

Data Classification using ZISC-Digital Neural network

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Introduction

- Perform Classification task on repository data using ZISC-Muren H/W and compare the results with other classification techniques
- The benchmark datas are taken from the Repository data website <http://www.ics.uci.edu/~mlearn/MLRepository.html>
- Benchmark datas taken to perform the classification task are,
 - 1)Breast cancer data
 - 2)Segment data
 - 3)Wine data

ZISC-78

Basic features of ZISC-78 chip are,

- Silicon based Neural network (with 78Neurons in one chip)
- High level parallelism
- Learning by examples(No complex modelling or programming)
- Excellent for Real-time applications
- Unlimited extension of the Network(Without changing the Rec. Rate)
- Two types of Classification methodologies(RBF and K-NN)

ZISC-78 Block diagram

Daisy Chain In

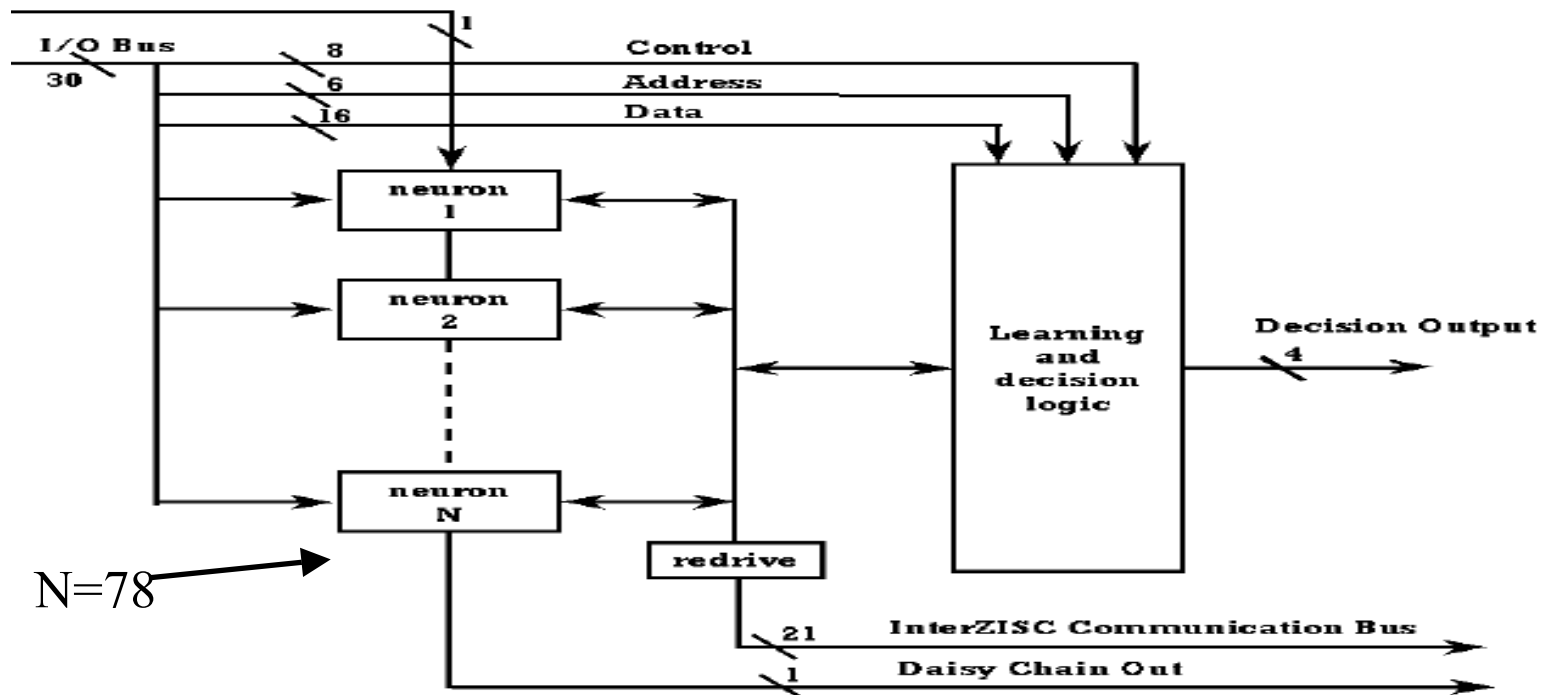


Fig: from ZISC User manual

Muren board (ZISC-78 HW board)

