

Neuroaesthetics in Fashion: Modeling the Perception of Fashionability

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Fashion has a tremendous impact on our society. Clothing typically reflects the person's social status and thus puts pressure on how to dress to fit a particular occasion. Its importance becomes even more pronounced due to online social sites like Facebook and Instagram where one's photographs are shared with the world. We also live in a technological era where a significant portion of the population looks for their dream partner on online dating sites. People want to look good; business or casual, elegant or sporty, sexy but not slutty, and of course trendy, particularly so when putting their picture online. This is reflected in the growing online retail sales, reaching 370 billion dollars in the US by 2017, and 191 billion euros in Europe [1].

In this paper, our goal is to predict how fashionable a person looks on a particular photograph. The fashionability is affected by the garments the subject is wearing, but also by a large number of other factors such as how appealing the scene behind the person is, how the image was taken, how visually appealing the person is, her/his age, etc. The garment itself being fashionable is also not a perfect indicator of someone's fashionability as people typically also judge how well the garments align with someone's "look", body characteristics, or even personality. Our aim here is to give a rich feedback to the user: not only whether the photograph is appealing or not, but also to make suggestions of what clothing or even the scenery the user could change in order to improve her/his look, as illustrated in Fig. 1. We parametrize the problem with a Conditional Random Field that jointly reasons about several important fashionability factors: the type of outfit and garments, the type of user, the setting/scenery of the photograph, and fashionability of the user's photograph. Our model exploits several domain-inspired features, such as beauty, age and mood inferred from the image, the scene type of the photograph, and if available, meta-data in the form of where the user is from, how many online followers she/he has, the sentiment of comments by other users, etc. An illustration of our model can be seen in Fig. 2.

Since no dataset with such data exists, we collected a novel dataset that consists of 144,169 user posts from the largest clothing-oriented social website chictopia.com. In a post, a user publishes one to six photographs of her/himself wearing a new outfit. Generally each photograph shows a different angle of the user or zooms in on different garments. Users sometimes also add a description of the outfit, and/or tags of the types and colors of the garments they are wearing. Not all users make this information available, and even if they do, the tags are usually not complete, i.e. not all garments are tagged. Users typically also reveal their geographic location, which, according to our analysis, is an important factor on how fashionability is being perceived by the visitors of the post. Other users can then view these posts, leave comments and suggestions, give a "like" vote, tag the post as a "favorite", or become a "follower" of the user. There are no "dislike" votes making the data challenging to work with from the learning perspective. An example of a post can be seen in Fig. 3.

Whether a person on a photograph is truly fashionable is probably best decided by fashion experts. It is also to some extent a matter of personal taste, and probably even depends on the nationality and the gender of the viewer. Here we opt for leveraging the taste of the public as a proxy for fashionability. In particular, we base our measure of interest on each post's number of votes, analogous to "likes" on other websites. The main issue with votes is the strong correlation with the time when the post was published. Since the number of users fluctuate, so does the number of votes. Furthermore, in the first months or a year since the website was created, the number of users (voters) was significantly lower than in the recent years. For this purpose we apply a normalization stage to remove the effect of the date on the votes.

We provide a detailed analysis of the data, in terms of fashionability scores across the world and the types of outfits people in different parts of

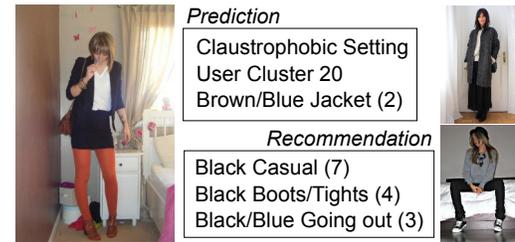


Figure 1: Example of recommendations provided by our model for the post on the left. In this case the user is wearing what we have identified as "Brown/Blue Jacket". This photograph obtains a score of 2 out of 10 in fashionability. Additionally the user is classified as belonging to cluster 20 and took a picture in the "Claustrophobic" setting. If the user were to wear a "Black Casual" outfit as seen on the right, our model predicts she would improve her fashionability to 7 out of 10. This prediction is conditioned on the user, setting and other factors allowing the recommendations to be tailored to each particular user.

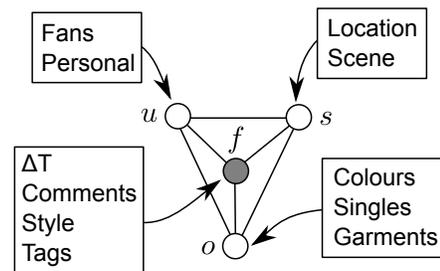


Figure 2: An overview of the CRF model and the features used by each of the nodes.

the world wear. We also analyze outfit trends through the last six years of posts spanned by our dataset. Such analysis is important for the users, as they can adapt to the trends in "real-time" as well as to the fashion industry which can adapt their new designs based on the popularity of garments types in different social and age groups.

This is an important first step to be able to build more complex and powerful models that will be able to understand fashion, trends, and users a whole in order to improve the experience of users in the modern day society. We will make the dataset and code public in hopes that this will inspire other researchers to tackle this challenging task.

- [1] Forbes Magazine. US Online Retail Sales To Reach \$370B By 2017; €191B in Europe. <http://www.forbes.com>, 2013. [Online; accessed 14-March-2013].



LOS ANGELES, CA

466 FANS
288 VOTES
62 FAVOURITES

TAGS

CHIC
EVERDAY
FALL

COLOURS

WHITE-BOOTS

NOVEMBER 10, 2014

GARMENTS

White Cheap Monday Boots
Chilli Beans Sunglasses
Missguided Romper
Daniel Wellington Watch

COMMENTS

Nice!!
Love the top!
cute
...

Figure 3: Anatomy of a post from the Fashion144k dataset. It consists always of at least a single image with additional metadata that can take the form of tags, list of nouns and adjectives, discrete values or arbitrary text.