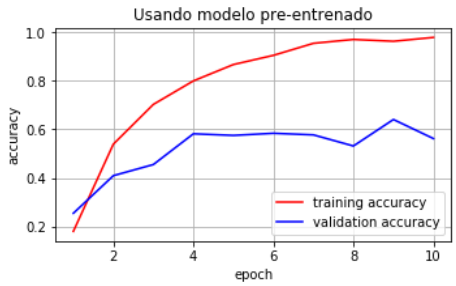
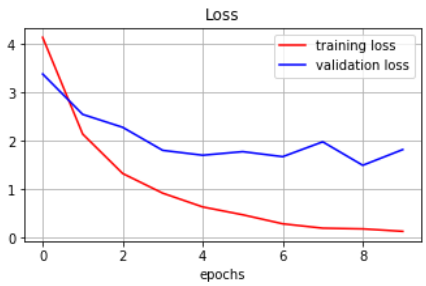
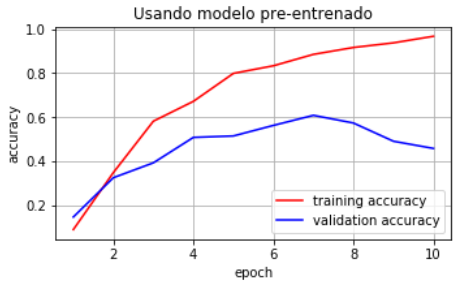
```
============================================================
Experimento VGG16-7
experimento = Experimento VGG16-7
model = <keras.engine.training.Model object at 0x7fa676c2be80>
samples_per_class = 30
number_of_classes = 102
optimizador = rmsprop
clasificador = VGG16-1
batch_size = 128
epochs = 10
run_experiment = True
------------------------------------------------------------
Creando sub-conjunto de datos con  102  clases y  30 muestras por clase
number_of_classes: 102
Sub-conjunto con 102 clases creado.
Cantidad de muestras: 3060
Creando datos de train, validate y test ...
Datos de train, validate y test creados.

Split de Entrenamiento, Validación y prueba: 2142, 459, 459
Número de clases: 102
Número de muestras: 30
Usando rmsprop
Train on 2142 samples, validate on 459 samples
Epoch 1/10
2142/2142 [==============================] - 4s 2ms/step - loss: 4.1453 - acc: 0.1807 - val_loss: 3.3884 - val_acc: 0.2549
Epoch 2/10
2142/2142 [==============================] - 3s 1ms/step - loss: 2.1452 - acc: 0.5392 - val_loss: 2.5520 - val_acc: 0.4096
Epoch 3/10
2142/2142 [==============================] - 3s 1ms/step - loss: 1.3279 - acc: 0.7026 - val_loss: 2.2841 - val_acc: 0.4553
Epoch 4/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.9211 - acc: 0.7993 - val_loss: 1.8074 - val_acc: 0.5817
Epoch 5/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.6358 - acc: 0.8665 - val_loss: 1.7063 - val_acc: 0.5752
Epoch 6/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.4736 - acc: 0.9043 - val_loss: 1.7805 - val_acc: 0.5839
Epoch 7/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.2866 - acc: 0.9538 - val_loss: 1.6763 - val_acc: 0.5773
Epoch 8/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.1960 - acc: 0.9697 - val_loss: 1.9837 - val_acc: 0.5316
Epoch 9/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.1815 - acc: 0.9622 - val_loss: 1.4977 - val_acc: 0.6405
Epoch 10/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.1306 - acc: 0.9781 - val_loss: 1.8233 - val_acc: 0.5621
```

