

ADIKAVI NANNAYA UNIVERSITY :: RAJAMAHENDRAVARAM
UNIVERSITY COLLEGE OF ENGINEERING
DEPARTMENT ELECTRONICS AND COMMUNICATIN ENGINEERING

A Report on One Day Seminar On
MACHINE LEARNING TECHNIQUES FOR IMAGE
PROCESSING

Preamble: A one day Seminar on Machine Learning Techniques for Image Processing conducted on 6th April, 2022 10am Venue at Seminar Hall, Administrative block, Adikavi Nannaya University Rajahmundry, East Godavari, AP. Chief Patron Prof.M Jagannadha Rao (Hon'ble Vice Chancellor, AKNU), Prof.T Ashok (Registrar, AKNU) Co-Patron Dr V Persis (Principal, UCE AKNU), Convener Mr B Sudha Kiran (Course Coordinator of Dept.of ECE). Key Speaker of the Seminar is Dr Ravi Kumar Jatoth (Associate Prof, Dept of ECE NIT Warangal).



Key Speaker Profile: Dr J. Ravi Kumar was born in Thorrur (mandal), of Warangal (dist), India on October 13 1980.He received his B.E degree in Electronics and communications engineering from Osmania University, Hyderabad, M.Tech in Instrumentation and Control Systems from Jawaharlal Nehru Technological University Hyderabad and completed his Ph.D from National Institute of Technology-Warangal. He is an Associate Editor of the International Journal of VLSI Design Tools & Technology (JoVDTT), associate editor of MECS International Journal of Image, Graphics and Signal Processing (IJIGSP), Springer and Elsevier journals. He is student friendly and Guided 18 B.Tech and 6 M.Tech students of NITW to present Research papers in International conferences in India and abroad.



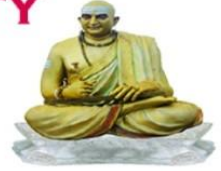


ADIKAVI NANNAYA UNIVERSITY

ఆదికవి నన్నయ విశ్వవిద్యాలయం

RAJAMAHENDRAVARAM, ANDHRA PRADESH INDIA - 533296

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UNIVERSITY COLLEGE OF ENGINEERING
AICTE APPROVED
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ONE DAY SEMINAR
ON
MACHINE LEARNING TECHNIQUES FOR IMAGE PROCESSING

Dated : 06-04-2022, Venue: Seminar Hall

PROGRAM SCHEDULE

Session 1

1. 10.00 -10.10 AM: Invitation & Remarks : Mr.B. Sudhakiran, CC- Dept. ECE
2. 10.10 - 10.20 AM: Greetings : Dr.V.Persis, Principal, UCE
3. 10.20 -10.25 AM : Introduction of the Chief Guest - Ms. B.Annie Keziah
4. 10.25 -10.40 AM: Chief Guest Message - Hon'ble Vice Chancellor, Prof M. Jagannadha Rao
5. 10.40 -10.45 AM: Introduction of the Resource Person - Mr. P. Venkata Ratnam
6. 10.45 -11.00 AM: Felicitation to Chief guest and resource person
7. 11.00 AM -12.30 PM: Lecture 1- Dr. Ravi kumar Jatoth
8. 12.30-2.00 PM: Lunch break

Session 2

1. 2.00-3.30 PM: Lecture 2 - Dr. Ravi kumar Jatoth
2. 3.30-3.35 PM: Tea break

Session 3

1. 3.35-4.50 PM: Lecture 3 - Dr. Ravi kumar Jatoth
2. 4.50-5.00 PM: Vote of Thanks - Mr. A. Vijaya Durga

Inagural Function



Description about the Program:

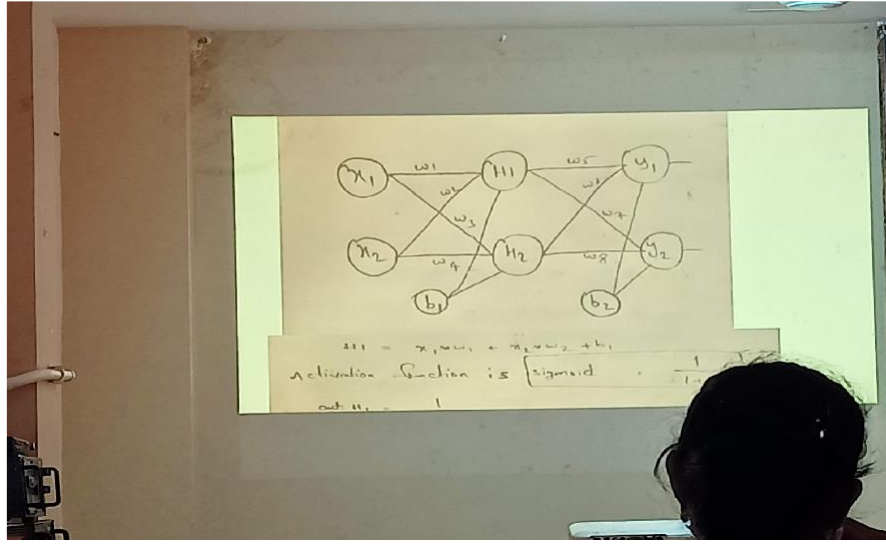
Dr J. Ravi Kumar explain detail about the machine learning techniques for image processing

1. Hybrid Feature Extraction Technique:

The mathematical expression recognition arrangement carried out in different stages which include collection of data from different sources, followed by the major processes including preprocessing, segmentation, feature extraction and finally symbol classification and mathematical expression recognition are performed.



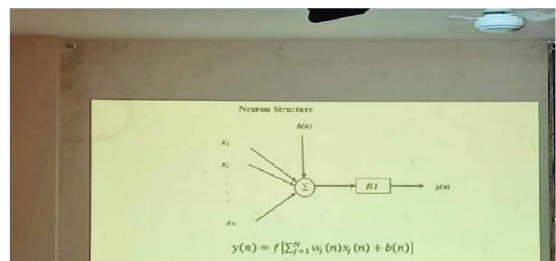
Input Image Acquisition- The image of mathematical equation via a^m.aⁿ=A^{m+n} , ax+by=c, y[n]=x[n]**h[n] ,law of gravity, Convolutional integral has gather as an input and provided to the proposed system. The offline approach is used to capture the image from the scanner. Various data from the data set such as numbers, alphabetical characters, symbols and special characters has been collected from different sources as a database and putted into sequential form.



Preprocessing- Input images which are in color format are converted into black and white form with a threshold of 0.5 through a grey scale image. This transformation or what we can say Image cleaning takes place to remove unwanted spots from image. The component whose size is less than 50 pixels is removed from the image. However, image inversion and reshaping takes place.

Segmentation-In this phase, structural and functional analysis is used. In segmentation, separation of words, lines, characters which consequently affects the recognition rate of script. Input images are broken into individual characters and then each character is resized into 5*7 pixels towards training methods.

Feature Extraction- The process of extracting certain type of information from scanned input image is known as extraction. The features viz. area, boundary box, centroid, zoning density and line segment are extracted from the image. Centroid extracted to find out the weights of the component and it locates the centre of component.



