

USECASE

# BRAIN TUMORS

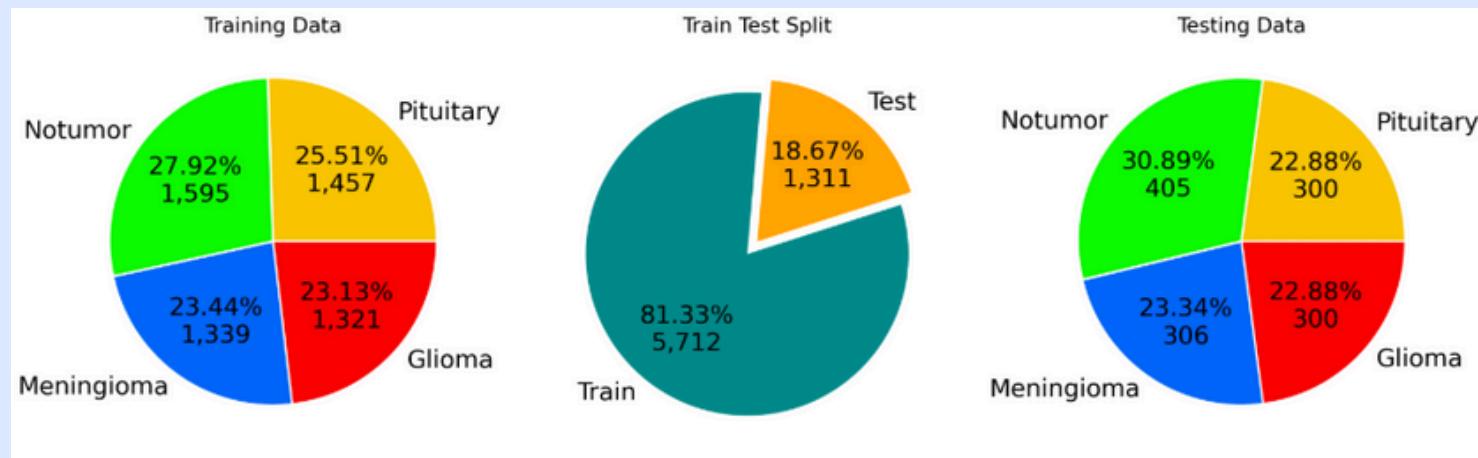
Team Name: Adi & Les

# PROBLEM DEFINITION

The objective of this UseCase, is to clasify different types of brain tumors with models of CNN using image clasification



# DATASET DESCRIPTION



**Training:** Found 5712 images belonging to 4 classes.

**Test:** Found 1311 images belonging to 4 classes.  
8,334 Images

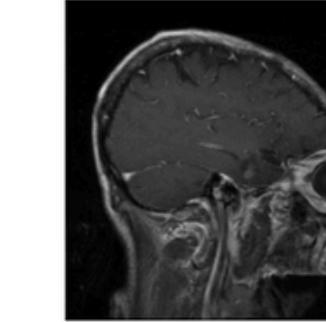
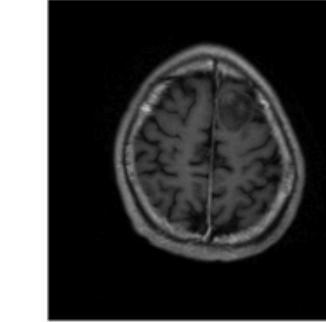
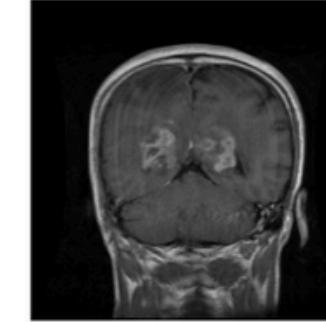
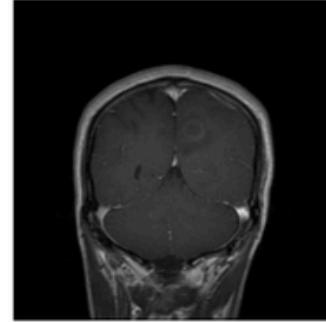
**Classes:** Glioma, Meningioma, Notumor, Pituitary'



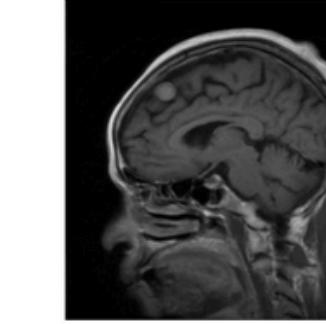
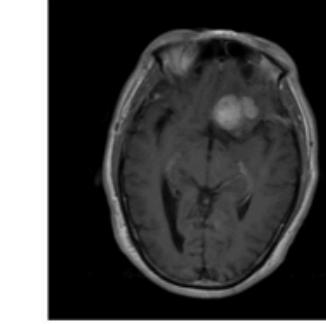
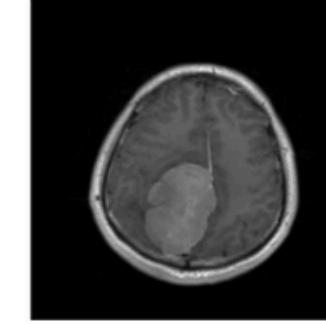
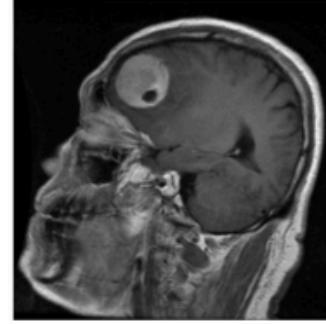
**Image Size:** 225px \* 225px  
**GrayScale**

