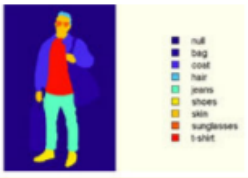
Deep Learning Approaches for Fashion Knowledge Extraction From Social Media

Introduction:

The use of social media sites such as Instagram has already spread to almost every fashion brand and been evaluated as business take-off tools. With the heightened use of social media as a means of marketing communication for fashion brands, it has become necessary to empirically analyse and extract fashion knowledge from them.In particular, five different tasks are considered: Object Detection, that includes Clothes Landmark Detection, Clothes Parsing and Product Retrieval, Fashion Classification, Clothes Generation, Automatic Fashion Knowledge Extraction and Clothes Recommendation. Therefore, the purpose of this report is to underline the multiple applications within the fashion world using deep learning techniques.

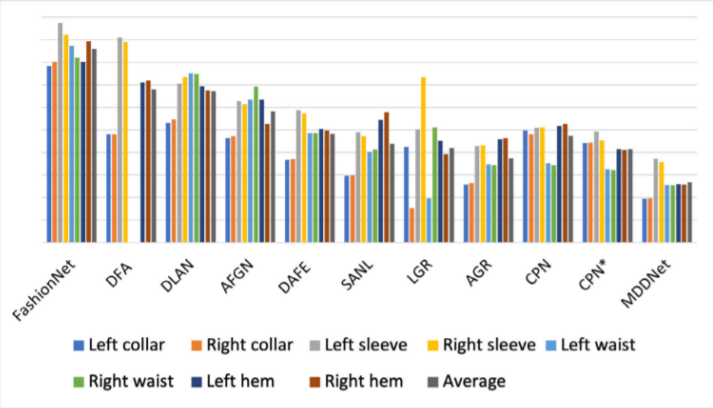
TASK	INPUT	OUTPUT
LANDMARK DETECTION DATASET GENERALIZATION		
CLOTHES PARSING DATASET GENERALIZATION		
PRODUCT RETRIEVAL DATASET GENERALIZATION		
FASHION CLASSIFICATION DATASET GENERALIZATION		
CLOTHES GENERATION DATASET GENERALIZATION		
CLOTHES RECOMMENDATION DATASET GENERALIZATION		

Object Detection:

1) Clothes Landmark Detection:

Detecting fashion landmarks from an image is a fundamental and practical task, whose goal is to predict the location of useful key points defined on fashion items, such as the corners of the neckline, hemline, and cuff.

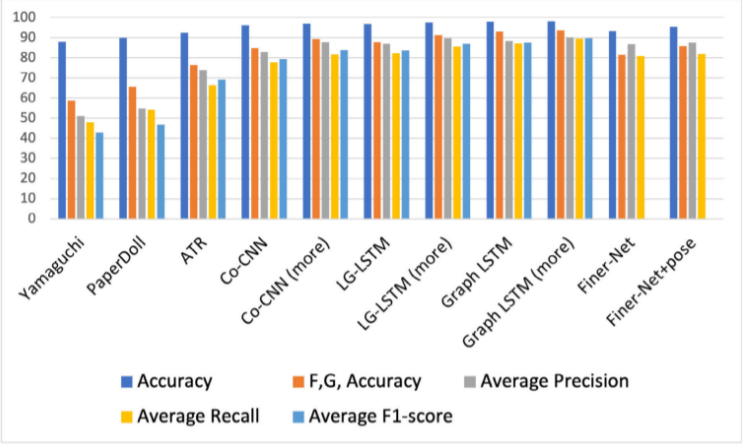
Some methods and their accuracy on FLD dataset



2) Clothes Parsing:

The purpose of object parsing is to understand the contents that are inside an image in a detailed way: this is done by segmenting the image into regions that have a different semantic meaning. In particular, fashion parsing and human parsing with clothing classes aims to resolve the problem of finding significant regions within images that contain people with certain clothes on. Similar to the semantic segmentation task, object and label diversity is a challenge not closed for human parsing. And, unlike classic semantic segmentation tasks, such as the parsing of a scene, the purpose of human parsing is both to understand the different parts of the person in the input image, and to assign the right label to each clothes that the person wears. Unlike semantic segmentation, human parsing also requires that the methods used to solve this task, can withstand large variation in occlusion, pose, lighting and viewpoints.