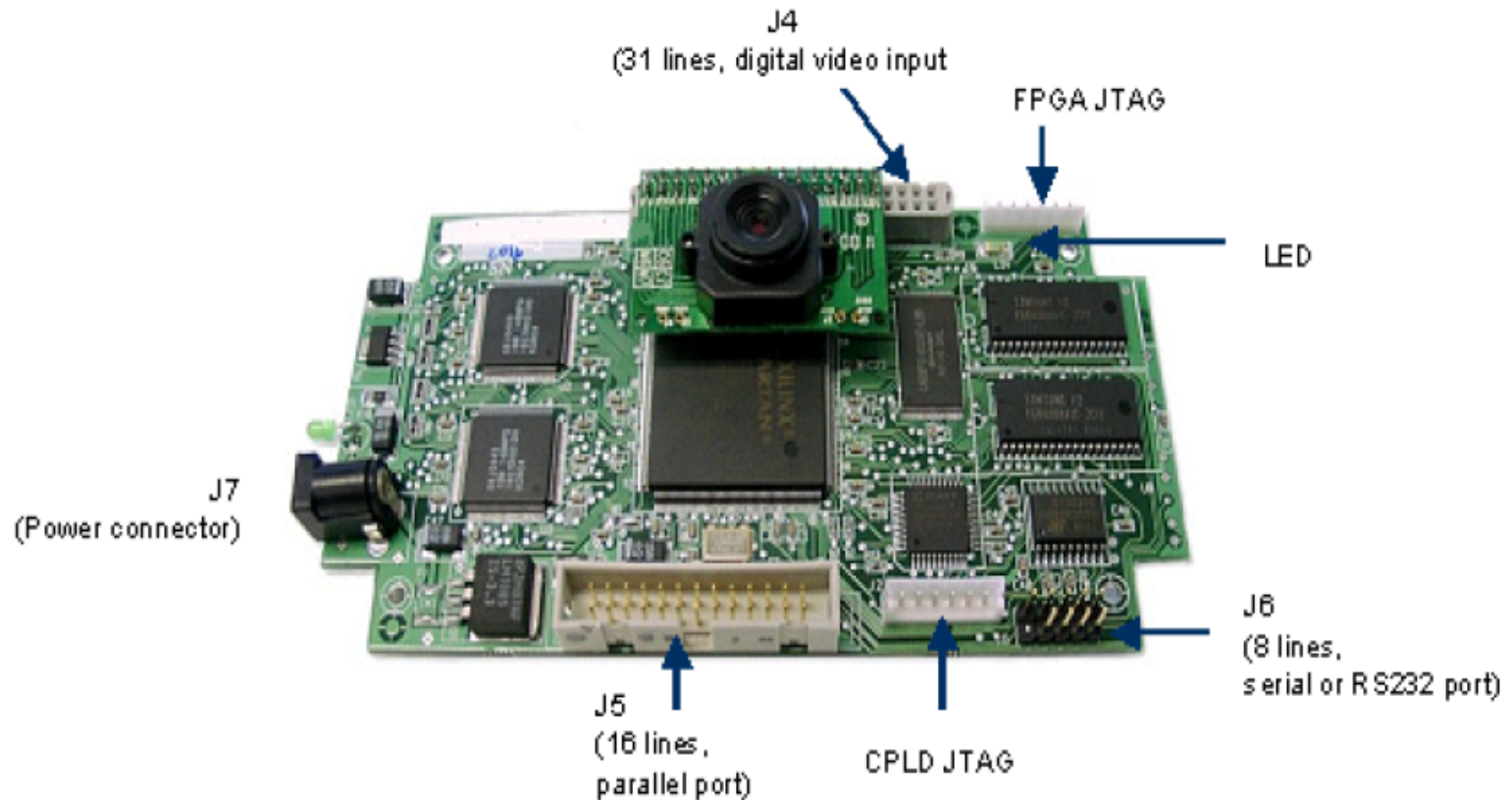


Fig: from ZISC user manual

Zisc-78 wizards

Muren (ZISC board) has mainly 3 application wizards as follows,

- 1) C-Wizard (Data classification).
- 2) I- Wizard (Image and Pattern Recognition).
- 3) T-Wizard (Object tracking).

In our task we make use of C-Wizard. C-wizard has mainly 4 modes of Operation namely,

- 1)Learn
- 2)Test
- 3)Recognition
- 4)View

C-Wizard

Input vector format for C-wizard can have one among the two of following Formats,

1) .csv format

Comma separated value (CSV) format:

Context value	Category value	Vector components
(1-byte)	(2-byte)*	(64-byte)

2) Binary format

Binary format:

Context value	Vector length	Vector components	Category value
1-byte	1-byte	Up to 64-byte	2-byte

Figures from ZISC user manual

C-Wizard

- Context field in the data format is used to divide the Neural network into sub networks during training.
- Category field specifies the Label or class information of the input vector.
- Vector components specifies the input vector field. Input vector should be 8 bit unsigned integer of max 64 byte size.