Muestra de Imágenes por Clase del Dataset de Entrenamiento

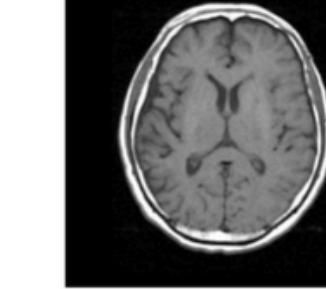
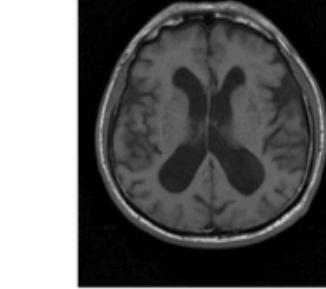
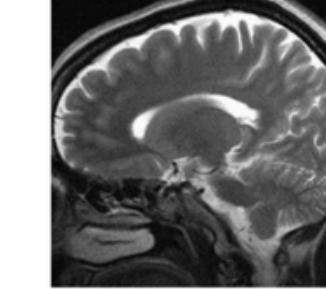
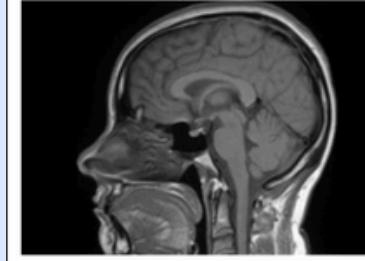
glioma



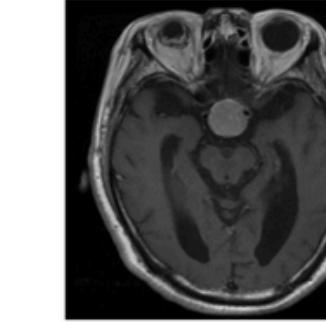
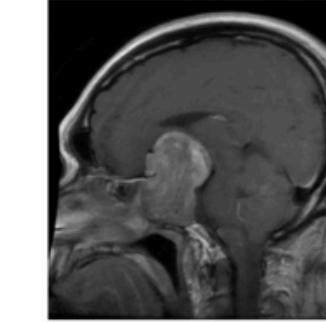
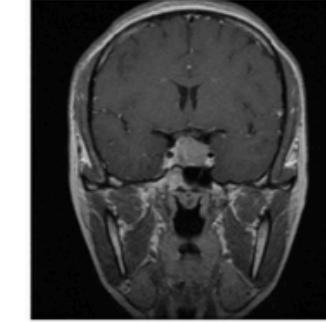
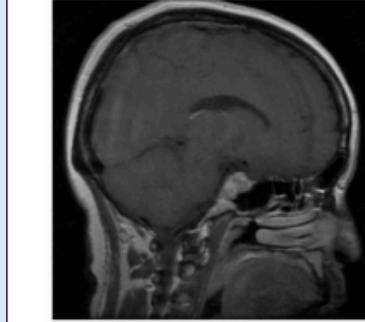
meningioma



notumor



pituitary



# SOLUTION APPROACH

## IMAGE PREPROCESSING

```
IMG_SIZE = (150, 150)  
BATCH_SIZE = 32
```

```
train_datagen = ImageDataGenerator(  
    rescale=1./255,  
    rotation_range=10,  
    brightness_range=(0.85, 1.15),  
    width_shift_range=0.002,  
    height_shift_range=0.002,  
    shear_range=12.5,  
    zoom_range=0,  
    horizontal_flip=True,  
    vertical_flip=False,  
    fill_mode="nearest")
```

- ★ Resizing. All images were standardized to a size of 150x150 px.
- ★ Normalization. Pixel values were rescaled to a [0, 1] range.

## DATA AUGMENTATION

### Applied transformations

- ★ Geometric variations.
- ★ Contrast simulation.
- ★ Anatomical symmetry.

### Deliberate exclusions

- ★ No vertical flipping.
- ★ No significant zoom.

