Collaboration Between Fashion and Engineering: How Do Fashion Students Apply the Visual Attention Prediction?

Seung-Hee Lee, Ying Chen, Gokarna Karki, Pukar, Bhandari & Jun Qin
Southern Illinois University

Keywords: collaboration, fashion and engineering, visual attention prediction

Introduction. Visual images are effective in conveying messages that words cannot. Consumers' visual attention to fashion images has become increasingly critical to the fashion industry. Previous studies have investigated visual attention to fashion images in marketing (Simmonds et al., 2020) and engineering (e.g., Mahdi et al., 2017). Digital devices and fashion software programs offer innovative and effective tools for predicting consumers' visual attention. Saliency modeling has become a crucial technical tool for predicting human visual attention in many fields (Novin et al., 2023), especially in fashion (Lee et al., 2021). Understanding how fashion consumers' visual attention to fashion images can be predicted and where they tend to look can be highly advantageous for fashion students as new hires. However, since no fashion program in universities teaches students about saliency prediction models, it is significant for fashion educators to seek ways to collaborate with engineering and to incorporate the knowledge into the teaching and learning environment, which can be an innovative attempt in the fashion area.
Purpose of the Project. As a collaborative approach, this project aims to (1) help students understand and experience saliency-based models for visual attention prediction - an innovative program developed by the engineering faculty; (2) enable fashion educators to use these saliency prediction models for the curriculum; and (3) apply the results of this collaborative education to the career development of fashion students.
Implementation of Strategy
Prior Knowledge: For this project, engineering researchers developed an educational tool using MATLAB software for fashion students to understand saliency prediction models. Ten fashion undergraduate students participated in the project. The researchers explained the learning objectives and introduced the students to saliency maps, distributing guidelines for using the MATLAB. This project consists of four parts.
Part 1: Mouse-click and eye-tracking heat map: Students can view the saliency map, which includes mouse-click and eye-tracking data, by opening MATLAB. They can select and click on the 20 fashion images used in previous studies (Lee et al., 2020) and visualize the distributions of human fixation data on the fashion images. The students can learn where consumers look when viewing fashion images through this data.
Part 2: Create saliency models: The students could run two classic saliency maps (Borji and Itti's model, 2012; Harel, Koch, & Perona's GBVS model, 2006) by selecting the fashion images they want to see. They could then compare the resulting saliency prediction maps with the experimental human fixation data, which predict where people view fashion images.

Part 3: Practice- Apply students' own images and create saliency models for the images: Students can apply their own fashion images to two saliency models (Itti-Koch & GBVS models), to predict human visual attentions on their fashion images.
Part 4: Assessment: After completing the three parts, each participant was asked to answer the following questions: 1) Have you heard of or had experience with eye-tracking or mouse-clicking before? 2) How was your experience using Saliency Models, and what did you learn? 3) Based on today's experience, how can you apply this saliency model in the future?

Learning Outcomes

From this project, students could compare where people are paying attention in images similar to the saliency prediction maps and experimental human fixation data. They learned that the saliency model could effectively predict consumers' views on various fields of the fashion industry (e.g., advertising, clothing design process, web design). Figure 1 shows six fashion image examples results generated in parts 1 and 2 experiments.

Experience and Learning: The researchers evaluated what the students learned and how the saliency models can be applied. In their feedback, most students were not aware of and no one had experience with eye-tracking/mouse-clicking. Overall, the project provided a unique and innovative learning experience in the class, and students wanted to learn the program in fashion classes. "I learned that certain parts of a garment are more eye-catching than others and affect how people perceive them." "I found it interesting plus was good to see the school is producing such work." "A lot more goes into advertising than I thought. Technology can help us sell better." "I think it's important to know where your eyes are drawn to and what consumers pay attention to." "I learned that viewers tend to focus their interest on the brand logo and products centered in the image as well as the eyes and faces of the models."

Application: The students perceived the saliency model as a valuable asset for future job prospects. "I think the saliency model could be very useful in my future job as a fashion buyer or merchandiser by forecasting of customer's visual attention of advertisements and providing guidance for future marketing purposes and solution." "I would apply this model to the fashion industry & my job in the future by using ads to see if viewers look at the interesting part first." "It would be very beneficial to use this model before finalizing an ad or merchandising display to see if people are looking where you want them to, or if you need to rethink your design or colors." "I feel this could be used to help understand the best parts of the design and help with marketing. Fashion retailers can understand what products in catalog grabs more attention."

Conclusion/Implications. This project provided fashion students with a unique, new, and innovative learning experience. This project will benefit fashion students to gain a competitive edge in the job market, applying saliency models to predict consumers' views. This collaboration project can provide an excellent example of how advanced engineering theory and technology can be used in fashion, which still needs theory and technology applications.

References

Borji, A., &Itti, L. (2012). State-of-the-art in visual attention modeling. *IEEE transactions on pattern analysis and machine intelligenc*e, 35(1), 185-207.

Harel, J., Koch, C., &Perona, P. (2006). Graph-based visual saliency. *Advances in neural information processing systems*, *19*.

Lee, S. H., Liang, Y., Chen, Y., Mahdi, A., & Qin, J. (2021). Can consumers' visual attention be predictable? A saliency modelling-based approach on fashion advertisements. *International Journal of Fashion Design, Technology and Education, 14*(3), 253-262.

Mahdi, A., Su M., Schlesinger M., & Qin J. (2017). A comparison study of saliency models for fixation prediction on infants and adults. *IEEE Transactions on Cognitive and Developmental Systems, 10*(3), 485-498.

Novin, S., Fallah, A., Rashidi, S., &Daliri, M. R. (2023). An improved saliency model of visual attention dependent on image content. *Frontiers in Human Neuroscience, 16*, 862588.

Simmonds, L., Bellman, S., Kennedy, R., Nenycz-Thiel, M., &Bogomolova, S. (2020). Moderating effects of prior brand usage on visual attention to video advertising and recall: An eye-tracking investigation. *Journal of Business Research, 111*, 241-248.