PART 1

Step 5: Training and validation errors

- Activation:relu, Learning Rate:0.1, Epoch:1000
    Training and validation errors: 0.4189, 0.4102

- Activation:relu, Learning Rate:0.1, Epoch:1500
    Training and validation errors: 0.4109, 0.4110

- Activation:relu, Learning Rate:0.1, Epoch:2250
    Training and validation errors: 0.4475, 0.4262

- Activation:relu, Learning Rate:0.01, Epoch:1000
    Training and validation errors: 0.4116, 0.4408

- Activation:relu, Learning Rate:0.01, Epoch:1500
    Training and validation errors: 0.4276, 0.4470

- Activation:relu, Learning Rate:0.01, Epoch:2250
    Training and validation errors: 0.4123, 0.4272

- Activation:relu, Learning Rate:0.001, Epoch:1000
    Training and validation errors: 0.6761, 0.5218

- Activation:relu, Learning Rate:0.001, Epoch:1500
    Training and validation errors: 0.6906, 0.5304

- Activation:relu, Learning Rate:0.001, Epoch:2250
    Training and validation errors: 0.6286, 0.4886

//

- Activation:tanh, Learning Rate:0.1, Epoch:1000
    Training and validation errors: 0.3740, 0.3865

- Activation:tanh, Learning Rate:0.1, Epoch:1500
    Training and validation errors: 0.3797, 0.3562

- Activation:tanh, Learning Rate:0.1, Epoch:2250
    Training and validation errors: 0.3644, 0.4170

- Activation:tanh, Learning Rate:0.01, Epoch:1000
    Training and validation errors: 0.3934, 0.3621

- Activation:tanh, Learning Rate:0.01, Epoch:1500
    Training and validation errors: 0.3652, 0.4034

- Activation:tanh, Learning Rate:0.01, Epoch:2250
    Training and validation errors: 0.3831, 0.4033

- Activation:tanh, Learning Rate:0.001, Epoch:1000
    Training and validation errors: 0.6706, 0.4939

- Activation:tanh, Learning Rate:0.001, Epoch:1500
    Training and validation errors: 0.6033, 0.5012

- Activation:tanh, Learning Rate:0.001, Epoch:2250
    Training and validation errors: 0.6104, 0.5130

//

- Activation:sigmoid, Learning Rate:0.1, Epoch:1000
    Training and validation errors: 0.4583, 0.4584

- Activation:sigmoid, Learning Rate:0.1, Epoch:1500
    Training and validation errors: 0.4607, 0.4835

- Activation:sigmoid, Learning Rate:0.1, Epoch:2250
    Training and validation errors: 0.3817, 0.4198

- Activation:sigmoid, Learning Rate:0.01, Epoch:1000
    Training and validation errors: 0.7820, 0.6317

- Activation:sigmoid, Learning Rate:0.01, Epoch:1500
    Training and validation errors: 0.7002, 0.5304

- Activation:sigmoid, Learning Rate:0.01, Epoch:2250
    Training and validation errors: 0.7560, 0.5918

- Activation:sigmoid, Learning Rate:0.001, Epoch:1000
    Training and validation errors: 1.3462, 1.1671

- Activation:sigmoid, Learning Rate:0.001, Epoch:1500
    Training and validation errors: 1.3464, 1.1625

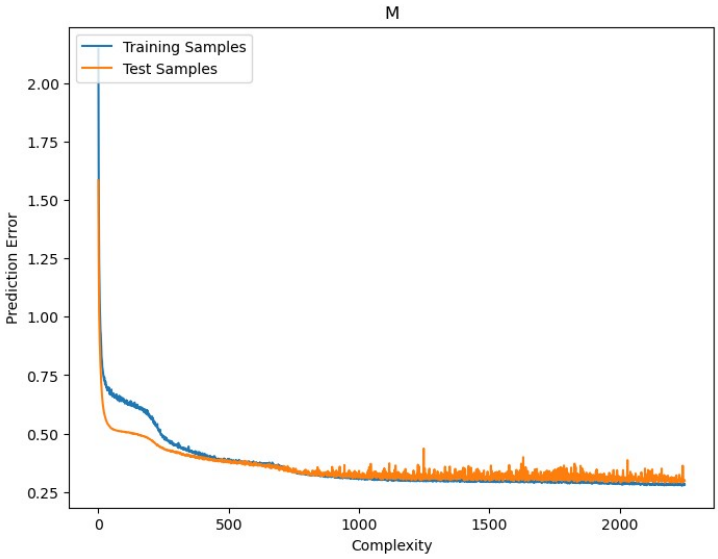
- Activation:sigmoid, Learning Rate:0.001, Epoch:2250
    Training and validation errors: 1.2918, 1.1248

