Técnicas Avanzadas de Data Mining y Sistemas Inteligentes

Maestría en Informática
Escuela de Posgrado
Pontificia Universidad Católica del Perú

2018-2

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Review

Keras code

```
from keras.layers import Dense, Conv2D, MaxPool2D, Flatten

model = Sequential([
    Conv2D(16, 3, activation='relu', input_shape=(28,28,1)),
    MaxPool2D(),
    Conv2D(32, 3, act
    MaxPool2D(),
    Flatten(),
    Dense(10, activat
])
```

¿Cuantos parámetros tiene esta capa de convolución?

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16 filtros de 3x3x1 -> 16x3x3x1 = 144

+ 16 bias -> 144 + 16 = **160**

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¿Cuantos parámetros tiene esta capa de convolución?

32 filtros de 3x3x16 -> 32x3x3x16 = 4,608

+ 32 bias -> 4,608 + 32 = **4,640**

Keras code

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    Conv2D(32, 3, activa
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¿Cuantos parámetros tiene la capa Dense, si el output del ultimo MaxPool2D tiene la forma Nx5x5x32?

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¿Cuantos parámetros tiene la capa Dense, si el output del ultimo MaxPool2D tiene la forma Nx5x5x32?

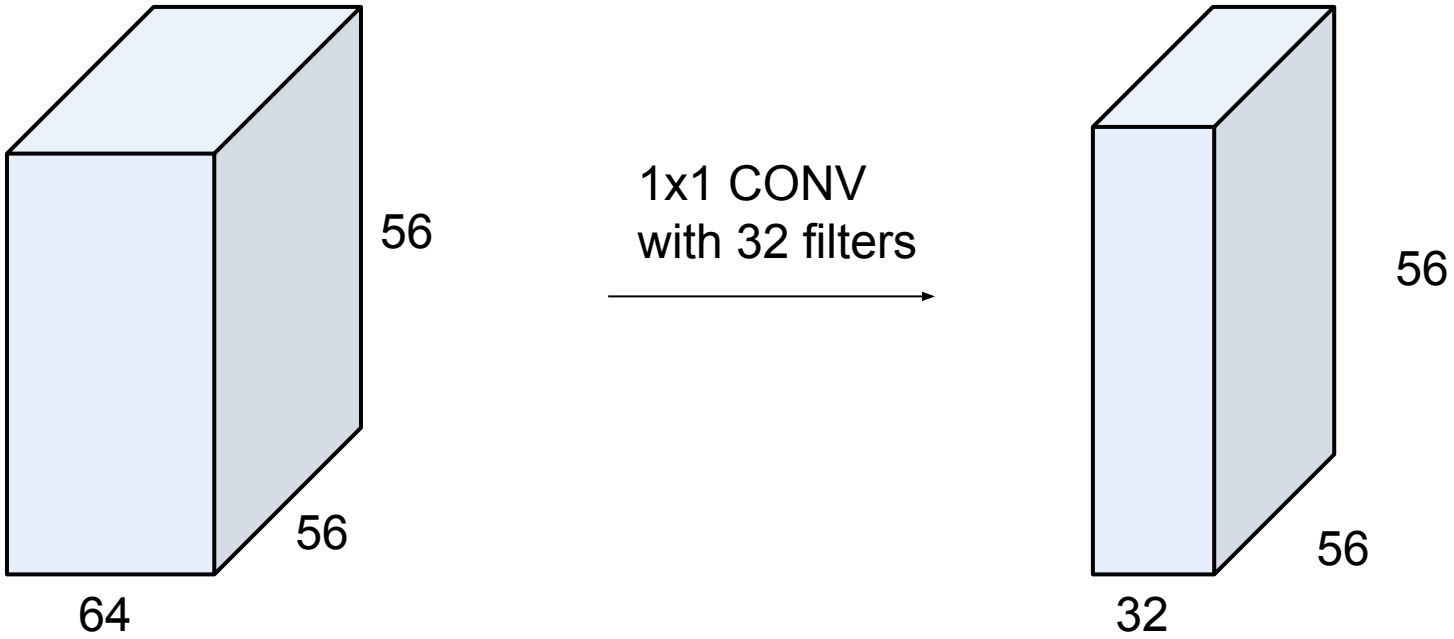