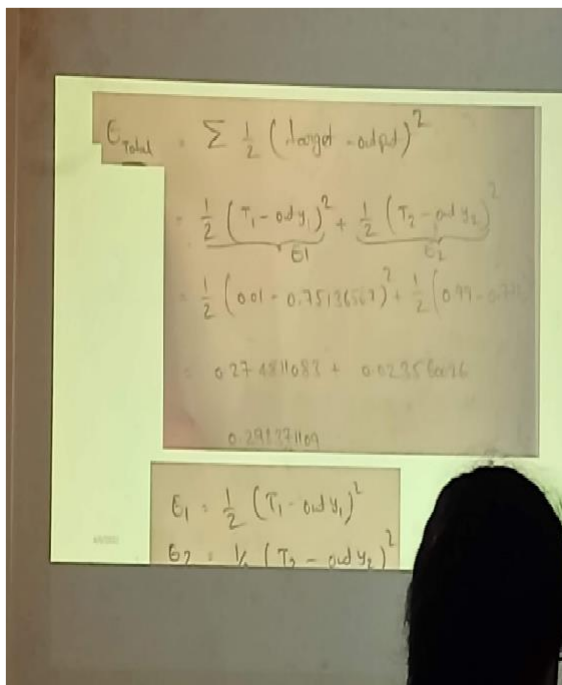
Classification- In this part , neural networks are used as classifier. Neural Network are generally based on soft computing techniques. The architecture used in designing neural network is arranged in layers known as multilayer preceptorn. It consist of three different layers including input layer, one or more layer of hidden nodes and a layer of outer nodes. This phase is dependent on the previous

phases as the classification performance depends on good feature extraction.

Training and recognition- In this phase, all the digit collected from the data set are trained and the recognized for performing the further processes. Multilayer Perceptron Feed forward Back propagation neural network is used for recognition of handwritten mathematical symbols and recognition.

In simple terms, different phases plays a vital role in recognition of mathematical equation. Preprocessing process involves various four different operation that includes:

- * Binarization-This process converts the grey letter image into binary letter image.
- * Noise Reduction-This operation, marks the image, or the finer details of the image, if they were concealed by the noise, and hence become even less visible after noise reduction.

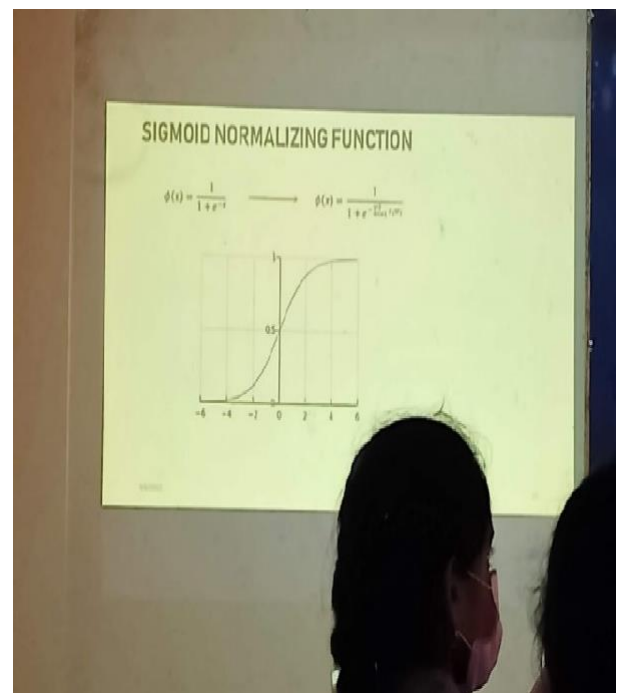


Handwritten mathematical derivation of total error on a whiteboard:

$$E_{\text{Total}} = \sum \frac{1}{2} (\text{target} - \text{output})^2$$
$$= \frac{1}{2} (T_1 - \text{out } y_1)^2 + \frac{1}{2} (T_2 - \text{out } y_2)^2$$
$$= \frac{1}{2} (0.01 - 0.75136577)^2 + \frac{1}{2} (0.99 - 0.7161143)^2$$
$$= 0.274811087 + 0.02356076$$
$$= 0.298371847$$

Below the main equation, two smaller equations are written:

$$E_1 = \frac{1}{2} (T_1 - \text{out } y_1)^2$$
$$E_2 = \frac{1}{2} (T_2 - \text{out } y_2)^2$$



- * Size-normalization –This process changes the range of pixel intensity values.
- * Skew detection and Correction-The skew detection identifies the divergence of the text lines from the horizontal or vertical axis.

2. Convolutional Neural Network

Upon its invention, CNN method was considered to be the best for the identification of mathematical pattern or English word. Different papers report various ways of achievements better results when training and evaluating CNNs.

