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New Product Design with Popular Fashion Style Discovery using Machine Learning

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Background

- Shoppers needs are difficult to interpret.
- Meeting the shoppers' needs lead to more profits.
- Fashion companies offer styles based on designer choices.

Motivations

- **Complement** the traditional investigation on future fashion trend.
- **Discover** the style pattern of historical fashion products and consider customer's needs by machine.
- **Variations** or evolutions of design leading trend can be explored by learning through continuous selling items.

- **Benefit targeted marketing**

Problem Statement

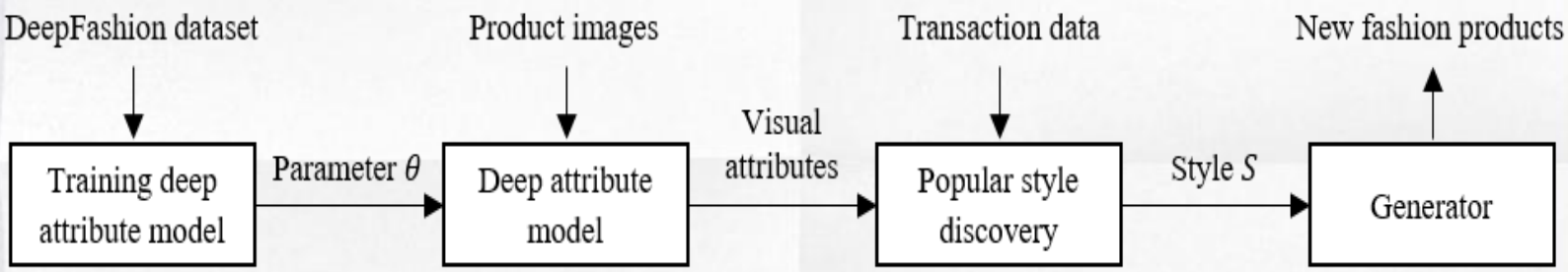
Given:	**1.Fashion product images** **2.Transaction history**
Objective:	**1.Discover the style of “must-have” fashion products** **2.Automatically generate new fashion products with “must-have” styles**

Contributions

- Previously:
  - Manually designed attributes other than attributes extracted from images.
  - Popularity of each fashion style is missing.

- Our Work:
  - Incorporate both **visual** contents and **popularity** information.
  - **Generate** new products based on the discovered styles.

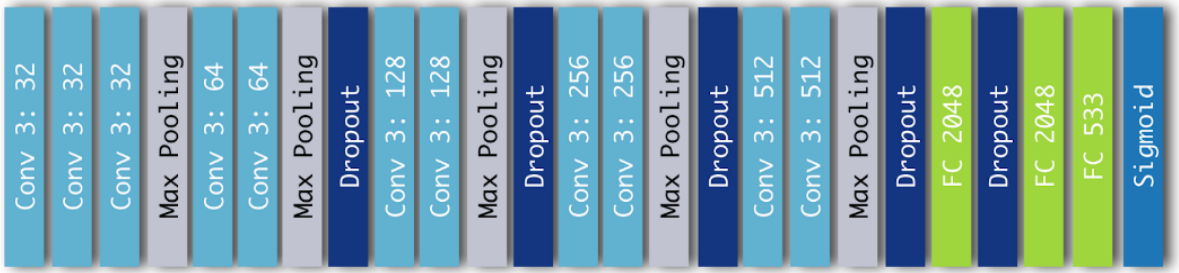
Methodologies



The proposed framework for generating popular fashion products.

Deep Attribute Model

- **Includes CUHK deep fashion dataset to train deep attribute model**
  - 139709 cropped upper body images
  - 533 semantic attributes labels
- **Deep attribute model**



- Given a set of images $C = \{c_i\}_{i=1}^{N}$, the probability of M attributes for ith image is a_i. With the deep attribute model, we can get the trained model parameters θ and have $a = f(c \mid \theta)$.

Popular Style discovery

- **Style discovery using non-negative matrix factorization**
  - The sales data for each product are simply treated as an additional attribute. By augmenting matrix $A \in R^{\{M \times N\}}$ to $A \in R^{\{(M+1) \times N\}}$
- **Apply the well trained model to our dataset and discover 30 styles**
  - Our data contains 950 T-shirts images with 2058 transactions including online and offline purchases from year 2015 to 2017.

Experiments

Evaluation on the deep attribute model:

- Split DeepFashion for training, validation & testing
  - 80% for training
  - 10% for validation
  - 10% for testing

- **77%** Area under curve (AUC) for attribute prediction

Experiments con't

Total transactions for each discovered style.

Style	1	2	3	4	5	6	7	8	9	10
Sales	111	20	18	22	29	16	66	16	29	43
Popular	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes
Style	11	12	13	14	15	16	17	18	19	20
Sales	16	17	33	15	25	11	77	14	54	15
Popular	No	No	Yes	No	Yes	No	Yes	No	Yes	No
Style	21	22	23	24	25	26	27	28	29	30
Sales	31	65	25	19	24	22	14	20	22	15
Popular	Yes	Yes	Yes	No	Yes	No	No	No	No	No

Experiments con't

High Popularity styles

Style 1

Style 10

Low popularity styles

Style 4

Style8

Experiments con't

Raw Data

Style 1

Style 10

New Product

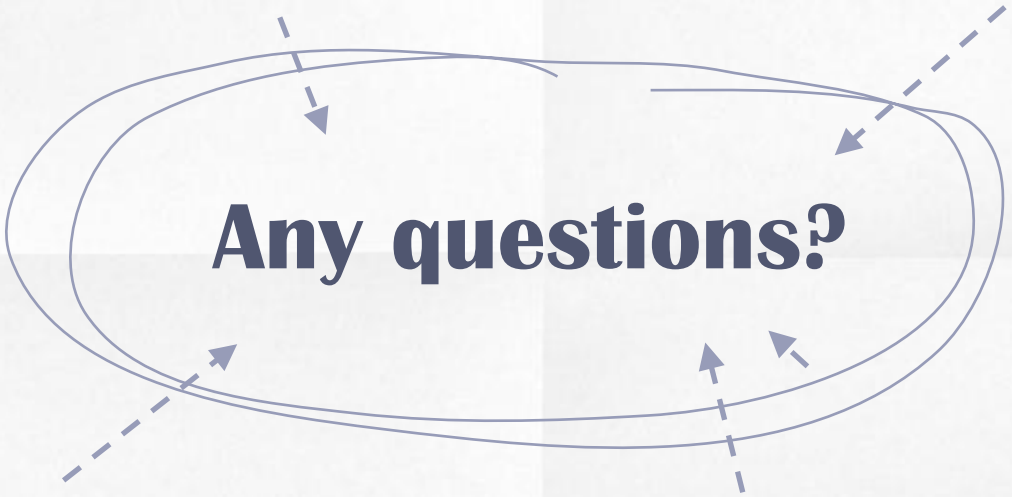
New products from style 1

New products from style 10

Conclusions

- **Incorporate** visual attributes and popularity together from **real world** product images with transaction data.
- **Discover** a set of styles that are sharing similar visual attributes and popularity in an **unsupervised** manner.
- New "must-have" fashion products that has **interpretable** elements are **automatically** designed.
- In the future, we are going to apply our method on **bigger** dataset and **evaluate** the popularity of new generated products in real world.

Thanks!



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