Nx5x5x32 = Nx800

Nx800 @ 800x10 = Nx10

pesos: 800x10 -> 8,000

+ 10 bias -> **8,010**

1x1 convolution layers



1x1 convolution layers

Ej: 128 filtros de 1x1 en un input de 1x1x64

1x1 convolution layers

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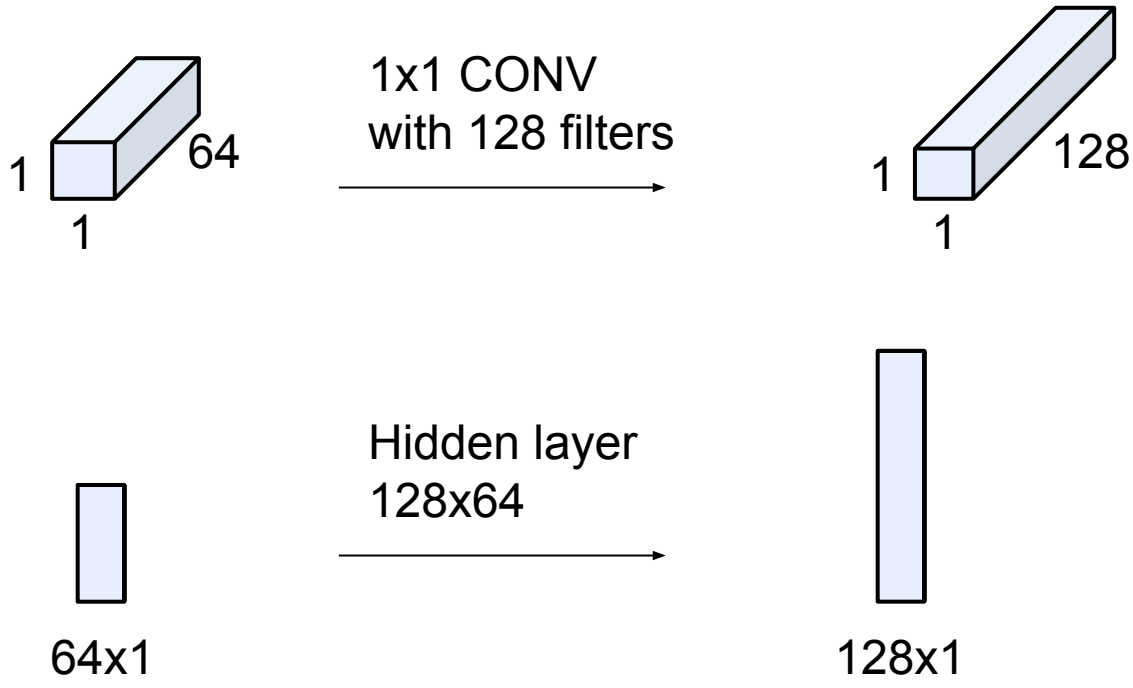
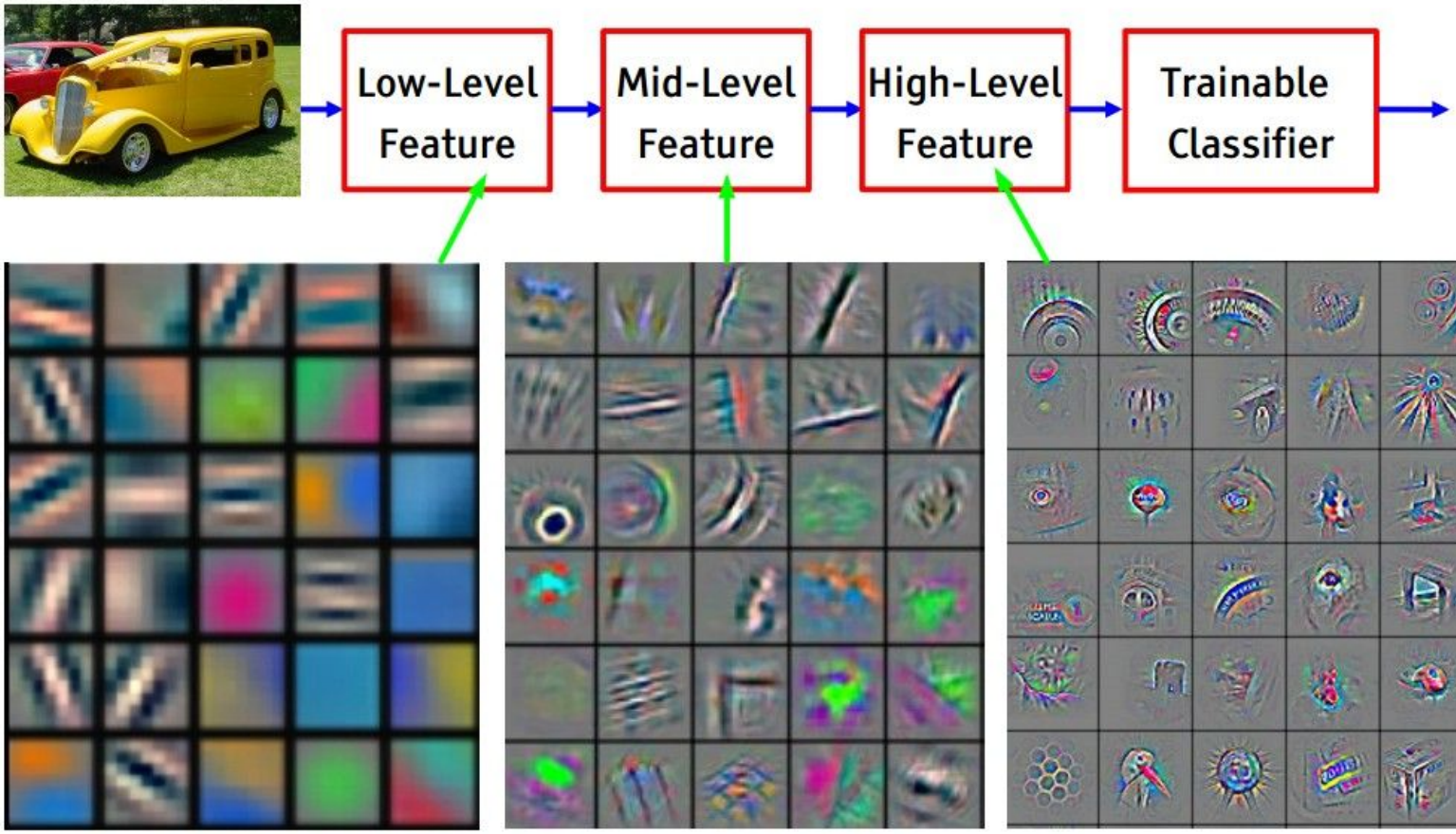
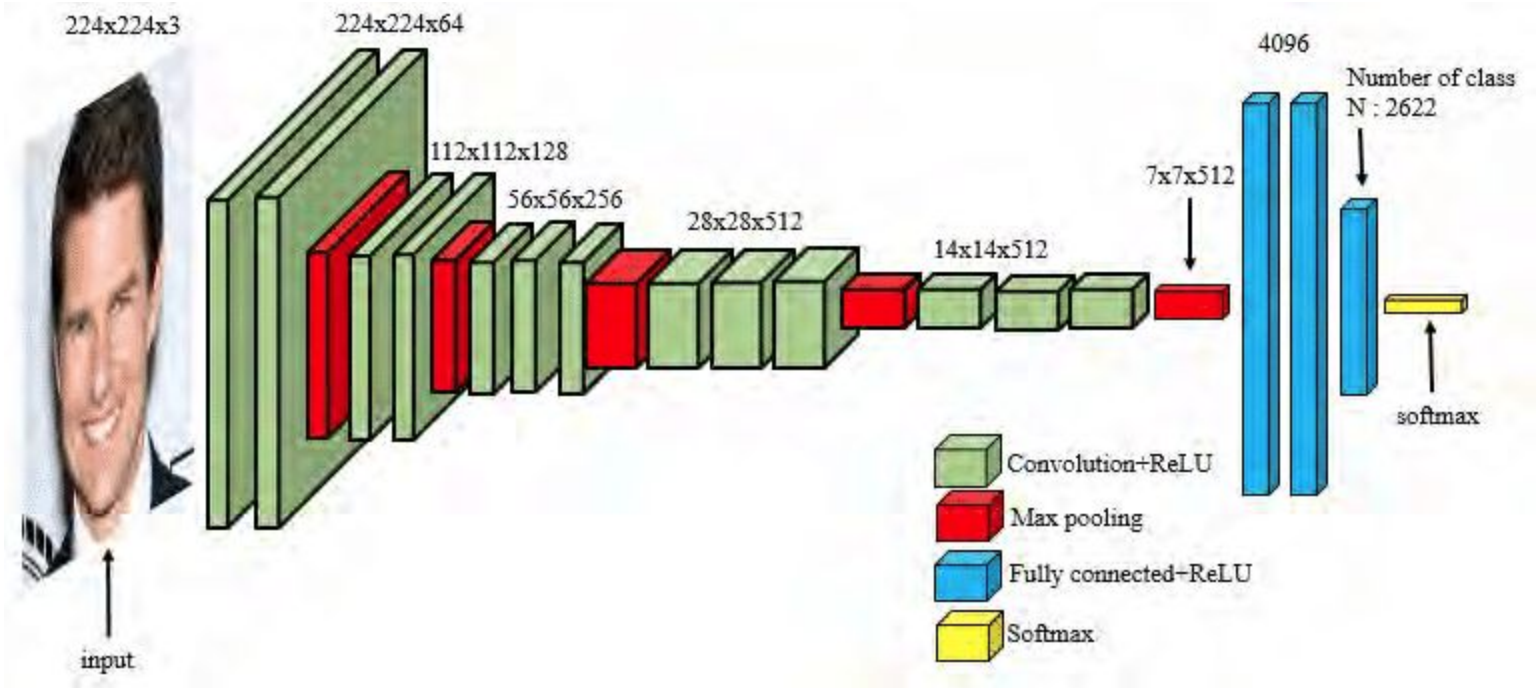
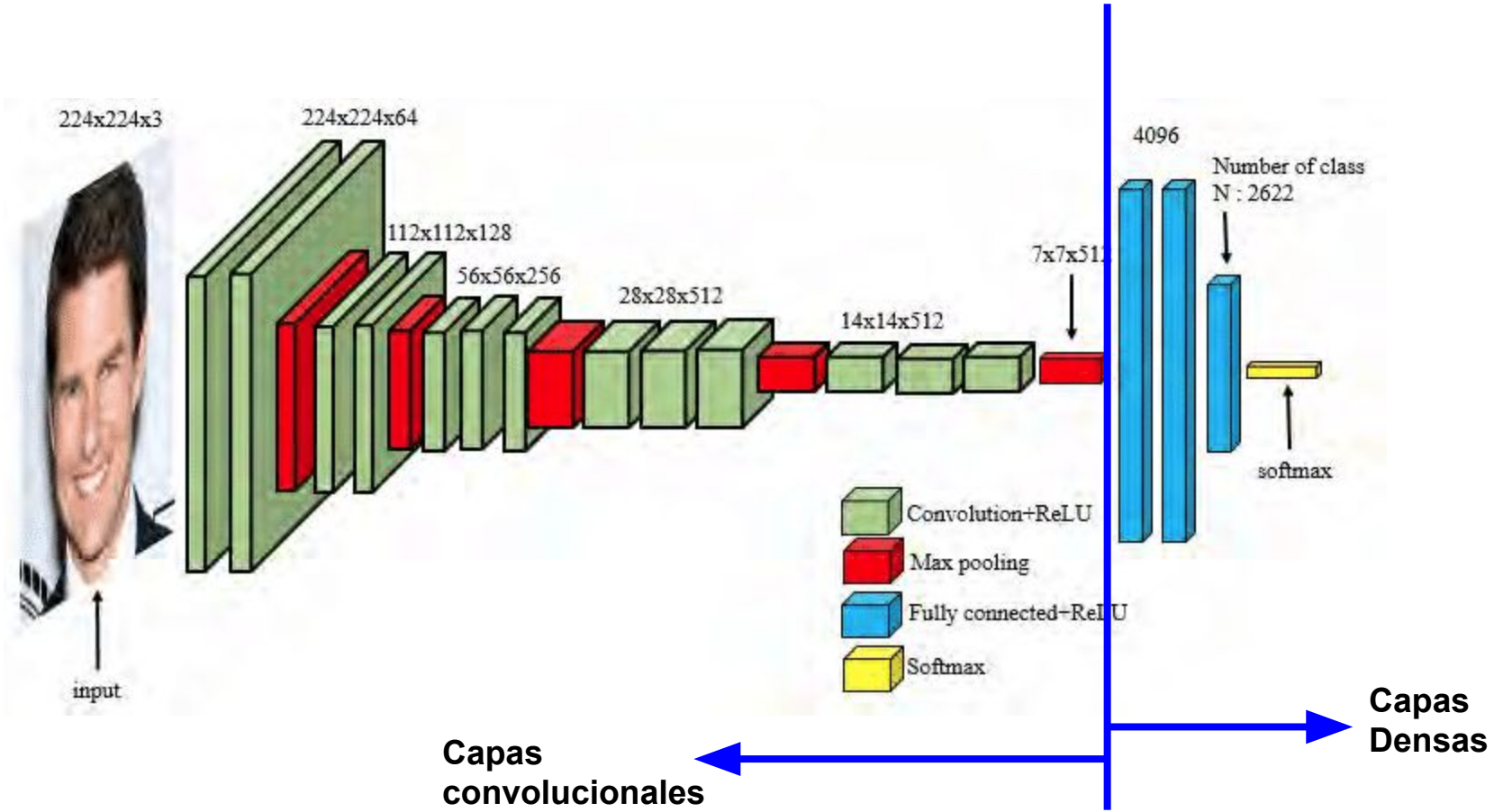


