



DADI INSTITUTE OF ENGINEERING & TECHNOLOGY

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NH-16, Anakapalle – 531002, Visakhapatnam, A.P.

Mobile: +91 9963981111, Website: www.diet.edu.in, E-mail: info@diet.edu.in

Anakapalle,
Dt: 11-10-2021

From,
Dr.P Poorna Priya
HOD - ECE,
Dadi Institute of Engineering & Technology.

(Through Proper Channel)

To,
The Principal,
Dadi Institute of Engineering & Technology.

Sub: Permission request for 30 days online internship training at Sri ShashaPrayathi Technologies Pvt Ltd
Sir.

With due respect, here by stating that, I, on behalf of ECE Department request you for allowing Final year ECE students to attend 30 days online internship training on Machine Learning with MATLAB at Sri ShashaPrayathi Technologies Pvt Ltd, NITK-STEP, Srinivasnagar, Surathkal Mangalore from 21st October to 29th November 2021.

We, therefore, hope that you would be kind enough to permit us.

Thanking you Sir,

Yours sincerely

P. Poorna Priya
HOD-ECE


PRINCIPAL
Dadi Institute of
Engineering & Technology
ANAKAPALLE - 531 002



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Date: 18-10-2022
Anakapalle

CIRCULAR

This is to inform all the Students, Teaching & Technical Staff of Dadi Institute of Engineering and Technology that the Department of ECE is organizing a 30days Online internship on Machine Learning with MATLAB at Sri Shasha Prayathi Technologies Pvt Ltd, NITK-STEP, Srinivasnagar, Surathkal Mangalore from 21st October to 29th November for all the Final year ECE students.

P. Poornima
HOD ECE



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REPORT ON ONE MONTH ONLINE INTERNSHIP PROGRAMME ON MACHINE LEARNING WITH MATLAB (21st Oct – 29th Nov)

**Department of Electronics and Communication Engineering
Organizing**

ONE MONTH ONLINE INTERNSHIP PROGRAMME ON MACHINE LEARNING WITH MATLAB (21st Oct – 29th Nov)

About Workshop:

In pursuit of excellence in technical education Dadi Institute of Engineering & Technology, Visakhapatnam in association with Sri ShashaPrayathi Technologies Pvt Ltd, NITK-STEP, Srinivasnagar, SurathkalMangloreorganized one month Workshop for the Final Year B.Tech-ECE Students of Department Electronics & Communication Engineering on Machine Learning with MATLAB during 21st OCT to 29th Nov 2021. The program focus on skill development programs in the area of radar systems, radar signal processing, radar target tracking and navigation systems. Resource person Dr. Srihari Pathipati trained students in the field of machine learning. Theday wise report gives on overview training.

WEEK 1 REPORT

INTRODUCTION TO NEURAL NETWORKS

This course gives an introduction to basic neural network architectures and learning rules. Emphasis placed on the mathematical analysis of these networks, on methods of training them and their application to practical engineering problems in such areas as pattern recognition, signal processing and control systems.