# MODEL PERFORMANCE

## ANALYSIS

### MODEL #1

#### Params

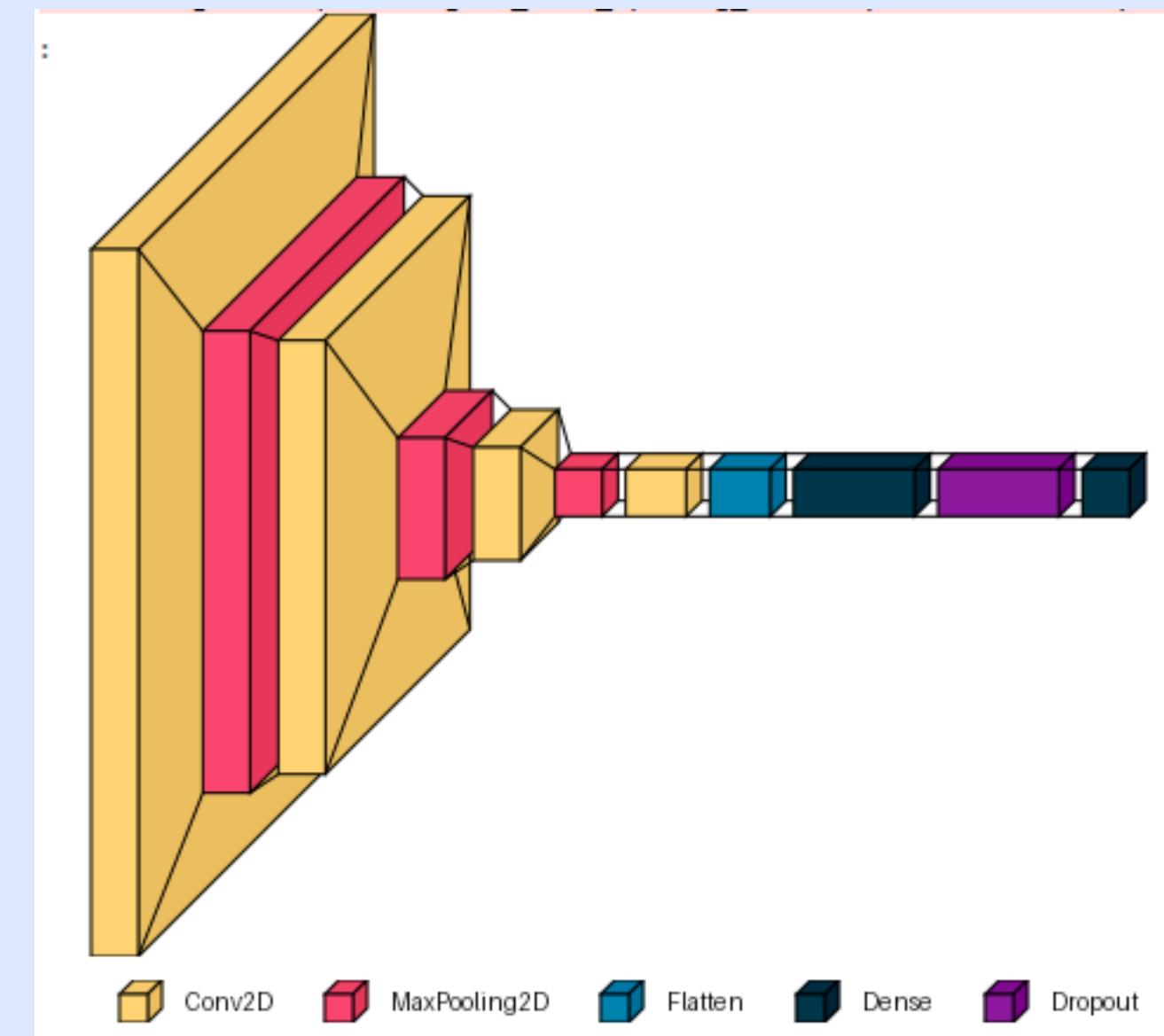
Layer (type)	Output Shape	Param #
conv2d_22 (Conv2D)	(None, 147, 147, 32)	1,568
max_pooling2d_18 (MaxPooling2D)	(None, 49, 49, 32)	0
conv2d_23 (Conv2D)	(None, 46, 46, 64)	32,832
max_pooling2d_19 (MaxPooling2D)	(None, 15, 15, 64)	0
conv2d_24 (Conv2D)	(None, 12, 12, 128)	131,200
max_pooling2d_20 (MaxPooling2D)	(None, 4, 4, 128)	0
conv2d_25 (Conv2D)	(None, 1, 1, 256)	524,544
flatten_6 (Flatten)	(None, 256)	0
dense_12 (Dense)	(None, 512)	131,584
dropout_6 (Dropout)	(None, 512)	0
dense_13 (Dense)	(None, 4)	2,052

Total params: 823,780 (3.14 MB)

Trainable params: 823,780 (3.14 MB)

Non-trainable params: 0 (0.00 B)

