Detección de Neumonía Empleando Radiografías de Tórax a través de redes Neuronales

Proyecto inteligencia artificial

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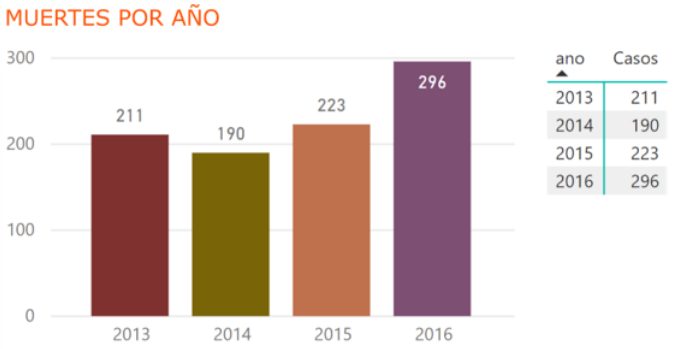
Introduction

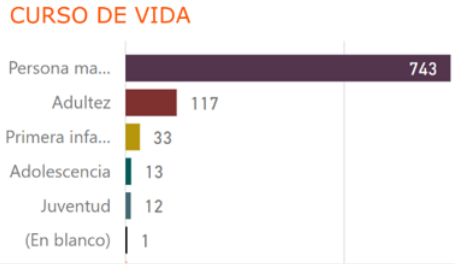
¿NEUMONIA?

- Esta enfermedad es una de las principales causas de mortalidad tanto en niños como en adultos en todo el mundo.
- Ambigüedad entre profesionales.

Causa carga enfermedad	Casos
Cardiopatía isquémica	2.530
Enfermedad cerebrovascular	1.397
Infecciones de vías respiratorias inferiores	920
Enf. Pulmonar obstructiva crónica	795
Diabetes mellitus	767
Otras enfermedades del sistema circulatorio **	564
	537
Residuo	529
Cáncer de Estomago	493
Cardiopatía hipertensiva	457
Agresiones	450
Otras enfermedades respiratorias **	423
Nefritis y nefrosis	383
Otras enfermedades del sistema digestivo **	378
Accidentes de tránsito	369
Cáncer de traquea, bronquios,pulmón	363



ano	Casos
2013	211
2014	190
2015	223
2016	296



Ciclo de vida	Casos
Persona mayor	743
Adultez	117
Primera infancia	33
Adolescencia	13
Juventud	12
	1
Infancia	1

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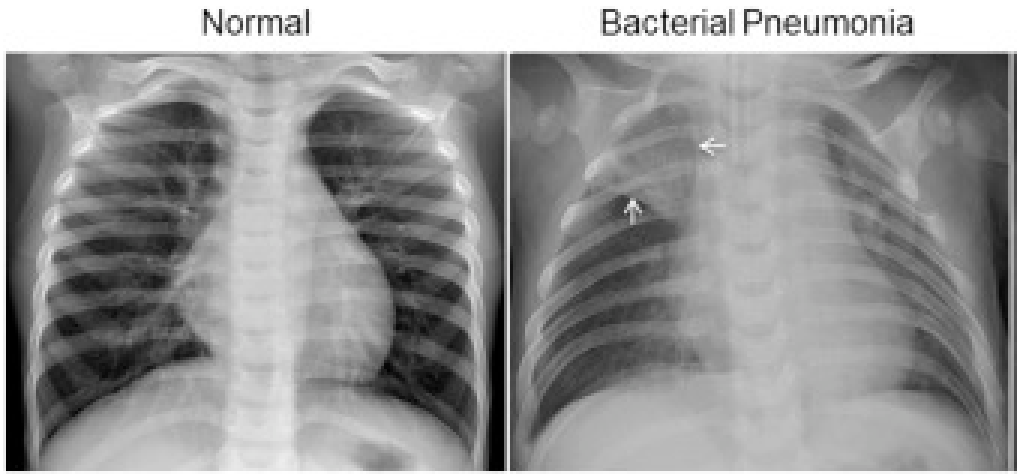
Introduction