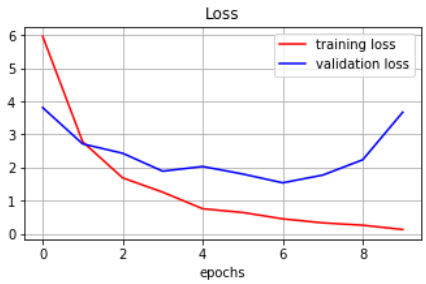




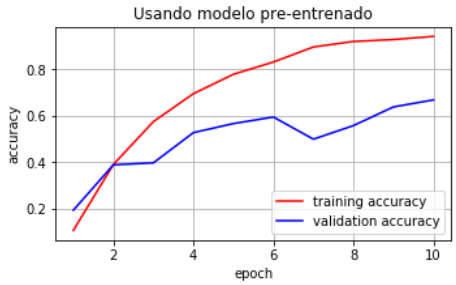

```
Exactitud en subconjunto de test:
Test loss: 1.456911909554259
Test accuracy: 0.6361655770823327

Exactitud en todo el dataset:
Test loss: 1.2630715006189457
Test accuracy: 0.704647348264712
============================================================
Experimento VGG16-8
experimento = Experimento VGG16-8
model = <keras.engine.training.Model object at 0x7fa676c2be80>
samples_per_class = 30
number_of_classes = 102
optimizador = rmsprop
clasificador = VGG16-2
batch_size = 128
epochs = 10
run_experiment = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 30
Usando rmsprop
Train on 2142 samples, validate on 459 samples
Epoch 1/10
2142/2142 [==============================] - 4s 2ms/step - loss: 5.9696 - acc: 0.0892 - val_loss: 3.8138 - val_acc: 0.1460
Epoch 2/10
2142/2142 [==============================] - 3s 1ms/step - loss: 2.7789 - acc: 0.3478 - val_loss: 2.7161 - val_acc: 0.3246
Epoch 3/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.6897 - acc: 0.5812 - val_loss: 2.4322 - val_acc: 0.3922
Epoch 4/10
2142/2142 [==============================] - 3s 1ms/step - loss: 1.2571 - acc: 0.6713 - val_loss: 1.8917 - val_acc: 0.5076
Epoch 5/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.7551 - acc: 0.7983 - val_loss: 2.0335 - val_acc: 0.5142
Epoch 6/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.6427 - acc: 0.8329 - val_loss: 1.8058 - val_acc: 0.5621
Epoch 7/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.4500 - acc: 0.8847 - val_loss: 1.5396 - val_acc: 0.6078
```

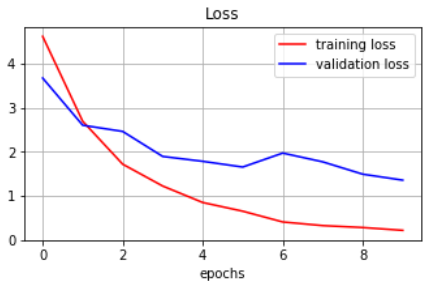
```
Epoch 8/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.3288 - acc: 0.9160 - val_loss: 1.7735 - val_acc: 0.5730
Epoch 9/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.2583 - acc: 0.9370 - val_loss: 2.2368 - val_acc: 0.4902
Epoch 10/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.1272 - acc: 0.9669 - val_loss: 3.6746 - val_acc: 0.4575
```