#### Visualization



# MODEL PERFORMANCE

## ANALYSIS

### MODEL #2

#### Params

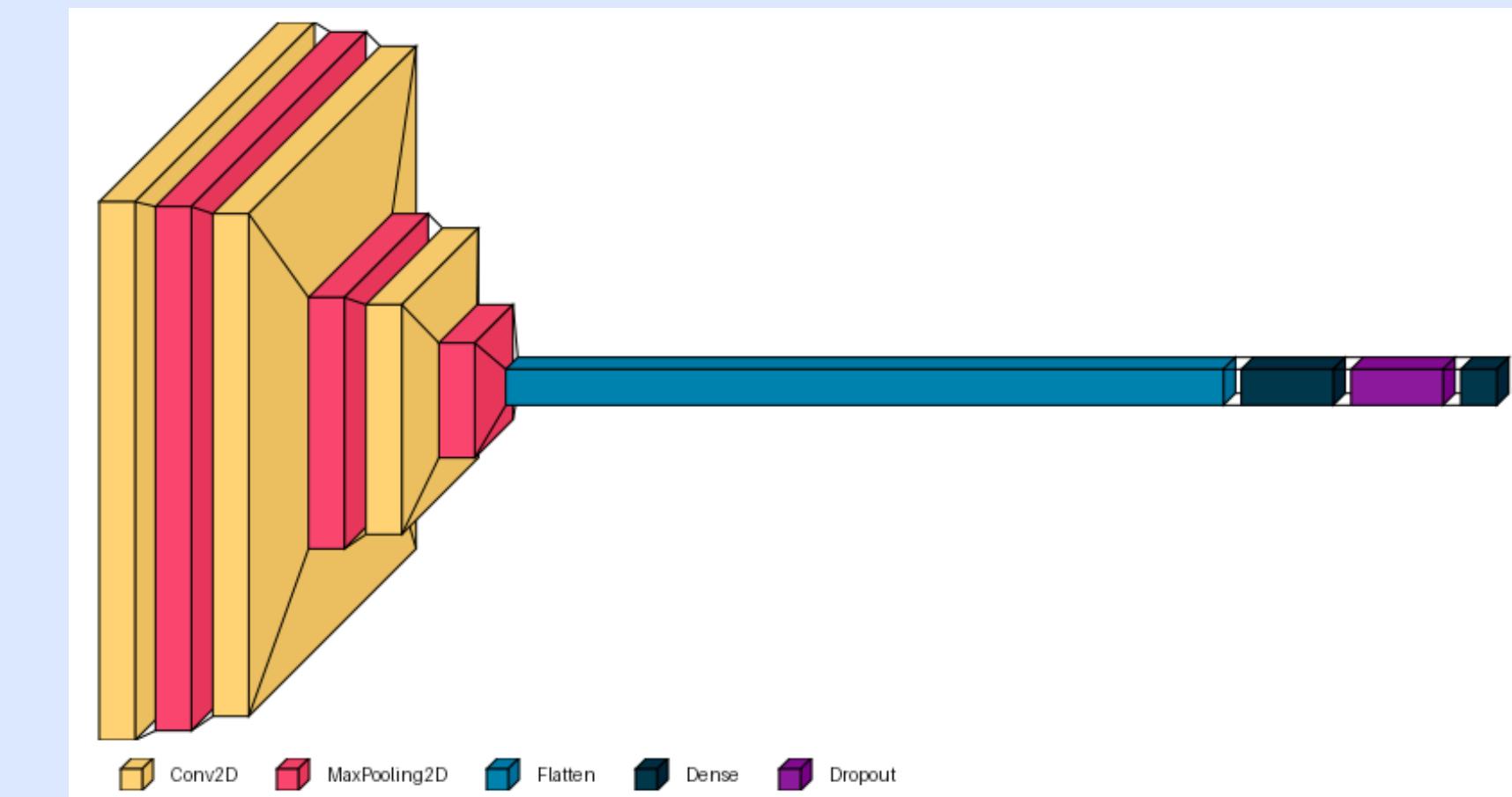
Layer (type)	Output Shape	Param #
conv2d_26 (Conv2D)	(None, 147, 147, 32)	1,568
max_pooling2d_21 (MaxPooling2D)	(None, 73, 73, 32)	0
conv2d_27 (Conv2D)	(None, 70, 70, 64)	32,832
max_pooling2d_22 (MaxPooling2D)	(None, 35, 35, 64)	0
conv2d_28 (Conv2D)	(None, 32, 32, 128)	131,200
max_pooling2d_23 (MaxPooling2D)	(None, 16, 16, 128)	0
flatten_7 (Flatten)	(None, 32768)	0
dense_14 (Dense)	(None, 512)	16,777,728
dropout_7 (Dropout)	(None, 512)	0
dense_15 (Dense)	(None, 4)	2,052

Total params: 16,945,380 (64.64 MB)

Trainable params: 16,945,380 (64.64 MB)

Non-trainable params: 0 (0.00 B)