CHEST X-RAY IMAGES (PNEUMONIA)

- Dataset extraido de https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia

	Normal	Neumonia	Total
Train	1,341	3,875	5,216
Test	234	390	624

Table: Cantidad de imagenes utilizadas para entrenar y testear



Introduction

Procesamiento

- Listar
- Recorrer las imágenes.
- Convertir a escalas de grises.
- Dimensionar las imágenes.
- Guardar.
- Etiquetar

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Metodo

```
Model: "sequential_13"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
flatten_13 (Flatten)         (None, 22500)             0
_________________________________________________________________
dense_69 (Dense)             (None, 200)               4500200
_________________________________________________________________
dense_70 (Dense)             (None, 100)               20100
_________________________________________________________________
dense_71 (Dense)             (None, 150)               15150
_________________________________________________________________
dense_72 (Dense)             (None, 50)                7550
_________________________________________________________________
dense_73 (Dense)             (None, 2)                 102
=================================================================
Total params: 4,543,102
Trainable params: 4,543,102
Non-trainable params: 0
_________________________________________________________________
```

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Metodo

Clasificadores

- Decision Tree Classifier
- Gaussian NB
- Random Forest
- SVM

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Resultados

```
[175] history=model.fit(data_test, ytest, epochs=10, batch_size=50)

Train on 624 samples
Epoch 1/10
624/624 [==============================] - 0s 666us/sample - loss: 51.4111 - acc: 0.7436
Epoch 2/10
624/624 [==============================] - 0s 430us/sample - loss: 14.7225 - acc: 0.8045
Epoch 3/10
624/624 [==============================] - 0s 450us/sample - loss: 5.5259 - acc: 0.8814
Epoch 4/10
624/624 [==============================] - 0s 442us/sample - loss: 1.8953 - acc: 0.9391
Epoch 5/10
624/624 [==============================] - 0s 444us/sample - loss: 2.1632 - acc: 0.9167
Epoch 6/10
624/624 [==============================] - 0s 444us/sample - loss: 1.7931 - acc: 0.9327
Epoch 7/10
624/624 [==============================] - 0s 434us/sample - loss: 6.6519 - acc: 0.8253
Epoch 8/10
624/624 [==============================] - 0s 435us/sample - loss: 2.3851 - acc: 0.9103
Epoch 9/10
624/624 [==============================] - 0s 432us/sample - loss: 2.3200 - acc: 0.9119
Epoch 10/10
624/624 [==============================] - 0s 420us/sample - loss: 1.0129 - acc: 0.9471
```

```
test_loss, test_acc = model.evaluate(data_test, ytest)

624/624 [==============================] - 0s 331us/sample - loss: 0.4802 - acc: 0.9696
```

