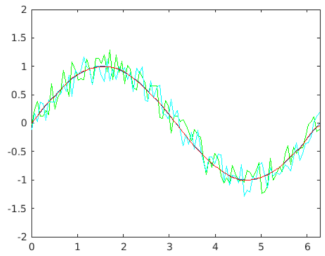
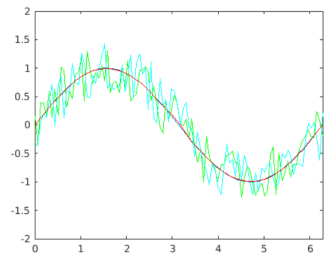
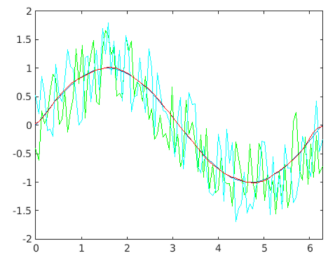
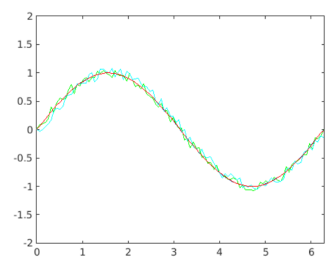
Practice 4

Tatsiana Palikarpava, Juan José Valenzuela Gómez

1. Noise, Samples

Using as a function the one which is in to the archiveEX2/f.m, that isf(x) = sin(x) in the interval[0...2PI], analyze the evolution of the error for progressively increasing variances of the noise and fordifferent number of training samples (functions).

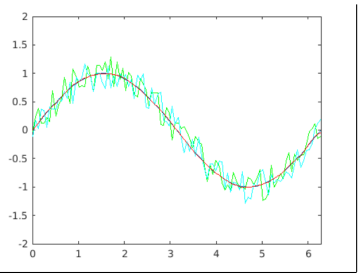
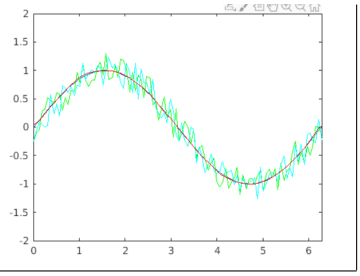
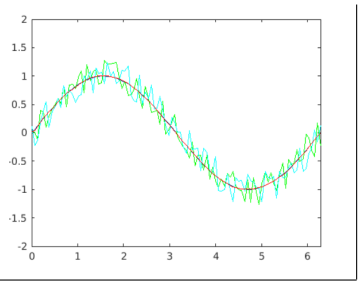
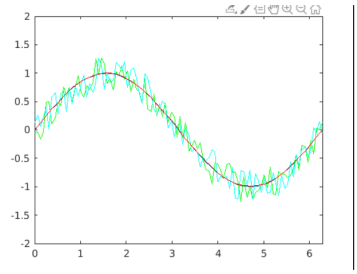
1.1. Increasing Noise

Variance 0.30 (original): Error: -0.297, 0.3077 Best Validation Performance: 0.029502 at epoch 20 BEST from increase	
Variance 0.50: Error: -0.5073, 0.4878 Best Validation Performance: 0.083455 at epoch 44	
Variance 0.80: Error: -0.8235, 0.779 Best Validation Performance: 0.20331 at epoch 16	
Variance 0.10 (Decreasing noise in that case): Error: -0.09933, 0.0992 Best Validation Performance: 0.0033795 at epoch 226	

1.1.1. Conclusion

With variance = 0.0 the error it's 0 so if we increase de variance we increase the error too.

1.2. Different number of training samples:

200 samples (original): Error: -0.297, 0.3077 Best Validation Performance: 0.029502 at epoch 20	
100 samples: Error: -0.315, 0.2996 Best Validation Performance: 0.029308 at epoch 19 BEST	
300 samples: Error: -0.2933, 0.3089 Best Validation Performance: 0.02956 at epoch 186	
250 samples: Error: -0.2999, 0.2929 Best Validation Performance: 0.029447 at epoch 40 SECOND BEST	

1.2.1. Conclusion

This is because the overfitting point, the values set the perfect number of training samples between 100 and 250.

2. Hidden layers

Once an acceptable result has been found, analyze now what happens if we change the configurationof the network: with one, or two (or more, if you have time) hidden layers and a variable number ofneurons in each layer.

Two layers (original): Error: -0.303, 0.2995 Best Validation Performance: 0.029638 at epoch 58	WITH 100 SAMPLES
Two layers (original): Error: -0.297, 0.3077 Best Validation Performance: 0.029502 at epoch 20 BEST	WITH 250 SAMPLES
Two layers [4 4]: Error: -0.308, 0.3082 Best Validation Performance: 0.029631 at epoch 23	WITH 250 SAMPLES
With three layers [10 10 10]: Error: -0.3081 , 0.3033 Best Validation Performance: 0.029699 at epoch 37	WITH 250 SAMPLES
With three layers [10 5 10]: Error: -0.3113 , 0.3014 Best Validation Performance: 0.030585 at epoch 33	WITH 250 SAMPLES

3. Complex function

Using any of the best results of the former exercise, change the function f by another, more com-plex one, and approximate it looking at the differences. Try to improve the result by changing theconfiguration of the network.

3.1. Using sin(x)+0.5*cos(2*x)

Error: -0.297 , 0.2952 Best Validation Performance: 0.029377 at epoch 48