Step 7: My best parameters

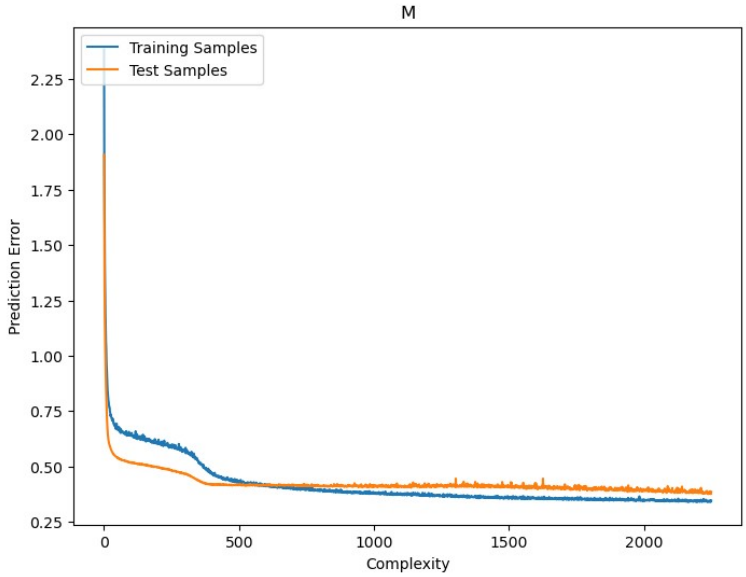
Best parameters: {'activation': '**tanh**', 'learning_rate': **0.1**, 'epoch': **1500**}

Step 8: Bias and variance curve

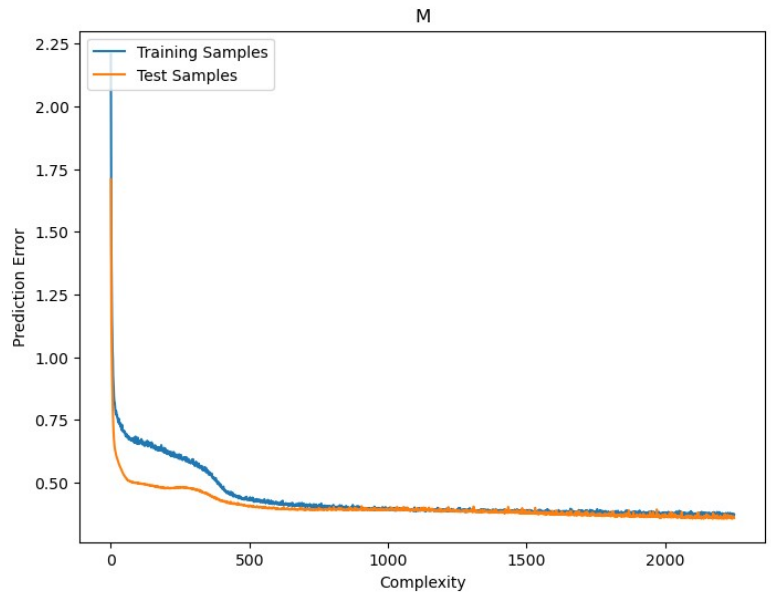
The first hidden layer with two nodes results.



The second hidden layer with two nodes results.

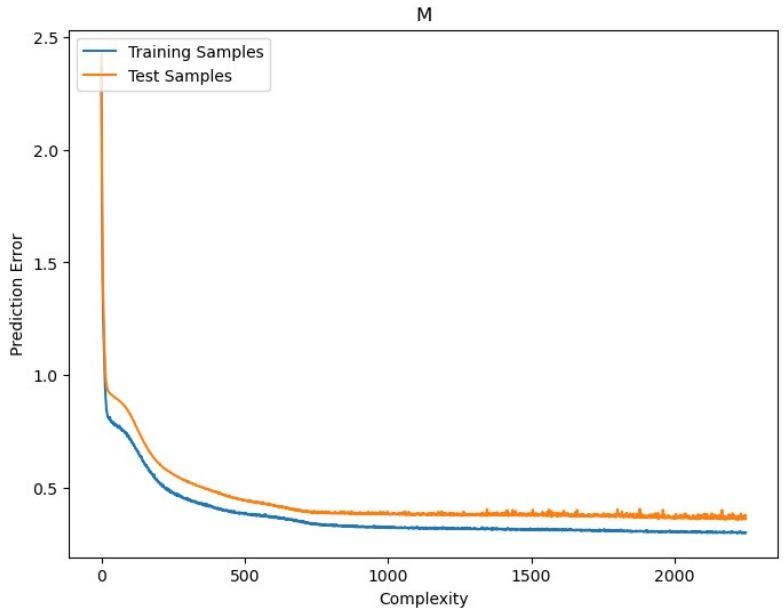


The third hidden layer with two nodes results.