Evaluation of different methods on Fashionista dataset



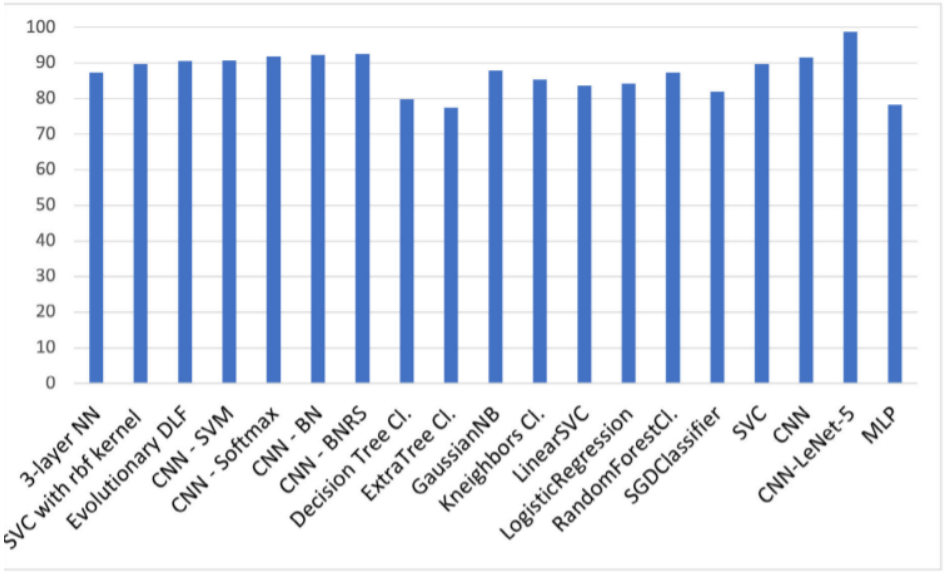
3) Product Retrieval:

Given the rapid development of e-commerce sites, which has resulted in an increase in online shopping, many researchers have dealt with the task of product retrieval based on images or videos. This type of study manages to make consumers and the computer interact.

Fashion Classification:

ML and DL techniques bring great benefits to image recognition and classification in the fashion environment. In fact, they can help to improve the user experience, which is a fundamental factor for the calculation of the Key Performance Indicator (KPI), which can be measured through factors such as the time spent by the user in front of the computer, the purchase volume and average checkout value. Deep Learning methods, and in particular Convolutional Neural Networks, can help the user to have a more pleasant experience on the site, being able to make a quicker and more convenient search of the products. As a consequence, there will be an increase in KPIs, in the business profits and in the efficiency of the product management system.

Some methods of classification and their accuracy on FASHION-MNIST dataset



Clothes Generation

In recent years, one of the most developed topics in the Deep Learning world, was Generative Adversarial Networks (GANs), created by Goodfellow in 2014 [162]. Their importance is due to the fact that they have proven to be excellent in many areas, especially in the generation of images The task consists in taking two images as input: the first contains the image of the clothes to try on, while the other contains the image of a person who will be in a certain pose and who is already wearing clothes. This is a very difficult task especially because the pose of the person can bring various problems, for example some parts of the body may be hidden or even the pose does not allow you to see some of them. Existing methods perform this task using three different networks, each of which is used for a specific purpose. The first network will have the task of carrying out a similar transformation to be able to align the desired clothes in the desired person; the second network will have the task of dressing the person; the last network will have the accomplishment of carrying out a post-processing phase to try to make the final image as realistic as possible.

Performance of some methods on deepfashion dataset

Method	IS	R-precision (%)	Avg. Cls. Acc. (%)
StackGAN++ [171]	1.74 ± 0.02	12.3	37.08
AttnGAN [172]	4.12 ± 0.06	70.73	56.18
e-AttnGAN [173]	$\mathbf{4.77 \pm 0.10}$	**76.21**	**58.39**

Clothes Recommendation:

Clothes Recommendation cannot be general, since the preferences of users are naturally subjective. In fact, they depend on the age, occupation, culture, place of living, and so on. From this perspective, the personalisation is fundamental since it guarantees that the Clothes Recommendation agrees with the personal taste of users and includes their likes and dislikes from several perspectives. In the last few years, personalised Clothes Recommendation has received a great amount of attention.

Different methods for fashion recommendation.

Method	Algorithm
Liu et al. [20]	CNN
Ma et al. [52]	CNN+Bi-LSTMs
Lin et al. [230]	OutfiNet
Jo et al. [231]	GAN
Jo et al. [232]	GAN+DNN
Tanseng et al. [233]	CNN
Li et al. [234]	CNN
Li et al. [235]	HFGN
Liu et al. [236]	neural graph filtering
Yu et al. [237]	DNN
Zhang et al. [239]	A3-FKG

Limitations:

Lack of Available Dataset

Domain Dependent Models

Hardware Limitations

Conclusion:

Valued at over 3 trillion dollars, the global fashion industry contributes to a healthy 2% of the global Gross Domestic Product (GDP). For this reason, fashion companies are increasingly trying to invest in the world of artificial intelligence to be able to satisfy the customer 100%. In particular, social media have long since changed the way of perceiving the world of fashion by the customers: in this context social networks are fundamental communication tools, in particular Facebook and Instagram. For this reason, this review aims to summarize the datasets that have been collected and the methods that have been used in deep learning in the fashion sector, and in particular in social networks