```
============================================================
Experimento VGG16-13
Experimento saltado
============================================================
Experimento VGG16-14_BORRAR
Experimento saltado
============================================================
Experimento_VGG16_Dropout_5b
experimento = Experimento_VGG16_Dropout_5b
model = <keras.engine.training.Model object at 0x7f15d203fba8>
samples_per_class = 1000
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-4
dropout = 0.5
batch_size = 128
epochs = 35
run_experiment = True
save_model = True
------------------------------------------------------------
Creando sub-conjunto de datos con  102  clases y  1000 muestras por clase
number_of_classes: 102
Sub-conjunto con 102 clases creado.
Cantidad de muestras: 9145
Creando datos de train, validate y test ...
Datos de train, validate y test creados.

Split de Entrenamiento, Validación y prueba: 6401, 1372, 1372
Número de clases: 102
Número de muestras: 1000
Usando Adam
Train on 6401 samples, validate on 1372 samples
Epoch 1/35
6401/6401 [==============================] - 12s 2ms/step - loss: 3.3217 - acc: 0.3207 - val_loss: 2.4877 - val_acc: 0.475
Epoch 2/35
6401/6401 [==============================] - 7s 1ms/step - loss: 2.1696 - acc: 0.5277 - val_loss: 1.7767 - val_acc: 0.6217
Epoch 3/35
6401/6401 [==============================] - 7s 1ms/step - loss: 1.6032 - acc: 0.6316 - val_loss: 1.3839 - val_acc: 0.7055
Epoch 4/35
6401/6401 [==============================] - 7s 1ms/step - loss: 1.1869 - acc: 0.7288 - val_loss: 1.1758 - val_acc: 0.7012
Epoch 5/35
6401/6401 [==============================] - 7s 1ms/step - loss: 1.0592 - acc: 0.7460 - val_loss: 1.0263 - val_acc: 0.7770
Epoch 6/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.9027 - acc: 0.7864 - val_loss: 0.8988 - val_acc: 0.7966
Epoch 7/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.6847 - acc: 0.8375 - val_loss: 0.8164 - val_acc: 0.8105
Epoch 8/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.5740 - acc: 0.8649 - val_loss: 0.7727 - val_acc: 0.8163
Epoch 9/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.5154 - acc: 0.8760 - val_loss: 0.7265 - val_acc: 0.8309
Epoch 10/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.4321 - acc: 0.9025 - val_loss: 0.7161 - val_acc: 0.8243
Epoch 11/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.5091 - acc: 0.8789 - val_loss: 0.6890 - val_acc: 0.8302
Epoch 12/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3516 - acc: 0.9205 - val_loss: 0.6527 - val_acc: 0.8338
Epoch 13/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2918 - acc: 0.9374 - val_loss: 0.6331 - val_acc: 0.8418
Epoch 14/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2588 - acc: 0.9466 - val_loss: 0.6210 - val_acc: 0.8389