C-Wizard

To convert data into *.csv* format we can make use of Matlab tool. Matlab code used for converting data into *.csv* format is as given below,

➤ `M=csvread('Filename')`

This function is used to read a comma separated value format file.

➤ `csvwrite('Filename',C)`

This function writes a *.mat* file into *.csv* file.

Hold out method is used for the data division and Matlab is used for Normalisation and data conversion. Data is normalised between 0-255

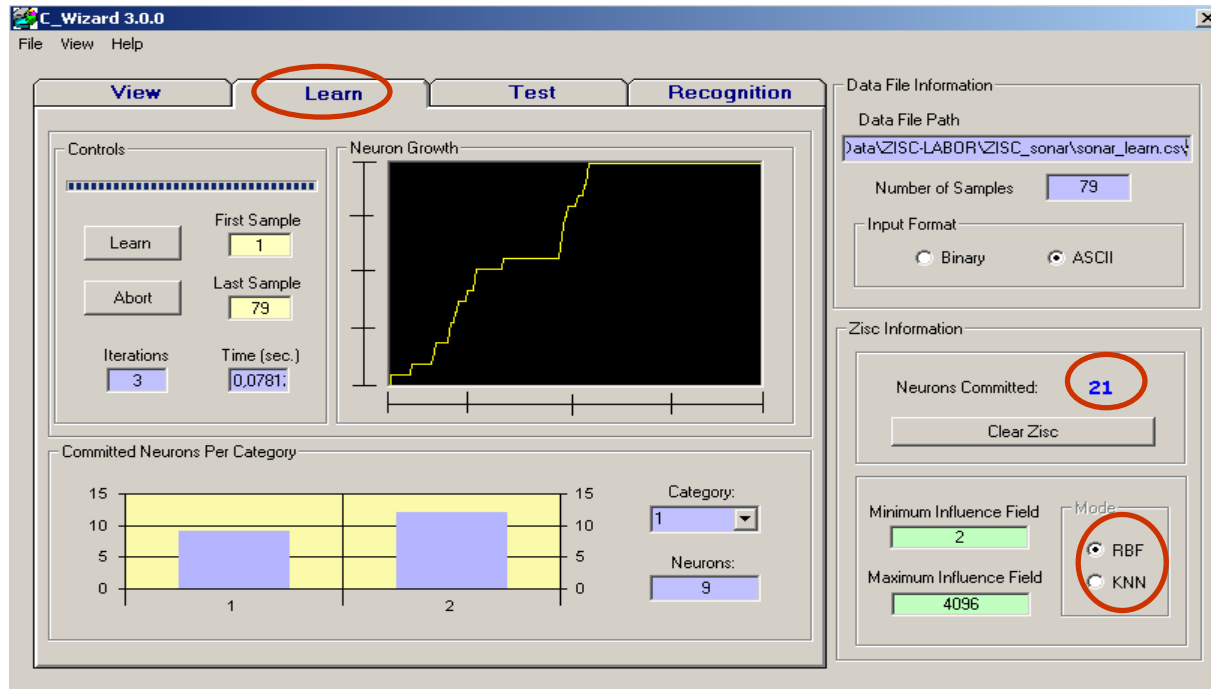
Classification data set

Data	Total No: of Vectors	No: of Features	No: of classes	No: of vectors for training	No: of vectors for testing	No: of vectors for Reco:
Cancer	208	60	2	79	77	52
Segment	2310	19	7	1561	518	231
Wine	178	13	3	67	66	45