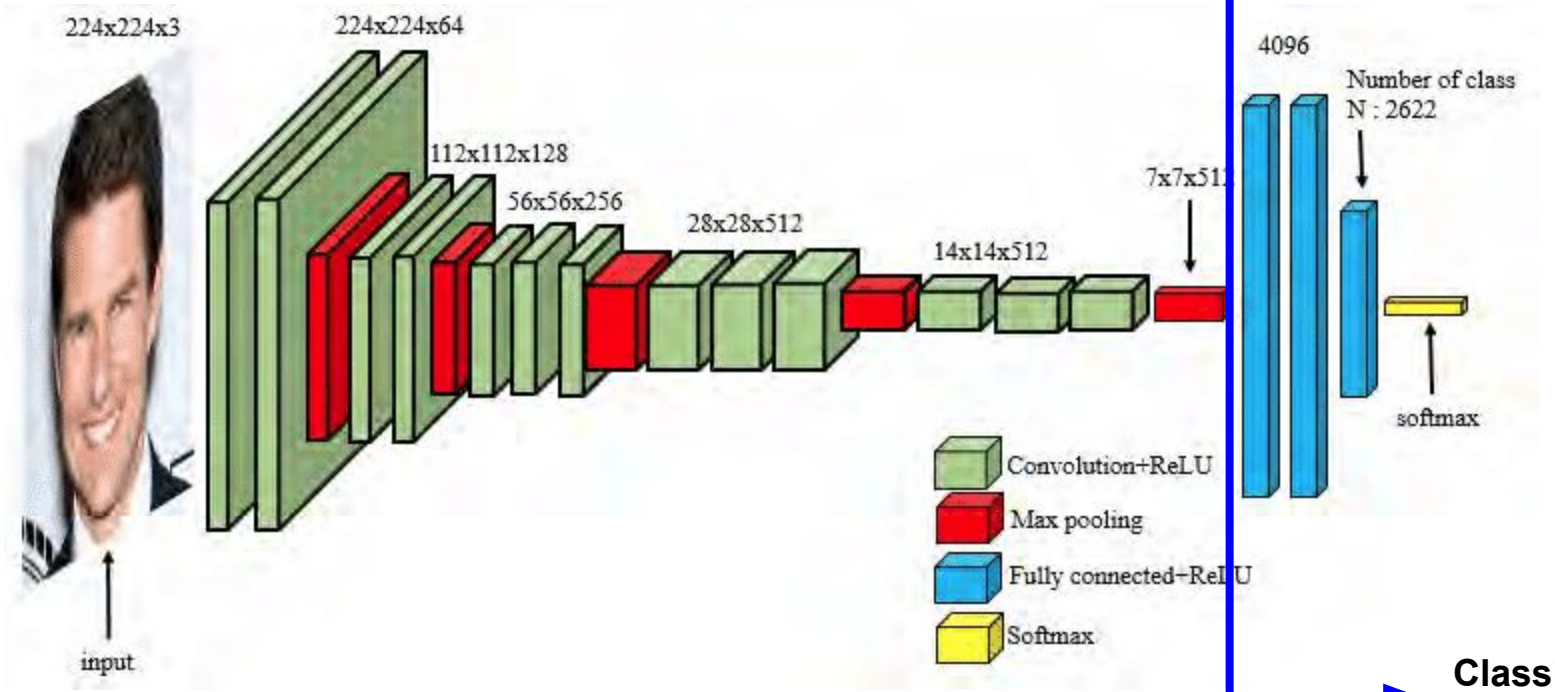
Transfer Learning



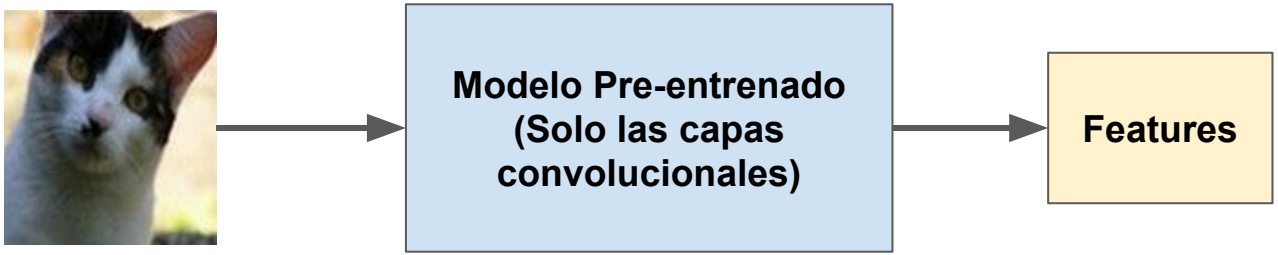
Feature visualization of convolutional net trained on ImageNet from [Zeiler & Fergus 2013]


224x224x3
224x224x64
112x112x128
56x56x256
28x28x512
14x14x512
7x7x512
4096
Number of class
N : 2622
softmax
input
Convolution+ReLU
Max pooling
Fully connected+ReLU
Softmax

