(TEI ’18). ACM

DeepWear

A Case Study of Collaborative Design between Human and Artificial Intelligence

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摘要 Abstract

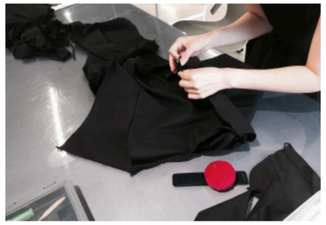
- **Artificial Intelligence 🧠 + Fashion Design 👗 = DeepWear**
- **AI Technologies :**
  - Deep Neural Networks **(DNNs)**
  - Deep Convolutional Generative Adversarial Networks **(DCGANs)**
- **A system conducted with application DCGANs to design clothes in practice**
- Learn Feature of Brand
- Generate Images
- Draw Pattern from Images
- Making Clothes
- User Survey & Feedback

流程圖 Flowchart

Conventional Method

Design Sketch

Patterns Making

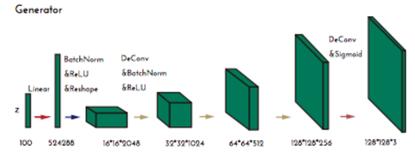


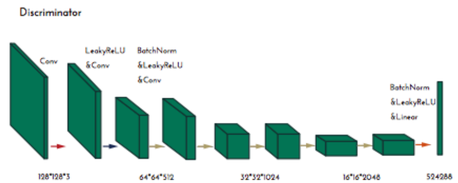
Clothes Making

Fashion Show

Input

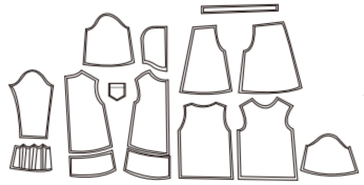
DCGANs





Output

Generated Images



Patterns Making

Clothes Making

Feedback

Our Contribution

文獻回顧 Introduction

- Recent 👍 - Computational Fabrication 數位、數值化之製造物
- Fashion Design 🤦‍♀️
- Project **Muze** (Amazon AI)
  - Wearable ? 🤔
  - Amazon AI in development stage 🤔

Intelligent Machines

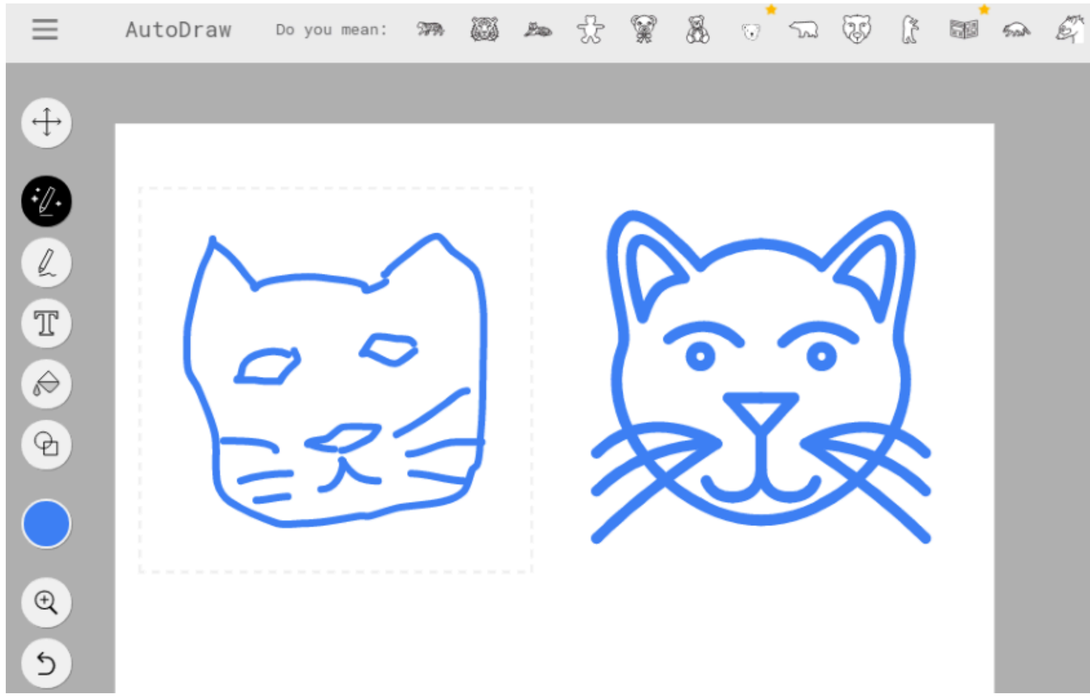
Amazon Has Developed an AI Fashion Designer