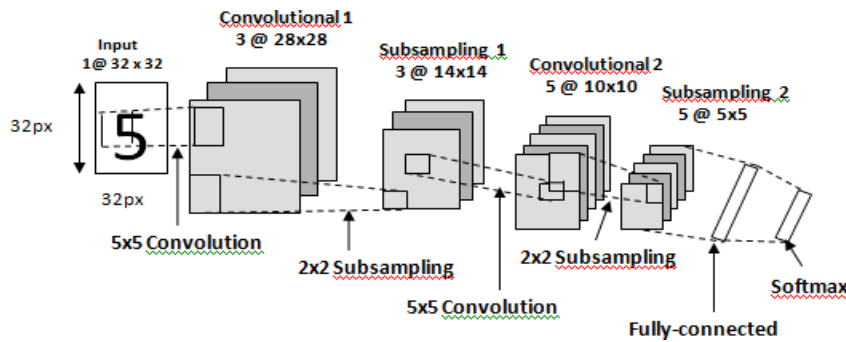
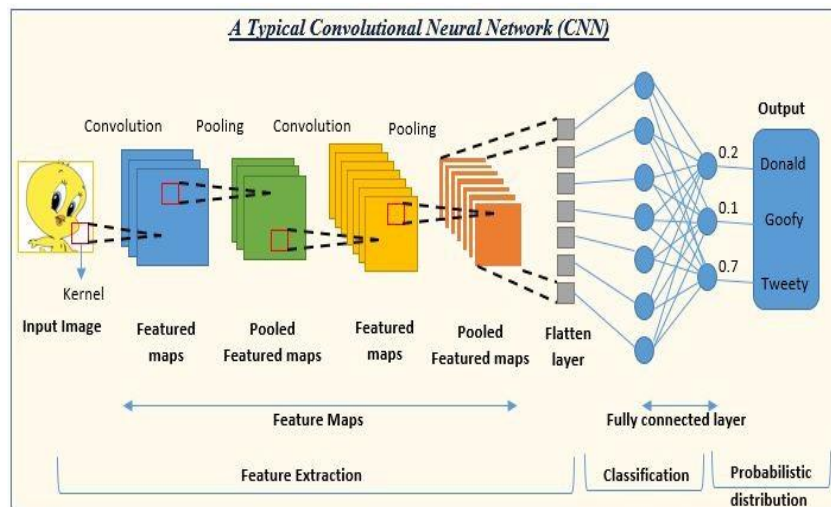


Figure1. Architecture of CNN

Convolutional Neural Networks (CNN) are the modified version of the Multilayer Perceptron (MLP) which is one of the architectures of Artificial Neural Network. Unlike MLP, CNN consists of a Convolutional layer and a subsampling layer.



CNN authorizes three different concepts related to machine learning systems that are- 1. Sparse Interaction 2. Parameter Sharing 3. Equivariant Representation. Sparse Interaction is used to detect small and meaningful features such as edges by making the kernel smaller than the input. We can also refer to it as sparse connectivity or sparse weight. Parameter Sharing, as the name suggests, means that each feature map is sharing the same weights, hence the number of parameters is reduced. The parameter sharing causes the layer to have the property known as equivariance and translation. Every layer is connected to the previous layer by a filter.

Convolution

Generally, a convolution is a mathematical operation on two functions that produces a third function expressing how the shape of one is modified by the other. It is an image processing operation that transforms an input image in order to show specific features, e.g. edge detection, image sharpening, and image blurring. The input image can be altered by curling around the image and the matrix, called as filters or kernels.

