


Social Fashion Media Mining for Fine-grained Outfits' Recommendation

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Agenda

- ❑ Project Motivation
- ❑ Semantic Fashion Knowledge Extraction from Social Media
- ❑ Outfit2Vec and PartialOutfit2Vec Recommendation Models
- ❑ Evaluation
- ❑ Conclusions

Project Motivation

1. Better Fashion Personalisation for online shopping

I don't like Heels

I like pink and yellow

Casual

I like it to be Elegant as well

I like Cardigans

Better ways to automatically understand customers' intentions and preferences and turn them into smart recommendations ??

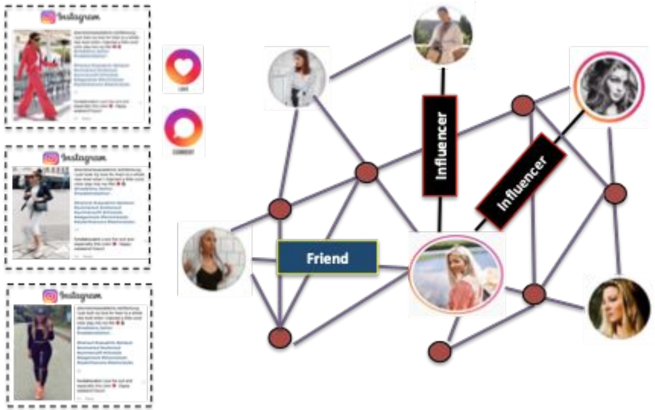
Project Motivation

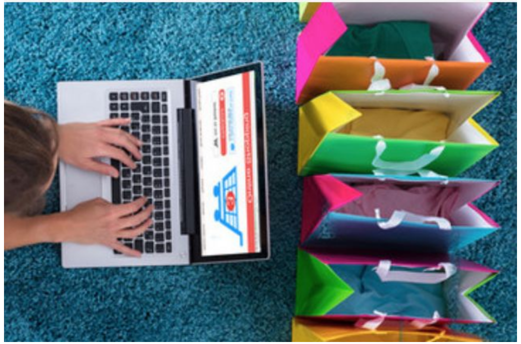
1. Better Fashion Personalisation for online shopping

Customer's Social Media Behavior => Intentions for new purchases from online shops

Project Motivation

1. Better Fashion Personalisation for online shopping





1 Analysis of the customer's previous images and text to extract Fashion info

2 Analysis of the customer's interactions with digital fashion influencers outfit images and text to extract Fashion preferences

3 Analysis of the customer's previous purchase history (some info about preferred brands and budget preferences)

Semantic Fashion Knowledge Extraction from Social Media

#lbd #mididress #blazerdress
#doublebreasted #workchic
#businesschic #officelook
#elegantwomen #timelesselegance
#dresstoimpress #streetstylechic
#streetchic #fashioninsider
#fashioninfluencers

hello, may I
ask where your boots is from
please? Thank you 😊

Nice total black 👍 😊 🌹

So chic

Images taken from public fashionistas accounts from
Instagram

Semantic Fashion Knowledge Extraction from Social Media

Fashion Vocabulary	Related Word
brands	hunter:29.57%, lole:25.82%, rusty:25.21%, weekend:19.40%
hashtags	#liketkit, #ltkunder100, #wiw, #fallfashion, #fall, #whatiwore, #ootd, #ootdmagazinewhatiwore
item_category	jumpers_and_cardigans:30.95%, shoes:26.45%, all_accessories:22.37%, trouser_and_shorts:20.23%
item_sub_category	scarf:49.72%, sweater:21.17%, cardigan:14.79%, boot:14.32%
materials	leather:34.96%, denim:29.08%, cashmere:19.61%, lace:16.35%
patterns	striped:26.79%, checked:26.13%, herringbone:24.80%, print:22.29%
styles	sporty / casual / easy/ practical - style:34.60%, trendy / creative / unique/ fashion-forward -style:25.30%, classic /

1] Kim Hammar, Shatha Jaradat, Nima Dokoohaki, Mihhail Matskin. Deep Text Mining of Instagram Data Without Strong Supervision. To appear in proceedings of 2018 IEEE/WIC/ACM International Conference on Web Intelligence., Santiago Chile, 2018.