The retail giant is taking a characteristically algorithmic approach to fashion.

by Will Knight August 24, 2017

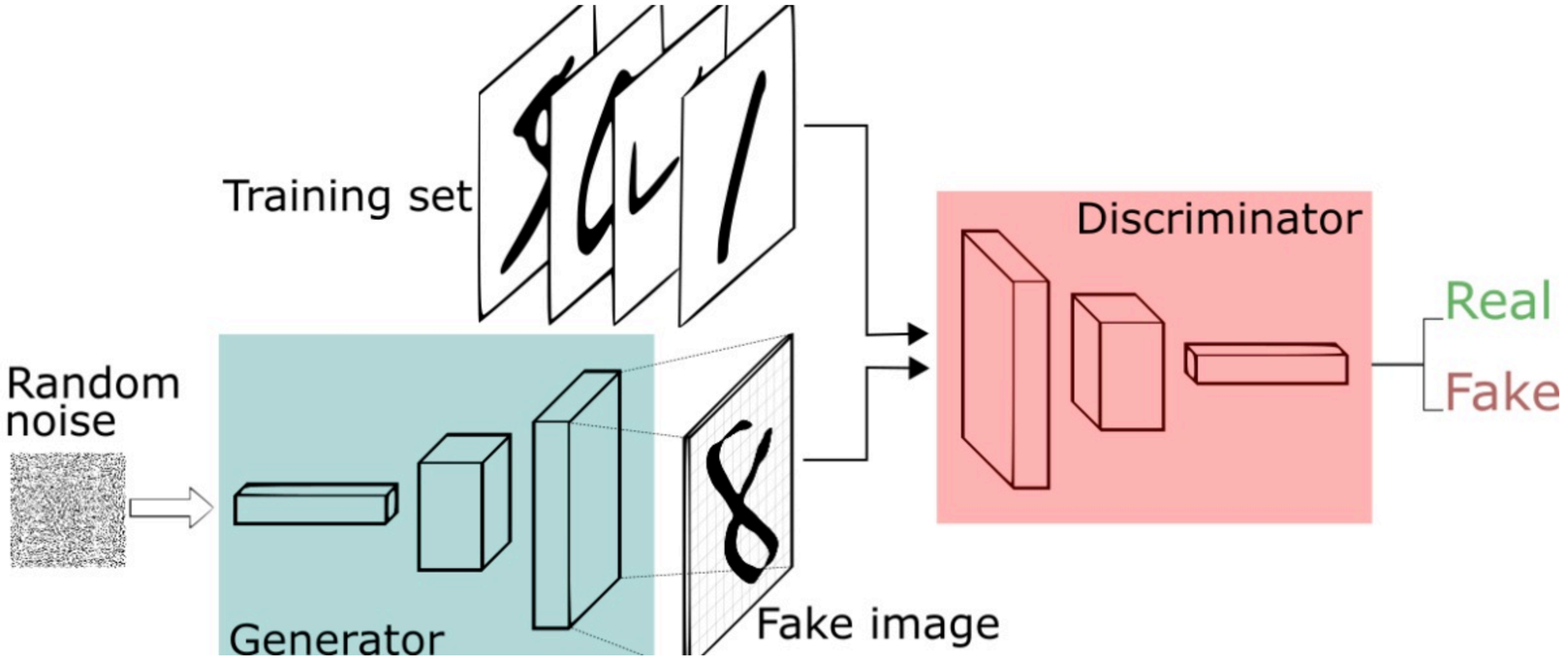
文獻回顧 Introduction

- **Related Works**
  - Image generation
    - Deep Belief Net (DBN)
    - Denoising Auto Encoder (DAE)
    - Variational Auto Encoder (VAE)
  - Machine intelligence creativity support
    - AutoDraw
  - Machine Intelligence & Fashion Design
    - Muze