#### Visualization



# MODEL PERFORMANCE

## ANALYSIS

### MODEL #3

## Params

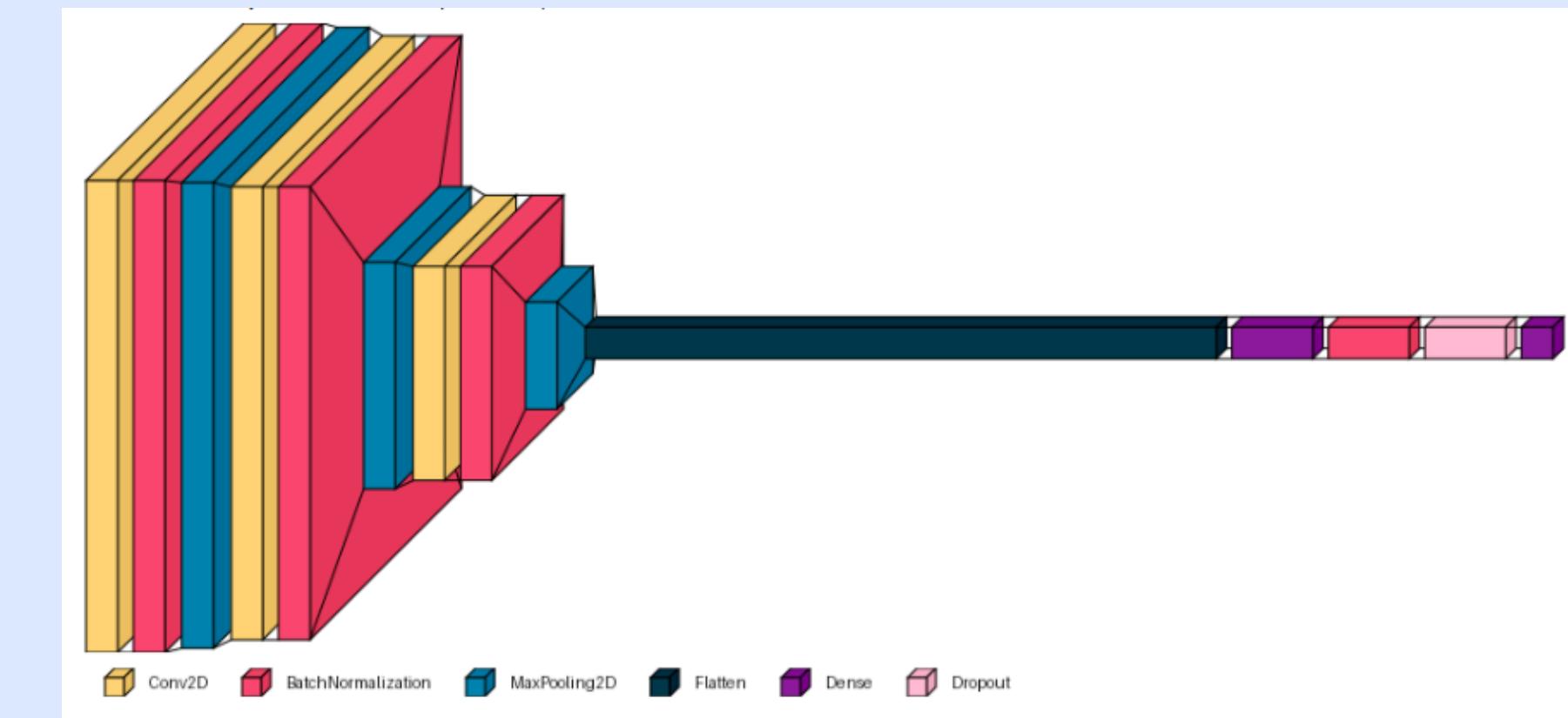
Layer (type)	Output Shape	Param #
Conv1_M3 (Conv2D)	(None, 148, 148, 32)	896
BN1_M3 (BatchNormalization)	(None, 148, 148, 32)	128
Pool1_M3 (MaxPooling2D)	(None, 74, 74, 32)	0
Conv2_M3 (Conv2D)	(None, 72, 72, 64)	18,496
BN2_M3 (BatchNormalization)	(None, 72, 72, 64)	256
Pool2_M3 (MaxPooling2D)	(None, 36, 36, 64)	0
Conv3_M3 (Conv2D)	(None, 34, 34, 128)	73,856
BN3_M3 (BatchNormalization)	(None, 34, 34, 128)	512
Pool3_M3 (MaxPooling2D)	(None, 17, 17, 128)	0
Flatten_M3 (Flatten)	(None, 36992)	0
Dense_M3 (Dense)	(None, 512)	18,940,416
BN4_M3 (BatchNormalization)	(None, 512)	2,048
Dropout_M3 (Dropout)	(None, 512)	0
Output_M3 (Dense)	(None, 4)	2,052

Total params: 19,038,660 (72.63 MB)

Trainable params: 19,037,188 (72.62 MB)

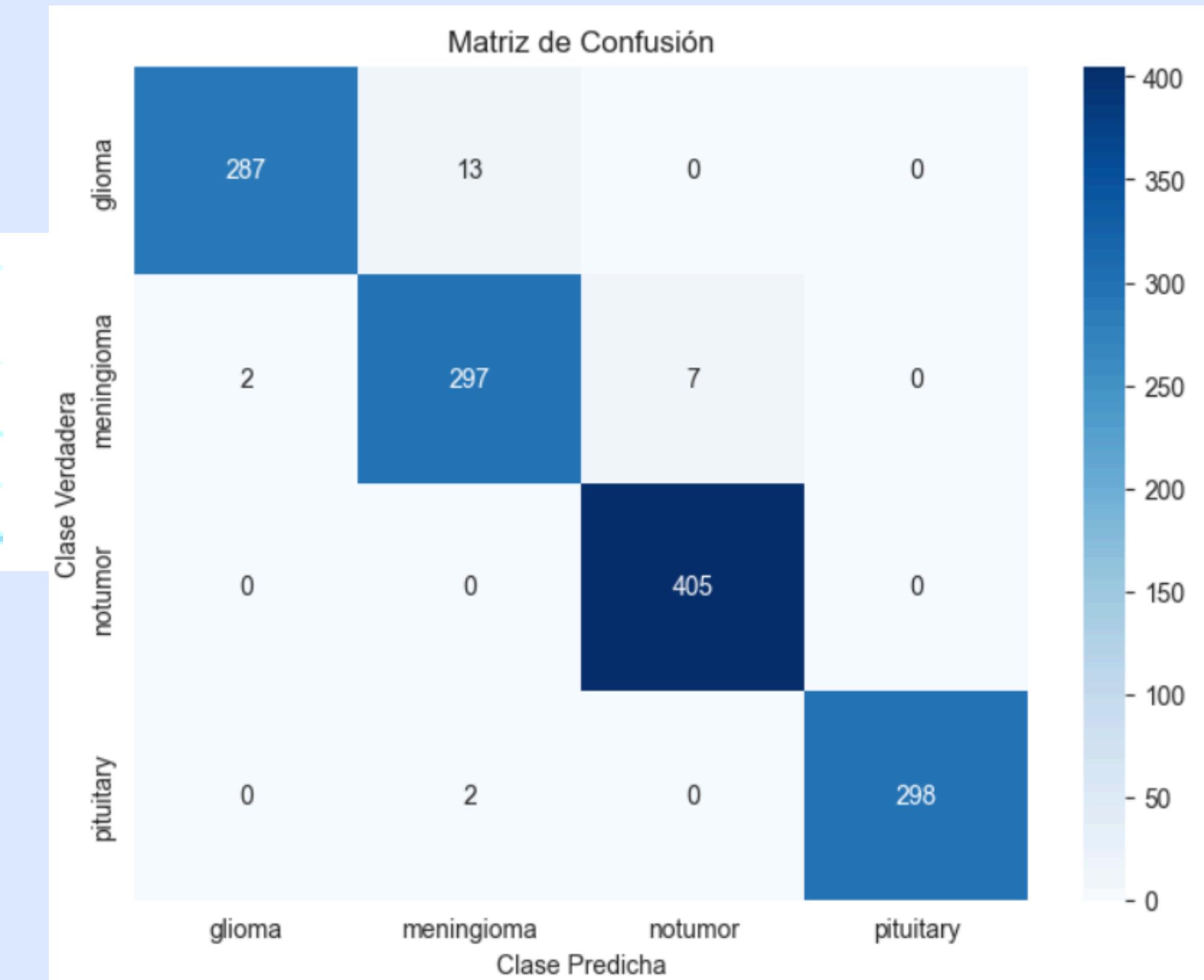
Non-trainable params: 1,472 (5.75 KB)