Epoch 15/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2367 - acc: 0.9500 - val_loss: 0.6113 - val_acc: 0.8375
Epoch 16/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2015 - acc: 0.9642 - val_loss: 0.5927 - val_acc: 0.8455
Epoch 17/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1746 - acc: 0.9702 - val_loss: 0.5999 - val_acc: 0.8397
Epoch 18/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1626 - acc: 0.9697 - val_loss: 0.5782 - val_acc: 0.8448
Epoch 19/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1420 - acc: 0.9773 - val_loss: 0.5751 - val_acc: 0.8440
Epoch 20/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1283 - acc: 0.9794 - val_loss: 0.5786 - val_acc: 0.8491
Epoch 21/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1198 - acc: 0.9794 - val_loss: 0.5716 - val_acc: 0.8469
Epoch 22/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0994 - acc: 0.9853 - val_loss: 0.5718 - val_acc: 0.8448
Epoch 23/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0895 - acc: 0.9877 - val_loss: 0.5563 - val_acc: 0.8484
Epoch 24/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0843 - acc: 0.9875 - val_loss: 0.5584 - val_acc: 0.8513
Epoch 25/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0722 - acc: 0.9913 - val_loss: 0.5505 - val_acc: 0.8513
Epoch 26/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0671 - acc: 0.9922 - val_loss: 0.5436 - val_acc: 0.8557
Epoch 27/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0603 - acc: 0.9948 - val_loss: 0.6062 - val_acc: 0.8404
Epoch 28/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3547 - acc: 0.9199 - val_loss: 0.6011 - val_acc: 0.8462
Epoch 29/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1079 - acc: 0.9839 - val_loss: 0.5672 - val_acc: 0.8513
Epoch 30/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0714 - acc: 0.9902 - val_loss: 0.5579 - val_acc: 0.8542
Epoch 31/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0561 - acc: 0.9942 - val_loss: 0.5549 - val_acc: 0.8542
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Epoch 32/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0532 - acc: 0.9941 - val_loss: 0.5579 - val_acc: 0.8535
Epoch 33/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0466 - acc: 0.9941 - val_loss: 0.5552 - val_acc: 0.8528
Epoch 34/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0405 - acc: 0.9955 - val_loss: 0.5492 - val_acc: 0.8542
Epoch 35/35
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0347 - acc: 0.9972 - val_loss: 0.5529 - val_acc: 0.8550
```
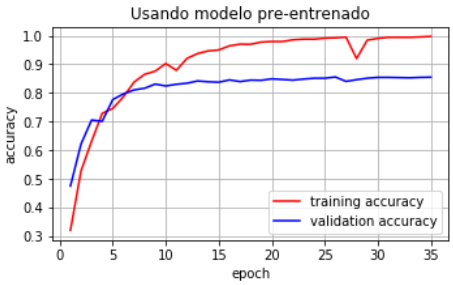
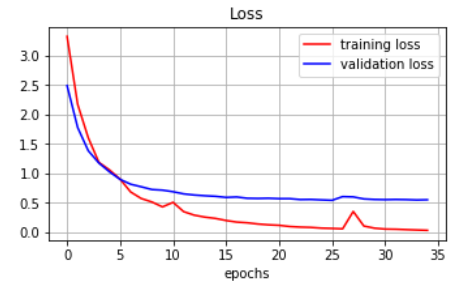
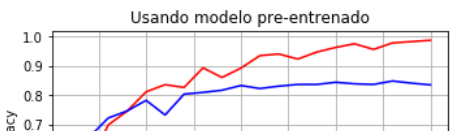
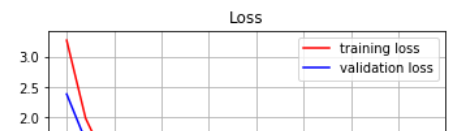
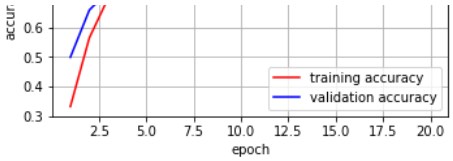