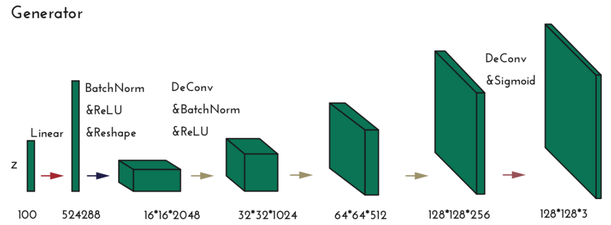
DCGAN 技術簡介

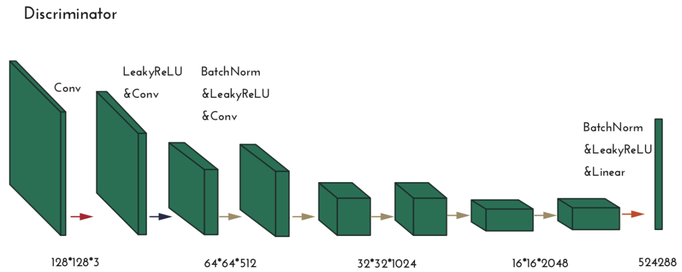
- GAN common applications : **image generation**
- Generator network *G* 生成器 + Discriminator network *D* 鑑別器 + Training data *x*
- *G* will **take input from random noise *z*** and try to generate data with distribution similar to *x*.
- The discriminator network *D* receives inputs from **both *x* and the generated from *G*** and estimate the **probability that the sample came from the training data**, not *G*.



DCGAN 技術簡介

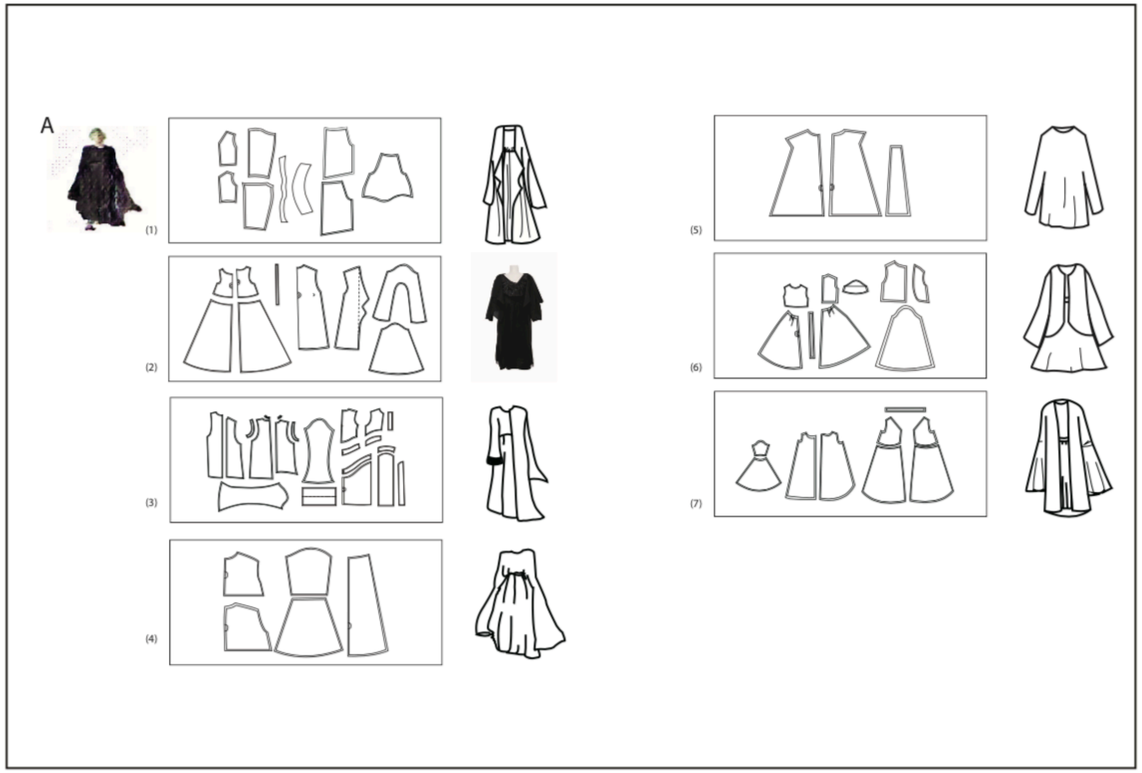
- **Data Collection 資料搜集**
  - web scraping Python
  - 1. follow the link from the top page of the target website
  - 2. list all HTML pages with the URL structure as directory structures.
  - 3. acquire all the image URLs specified by ***src*** of the ***img*** tag in the HTML pages detected in the second step.
  - 4. downloaded all image URLs
- **Training 資料訓練**
  - batch size of 7, using Adam with hyper parameters
  - (α=0.0002, β1 = 0.5, β2 = 0.999, ε = 1e – 08)
  - NVIDIA Titan X GPU for 1000 epochs