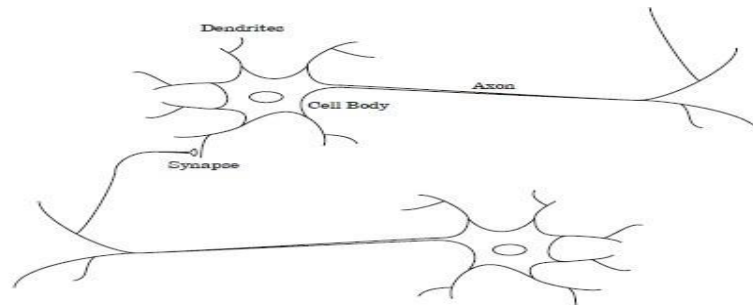


Fig 1 Biological neural network

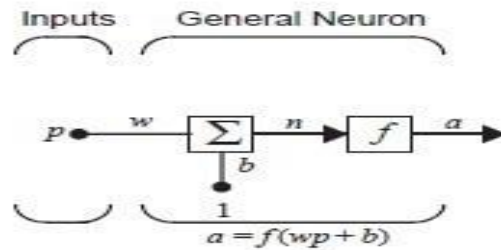


FIG. 2 Neuron representation

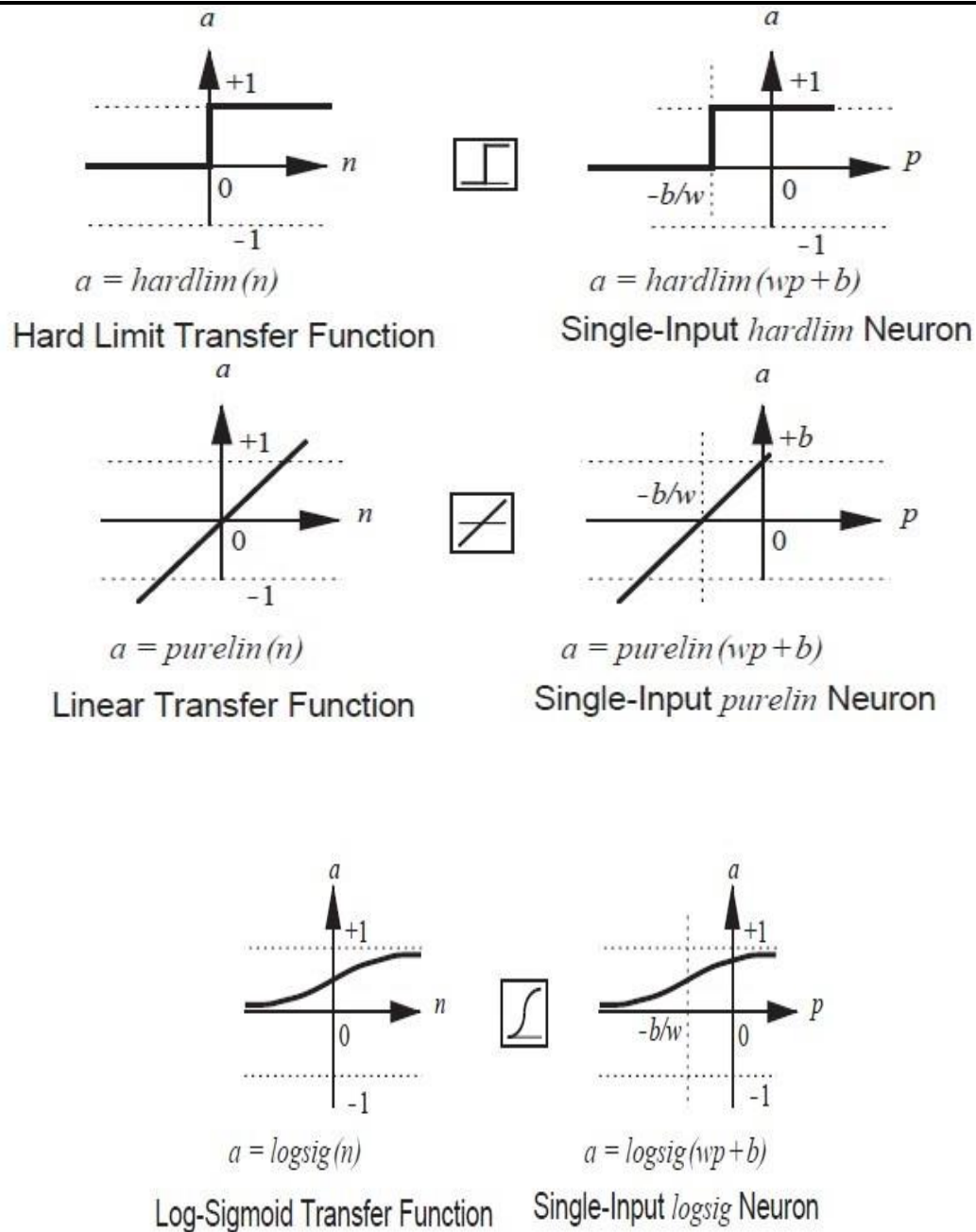
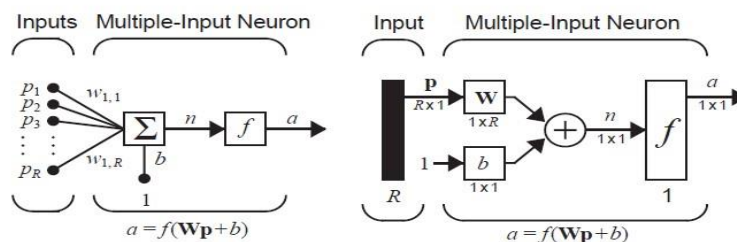