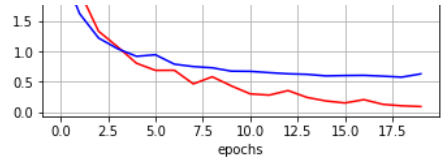



```
Exactitud en subconjunto de test:
Predict loss: 0.6274864616268926
Predict accuracy: 0.8352769681038036

Exactitud en todo el dataset:
Predict loss: 0.1848599675551865
Predict accuracy: 0.9529797703663204

Pesos del modelo guardados en: /content/drive/My Drive/MAIR-Master/07MAIR-Actividad1/pesos_Experimento_VGG16_Dropout_5b_VG
Modelo guardado en: /content/drive/My Drive/MAIR-Master/07MAIR-Actividad1/modelo_Experimento_VGG16_Dropout_5b_VGG16-4.hdf5
============================================================
Experimento_VGG16_Dropout_4
experimento = Experimento_VGG16_Dropout_4
model = <keras.engine.training.Model object at 0x7f15d203fba8>
samples_per_class = 1000
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-4
dropout = 0.4
batch_size = 128
epochs = 20
run_experiment = True
save_model = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 1000
Usando Adam
Train on 6401 samples, validate on 1372 samples
Epoch 1/20
6401/6401 [==============================] - 12s 2ms/step - loss: 3.2709 - acc: 0.3315 - val_loss: 2.3871 - val_acc: 0.498
Epoch 2/20
6401/6401 [==============================] - 7s 1ms/step - loss: 1.9891 - acc: 0.5640 - val_loss: 1.6216 - val_acc: 0.6582
Epoch 3/20
6401/6401 [==============================] - 7s 1ms/step - loss: 1.3326 - acc: 0.6996 - val_loss: 1.2213 - val_acc: 0.7230
Epoch 4/20
6401/6401 [==============================] - 7s 1ms/step - loss: 1.0775 - acc: 0.7468 - val_loss: 1.0456 - val_acc: 0.7471
Epoch 5/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.8062 - acc: 0.8117 - val_loss: 0.9202 - val_acc: 0.7828
Epoch 6/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.6895 - acc: 0.8360 - val_loss: 0.9460 - val_acc: 0.7332
Epoch 7/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.6908 - acc: 0.8266 - val_loss: 0.7910 - val_acc: 0.8039
Epoch 8/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.4674 - acc: 0.8930 - val_loss: 0.7520 - val_acc: 0.8098
Epoch 9/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.5840 - acc: 0.8603 - val_loss: 0.7314 - val_acc: 0.8171
Epoch 10/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.4353 - acc: 0.8920 - val_loss: 0.6768 - val_acc: 0.8331
Epoch 11/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3033 - acc: 0.9344 - val_loss: 0.6735 - val_acc: 0.8229
Epoch 12/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2831 - acc: 0.9400 - val_loss: 0.6520 - val_acc: 0.8309
Epoch 13/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3573 - acc: 0.9228 - val_loss: 0.6330 - val_acc: 0.8367
Epoch 14/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2449 - acc: 0.9464 - val_loss: 0.6242 - val_acc: 0.8367
Epoch 15/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1866 - acc: 0.9622 - val_loss: 0.5984 - val_acc: 0.8440
Epoch 16/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1541 - acc: 0.9744 - val_loss: 0.6045 - val_acc: 0.8389
Epoch 17/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2082 - acc: 0.9555 - val_loss: 0.6074 - val_acc: 0.8367
Epoch 18/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1316 - acc: 0.9775 - val_loss: 0.5943 - val_acc: 0.8484
Epoch 19/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1070 - acc: 0.9819 - val_loss: 0.5782 - val_acc: 0.8411
Epoch 20/20
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0951 - acc: 0.9864 - val_loss: 0.6320 - val_acc: 0.8353
```