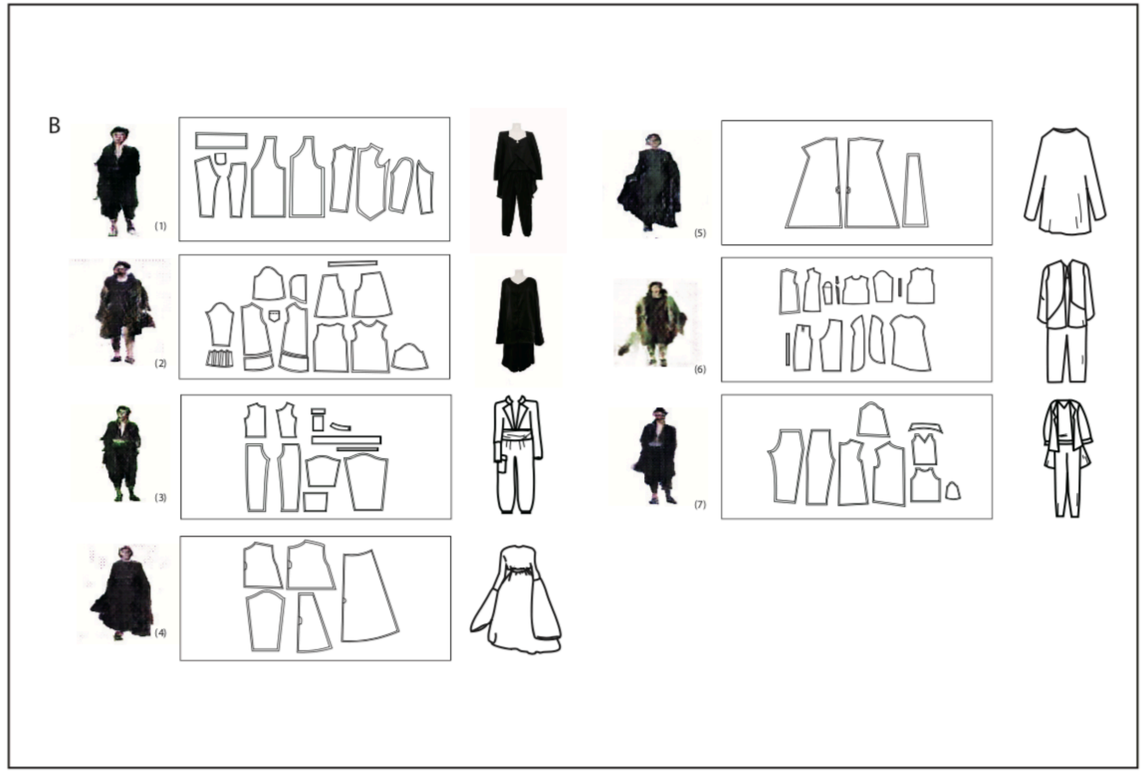




Clothing Implementation 製作衣服

- **Draw Patterns**
  - **Patterners** are people who draw patterns of clothes based on instructions from designers
  - time limit 70 minutes
  - **A** patterns are drawn from **same image** by each patterners
  - **B** patterns are drawn from what patterners selected.





製作衣服 Clothing Implementation

- **Make Clothes from the Patterns**
  - Material
  - Size (common characteristic)
  - Color

A(1)

B(1)

B(2)

回饋搜集 Qualification & User Reaction

- 相似度調查：
- **six** clothes of the source brand were first exemplified
- clothing images one by one in **random order** and evaluated whether or not the **displayed image can be seen closer to the product of the source brand** in 7 stages of 1 (looks different) to 7 (looks learning source brand)

				Ave
Other	80 (1)	78 (5)	97 (7)	85
DeepWear	121 (3)	87 (6)	107 (8)	105(+23.5%)
Source brand	131 (2)	120 (4)	115 (9)	122(+43.5%)

- we have shown that our output is close enough to the learning source brand.

回饋搜集 Qualification & User Reaction

- It is difficult for a patterner to judge **detailed details** from the generated image
- 因為圖樣解析度不足，打版師難以判斷細節。
- many of the clothing of the learning source brand are black in color and simple design, so **texture of the cloth is more emphasized**.
- Some Patterners Feedback to Experiment

意見 My Opinion

- 👩🏽‍🔬 **Patterner** 打樣工、衣服打版，介入 DCGANs 訓練出成果圖片過多，包括**主觀美感、細節腦補、材質尺寸**。
- 👩🏽‍🔬 實驗目的、使用者調查，僅限於「**是否與原始資料庫相似**」，依舊**主觀意識**過多，因訓練結果與原始資料及本來就相同，他牌比較對象如相異甚巨，自然是相似度小。其題目意義可再釐清。
- 👍🏽 時裝產業下，人與機器之間的「**相互合作**」，為產業帶入新想法。