

## Computational Intelligence Laboratory Exercise 2

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## 1 Problem 1 - Two Spatial Problem

The problem 1 is Two Spiral Problem, it can be described as a two class problem where each class is an inter twined spiral on a two dimensional plane. We can tell that this problem is a non-linear data problem. So I decide to use multi-neural network to solve this problem. With the codes in the other file, we get the result form different parameters:

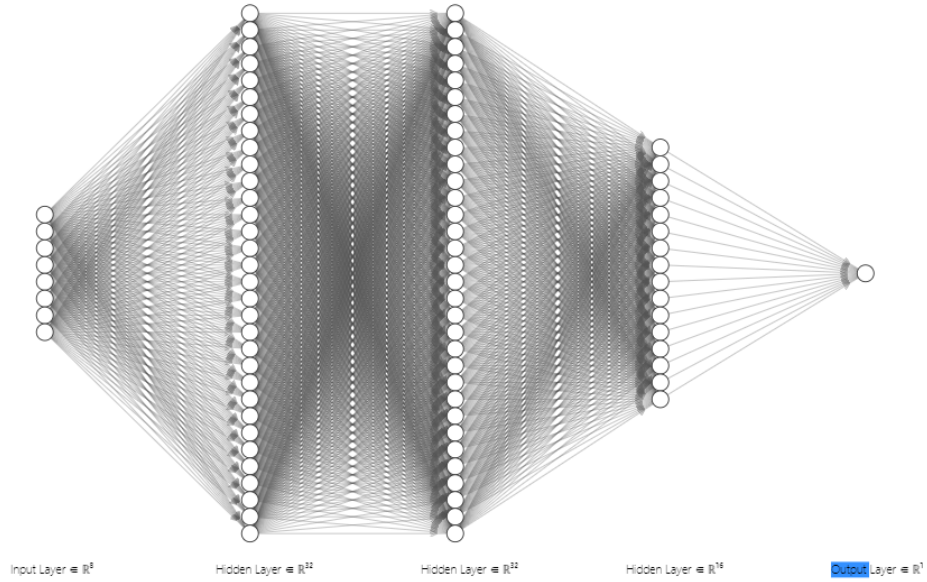
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Numlts	NumHN	NumHN1	NumHN2	NumHN3	Lnrate	Mtm1	Mtm2	ObejErr	Ordering	MinErr	AveErr	MaxErr	%Err
2	1536	3	10	25	25	0.03	1	0.5	0.005	0	0.388103	0.494373	0.596756	49.47916
3	1536	3	25	25	25	0.03	0.8	0.4	0.005	0	0.390744	0.494202	0.593656	48.7375
4	3072	3	25	25	25	0.03	0.8	0.4	0.005	0	0.369982	0.493462	0.602254	47.91666
5	6144	3	25	25	25	0.03	0.8	0.4	0.005	0	0.163765	0.486704	0.589091	49.47916
6	12288	3	25	25	25	0.03	0.8	0.4	0.005	0	0.008355	0.466621	0.895162	46.875
7	24576	3	25	25	25	0.03	0.8	0.4	0.005	0	0.000934	0.425752	0.987836	40.10416
8	49152	3	25	25	25	0.03	0.8	0.4	0.005	0	0	0.064119	0.995998	3.645833
9	49152	3	25	25	25	0.03	0.8	0.4	0.005	1	0.00039	0.176218	0.998015	11.91917
10	49152	3	25	25	25	0.03	0.8	0.4	0.005	2	0.000001	0.031266	0.999212	1.5625
11	49152	3	25	25	25	0.03	0.8	0.4	0.005	3	0	0.010815	0.035152	0

So in this problem, when the number of iteration reach to more than 40000, the accuracy of prediction increase apparently. And in training pattern, the Ordering 3 is selected each training iteration perform better than the left way, which parameters is NumIts: 49152, NumHN: 3, NumHN1: 25, NumHN2: 25, NumHN3: 25. Lerning rate is 0.03. The accuracy can reach 100%. Ordering 1 is the worst one in classify Two Sprial Problem.

## 2 Problem 2 – Abalone Age Problem

Abalone Age Problem is to predict the age of abalone from physical measurements. There are several points to determine the age such as sex, length, diameter, height, whole weight, shucked weight, viscera weight, shell weight, and rings. So the data should have 8 inputs in the input layer.

[illegible]



The same as problem 1, the ordering-1 has the worst performance the 3 left training pattern. And the epoch number over 7354 will influence a little in the accuracy of prediction. The parameters of best performance is NumIts: 7354, NumHN: 3, NumHN1: 16, NumHN2: 16, NumHN3: 8. Learning rate is 0.03. The accuracy can reach 80%.

### 3 SPECT Heart Diagnosis Problem

A SPECT scan of the heart is a noninvasive nuclear imaging test. It uses radioactive tracers that are injected into the blood to produce pictures of your heart. Doctors use SPECT to diagnose coronary artery disease and find out if a heart attack has occurred. We need to know whether the people is normal or abnormal categorized into 0 and 1. The data set extract 44 features to training this classification model. From the MLP algorithm:

1	NumIts	NumHN	NumHN1	NumHN2	NumHN3	Lrnrate	Mtm1	Mtm2	ObejErr	Ordering	MinErr	AveErr	MaxErr	%Err
2	1196	1	50			0.002	0.04	0.02	0.005	0	0.1344	0.554014	0.779957	66
3	2392	1	50			0.002	0.04	0.02	0.005	0	0.211941	0.557612	0.788059	60
4	9568	1	50			0.002	0.04	0.02	0.005	0	0.098203	0.516486	0.901797	58
5	19136	1	50			0.002	0.04	0.02	0.005	0	0.049719	0.549374	0.7838	60
6	38272	1	50			0.002	0.04	0.02	0.005	0	0.005458	0.055321	0.786817	60
7	38272	2	50	50		0.002	0.04	0.02	0.005	0	0.090293	0.529846	0.909707	60
8	19136	3	50	50	50	0.02	0.04	0.02	0.005	0	0.242839	0.551432	0.757161	60
9	38272	3	50	50	50	0.2	0.04	0.02	0.005	0	0.117699	0.57646	0.882298	60
10														

We can know from the blank, the accuracy does not change ignoring how the parameters has changed. The MLP might not suit this problem.