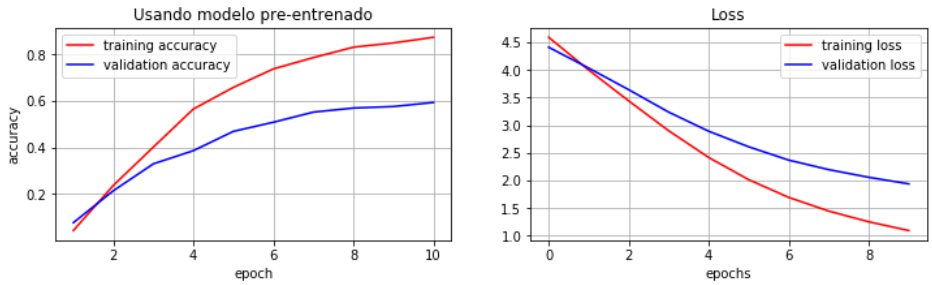

```
Exactitud en subconjunto de test:
Test loss: 3.0076073036734057
Test accuracy: 0.5206971681455641

Exactitud en todo el dataset:
Test loss: 2.6707269684449777
Test accuracy: 0.529032257992821
============================================================
Experimento VGG16-9
experimento = Experimento VGG16-9
model = <keras.engine.training.Model object at 0x7fa676c2be80>
samples_per_class = 30
number_of_classes = 102
optimizador = rmsprop
clasificador = VGG16-3
batch_size = 128
epochs = 10
run_experiment = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 30
Usando rmsprop
Train on 2142 samples, validate on 459 samples
Epoch 1/10
2142/2142 [==============================] - 4s 2ms/step - loss: 4.6139 - acc: 0.1046 - val_loss: 3.6687 - val_acc: 0.1917
Epoch 2/10
2142/2142 [==============================] - 2s 1ms/step - loss: 2.6890 - acc: 0.3894 - val_loss: 2.5983 - val_acc: 0.3878
Epoch 3/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.7145 - acc: 0.5747 - val_loss: 2.4578 - val_acc: 0.3965
Epoch 4/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.2188 - acc: 0.6956 - val_loss: 1.8900 - val_acc: 0.5272
Epoch 5/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.8450 - acc: 0.7796 - val_loss: 1.7796 - val_acc: 0.5664
Epoch 6/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.6477 - acc: 0.8329 - val_loss: 1.6495 - val_acc: 0.5948
Epoch 7/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.4035 - acc: 0.8978 - val_loss: 1.9665 - val_acc: 0.4989
Epoch 8/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.3206 - acc: 0.9216 - val_loss: 1.7677 - val_acc: 0.5577
Epoch 9/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.2770 - acc: 0.9300 - val_loss: 1.4875 - val_acc: 0.6383
Epoch 10/10
2142/2142 [==============================] - 2s 1ms/step - loss: 0.2133 - acc: 0.9435 - val_loss: 1.3521 - val_acc: 0.6688
```



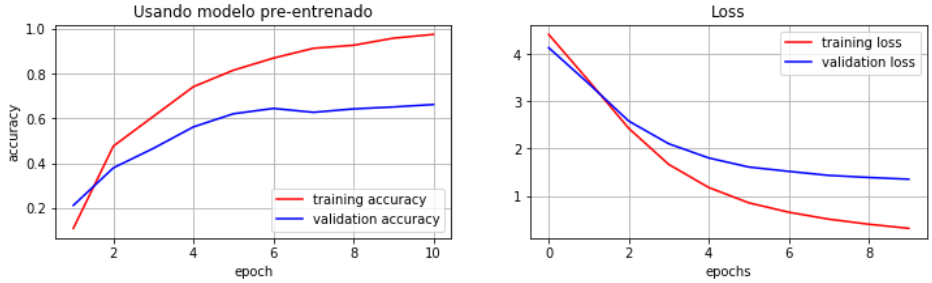



```
Exactitud en subconjunto de test:
Test loss: 1.0942346140385193
Test accuracy: 0.7189542483660131

Exactitud en todo el dataset:
Test loss: 0.9987659286178074
Test accuracy: 0.7558228540968022
============================================================
Experimento VGG16-10
experimento = Experimento VGG16-10
model = <keras.engine.training.Model object at 0x7fa676c2be80>
samples_per_class = 30
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-1
batch_size = 128
epochs = 10
run_experiment = True
------------------------------------------------------------
Número de clases: 102
```

```
Número de clases: 102
Número de muestras: 30
Usando Adam
Train on 2142 samples, validate on 459 samples
Epoch 1/10
2142/2142 [==============================] - 4s 2ms/step - loss: 4.5888 - acc: 0.0425 - val_loss: 4.4089 - val_acc: 0.0763
Epoch 2/10
2142/2142 [==============================] - 2s 1ms/step - loss: 3.9963 - acc: 0.2362 - val_loss: 4.0316 - val_acc: 0.2135
Epoch 3/10
2142/2142 [==============================] - 2s 1ms/step - loss: 3.4394 - acc: 0.4010 - val_loss: 3.6411 - val_acc: 0.3290
Epoch 4/10
2142/2142 [==============================] - 2s 1ms/step - loss: 2.8983 - acc: 0.5644 - val_loss: 3.2354 - val_acc: 0.3856
Epoch 5/10
2142/2142 [==============================] - 2s 1ms/step - loss: 2.4152 - acc: 0.6573 - val_loss: 2.8897 - val_acc: 0.4684
Epoch 6/10
2142/2142 [==============================] - 2s 1ms/step - loss: 2.0141 - acc: 0.7367 - val_loss: 2.6086 - val_acc: 0.5076
Epoch 7/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.6932 - acc: 0.7852 - val_loss: 2.3678 - val_acc: 0.5512
Epoch 8/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.4465 - acc: 0.8301 - val_loss: 2.1957 - val_acc: 0.5686
Epoch 9/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.2526 - acc: 0.8483 - val_loss: 2.0567 - val_acc: 0.5752
Epoch 10/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.0944 - acc: 0.8725 - val_loss: 1.9385 - val_acc: 0.5926
```