Fine-Grained Fashion Outfits' Recommendation

1. Generating Fine-Grained Fashion Recommendations

❑ Multi-class classification:

[1] Tops and Tshirts [2] Jackets

[3] Jeans [4] Shoes

The subcategories level as well:

[1] Long-sleeve Top [2] Vest

[3] Skinny-Fit [4] Sandals

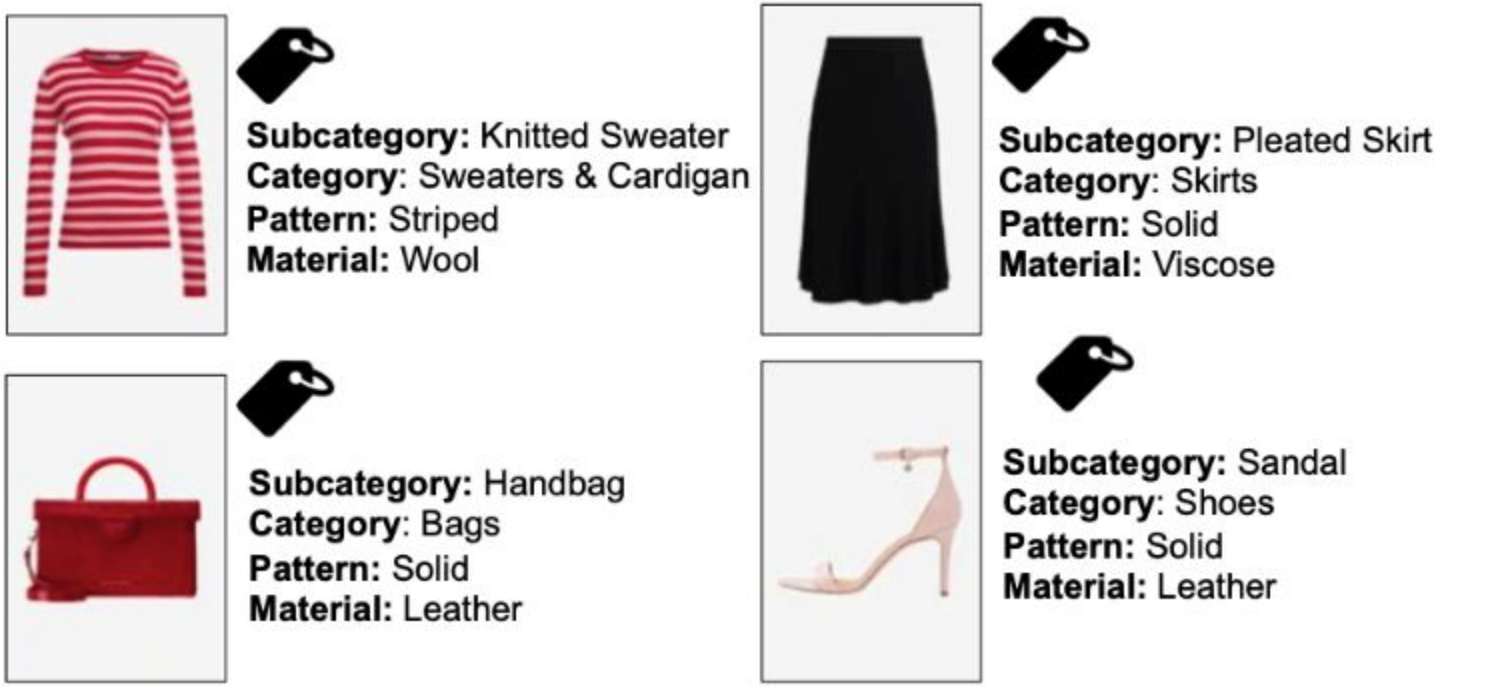
❑ Multi-attributes classification:

Material & Patterns: Denim, Leather, Wool, Lace, Checked, Print

Style and brands information

Fine-Grained Clothing Information is what really helps in understanding the customer's real needs

Outfit2Vec and PartialOutfit2Vec Recommendation Models



A complex scenario: outfit sequence consisting of multiple items where each item has attributes

Outfit2Vec and PartialOutfit2Vec Recommendation Models

- ❏ Existing Neural Recommendation Models based on the idea of Word2Vec and focusing on one type of inputs: Prod2Vec, Item2Vec, MetaProd2Vec

- ❏ Need for a methodology to generate representative vectors of such hierarchically composed items such as outfits to be provided to a neural embeddings model

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Finding a representation of each outfit such that similar outfits based on their vectors' similarity can be recommended to the user

As each outfit is composed of multiple clothing items and each item has different attributes, a strategy of projecting these details into vectors should be decided:

Mapping Items into Clothing Entities	Projecting the entities into outfit vectors

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Mapping Items into Clothing Entities

Pattern material subcategory category (structured words)
Pattern-material-subcategory-category (structured entities)