Fig. 3 Transfer functions for different inputs

Name	Input/Output Relation	Icon	MATLAB Function
Hard Limit	$a = 0 \quad n < 0$ $a = 1 \quad n \geq 0$		hardlim
Symmetrical Hard Limit	$a = -1 \quad n < 0$ $a = +1 \quad n \geq 0$		hardlims
Linear	$a = n$		purelin
Saturating Linear	$a = 0 \quad n < 0$ $a = n \quad 0 \leq n \leq 1$ $a = 1 \quad n > 1$		satlin
Symmetric Saturating Linear	$a = -1 \quad n < -1$ $a = n \quad -1 \leq n \leq 1$ $a = 1 \quad n > 1$		satlins
Log-Sigmoid	$a = \frac{1}{1 + e^{-n}}$		logsig
Hyperbolic Tangent Sigmoid	$a = \frac{e^n - e^{-n}}{e^n + e^{-n}}$		tansig
Positive Linear	$a = 0 \quad n < 0$ $a = n \quad 0 \leq n$		poslin
Competitive	$a = 1$ neuron with max n $a = 0$ all other neurons		compet

Fig.4 MATLAB functions for various inputs



Abbreviated Notation

Fig.5 Multiple-input neuron

The neuron has a bias b , which is summed with the weighted inputs to form the net input n :

$$n = w_{1,1}p_1 + w_{1,2}p_2 + \dots + w_{1,R}p_R + b,$$

This expression can be written in matrix form:

$$n = Wp + b,$$

where the matrix W for the single neuron case has only one row. Now the neuron output can be written as

$$a = f(Wp + b).$$

Layer of neuron representation

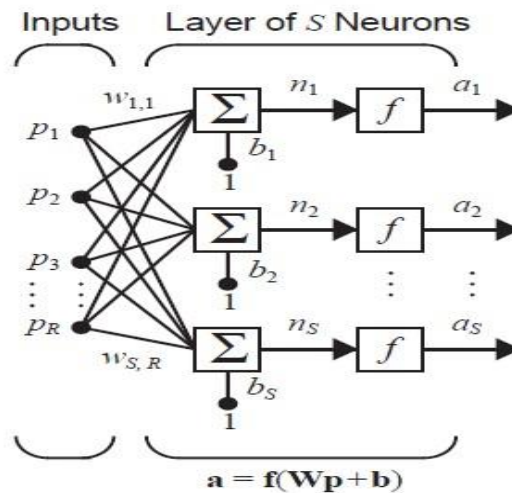


Fig.6 Layer neuron representation

Multi-layer network:

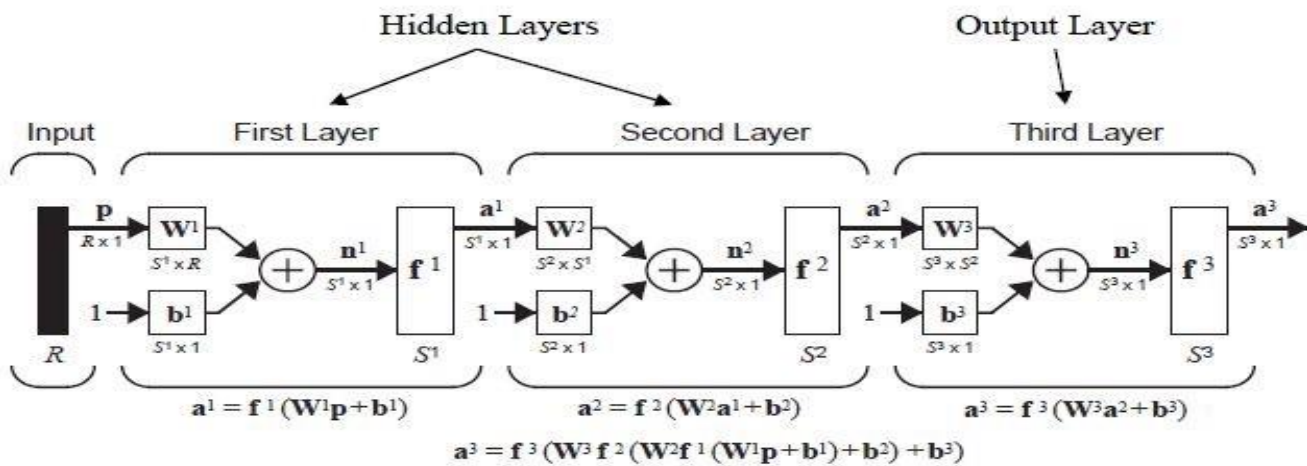


Fig 7 Multi layer Network

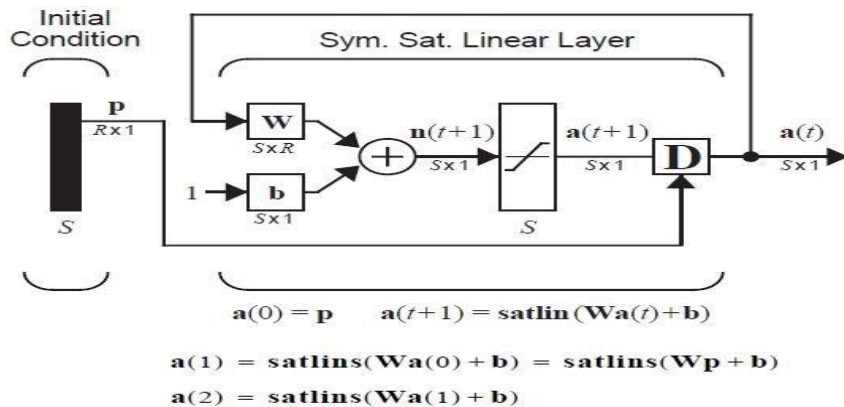


Fig 8 Recurrent network

Delay block:

The delay output is $a(t)$ computed from its input $u(t)$ according to

$$a(t) = u(t-1) \quad (4)$$

Thus, the output is the input delayed by one time step. (This assumes that time is updated in discrete steps and takes on only integer values.) The equation requires that the output be initialized at time. This initial condition is indicated in figure by the arrow coming into the bottom of the delay block.

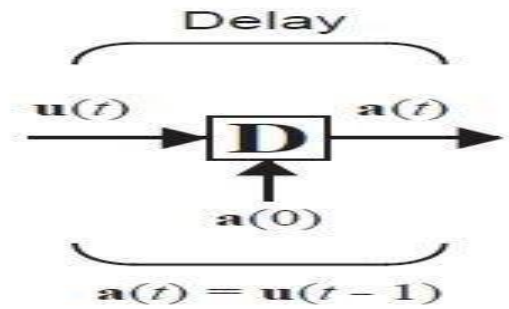


Fig. 9 Delay Network

WEEK 2

Hopfield network

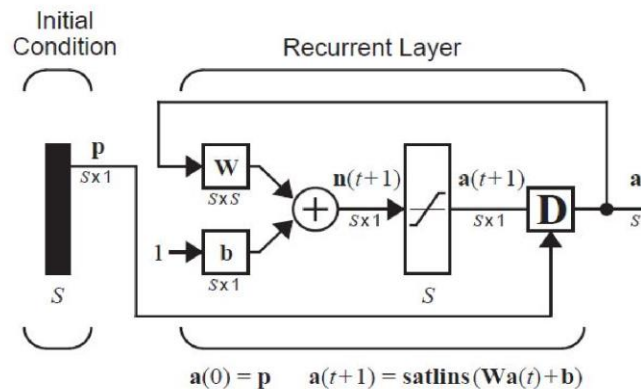


Fig.10 Hopfield Network

- This is a recurrent network that is similar in some respects to the recurrent layer of the Hamming network, but which can effectively perform the operations of both layers of the Hamming network.
- The neurons in this network are initialized with the input vector, then the network iterates until the
- output converges.

When the network is operating correctly, the resulting output should be one of the prototype vectors.

Therefore, whereas in the Hamming network the nonzero neuron indicates which prototype pattern is chosen, the Hopfield network actually produces the selected prototype pattern at its output.

$$\mathbf{W} = \begin{bmatrix} 1.2 & 0 & 0 \\ 0 & 0.2 & 0 \\ 0 & 0 & 0.2 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 0 \\ 0.9 \\ -0.9 \end{bmatrix}$$

$$a_1(t+1) = \text{satlins}(1.2a_1(t))$$

$$a_2(t+1) = \text{satlins}(0.2a_2(t) + 0.9)$$

$$a_3(t+1) = \text{satlins}(0.2a_3(t) - 0.9)$$

Test: “Rough” Banana

$$\mathbf{a}(0) = \begin{bmatrix} -1 \\ -1 \\ -1 \end{bmatrix} \quad \mathbf{a}(1) = \begin{bmatrix} -1 \\ 0.7 \\ -1 \end{bmatrix} \quad \mathbf{a}(2) = \begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix} \quad \mathbf{a}(3) = \begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix} \text{ (Banana)}$$