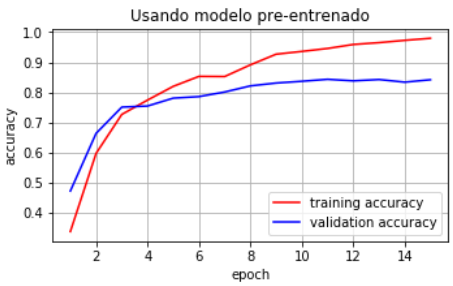


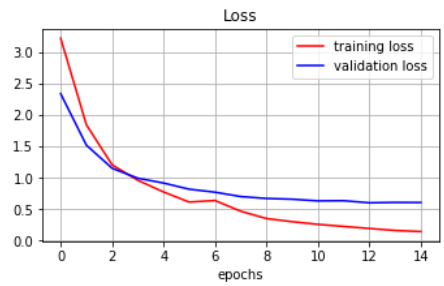






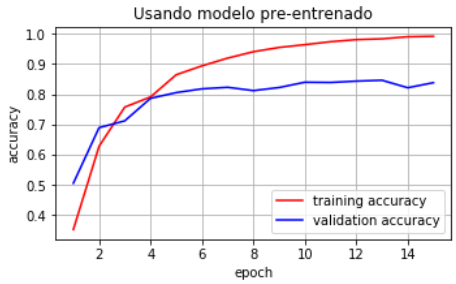

```
Exactitud en subconjunto de test:
Predict loss: 0.6701405799076091
Predict accuracy: 0.8134110783696522

Exactitud en todo el dataset:
Predict loss: 0.2393042860532046
Predict accuracy: 0.9407326407873154

Pesos del modelo guardados en: /content/drive/My Drive/MAIR-Master/07MAIR-Actividad1/pesos_Experimento_VGG16_Dropout_4_VGG
Modelo guardado en: /content/drive/My Drive/MAIR-Master/07MAIR-Actividad1/modelo_Experimento_VGG16_Dropout_4_VGG16-4.hdf5
============================================================
Experimento_VGG16-17_Dropout_3
experimento = Experimento_VGG16-17_Dropout_3
model = <keras.engine.training.Model object at 0x7f15d203fba8>
samples_per_class = 1000
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-4
dropout = 0.3
batch_size = 128
epochs = 15
run_experiment = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 1000
Usando Adam
Train on 6401 samples, validate on 1372 samples
Epoch 1/15
6401/6401 [==============================] - 12s 2ms/step - loss: 3.2217 - acc: 0.3367 - val_loss: 2.3379 - val_acc: 0.471
Epoch 2/15
6401/6401 [==============================] - 7s 1ms/step - loss: 1.8436 - acc: 0.5966 - val_loss: 1.5182 - val_acc: 0.6633
Epoch 3/15
6401/6401 [==============================] - 7s 1ms/step - loss: 1.2048 - acc: 0.7264 - val_loss: 1.1505 - val_acc: 0.7507
Epoch 4/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.9582 - acc: 0.7741 - val_loss: 0.9913 - val_acc: 0.7544
Epoch 5/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.7724 - acc: 0.8199 - val_loss: 0.9147 - val_acc: 0.7806
Epoch 6/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.6117 - acc: 0.8530 - val_loss: 0.8163 - val_acc: 0.7857
Epoch 7/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.6367 - acc: 0.8525 - val_loss: 0.7689 - val_acc: 0.8010
Epoch 8/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.4656 - acc: 0.8914 - val_loss: 0.6994 - val_acc: 0.8214
Epoch 9/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3489 - acc: 0.9269 - val_loss: 0.6690 - val_acc: 0.8309
Epoch 10/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2988 - acc: 0.9361 - val_loss: 0.6572 - val_acc: 0.8367
Epoch 11/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2562 - acc: 0.9459 - val_loss: 0.6303 - val_acc: 0.8433
Epoch 12/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2234 - acc: 0.9592 - val_loss: 0.6333 - val_acc: 0.8382
Epoch 13/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1906 - acc: 0.9653 - val_loss: 0.5996 - val_acc: 0.8426
Epoch 14/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1591 - acc: 0.9730 - val_loss: 0.6058 - val_acc: 0.8338
Epoch 15/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1418 - acc: 0.9798 - val_loss: 0.6043 - val_acc: 0.8418
```

