Data Analytics Research Paper: Machine Learning Project for a Virtual Personal Stylist

Katie Meyer

Summary: “Apparel-based deep learning system design for apparel style recommendation”

A Scholarly Journal Article by Guan, Congying; Shengfeng Qin; Long Yang from the

International Journal of Clothing Science and Technology Vol.31, Iss 3 (2019)

DOI:10.1108/IJCST-02-2018-0019

**Introduction:**

**Purpose**: The authors of this article sought to explore an advanced style learning and recommendation system, seeking to understand how a deep learning system could be used to understand clothing, fashion, and people. And from these things, know what features of the clothing and the body were necessary to make style recommendations as well as a skilled human expert.

**Methodology:**

**Information about the data sets: 3 data sets, newly proposed apparel data sets**

* **Image data set** – 200 men’s mix and matched sets from online shops, of 4 categories: suit jackets/blazers, shirts, ties, pocket squares.
* **ATTRIBUTE data** – literal meanings of clothes – coding system with 45 attributes and 220 sub-categories to describe the jacket/blazers, shirts, ties, and pocket squares. (Ex: Lapel shape is denoted as peak, notch, or shawl, proportion of lapel shapes and contrast of color schemes.)
* **MEANING data** – connotation meanings outside of apparel which denote the feelings, thoughts, beliefs, desires of clothes based on mental concepts. The coding system: 11 semantic words relating to feelings and body meanings used to label the apparel samples (Ex. Peak lapel with a wider shape and higher position of gorge can create a muscular chest look).

**Data training model design:** The authors compared different training data between knowledge encoded attribute data set and raw apparel image set, compare different machine learning algorithms in apparel meaning predictions, and then evaluate the feasibility of the designed model as an intelligent clothing recommendation model. The training of the 3 models was implemented by the Python script.

* Model A – machine learning model using attribute features to predict meanings.

“This method is denoted as Attr+LKF.”

* Model B – deep-learning model using image features to predict meanings:

“This method is denoted as CNN+LKF.”

* Model C – 2-step deep-learning model using image attribute collaborated features to predict both attributes and meanings, “which are denoted as CNN2Attr+SVM and CNN2Attr+LKF.”

**Results & Comparisons:**

Generation of ATTRIBUTE codes through a sample image: 5 codes (1,2,3,4,5)

Generation of MEANING codes through a sample image: 2 codes (0, 1) – [negative, positive]

* **Model A**: The training input and output data in model A are the apparel ATTRIBUTE data set and MEANING label data set, respectively. The training results indicate the prediction accuracy of proposed two methods in Model A.” Table results showed: Prediction accuracy of Model A: Attr+SVM vs Attr+LKF > Attr+SVM more accurate.
* **Model B**: “The training input and output data in Model B are the apparel image data set and MEANING label data set. Comparing Model A and B it was found that the image-based prediction model is less effective than the ATTRIBUTE-based prediction model in all classes of MEANINGs” Table result showed: Prediction accuracy of Model A vs B: Model B performed better than Model A.
* **Model C**: Adding CNN2Attr method to extract feature data, the performances further improved particularly for those classes received lower rate in previous two models. With the LKF classifier, Model C predicts is better in all classes than the other 2 models. CNN2Attr+LKF provided the most predictability of classes.

**Conclusion:**

This research presented a new deep learning design for clothing evaluation for style recommendations using three models to compare which provides the most predictive accuracy to providing recommendations as a skilled human expert would. Their CNN deep learning new model, SVM with a new LKF classifier trained the 3 data sets. First, predicting attributes through images, and then predicting meanings based on those predicted attributes was overall the most accurate method. What the study did not mention, but seems plausible, is a similar predictive systems could be designed around other types of men’s clothing, as well as women’s clothing. These would also have new attributes and meanings assigned to them through the training process.

# Bibliography

Guan, C., Qin, S., & Long, Y. (2019). Apparel-based deep learning system design for apparel style recommendation. *International Journal of Clothing Science and Technology, 31*(3), 376-389. doi:10.1108/IJCST-02-2018-0019