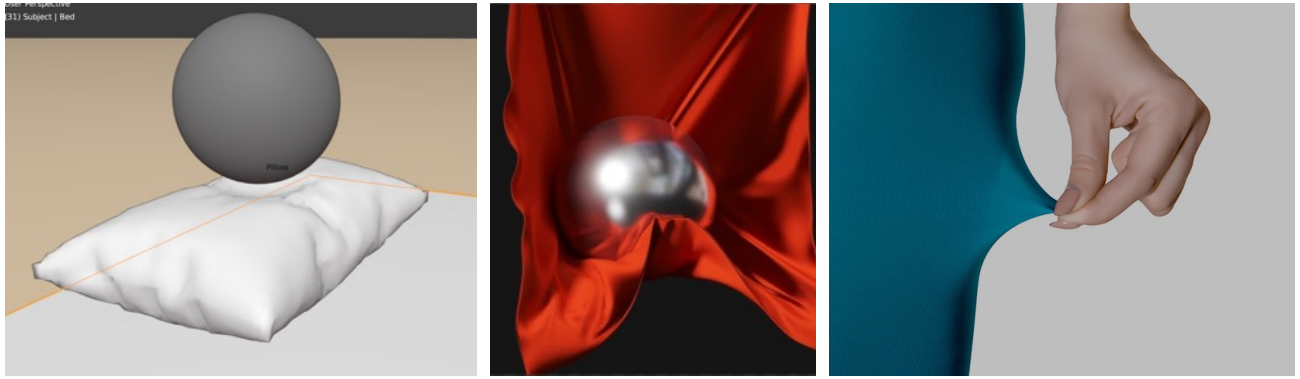
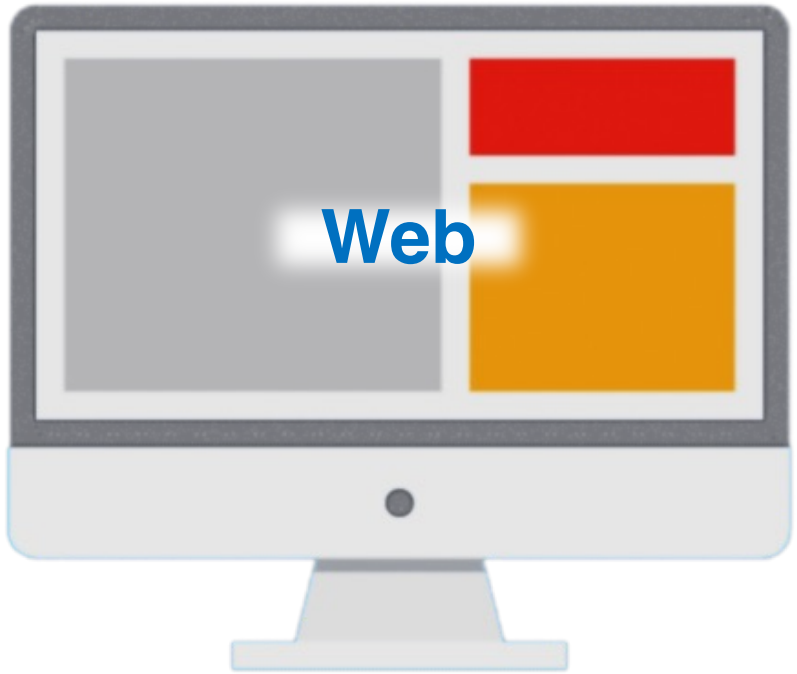


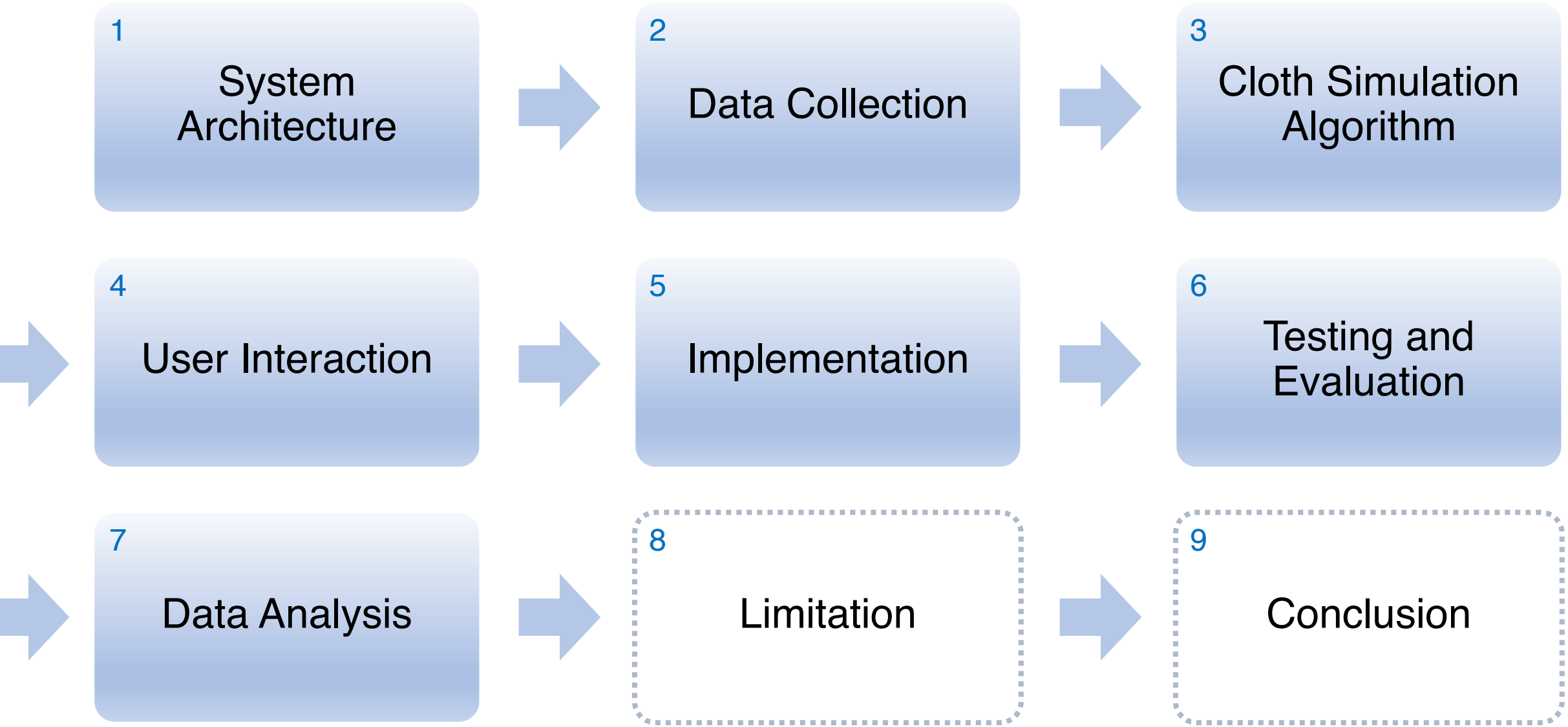
This research aims to develop a **web-based system** with a user-friendly interface for **interactive 3D cloth simulation**.