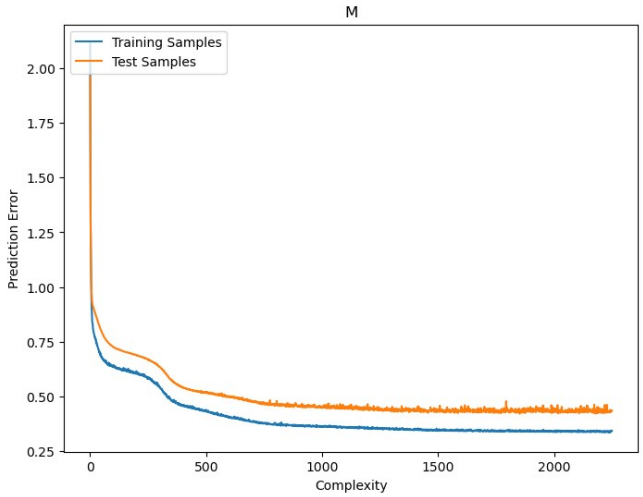


Step 9: Increase *Nt* by 10%

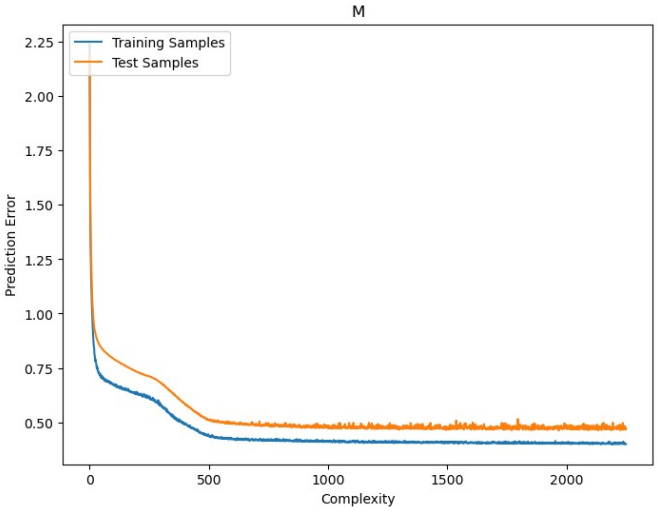
The first hidden layer with two nodes results.



The second hidden layer with two nodes results.



The third hidden layer with two nodes results.

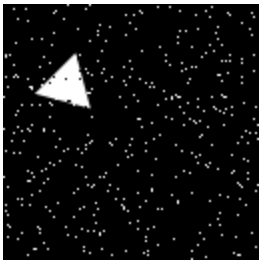


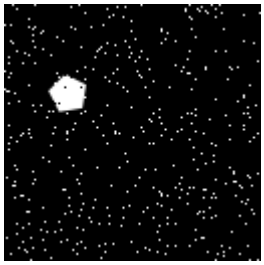
PART 2

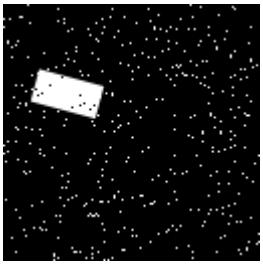
I generate 256 images for each class, so I have 2048 images via below code pieces.

python main.py --shapes ellipse rect poly3 poly5 poly6 poly7 star5 star8 --to_transform scale rota trx try --num_transformations 4 -stim_ellipse_ratio 0.5 0.7

My Sample Data Images, for example elipses







Train Report

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 55, 55, 96)	34,944
batch_normalization (BatchNormalization)	(None, 55, 55, 96)	384
max_pooling2d (MaxPooling2D)	(None, 27, 27, 96)	0
conv2d_1 (Conv2D)	(None, 27, 27, 256)	2,973,952
batch_normalization_1 (BatchNormalization)	(None, 27, 27, 256)	1,024
conv2d_2 (Conv2D)	(None, 27, 27, 384)	885,120
batch_normalization_2 (BatchNormalization)	(None, 27, 27, 384)	1,536
conv2d_3 (Conv2D)	(None, 27, 27, 384)	1,327,488
batch_normalization_3 (BatchNormalization)	(None, 27, 27, 384)	1,536
conv2d_4 (Conv2D)	(None, 27, 27, 256)	884,992
batch_normalization_4 (BatchNormalization)	(None, 27, 27, 256)	1,024
max_pooling2d_1 (MaxPooling2D)	(None, 13, 13, 256)	0
flatten (Flatten)	(None, 43264)	0
dense (Dense)	(None, 4096)	177,213,440
dense_1 (Dense)	(None, 4096)	16,781,312
dense_2 (Dense)	(None, 8)	32,776

Total params: 200,139,528 (763.47 MB)

Trainable params: 200,136,776 (763.46 MB)

Non-trainable params: 2,752 (10.75 KB)