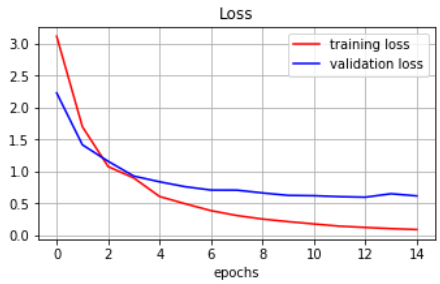





```
Exactitud en subconjunto de test:
Predict loss: 0.640013578855609
Predict accuracy: 0.8360058310775645

Exactitud en todo el dataset:
Predict loss: 0.24565058395423367
Predict accuracy: 0.946965554948059
============================================================
Experimento_VGG16_Dropout_2
experimento = Experimento_VGG16_Dropout_2
model = <keras.engine.training.Model object at 0x7f15d203fba8>
samples_per_class = 1000
number_of_classes = 102
optimizador = Adam
clasificador = VGG16-4
dropout = 0.2
batch_size = 128
```

```
epochs = 15
run_experiment = True
------------------------------------------------------------
Número de clases: 102
Número de muestras: 1000
Usando Adam
Train on 6401 samples, validate on 1372 samples
Epoch 1/15
6401/6401 [==============================] - 12s 2ms/step - loss: 3.1160 - acc: 0.3528 - val_loss: 2.2281 - val_acc: 0.505
Epoch 2/15
6401/6401 [==============================] - 7s 1ms/step - loss: 1.6986 - acc: 0.6279 - val_loss: 1.4150 - val_acc: 0.6895
Epoch 3/15
6401/6401 [==============================] - 7s 1ms/step - loss: 1.0744 - acc: 0.7575 - val_loss: 1.1572 - val_acc: 0.7121
Epoch 4/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.8948 - acc: 0.7910 - val_loss: 0.9246 - val_acc: 0.7864
Epoch 5/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.6052 - acc: 0.8644 - val_loss: 0.8353 - val_acc: 0.8054
Epoch 6/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.4903 - acc: 0.8938 - val_loss: 0.7581 - val_acc: 0.8178
Epoch 7/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3829 - acc: 0.9194 - val_loss: 0.7059 - val_acc: 0.8229
Epoch 8/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.3069 - acc: 0.9405 - val_loss: 0.7045 - val_acc: 0.8120
Epoch 9/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2514 - acc: 0.9547 - val_loss: 0.6606 - val_acc: 0.8222
Epoch 10/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.2108 - acc: 0.9638 - val_loss: 0.6225 - val_acc: 0.8397
Epoch 11/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1747 - acc: 0.9736 - val_loss: 0.6175 - val_acc: 0.8389
Epoch 12/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1397 - acc: 0.9805 - val_loss: 0.6021 - val_acc: 0.8433
Epoch 13/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1198 - acc: 0.9831 - val_loss: 0.5940 - val_acc: 0.8462
Epoch 14/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.1010 - acc: 0.9900 - val_loss: 0.6480 - val_acc: 0.8214
Epoch 15/15
6401/6401 [==============================] - 7s 1ms/step - loss: 0.0870 - acc: 0.9916 - val_loss: 0.6143 - val_acc: 0.8382
```






```
Exactitud en subconjunto de test:
Predict loss: 0.6585044230038501
Predict accuracy: 0.8214285710810225

Exactitud en todo el dataset:
Predict loss: 0.23204369157610769
Predict accuracy: 0.9466375068343357
```

Resultados VGG16

Para la VGG16 hice primero tres lotes de seis experimentos cada uno, en cada lote se probaban 3 tipos de capas clasificadoras por optimizador(msprop y Adam). En cada lotes se varió la cantidad de muestras por clase (100, 30 y 1000 que representa todo el dataset). Con esto queria identificar cual era el mejor clasificador por optimizador en términos generales. Los resultados dieron que el uso de Adam demostró ser mas consistente con el clasificador VGG16-2 mientras que con el msprop variaba siendo algo mejor con el VGG16-1. Los dos optimizadores dieron resultados muy similares tanto en exactitud y perdida para el juego de datos de prueba como el juego de datos completo. Con mi mejor modelo luego hice una nueva seerie de experimentos (Lote 4) utlizando varios valores de dropout.

Lote 1

Ver PDF con el output de pruebas del lote 1

Experimento	Muestras*Clase	Optimizador	Clasificador	Batch Size	epocas	Tiempo Entrenamiento	Exac. Test	Exact. Full	Loss Test	Loss Full
VGG16-1	100	**rmsprop**	**VGG16-1**	128	10	51seg.	**79%**	90%	**0.83**	**0.42**
VGG16-2	100	rmsprop	VGG16-2	128	10	51seg.	79%	**91%**	0.96	0.43
VGG16-3	100	rmsprop	VGG16-3	128	10	50seg.	79%	89%	0.88	0.48
VGG16-4	100	Adam	VGG16-1	128	10	50seg.	78%	86%	1.09	0.77
VGG16-5	100	**Adam**	**VGG16-2**	128	10	51seg.	**79%**	**90%**	**0.78**	**0.45**
VGG16-6	100	Adam	VGG16-3	128	10	51seg.	79%	89%	0.89	0.54