Fig 11 Hamming Network



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Perceptron learning rules:

- In 1943, Warren McCulloch and Walter Pitts introduced one of the first artificial neurons.
- The main feature of their neuron model is that a weighted sum of input signals is compared to a threshold to determine the neuron output.
- When the sum is greater than or equal to the threshold, the output is 1.

When the sum is less than the threshold, the output is 0. They went on to show that networks of these neurons could, in principle, compute any arithmetic or logical function.

Unlike biological networks, the parameters of their networks had to be designed, as no training method was available.

However, the perceived connection between biology and digital computers generated a great deal of interest

- By learning rule is a procedure for modifying the weights and biases of a network.
- This procedure may also Learning Rule be referred to as a training algorithm.

The purpose of the learning rule is to train the network to perform some tasks. There are many types of neural network learning rules.

They fall into three broad categories: supervised learning, unsupervised learning and reinforcement (or graded) learning.



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WEEK 3

Commonly used notebooks:

- Jupyter Notebook is a web-based application developed by Project Jupyter.
-
- Its aim is to enable users to, as stated on the official website, “create and share documents that contain
- live code, equations, visualizations and narrative text.”
-

Jupyter Notebook was developed in 2014 as a spin-off of the original IPython, which is a command shell used to carry out interactive coding.

With the release of Jupyter Notebook, IPython found itself competing with it, to an extent. It still remained as a kernel for Jupyter and as a shell for Python, but everything else came under Jupyter Notebook.

- Jupyter Notebook
- IPython
- Apache Spark Notebook
- Apache Zeppelin
- JupyterLab
- R Markdown

Features of jupyter notebook:

- Each Jupyter Notebook is a JSON document. JSON is a language-independent data format that is derived from JavaScript. It uses human-readable text to transmit data containing arrays or attribute–value pairs.
- Each Jupyter Notebook is usually saved with a .ipynb extension.

-
- Jupyter Notebook is similar in style to other interfaces that originated years before it, including Maple and Mathematica (from the 1980s) and SageMath (from the 2000s). Jupyter Notebook was released under the modified BSD license, which provides users with minimum limitations in the usage and distribution of the software.
 - Jupyter Notebooks can easily be shared with others through email, Dropbox, GitHub, and the Jupyter Notebook Viewer.

Other applications of python in MI:

- Web development
- Data analysis
- Educational purposes
- Software testing
- Computer graphics
- Game development
- Scientific and numeric computing
- Desktop GUIs

Python Interpreters:

- A compiled language takes the entire program and translates it from machine code to source code in order to obtain the required output.
- These languages therefore have a faster runtime, but are not cross-platform.
- An interpreted language executes the code directly by reading each line one by one and then running it to obtain the required output.
- These languages therefore have a slightly slower runtime, but are cross-platform.
- There are newer technologies being developed to tackle this issue of slow runtime, like the “just-in-time” compiler, which compiles the program during its execution instead of before it. Python is an interpreted language; it does not mean that it is not compiled at all.
- Compilation happens for a Python program, but it is not explicitly shown to the programmer



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Types of interpreters:

- CPython: This is the default implementation of Python. It is most popularly used as it is most compatible with Python packages and with extension modules that are written in C. It is the reference implementation of Python, which means that all the different versions of Python are implemented in C.
- Jython (formerly JPython): This is an implementation of Python that is written in Java and Python. It translates Python code into Java bytecode, and then executes it on a Java virtual machine. This allows Python code to run on Java platforms. It also allows users to use a Java class like a Python module

Signal and weight vector spaces:

Linear algebra is the core of the mathematics required for understanding neural networks.

In previous classes, we saw the utility of representing the inputs and outputs of neural networks as vectors.

In addition, we saw that it is often useful to think of the rows of a weight matrix as vectors in the same vector space as the input vectors.

In the Hamming network the rows of the weight matrix of the feedforward layer were equal to the prototype vectors.

In fact, the purpose of the feedforward layer was to calculate the inner products between the prototype vectors and the input vector.