Resultados

```
[179] history=model.fit(data_test, ytest, epochs=10 batch_size=200)

Train on 624 samples
Epoch 1/10
624/624 [==============================] - 0s 281us/sample - loss: 1.1599 - acc: 0.9327
Epoch 2/10
624/624 [==============================] - 0s 275us/sample - loss: 1.0026 - acc: 0.9263
Epoch 3/10
624/624 [==============================] - 0s 290us/sample - loss: 0.6228 - acc: 0.9503
Epoch 4/10
624/624 [==============================] - 0s 279us/sample - loss: 0.1136 - acc: 0.9904
Epoch 5/10
624/624 [==============================] - 0s 271us/sample - loss: 0.3721 - acc: 0.9599
Epoch 6/10
624/624 [==============================] - 0s 279us/sample - loss: 0.1273 - acc: 0.9824
Epoch 7/10
624/624 [==============================] - 0s 273us/sample - loss: 0.1289 - acc: 0.9776
Epoch 8/10
624/624 [==============================] - 0s 289us/sample - loss: 0.2221 - acc: 0.9663
Epoch 9/10
624/624 [==============================] - 0s 304us/sample - loss: 0.2336 - acc: 0.9696
Epoch 10/10
624/624 [==============================] - 0s 284us/sample - loss: 0.5300 - acc: 0.9471
```

```
test_loss, test_acc = model.evaluate(data_test, ytest)

624/624 [==============================] - 0s 215us/sample - loss: 3.7913 - acc: 0.7997
```

```
[185] history=model.fit(data_test, ytest, epochs=10)

Train on 624 samples
Epoch 1/10
624/624 [==============================] - 0s 581us/sample - loss: 0.6587 - acc: 0.6250
Epoch 2/10
624/624 [==============================] - 0s 578us/sample - loss: 0.6587 - acc: 0.6250
Epoch 3/10
624/624 [==============================] - 0s 584us/sample - loss: 0.6587 - acc: 0.6250
Epoch 4/10
624/624 [==============================] - 0s 586us/sample - loss: 0.6586 - acc: 0.6250
Epoch 5/10
624/624 [==============================] - 0s 572us/sample - loss: 0.6586 - acc: 0.6250
Epoch 6/10
624/624 [==============================] - 0s 580us/sample - loss: 0.6587 - acc: 0.6250
Epoch 7/10
624/624 [==============================] - 0s 585us/sample - loss: 0.6587 - acc: 0.6250
Epoch 8/10
624/624 [==============================] - 0s 559us/sample - loss: 0.6586 - acc: 0.6250
Epoch 9/10
624/624 [==============================] - 0s 576us/sample - loss: 0.6588 - acc: 0.6250
Epoch 10/10
624/624 [==============================] - 0s 566us/sample - loss: 0.6586 - acc: 0.6250

test_loss, test_acc = model.evaluate(data_test, ytest)

624/624 [==============================] - 0s 217us/sample - loss: 0.6585 - acc: 0.6250
```

```
[183] history=model.fit(data_test, ytest, epochs=10, batch_size=5)

Train on 624 samples
Epoch 1/10
624/624 [==============================] - 2s 3ms/sample - loss: 5.9328 - acc: 0.8141
Epoch 2/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.7068 - acc: 0.5705
Epoch 3/10
624/624 [==============================] - 2s 3ms/sample - loss: 1.0227 - acc: 0.6250
Epoch 4/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6617 - acc: 0.6250
Epoch 5/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6603 - acc: 0.6250
Epoch 6/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6590 - acc: 0.6250
Epoch 7/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6591 - acc: 0.6250
Epoch 8/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6591 - acc: 0.6250
Epoch 9/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6592 - acc: 0.6250
Epoch 10/10
624/624 [==============================] - 2s 3ms/sample - loss: 0.6595 - acc: 0.6250

test_loss, test_acc = model.evaluate(data_test, ytest)

624/624 [==============================] - 0s 235us/sample - loss: 0.6585 - acc: 0.6250
```

Resultados

CASIFICADOR	PRECISIÓN
DecisionTreeClassifier	82.9 %
GaussianNB	85.6%
DNN	**96.9%**

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Resultados

CASIFICADOR	PRECISIÓN
DecisionTreeClassifier	85.9 %
GaussianNB	85.6%
Random Forest Classifier	**94.3%**
SVM	85.6%
DNN	84.6%

Conclusiones

Conclusiones

- Esperabamos un rendimiento sobresaliente con la red neuronal por ser en estos momentos tendencia mundial, pero los resultados obtenidos muestran una mejor precisión con otros metodos de vanguardia.
- La red neuronal para este caso no fue la más precisa, pero en cuestión de tiempo-precisión es la mejor opción, se debe tener en cuanta, ya que toma relevancia a la hora de trabajar con muchos datos.
- Se determinó que el clasificador que arrojo mejores resultados fue Random Forest Classifier