Aprendizaje Automático Profundo (Deep Learning)

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Arquitectura AllConvolutional

AllConvolutional (notebook, paper)

- Idea principal
  - Solo convoluciones
  - Sin MaxPooling => convoluciones con stride=2
  - Sin capas Lineales (Dense)
- Probó que era posible usar sólo Convoluciones
- 3 versiones
  - La C es la más popular
- Capa especial
  - GlobalAveragePooling
  - Reemplaza las Dense

A	B	All-CNN-C
	Input 32 × 32 RGB image	
5 × 5 conv. 96 ReLU	5 × 5 conv. 96 ReLU 1 × 1 conv. 96 ReLU	3 × 3 conv. 96 ReLU 3 × 3 conv. 96 ReLU
		3 × 3 conv. 96 ReLU with stride $r = 2$
5 × 5 conv. 192 ReLU	5 × 5 conv. 192 ReLU 1 × 1 conv. 192 ReLU	3 × 3 conv. 192 ReLU 3 × 3 conv. 192 ReLU
	3 × 3 conv. 192 ReLU	
	1 × 1 conv. 192 ReLU	3 × 3 conv. 192 ReLU with stride $r = 2$
	1 × 1 conv. 10 ReLU	
global averaging over 6 × 6 spatial dimensions		
10 or 100-way softmax		

Implementación (notebook, paper)

```
def AllConvolutional(classes,input_shape):
 model = keras.Sequential()
 model.add(InputLayer(input_shape))
 for feature_maps in [96,192]:
   model.add(Conv2D(feature_maps,(3,3),activation="relu",padding="same",))
   model.add(Conv2D(feature_maps,(3,3),activation="relu",padding="same",))
   model.add(Conv2D(feature_maps,(3,3),activation="relu",padding="same",strides=(2,2)))

 model.add(Conv2D(192,(3,3),activation="relu",padding="same",))
 model.add(Conv2D(192,(1,1),activation="relu",padding="same",))

 model.add(Conv2D(classes,(1,1),activation="relu",padding="same",))
 model.add(GlobalAveragePooling2D())
 model.add(Activation('softmax'))
 return model
```

AllConvolutional (notebook, paper)

- Más pequeña que VGG
  - 1.3M parámetros
- Diseñada para CIFAR10 o CIFAR100
  - Más fácil que ImageNet
- Fácil de entrenar
- Buena performance
- Reducción de dimensionalidad espacial (32-> 16, 16->8)

```
input_shape=(32,32,3)
classes=10
model = AllConvolutional(classes,input_shape)
print(model.summary())
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_19 (Conv2D)           (None, 32, 32, 96)        2688
conv2d_20 (Conv2D)           (None, 32, 32, 96)        83040
conv2d_21 (Conv2D)           (None, 16, 16, 96)        83040
conv2d_22 (Conv2D)           (None, 16, 16, 192)       166080
conv2d_23 (Conv2D)           (None, 16, 16, 192)       331968
conv2d_24 (Conv2D)           (None, 8, 8, 192)         331968
conv2d_25 (Conv2D)           (None, 8, 8, 192)         331968
conv2d_26 (Conv2D)           (None, 8, 8, 192)         37056
conv2d_27 (Conv2D)           (None, 8, 8, 10)          1930
global_average_pooling2d_1 ( (None, 10)                0
activation_1 (Activation)    (None, 10)                0
=================================================================
Total params: 1,369,738
```

Resumen

- Resumen
  - Solo Convoluciones!
  - Orientada a Cifar10/100

A	B	All-CNN-C
Input 32×32 RGB image		
5×5 conv. 96 ReLU	5×5 conv. 96 ReLU 1×1 conv. 96 ReLU	3×3 conv. 96 ReLU 3×3 conv. 96 ReLU
3×3 max-pooling stride 2		3×3 conv. 96 ReLU with stride $r = 2$
5×5 conv. 192 ReLU	5×5 conv. 192 ReLU 1×1 conv. 192 ReLU	3×3 conv. 192 ReLU 3×3 conv. 192 ReLU
3×3 max-pooling stride 2		3×3 conv. 192 ReLU with stride $r = 2$
3×3 conv. 192 ReLU		
1×1 conv. 192 ReLU		
1×1 conv. 10 ReLU		
global averaging over 6×6 spatial dimensions		
10 or 100-way softmax		