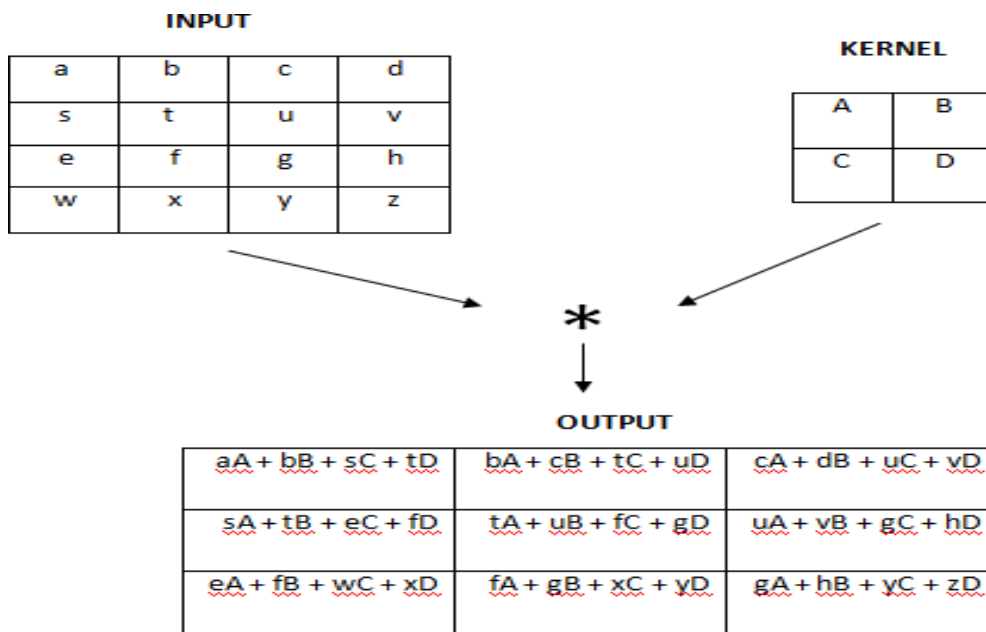
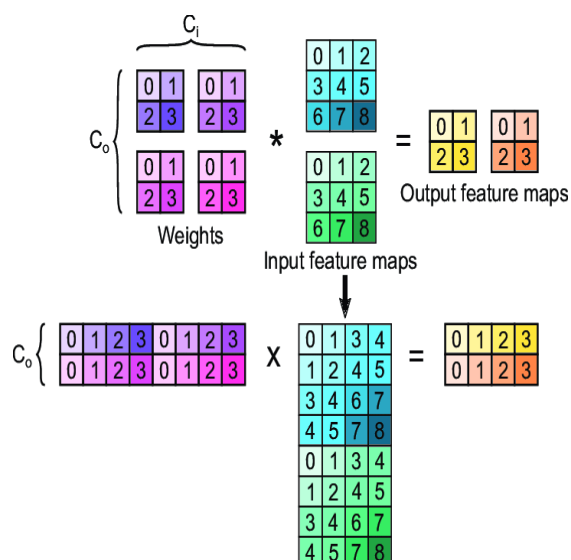


Figure2. Sub sampling

There are five different layers in Convolutional Neural Network. They are

1. Input- In this layer, raw pixels are provided as input.
2. Convolutional Layer- In this, the input layer changes the result of the neuron layer. The filter that are going to be used should be defined beforehand.
3. Rectified Input unit layer- During back propagation, this function prevents the values of pixels from changing. It also provides activation function on the image.
4. Pooling layer- It performs a down
5. sampling operation along the height and width of the image.
6. Fully connected layer- In this layer, focus is on score class and who has the maximum score of the input digit is found.



Feedback:

Image processing is a very useful technology and the demand from the industry seems to be growing every year. Historically, image processing that uses machine learning appeared in the 1960s as an attempt to simulate the human vision system and automate the image analysis process. This session plays a crucial role in every student on technical skills along with machine learning with image processing, especially how those techniques need to society for development etc.