## Visualization



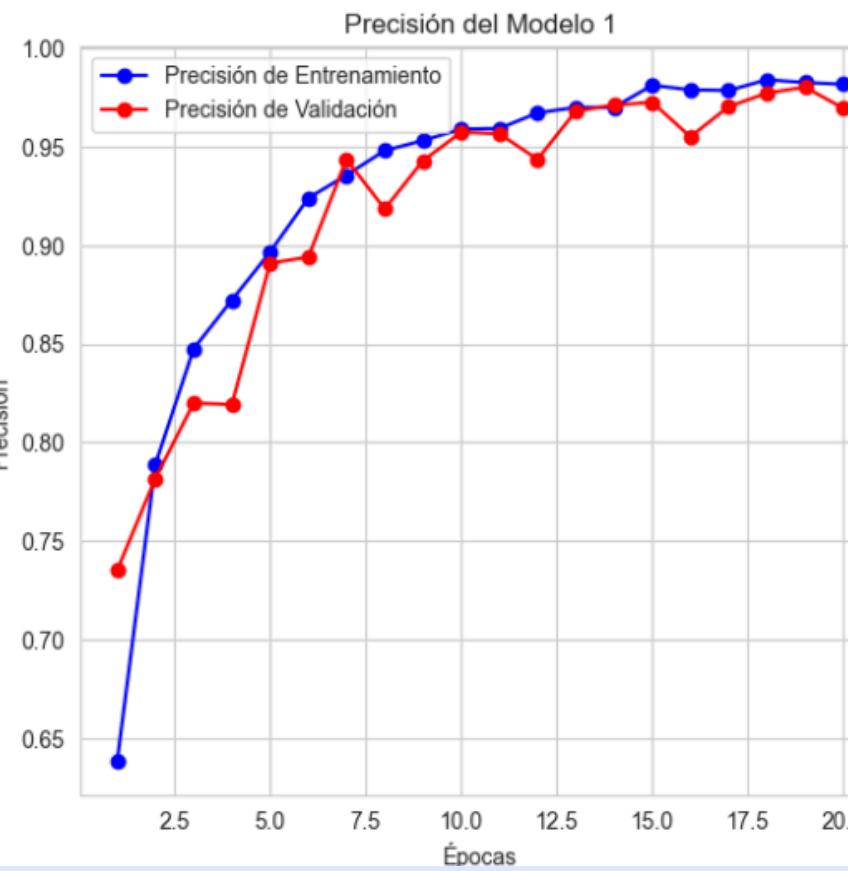
# Model Performance Analysis Results

	precision	recall	f1-score
glioma	0.99	0.96	0.97
meningioma	0.95	0.97	0.96
notumor	0.98	1.00	0.99
pituitary	1.00	0.99	1.00