Solid-Leather-Handbag-Bags = One word in the model's vocabulary

Solid-Leather-Handbag-Bags = Structured Entity
Solid Leather Handbag Bags = Structured Words

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Projecting the entities into outfit vectors

Rule-based approach for consistency

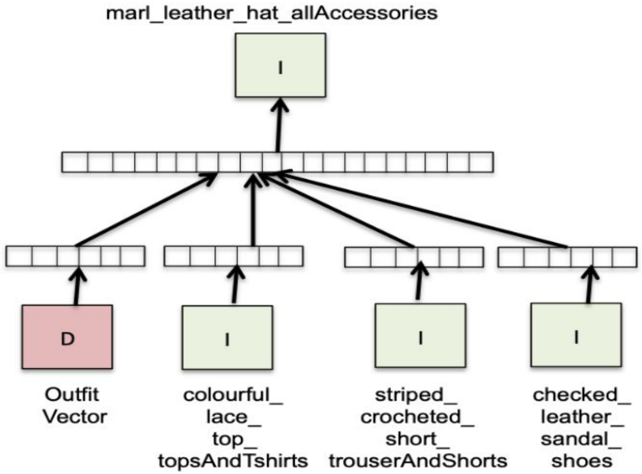
(1) Add Jacket or Coat Entity if Exists
(2) If Upper Body and Lower Body Exists:
   a. Add Upper Body Entity
   b. Add Lower Body Entity
(3) If Upper Body doesn’t Exist and a Dress Exists: Add Dress Entity
(4) Add Tights and Socks Entity if Exists
(5) Add Shoes Entity if Exists
(6) Add Bags Entity if Exists
(7) Add Accessories Entity if Exists

Upper body entities consist of the following categories: (1) Blouses and Tunics , (2) Tops and Shirts , (3) Jumpers and Cardigans
Lower body categories include: (1) Skirts , (2) Jeans ,(3) Trousers and Shorts
.

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Outfit Sequence:

- Striped_Wool_Sweater_SweatersAndCardigans
- Solid_Leather_HandBag_Bags
- Solid_Viscose_PleatedSkirt_Skirts
- Solid_Leather_Sandal_Shoes



Paragraph Vector (PV-DM) and Paragraph Vector (PV-DBOW)

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Outfit 1
Outfit 2
Outfit 3
…..

Predict Next Outfit

Whole outfits Prediction

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Outfit Sequence:

- Striped_Wool_Sweater_SweatersAndCardigans
- Solid_Leather_HandBag_Bags
- Solid_Viscose_PleatedSkirt_Skirts
- Solid_Leather_Sandal_Shoes

Item 1 Item 2 Item 3 ???

Predict Next Item

Partial outfits Prediction

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Evaluation Metrics

Normalised Discounted Cumulative Gain
NDCG

Position of Retrieved Outfit

Mean Average Precision
MAP

Binary Metric
Multiclass output for each item

Relevant Item = 0.7 of the details of the ground truth entity/sequence

Mean Reciprocal Rank
MRR

Rank position of first relevant Outfit

Outfit2Vec and PartialOutfit2Vec Recommendation Models

+19%

Model	NDCG@30	NDCG@40	MAP@30	MAP@40	MRR@30	MRR@40
Outfit2Vec(PV-DM)-SE	**0.22**	**0.33**	0.37	0.41	0.06	0.06
Outfit2Vec(PV-DM)-SW	0.08	0.09	0.39	0.44	0.06	0.05
Outfit2Vec(PV-DBOW)-SE	**0.30**	**0.38**	0.37	0.41	0.07	0.07
Outfit2Vec(PV-DBOW)-SW	0.08	0.10	0.21	0.23	0.04	0.04
PV-DBOW-Random	0.08	0.09	0.13	0.14	0.03	0.03
PV-DM-Random	0.07	0.07	0.23	0.23	0.04	0.03

Whole Outfits Recommendation:

Defining Structured Entities for the PV-DM has resulted in +19% for the NDCG evaluation

Both Structured Words and Structured Entities have improved in MRR and MAP when compared to the random sequences

Outfit2Vec and PartialOutfit2Vec Recommendation Models

Model	NDCG@30	NDCG@40	MAP@30	MAP@40	MRR@30	MRR@40
Outfit2Vec(PV-DM)-SE	**0.22**	**0.33**	0.37	0.41	0.06	0.06
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Outfit2Vec(PV-DBOW)-SE	**0.30**	**0.38**	0.37	0.41	0.07	0.07
Outfit2Vec(PV-DBOW)-SW	0.08	0.10	0.21	0.23	0.04	0.04
PV-DBOW-Random	0.08	0.09	0.13	0.14	0.03	0.03
PV-DM-Random	0.07	0.07	0.23	0.23	0.04	0.03