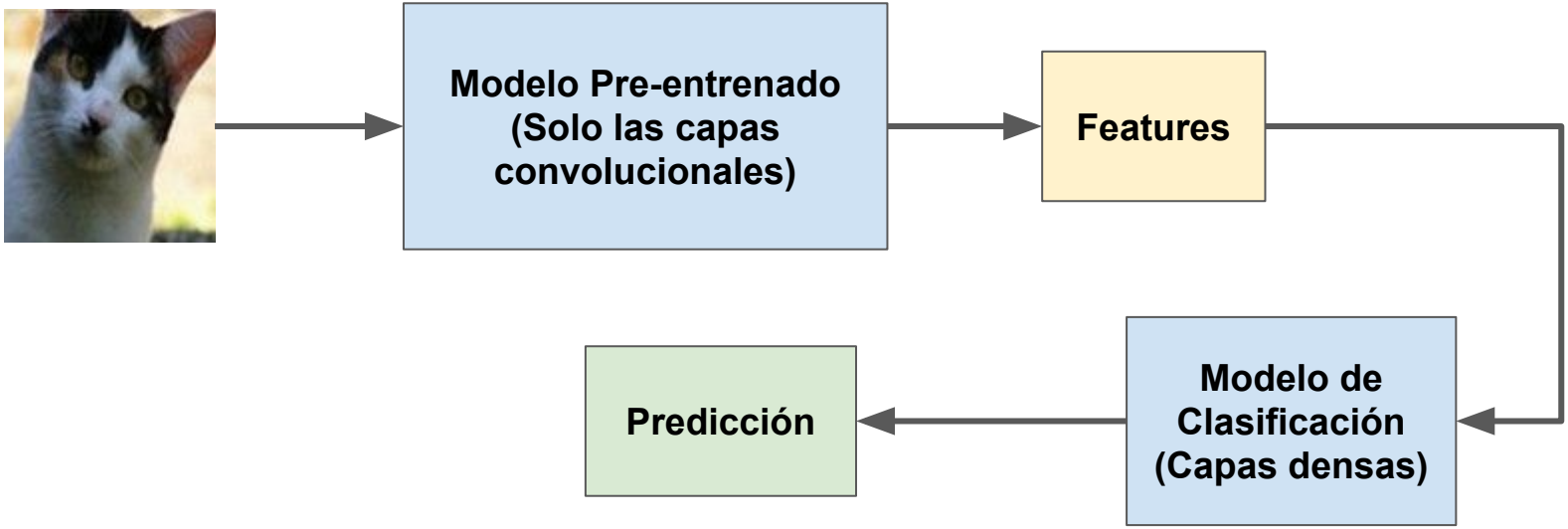

224x224x3
224x224x64
112x112x128
56x56x256
28x28x512
14x14x512
7x7x512
4096
Number of class
N : 2622
softmax
input
Convolution+ReLU
Max pooling
Fully connected+ReLU
Softmax
Capas convolucionales
Capas Densas


224x224x3
224x224x64
112x112x128
56x56x256
28x28x512
14x14x512
7x7x51
4096
Number of class
N : 2622
softmax
input
Convolution+ReLU
Max pooling
Fully connected+ReLU
Softmax
Feature extraction
Classification head