Classification task

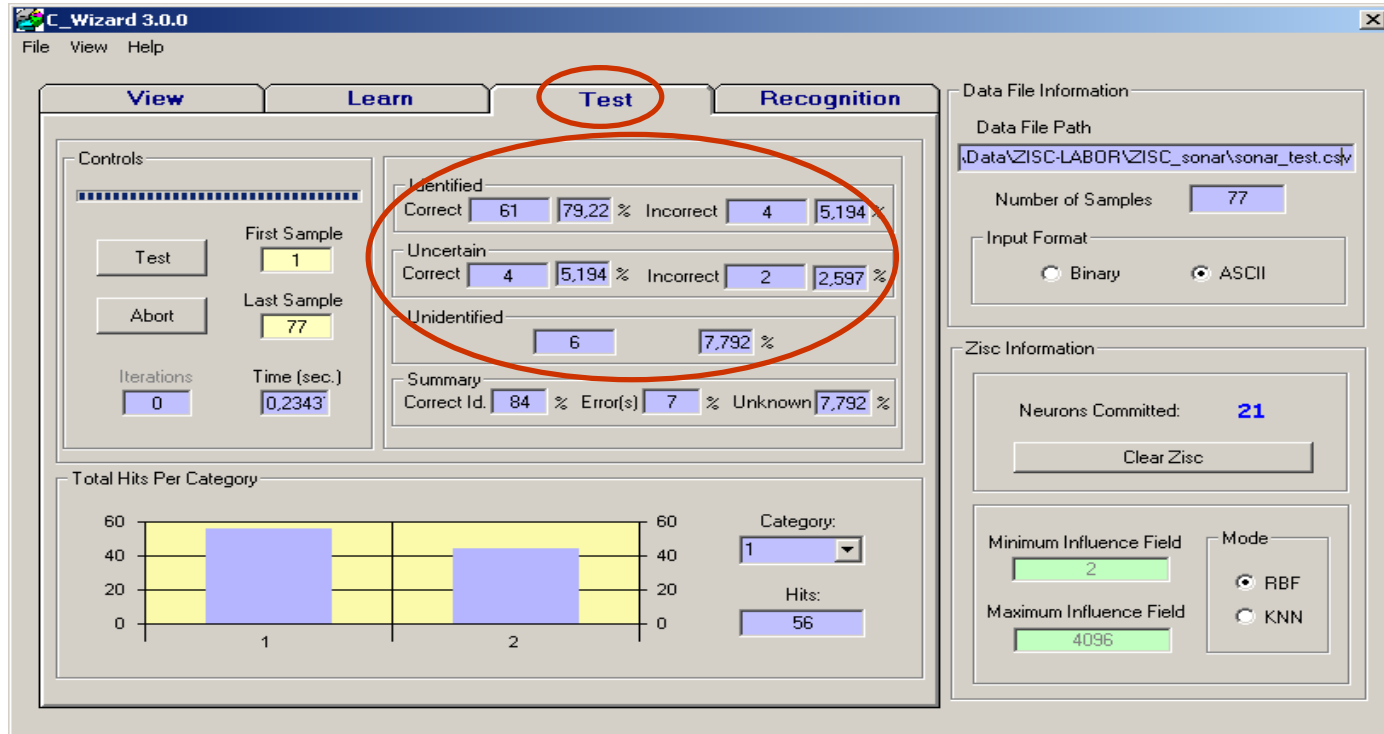
- In our task we carried out the classification on three data sets namely, Breast cancer data, Segment data and Wine data
- Learning ,Testing ,Recognition and View mode of the C-wizard are depicted in the following slides by taking Cancer
- Similar steps are carried out for other data sets
- Results and various parameters are explained in the following slides

Learning(Cancer data)



Learn mode is used to train the ZISC neural network with input vector. The statistics gives the quality of training and Neuron growth.

Testing(cancer data)



Test mode is used to check the quality of Learning. From the Test statistics, We decides whether more learning is required or not.

Recognition(Cancer data)