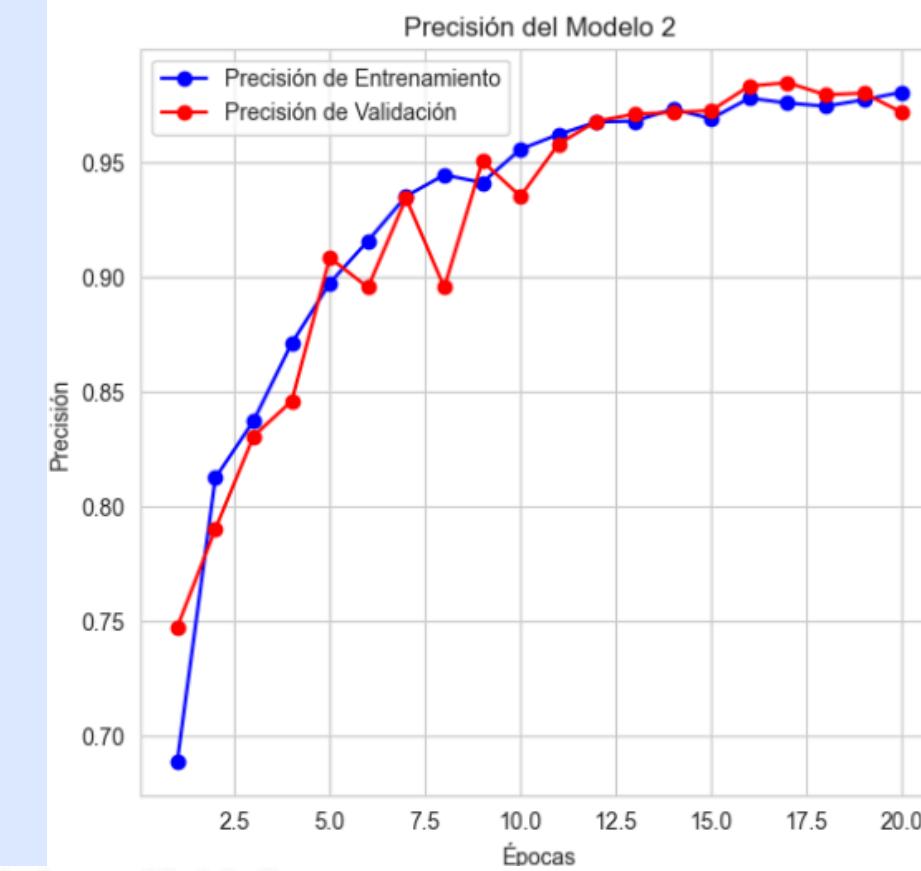


# Final results

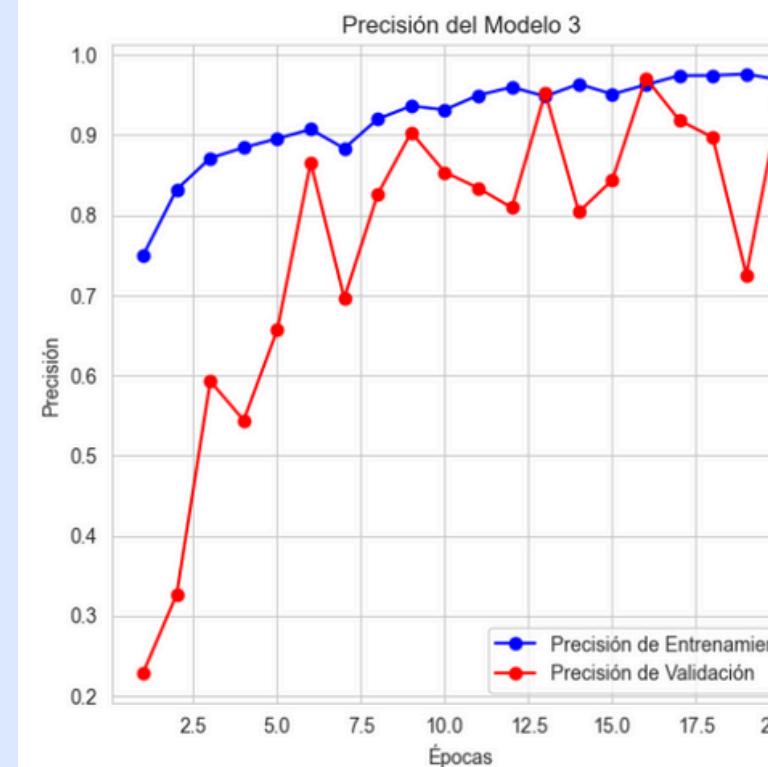
Curvas de Aprendizaje para Modelo 1



Curvas de Aprendizaje para Modelo 2



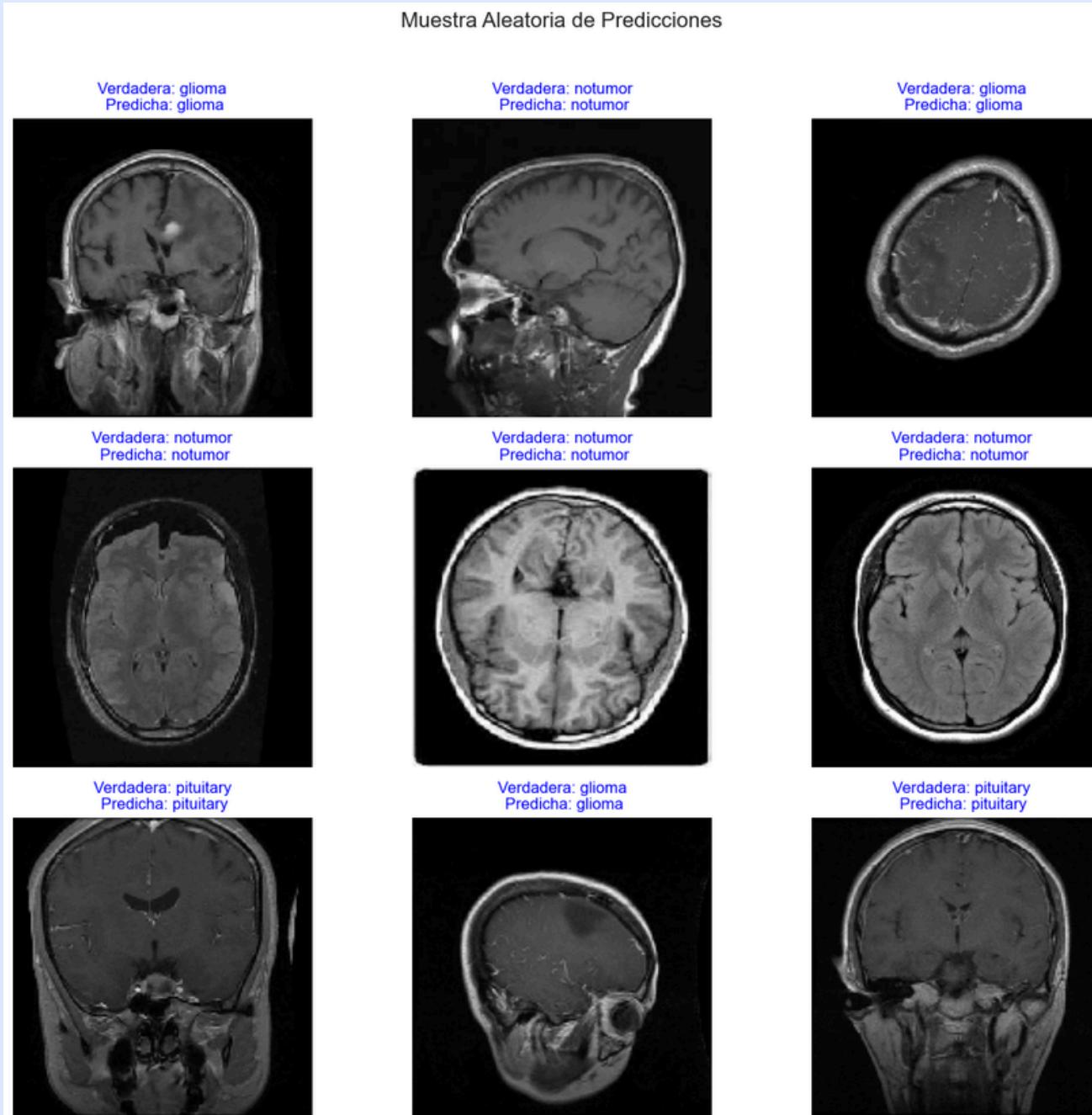