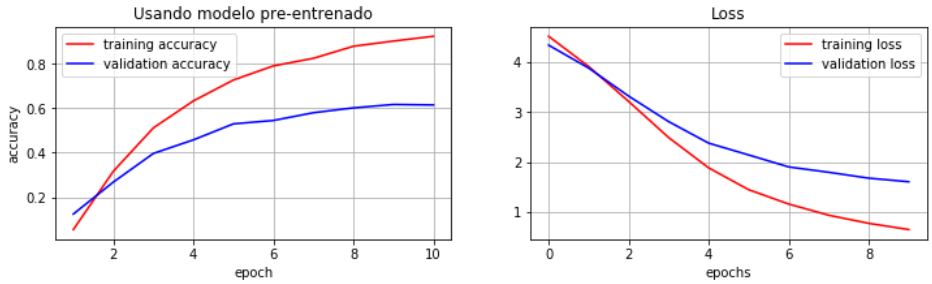



```
Exactitud en subconjunto de test:
Test loss: 1.6549639655094521
Test accuracy: 0.6840958604365912

Exactitud en todo el dataset:
Test loss: 1.6059102725304821
Test accuracy: 0.706506287621435
============================================================
Experimento VGG16-11
experimento = Experimento VGG16-11
model = <keras.engine.training.Model object at 0x7fa676c2be80>
samples_per_class = 30
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-2
batch_size = 128
epochs = 10
run_experiment = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 30
Usando Adam
Train on 2142 samples, validate on 459 samples
Epoch 1/10
2142/2142 [==============================] - 4s 2ms/step - loss: 4.4163 - acc: 0.1088 - val_loss: 4.1355 - val_acc: 0.2113
Epoch 2/10
2142/2142 [==============================] - 3s 1ms/step - loss: 3.4353 - acc: 0.4762 - val_loss: 3.3758 - val_acc: 0.3791
Epoch 3/10
2142/2142 [==============================] - 3s 1ms/step - loss: 2.4297 - acc: 0.6092 - val_loss: 2.5831 - val_acc: 0.4662
Epoch 4/10
2142/2142 [==============================] - 3s 1ms/step - loss: 1.6665 - acc: 0.7418 - val_loss: 2.1026 - val_acc: 0.5621
Epoch 5/10
2142/2142 [==============================] - 3s 1ms/step - loss: 1.1766 - acc: 0.8156 - val_loss: 1.8026 - val_acc: 0.6209
Epoch 6/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.8530 - acc: 0.8697 - val_loss: 1.6101 - val_acc: 0.6449
Epoch 7/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.6534 - acc: 0.9136 - val_loss: 1.5182 - val_acc: 0.6275
Epoch 8/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.5067 - acc: 0.9272 - val_loss: 1.4332 - val_acc: 0.6427
Epoch 9/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.3996 - acc: 0.9589 - val_loss: 1.3891 - val_acc: 0.6514
Epoch 10/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.3126 - acc: 0.9757 - val_loss: 1.3525 - val_acc: 0.6623
```




```
Exactitud en subconjunto de test:
Test loss: 1.0861185842349899
```

```
Test accuracy: 0.7320261436609921

Exactitud en todo el dataset:
Test loss: 1.0393095190437718
Test accuracy: 0.7595407325690923
============================================================
Experimento VGG16-12
experimento = Experimento VGG16-12
model = <keras.engine.training.Model object at 0x7fa676c2be80>
samples_per_class = 30
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-3
batch_size = 128
epochs = 10
run_experiment = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 30
Usando Adam
Train on 2142 samples, validate on 459 samples
Epoch 1/10
2142/2142 [==============================] - 4s 2ms/step - loss: 4.5135 - acc: 0.0546 - val_loss: 4.3363 - val_acc: 0.1242
Epoch 2/10
2142/2142 [==============================] - 2s 1ms/step - loss: 3.9098 - acc: 0.3165 - val_loss: 3.8776 - val_acc: 0.2680
Epoch 3/10
2142/2142 [==============================] - 2s 1ms/step - loss: 3.2104 - acc: 0.5112 - val_loss: 3.3172 - val_acc: 0.3965
Epoch 4/10
2142/2142 [==============================] - 3s 1ms/step - loss: 2.4884 - acc: 0.6326 - val_loss: 2.8075 - val_acc: 0.4575
Epoch 5/10
2142/2142 [==============================] - 3s 1ms/step - loss: 1.8834 - acc: 0.7264 - val_loss: 2.3773 - val_acc: 0.5294
Epoch 6/10
2142/2142 [==============================] - 3s 1ms/step - loss: 1.4466 - acc: 0.7899 - val_loss: 2.1412 - val_acc: 0.5447
Epoch 7/10
2142/2142 [==============================] - 2s 1ms/step - loss: 1.1605 - acc: 0.8240 - val_loss: 1.9023 - val_acc: 0.5795
Epoch 8/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.9365 - acc: 0.8782 - val_loss: 1.7952 - val_acc: 0.6013
Epoch 9/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.7749 - acc: 0.9015 - val_loss: 1.6777 - val_acc: 0.6166
Epoch 10/10
2142/2142 [==============================] - 3s 1ms/step - loss: 0.6507 - acc: 0.9230 - val_loss: 1.6060 - val_acc: 0.6144
```




```
Exactitud en subconjunto de test:
Test loss: 1.3472823294159633
Test accuracy: 0.6775599125943153

Exactitud en todo el dataset:
Test loss: 1.242486532657377
Test accuracy: 0.7288135592503389
```