The primary objective is to provide users with an intuitive experience in understanding the **elasticity of 3D cloth**, thereby enhancing user interactions with virtual cloth.

Example of Clothes : woven, knitted, or non-woven



Research Method



Research Method

1 System Architecture

Front-end

- React (user interaction)
- Three.js, ModelViewer (3d rendering)

Back-end

- Supabase or Firebase (serverless DB)
- CloudFlare (for caching and speed optimization)

* List above is subject to change

2 Data Collection

Gather data for research, such as :

- Cloth material properties
- Tensile properties of the fabric and the garment pressure
- Elastic behavior of stretched cloth

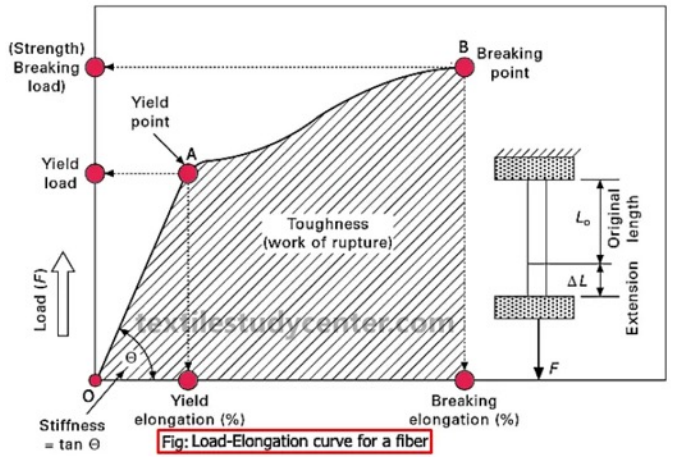
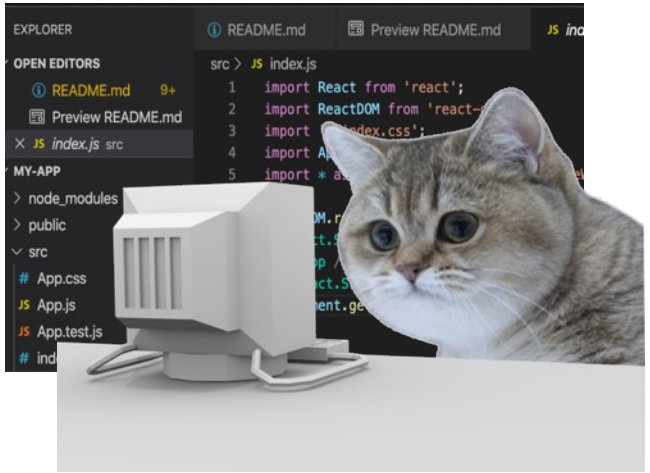


Fig: Load-Elongation curve for a fiber

3 Cloth Simulation Algorithm

Write an algorithm simulating cloth elasticity with user interaction and build web pilot system.



Research Method

4 User Interaction

5 Implementation

6 Testing and Evaluation

GUI

Describe how users interact with the system's GUI. Users can adjust cloth elasticity parameters.

*to be added

User Controls / Input Methods

Mouse

• Click and Drag

Touch Interaction

• One-Finger Pan

Host service online with vercel

Usability Testing

Gather user feedback on the interface and interaction.

Performance Testing

Assess the system's speed and responsiveness with tests and performance benchmarks.

Research Method

7

Data Analysis

Analyze the data collected during testing and evaluation.
Use statistical methods or tools to draw conclusions from the data.
*to be added

8

Limitation

N/A

9

Conclusion

N/A