Alpha Presentation
FIBRE: Fabric Identification Based Recommendation Engine

The Capstone Experience

Team Herman Miller

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Ted Stacy
David Xuan

Department of Computer Science and Engineering
Michigan State University
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Project Overview

• FIBRE is an AI system, composed of a classification and recommendation engine.
• The classification component uses deep learning and computer vision models to objectively classify fabrics.
• The recommendation engine correlates any fabric a customer may submit with Herman Miller fabrics.
System Architecture
FIBRE Fabric Upload

Choosing *fabrics* made easy.
FIBRE Fabric Classification (Single)

Classification Result for 1 Fabric

Color: yellow, brown
Pattern: woven
FIBRE Fabric Classification (Multiple)

Classification Results for 6 Fabrics

- Color: beige
  Pattern: solid texture

- Color: brown, gray, red, beige
  Pattern: botanical

- Color: pink, white, beige, red, gray, violet
  Pattern: abstract

- Color: orange, red
  Pattern: solid texture
FIBRE Recommendation

Customer’s Requested Fabric

Color: brown, gray, red, beige
Pattern: botanical

Fabric Recommendations

- Hand Tinted Rose
- Whirl Breeze
- Kicksilver
- Scape Nighthawk
Recommendation Engine

RDS Database

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Recommendation Engine

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Color Classifier

Pattern Classifier
Recommendation Engine

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Recommendation Engine

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Recommendation Engine

Query Image

\[
q = \begin{array}{cccccccccccccc}
0 & 0.7 & 0 & 0.1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & s
\end{array}
\]

Color Classifier

Pattern Classifier

Recommendation Engine API
Recommendation Engine

\[ q = \begin{array}{cccccccccccccc}
0 & 0.7 & 0 & 0.1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & s \\
\end{array} \]

Match score algorithm

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Recommendation Engine

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Match score algorithm
Recommendation Engine

\[ q = \begin{bmatrix} 0 & 0.7 & 0 & 0.1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & s \end{bmatrix} \]

**RDS Database**

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\]
Recommendation Engine

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Match score algorithm
Recommendation Engine

$$q = 0 \ 0.7 \ 0 \ 0.1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ s$$

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$$p = s$$
Recommendation Engine

s
0.2
0.6
0.3
0.1
Recommendation Engine

<table>
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</table>
Recommendation Engine

\[ s_r \]

\[ \begin{array}{c}
0.1 \\
0.2 \\
0.3 \\
0.6 \\
\end{array} \]

\[ q = \]

[Diagram of a square]
Recommendation Engine

\[ s_r \]

- 0.1
- 0.2
- 0.3
- 0.6

\[ q = \]
Recommendation Engine

\[ s_r \]

| 0.1 |
| 0.2 |
| 0.3 |
| 0.6 |

\[ q = \]

[Image of fabric samples]
Recommendation Engine

\[ q = s_r \]

- 0.1
- 0.2
- 0.3
- 0.6
Recommendation Engine

\[ s_r \]
- 0.1
- 0.2
- 0.3
- 0.6

\[ q = \]
Match Score Equation

\[ s = -\frac{q_n \cdot \mathbf{p}}{2} + \sum_{i=1}^{n} q_i |e_i - q_i| \]

\( s = \text{match score} \)
\( q = \text{query feature vector} \)
\( e = \text{entry in database} \)
\( \mathbf{p} = 1 \text{ if pattern match, 0 if no pattern match} \)
\( n = \text{number of color classes in query image} \)
What’s left to do?

• Conform UI to be more similar to Herman Miller’s Design
• Improve UX to make frontend more user friendly
• Continue to migrate Heroku APIs and frontend to AWS
• Implement AWS Security
Questions?