Resultados VGG16

Experimento	*Muestras*	*Optimizador*	*Clasificador*	*BatchSize*	*epocas*	**Tiempo Medio Entrenamiento**	**Exac. SubSet**	*Exac .Todo*	**Exac. run 2**	**Exact. run 2**	**Loss 1**	**Loss 2**
VGG16-1	100	rmsprop	VGG16-1	128	10	51seg.	77%	91%	79%	90%	0.83	0.42
VGG16-2	100	rmsprop	VGG16-2	128	10	51seg.	68%	83%	79%	91%	0.96	0.43
VGG16-3	100	rmsprop	VGG16-3	128	10	50seg.	74%	87%	79%	89%	0.88	0.48
VGG16-4	100	Adam	VGG16-1	128	10	50seg.	77%	85%	78%	86%	1.09	0.77
VGG16-5	100	Adam	VGG16-2	128	10	51seg.	79%	90%	79%	90%	**0.78**	**0.45**
VGG16-6	100	Adam	VGG16-3	128	10	51seg.	77%	89%	79%	89%	0.89	0.54
XCEPTION-1	100	rmsprop	XCEPTION-1			54	67%	67%				
XCEPTION-2	100	rmsprop	XCEPTION-2			54	66%	64%				
XCEPTION-3	100	rmsprop	XCEPTION-3			54	64%	63%				
XCEPTION-4	100		XCEPTION-1			65	65	64				
XCEPTION-5	100		XCEPTION-2			66	68	68				
XCEPTION-6	100		XCEPTION-3			67	72%	71%				

Experimento	*Muestras*	*Optimizador*	*Clasificador*	*BatchSize*	*epocas*	**Tiempo Medio Entrenamiento**	**Exac. Test**	**Exact. All**	**Loss Test**	**Loss All**
VGG16-1	100	rmsprop	VGG16-1	128	10	51seg.	79%	90%	0.83	0.42