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**MACHINE LEARNING TECHNIQUES
FOR
IMAGE PROCESSING**

on 6th April, 2022 10:00 am, Venue - Seminar Hall



CHEIF PATRON

PROF M JAGANNADHA RAO

Hon'ble Vice Chancellor
Adikavi Nannaya University



KEY SPEAKER

Dr Ravi kumar Jatoth

Associate Prof,
Dept. of ECE
NIT Warangal

PATRON

Prof T Ashok, Registrar, AKNU

CO- PATRON

Dr V Persis, Principal UCE, AKNU

CONVENER

Mr B Sudha biran

Course Coordinator, Dept. of ECE

CO CONVENERS

Student coordinators

M Dinesh - IV ECE
V Karthik - III ECE
Y Prathyusha - III ECE
N Hema latha - II ECE

Mr A Vijaya Durga, Asst Professor Dept. of ECE

Mr B Krishna, Asst Professor Dept. of ECE

Ms B Annie Keziah, Asst Professor Dept. of ECE

Mr P Venkata Ratnam, Asst Professor Dept. of ECE

మిషన్ లెర్నింగ్ మెలుకువలు తెలుసుకొండి

06.04.22 (మీడియాసెల్) మిషన్ లెర్నింగ్ తో ఎన్నో ప్రయోజనాలు ఉన్నాయని, మిషన్ లెర్నింగ్ మెలుకువలను తెలుసుకోవాలని రిజిస్ట్రార్ ఆచార్య డి.అశోక్ అన్నారు. ఆదికవి నన్నయ యూనివర్సిటీ కాలేజీ ఆఫ్ ఇంజనీరింగ్ డిపార్ట్మెంట్ ఆఫ్ ఎలక్ట్రానిక్స్ అండ్ కమ్యూనికేషన్ ఇంజనీరింగ్ ఆధ్వర్యంలో బుధవారం నేషనల్ సెమినార్ ను నిర్వహించారు. యూనివర్సిటీ సెమినార్ హాల్ లో "మిషన్ లెర్నింగ్ టెక్నిక్స్ ఫర్ ఇమెజ్ ప్రోసెసింగ్" అనే అంశంపై జరిగిన ఈ నేషనల్ సెమినార్ కు ముఖ్య అతిథిగా రిజిస్ట్రార్ ఆచార్య డి.అశోక్, అధ్యక్షులు ప్రిన్సిపాల్ డా.వి.వెర్మిన్, ప్రధానపక్ష ఎన్.బి.టి. వరంగల్ సహచార్యులు డా.రవికుమార్ జాట్లోత్ హాజరయ్యారు. ఈ

కార్యక్రమంలో రిజిస్ట్రార్ మాట్లాడుతూ మిషన్ లెర్నింగ్ మెలుకువలు మరియు కోడింగ్ పై అవగాహన పెంచుకోవాలని తెలియజేశారు. సాంకేతిక పరిజ్ఞానాన్ని ఇంజనీరింగ్ విద్యార్థులు అలవర్చుకోవాలని చెప్పారు. తరువాత టెక్నికల్ పేపర్ ప్రెజెంటేషన్ లో గెలుపొందిన విద్యార్థులకు బహుమతులు ప్రధానం చేశారు. ప్రధాన వక్తగా విచ్చేసిన ఆసోసియేట్ ప్రొఫెసర్ ఎన్.బి.టి. వరంగల్ డా.రవి కుమార్ జాట్లోత్ మిషన్ లెర్నింగ్ పై పట్టు సాధించడం ద్వారా ఎన్నో ఉద్యోగ అవకాశాలు ఉన్నాయని తెలిపారు. ఇమెజ్ కంప్రెషన్ ను చేయవచ్చునని, గణిత



సమావేశంలో మాట్లాడుతున్న రిజిస్ట్రార్ డి.అశోక్

నమస్కలను పరిష్కరించవచ్చునని అన్నారు. ఈ కార్యక్రమంలో కన్వీనర్ గా ఈసీఈ కోర్స్ కోఆర్డినేటర్ బి.సుధాకిరణ్, కోకన్వీనర్స్ గా ఎ.విజయదుర్గ, బి.కృష్ణ, బి.యానీకెజియా, పి.వెంకటరత్నం మరియు స్టూడెంట్ కోఆర్డినేటర్లు తదితరులు పాల్గొన్నారు.