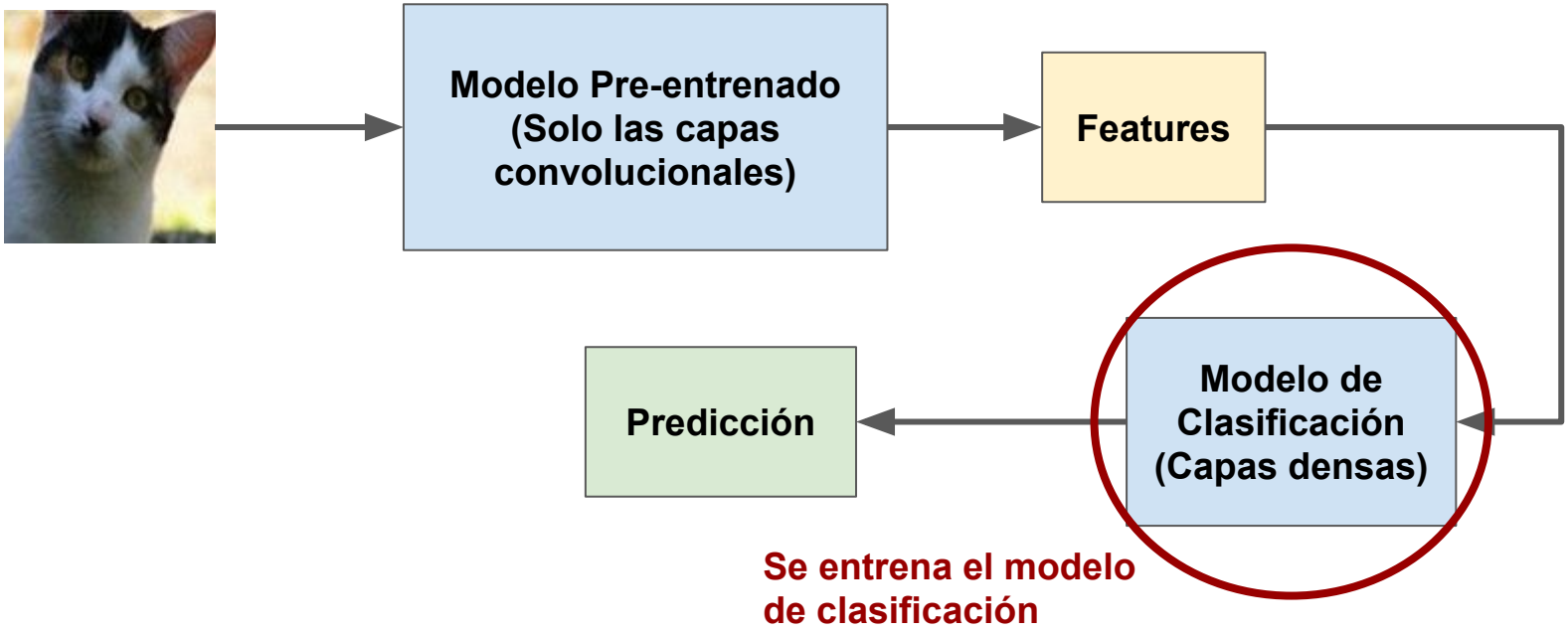
Transfer Learning



Transfer Learning



Transfer Learning - entrenamiento



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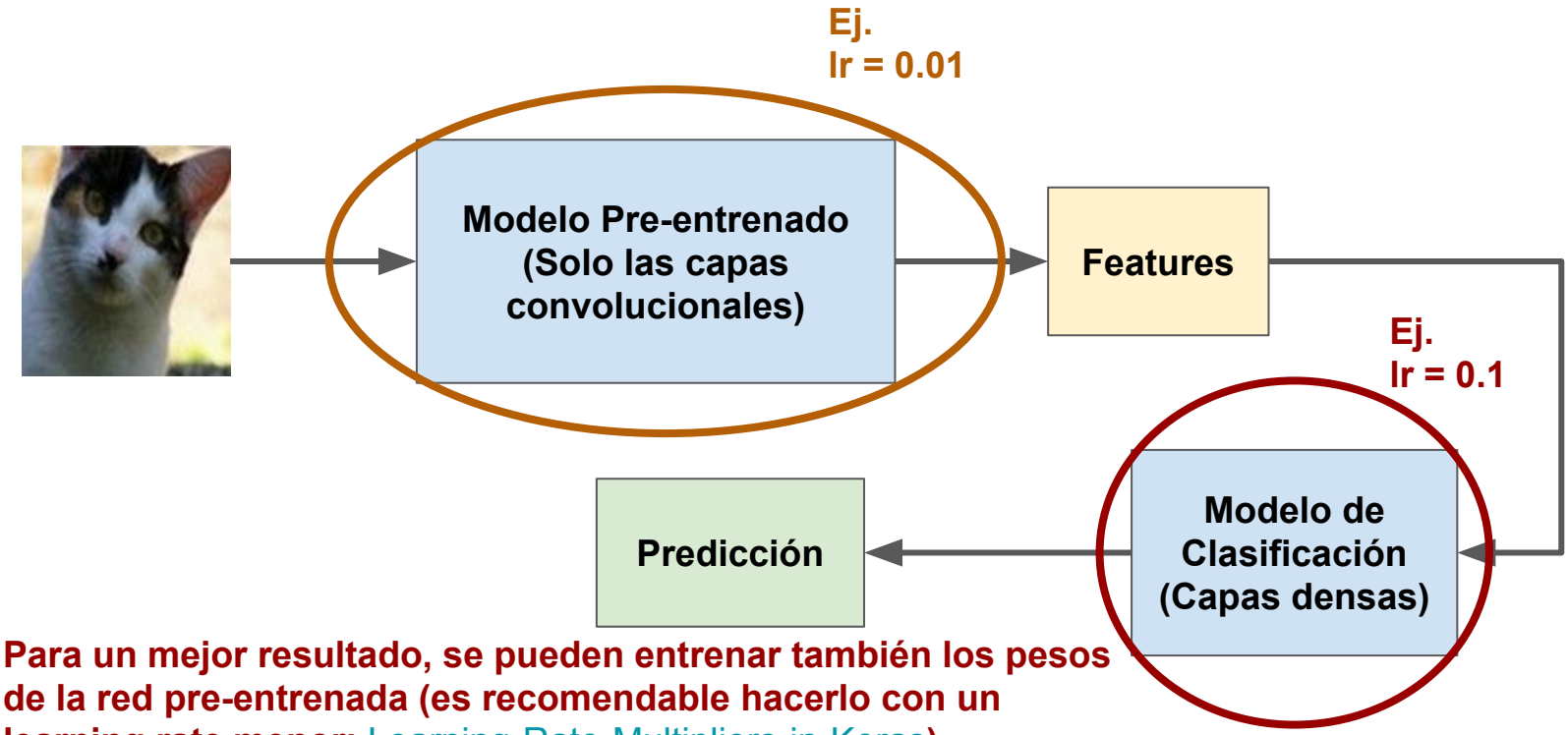

Para un mejor resultado, se pueden entrenar también los pesos de la red pre-entrenada (es recomendable hacerlo con un learning rate menor: Learning-Rate-Multipliers-in-Keras).