E6893 Big Data Analytics:

Fashion AI --
Attributes Recognition of Apparel

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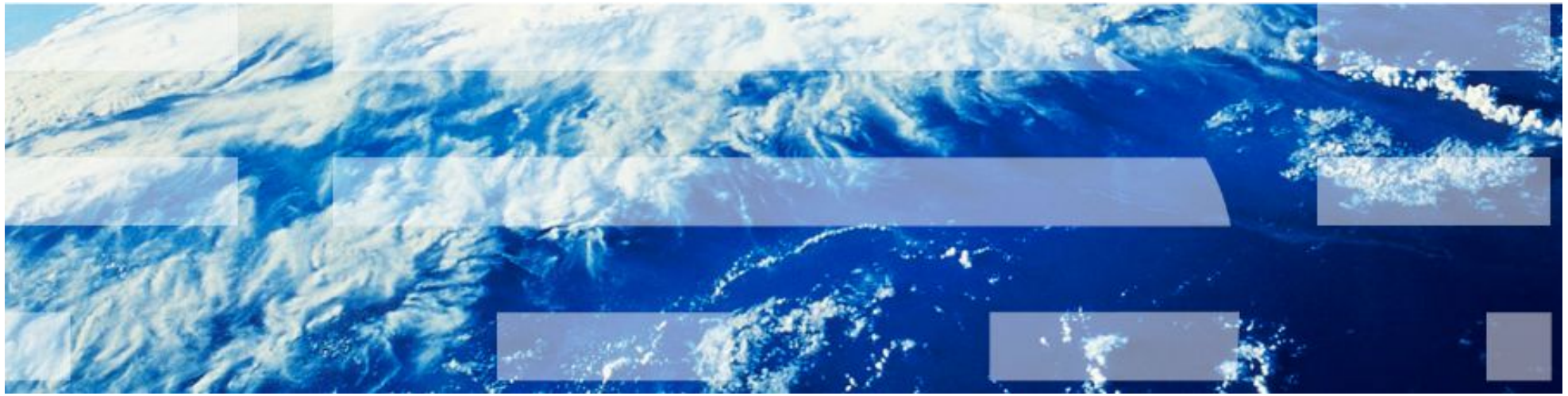
Project ID: 201812-3



Motivation

- Online shopping for fashion items grow a lot, raises problems:
  - Sellers provide information not consistent with the real stuff
  - Different sellers have inconsistent understandings of apparel styles.
- An automatic fashion attributes detection system
- Apparel image searching, navigating tagging, and mix-and-match recommendation, etc.

Dataset, Algorithm, and Tools

Dataset: From Alibaba TianChi Competition

- Image:
  - All image data are from Alibaba e-Commerce platform.
  - # 79,573 pictures in total

- Label:
  - Eight major attribute dimensions are selected:

Sleeve length	Skirt length	Coat length	Pant length	Neck design	Collar design	Lapel design	Neckline design

https://tianchi.aliyun.com/getStart/information.htm?spm=5176.100067.5678.2.3ebc313amMI3XP&raceId=231671

Dataset, Algorithm, and Tools

For example:

skirt_length_labels

+ AttrValues :
  - Invisible
  - Short Length
  - Knee Length
  - Midi Length
  - Ankle Length
  - Floor Length

neck_design_labels

+ AttrValues :
  - Invisible
  - Turtle Neck
  - Ruffle Semi-High Collar
  - Low Turtle Neck
  - Draped Collar

Dataset, Algorithm, and Tools

For example:

skirt_length_labels

+ AttrValues :
  - Invisible
  - Short Length
  - Knee Length
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  - Ankle Length
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neck_design_labels