In the single neuron perceptron network we noted that the decision boundary was always orthogonal to the weight matrix (a row vector).

Linear transformation for neural network:

The multiplication of an input vector by a weight matrix is one of the key operations that is performed by neural networks. This operation is an example of a linear transformation. We want to investigate general linear transformations and determine their fundamental characteristics.

The concepts covered in this class, such as eigenvalues, eigenvectors and change of basis, will be critical to our understanding of such key neural network topics as performance learning (including the Widrow-Hoff rule and backpropagation) and Hopfield network convergence.

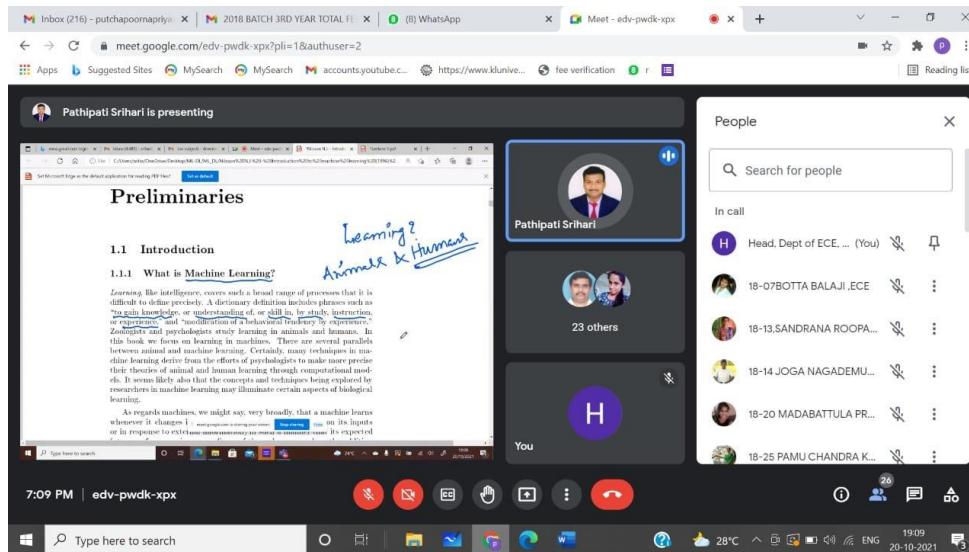


Fig 12 Student attending Online Session

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Certificate

This is to certify that Mr. R. Srinivas of Dadi Institute of Engineering & Technology, Vishakhapatnam has participated in the "Online Internship Programme on Machine Learning with MATLAB" held from 21st October 2021 to 29th November 2021 and has satisfactorily completed the course.



P. Yeswanth

Mr. Yeswanth Pattipathi
Director



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Certificate

This is to certify that Mr. S. Guna of Dadi Institute of Engineering & Technology, Vishakhapatnam has participated in the "Online Internship Programme on Machine Learning with MATLAB" held from 21st October 2021 to 29th November 2021 and has satisfactorily completed the course.



P. Yeswanth

Mr. Yeswanth Pattipathi
Director

Fig 13 Sample Certificate



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3	18U41A0407	B. Balaji
4	18U41A0409	CH. Prasad
5	18U41A0413	S. Roopa
6	18U41A0414	J. Nagademullu
7	18U41A0420	M. Pratyusha
8	18U41A0421	M. Dakshayani
9	18U41A0425	P.Chandrakala
10	18U41A0426	P. Swarjan
11	18U41A0431	S. Guna
12	18U41A0432	S. Ganesh
13	18U41A0445	M. Akhilesh
14	18U41A0434	V. Rohin Kumar
15	18U41A0443	R. Srinivas
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18	19U45A0406	B. Pavani
19	19U45A0403	B. Sirisha
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Department of ECE

FEEDBACK FORM ON INTERNSHIP TRAINING

1. Has the Internship attained its objectives

- Yes
- No

2. Internship was relevant to my needs

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. Instructions were clear and understandable

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. Classes was well organised

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. Was the Duration of the training sufficient.

- Yes
- No

6. Resource persons were effective.

- Strongly agree
- Agree



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-
- Neutral
 - Disagree
 - Strongly disagree

7. Queries were encouraged

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

8. Any additional remarks

9. Overall how would you rate this event

- Excellent
- Very good
- Good
- Fair
- Poor

10. Propose the name of training program you will be interested in participating in future.