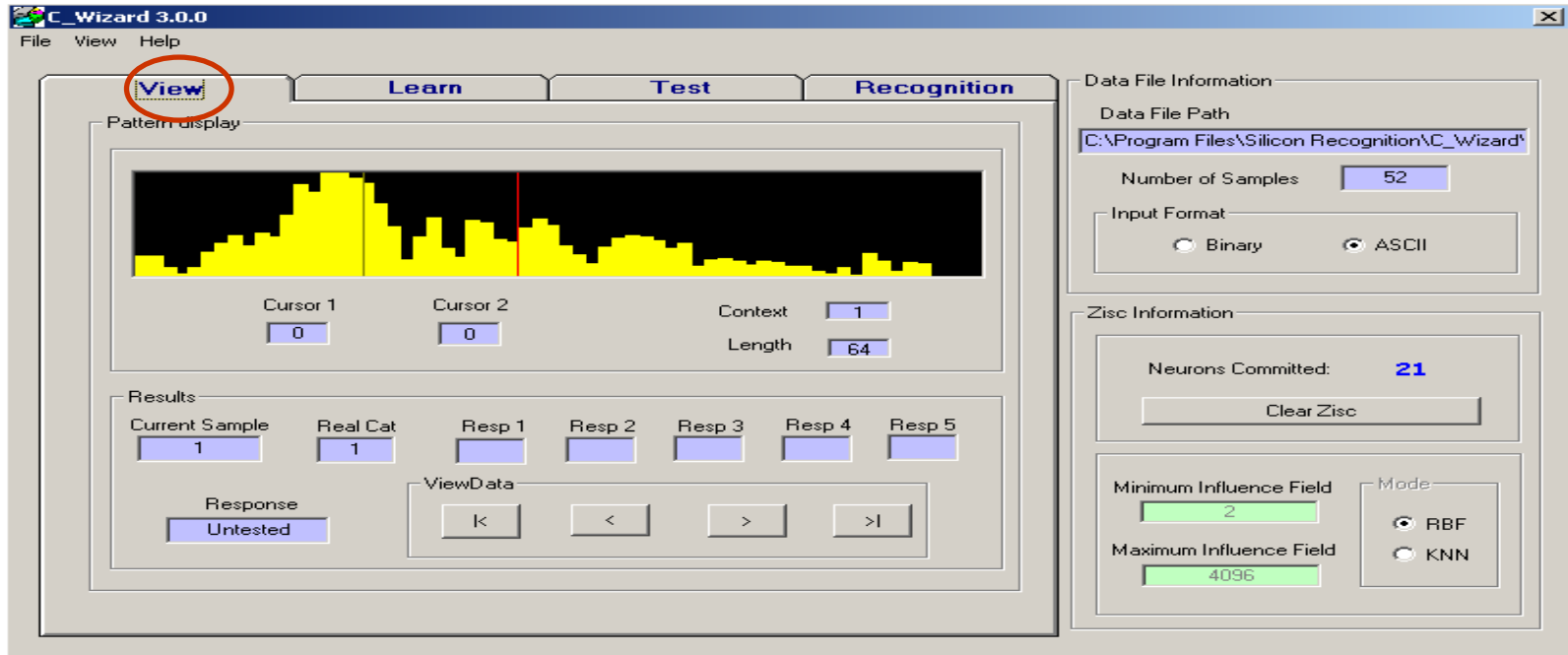
The screenshot displays the C_Wizard 3.0.0 software interface in Recognition mode. The 'Test' tab is highlighted with a red circle. The main control panel shows the following data:

Category	Count	Percentage
Identified	51	98.07692 %
Uncertain	0	0 %
Unidentified	1	1.923076 %

The 'Recognition' field indicates 416 Patterns Per Second. The 'Data File Information' section shows the Data File Path as C:\Program Files\Silicon Recognition\C_Wizard* and the Number of Samples as 52. The 'Input Format' is set to ASCII. The 'Zisc Information' section shows 21 Neurons Committed. The 'Minimum Influence Field' is 2 and the 'Maximum Influence Field' is 4096. The 'Mode' is set to RBF. The 'Total Hits Per Category Per Vector' chart shows 2 hits for category 1 and 1 hit for category 2.

Recognition mode is used to do the final data recognition. It gives the final Classification results. Depending up on the results we can go back and tune Learning step if required.

View mode(Cancer data)



This mode help us to view each vector and see whether it is used for Learning, testing or recognition.

ZISC-78 Results

Data	# Neurons	# Iterations	# Rec. data	Identi- fied	Uncer- tain	Unide- ntified	RBF (%)	KNN (%)
Cancer	55	6	142	139	3	0	97.8	97.88
Segment	202	5	231	216	9	6	93.5	93.5
Wine	14	4	45	40	4	1	88.8	88.88

Classification Results(Comparison with other classifiers)

Data	K-NN (%)	PNN (%)	RNN (%)	SVM (%)	ZISC (%)
Cancer	95.75	96.479	94.366	97.5	97.88
Segment	95.993	95.122	94.425	93.033	93.5
Wine	97.78	97.78	97.78	93.3	88.88

Conclusion

- ZISC is a very powerful tool for Recognition and classification.
- Results are competitive with other complex classification algorithms.
- Require only less complex steps for learning and classification.
- Classification wizard gives the clear statistics of learning and testing results so that we can improve the learning by teaching the tool with extra data.
- Free from programming and modelling, so it makes the classification Recognition task easier for the user.
- The video module aswell as the unlimited extension capability makes ZISC-Muren board well suited for Real-time applications.

References

- Neurocomputing Lecture materials from Prof: Dr.Ing Andreas König
- ZISC- Muren User manual.

ZISC based Neural networks

Questions???