Curvas de Aprendizaje para Modelo 3



# Final results

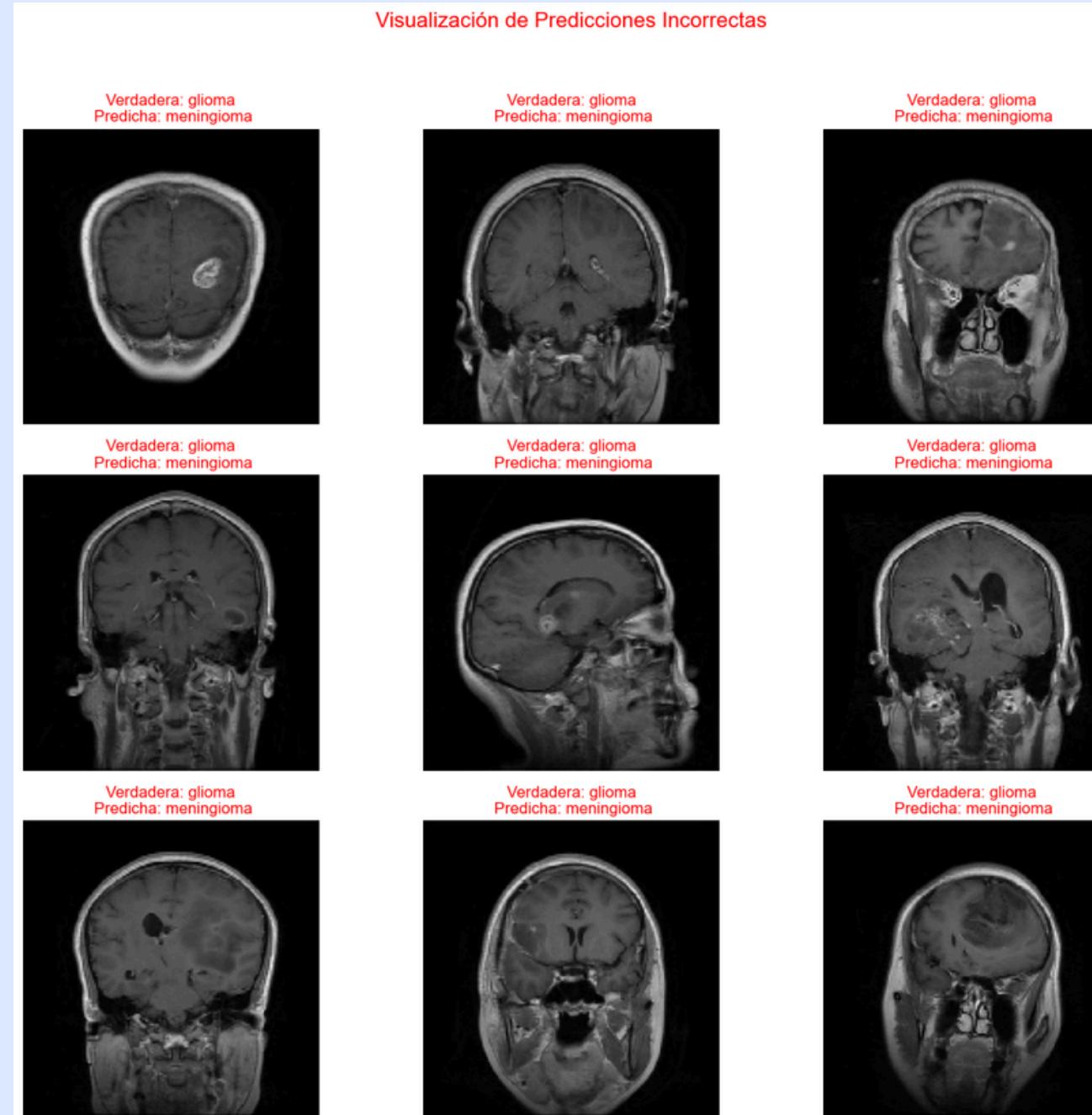
# Correct Prediction

Muestra Aleatoria de Predicciones



# Incorrect Prediction

## Visualización de Predicciones Incorrectas



**THANKS  
4 YOUR  
ATTENTION**