+25%

Whole Outfits Recommendation:

Defining Structured Entities for the PV-DBOW has resulted in +25% for the NDCG evaluation

Both Structured Words and Structured Entities have improved in MRR and MAP when compared to the random sequences

Outfit2Vec and PartialOutfit2Vec Recommendation Models

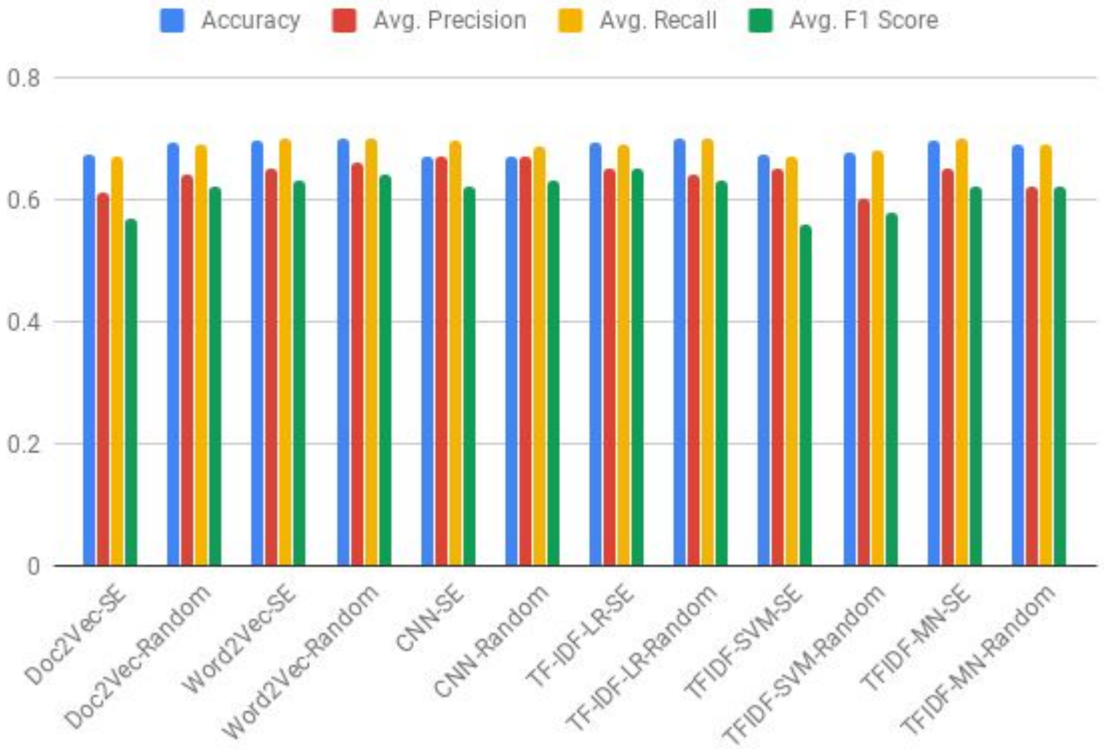
Model	NDCG@30	NDCG@40	MAP@30	MAP@40	MRR@30	MRR@40
PartialOutfit2Vec(PV-DM)-SE	0.43	0.60	0.26	0.34	0.19	0.26
PartialOutfit2Vec(PV-DM)-SW	**0.77**	**0.86**	**0.65**	**0.67**	**0.59**	**0.58**
PartialOutfit2Vec(PV-DBOW)-SE	0.54	0.67	0.34	0.38	0.28	0.31
PartialOutfit2Vec(PV-DBOW)-SW	**0.77**	**0.79**	**0.82**	**0.81**	**0.74**	**0.75**
Word2Vec-SkipGram	0.07	0.08	0.19	0.29	0.05	0.05

Partial Outfits Recommendation:

Structured words has improved results (Shorter length for prediction)

Both Structured Words and Structured Entities have improved when compared to the random sequences

MultiClass Style Classification



Conclusions

- Methodology for learning representations of hierarchically-composed complex structures to learn their embeddings as unique instances within a taxonomy.
- Outfit2Vec and PartialOutfit2Vec for learning clothing embeddings
- Whole- and Partial outfits prediction experiments where our approaches: Structured Entities and Structured Words have shown improvements in evaluation metrics

Thank You