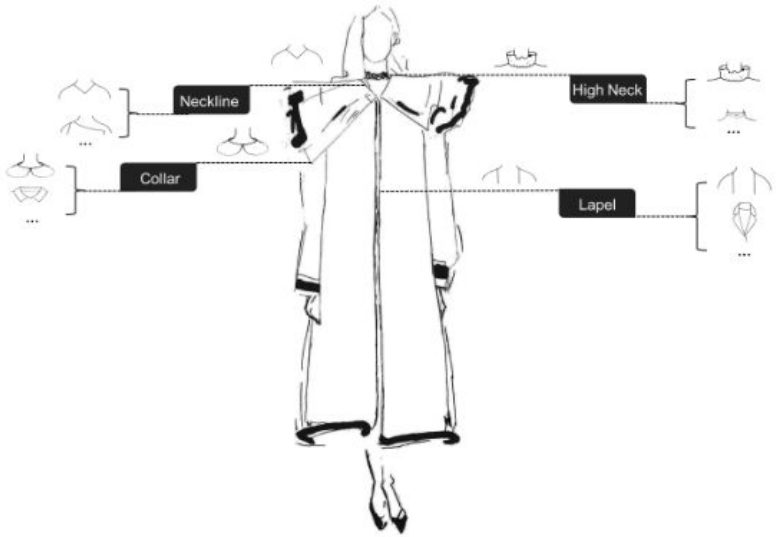
+ AttrValues :
  - Invisible
  - Turtle Neck
  - Ruffle Semi-High Collar
  - Low Turtle Neck
  - Draped Collar

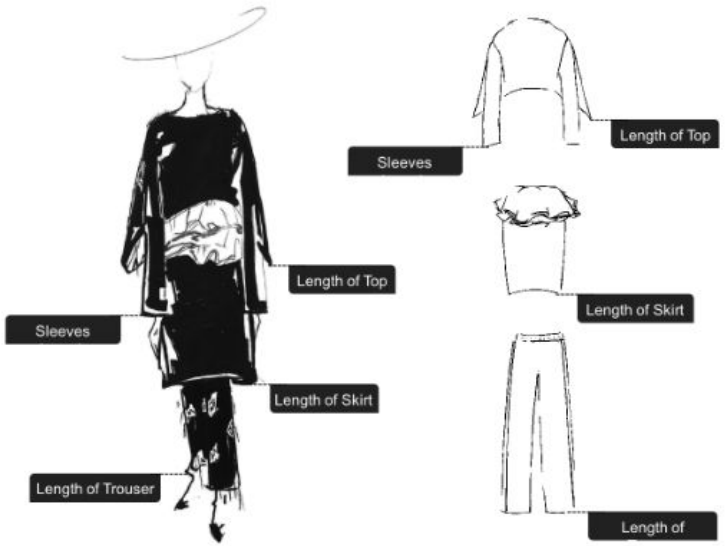
Dataset, Algorithm, and Tools

Pant Length, Sleeve Length, Coat Length, Neck Design, Neckline Design:

Invisible

Process Overview





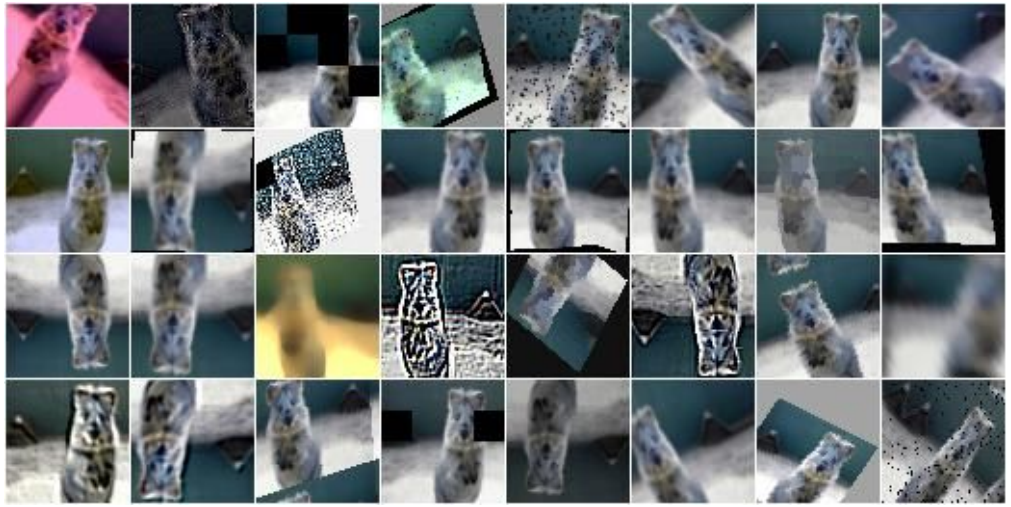
8 tasks

- **Image augmentation**
- **8 different CNNs for 8 tasks**

Algorithm -- Random Image Augmentation

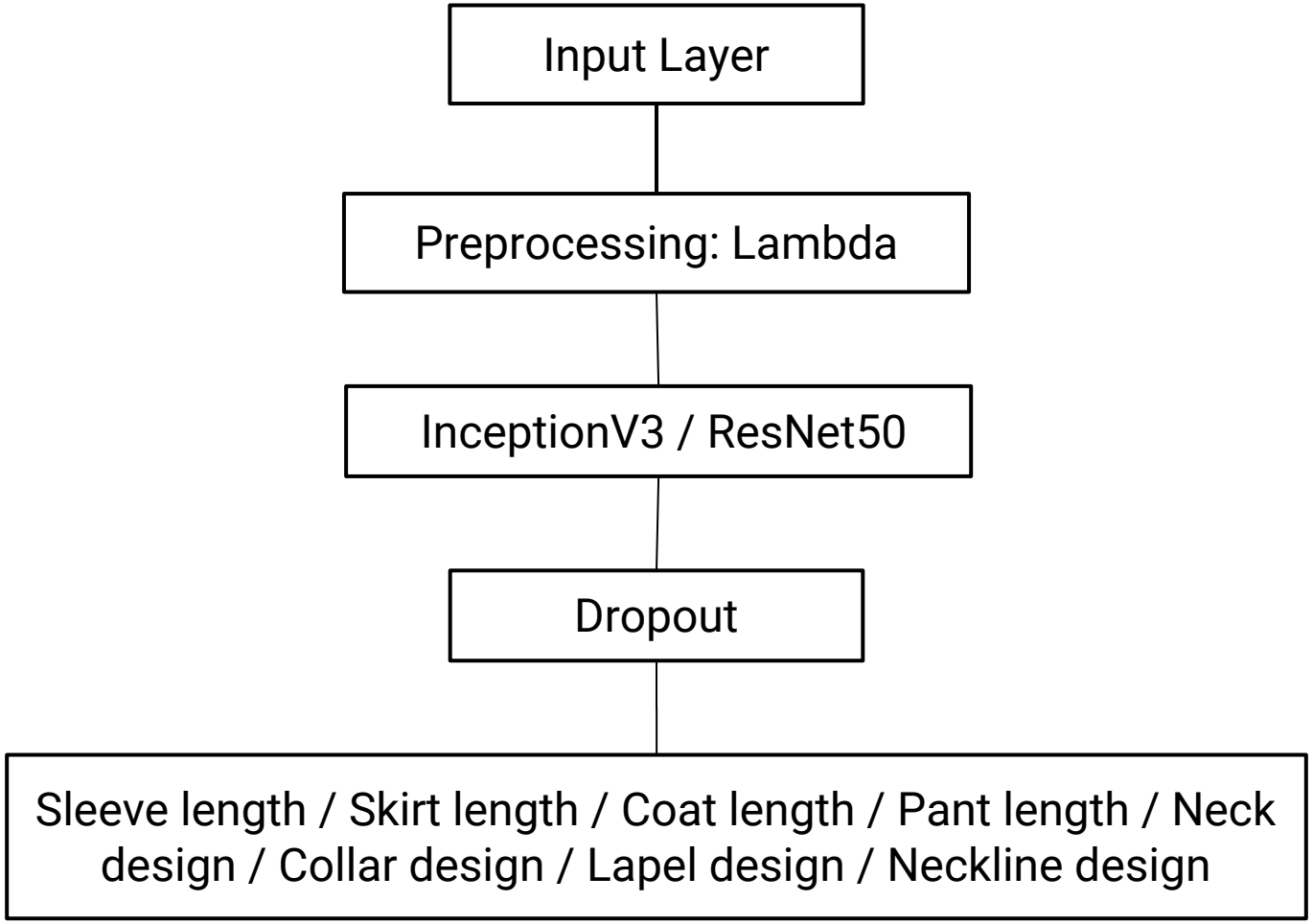
Each image going through the following steps:

- 50% probability [scale, translate, rotate, shear]
- apply one of the 4 augmentors:
  - 10% probability [superpixel representation, blur]
  - [sharpen]
  - [emboss]
  - 10% probability [mark and overlay edges]
- [add gaussian noise]
- [dropout]
- 10% probability [invert]
- 50% probability [add value to each pixel]
- [change brightness, normalization, greyscale]
- 25% probability [distort local areas with varying strength]
- 25% probability [move pixels locally around]



https://imgaug.readthedocs.io/en/latest/source/examples_basics.html

Algorithm -- Transfer Learning



Algorithm -- Techniques to improve performance

- **To improve the accuracy:**
  - Using the largest sizes of pictures the memory can handle. (Width 399)
  - Image augmentation which gave an additional 2~3% increase.
  - Comparing between InceptionV3 and ResNet50 for each task.

- **To improve the efficiency:**
  - Starting with Adam using decaying learning rates.
  - Finishing with SGD.
  - For example:

    Adam(0.0001)/epoch=3; Adam(0.000025)/epoch=2; Adam(0.00000625)/epoch=3; Adam(0.00000425)/epoch=1; SGD(0.000001)/epoch=1

https://github.com/Jeremyczhj/FashionAI_Tianchi_2018

Environment and Tools

- **Environment:**
  - Google Cloud Platform (8 CPUs and 2 GPUs)
  - Jupyter Notebook

- **Packages:**
  - TensorFlow
  - Keras
  - OpenCV
  - Imgaug

Experiment Results

Training & Validation Accuracy

	Sleeve length	Skirt length	Coat length	Pant length	Neck design	Collar design	Lapel design	Neckline design
Training Accuracy	0.9655	0.9839	0.9895	0.9758	0.9626	0.9786	0.9641	0.9457
Test Accuracy	0.8992	0.8656	0.8825	0.8646	0.8632	0.8696	0.8927	0.8592

InceptionV3

ResNet50

Experiment Results

Training & Validation Accuracy

```
model2.compile(optimizer = Adam(0.00000625),loss = 'categorical_crossentropy', metrics = ['accuracy'])
model2.fit_generator(gen_train.generator, steps_per_epoch=gen_train.steps,
                     epochs=3, validation_data=(X_valid, y_valid))
```

```
Epoch 1/3
210/210 [==============================] - 501s 2s/step - loss: 0.0732 - acc: 0.9775 - val_loss: 0.5279 - val_acc: 0.
8642
Epoch 2/3
210/210 [==============================] - 470s 2s/step - loss: 0.0608 - acc: 0.9787 - val_loss: 0.5170 - val_acc: 0.
8678
Epoch 3/3
210/210 [==============================] - 475s 2s/step - loss: 0.0635 - acc: 0.9784 - val_loss: 0.5211 - val_acc: 0.
8648

<keras.callbacks.History at 0x7f41557c7208>
```

```
model2.compile(optimizer = Adam(0.00000425),loss = 'categorical_crossentropy', metrics = ['accuracy'])
model2.fit_generator(gen_train.generator, steps_per_epoch=gen_train.steps,
                     epochs=1, validation_data=(X_valid, y_valid))
```

```
Epoch 1/1
210/210 [==============================] - 494s 2s/step - loss: 0.0567 - acc: 0.9826 - val_loss: 0.5292 - val_acc: 0.
8672

<keras.callbacks.History at 0x7f414d82e390>
```

```
model2.compile(optimizer = Adam(0.000001),loss = 'categorical_crossentropy', metrics = ['accuracy'])
model2.fit_generator(gen_train.generator, steps_per_epoch=gen_train.steps,
                     epochs=1, validation_data=(X_valid, y_valid))
```

```
Epoch 1/1
210/210 [==============================] - 501s 2s/step - loss: 0.0522 - acc: 0.9818 - val_loss: 0.5332 - val_acc: 0.
8666
```

Experiment Results

Prediction Examples

Attributes	True Results	Predictions
Sleeve length	Long Sleeves	Wrist Length
Skirt length	Short Length	Short Length
Coat length	High Waist Length	High Waist Length
Pant length	Invisible	Invisible
Neck design	Turtle Neck	Ruffle Semi-High Collar
Collar design	Rib Collar	Rib Collar
Lapel design	Collarless	Collarless
Neckline design	Invisible	Invisible

Thank You!
Any Question?