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Using Deep Learning Techniques To Enhance Brain Tumor Diagnosis And Classification On Mri Images

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Abstract: ***Brain Tumor Classification Is Actually Difficult Task In Early Stages Of Life. But Now It Became Advanced With Varied Machine Learning Algorithms. Currently A Day's Issue Of Tumour Automatic Identification Is Of Great Interest. So As To Detect The Tumour Of A Patient We Tend To Think About The Info Of Patients Like Mri Pictures Of A Patient's Brain. Here Our Problem Is To Spot Whether Or Not Tumour Is Present In Patient's Brain Or Not. It's Important To Detect The Tumors At Beginning Level For A Healthy Lifetime Of A Patient. There Are Several Literatures On Detecting These Types Of Brain Tumors And Raising The Detection Accuracies. During This Paper, We Tend To Estimate The Tumour Severity Using Convolutional Neural Network Algorithm Which Provides The Correct Results.***

Keywords: Convolutional Neural Networks, Gaussian Filter, Data Agumentation,Vgg_16.

1. INTRODUCTION

Cancer Verdict Is One Of The Most Premeditated Efforts In The Medicinal Field[1].Now Let's See What Actually The Growth Mean, A Growth Can Be A Group, Or Mass, Of Abnormal Cells In Your Brain. Your Skull, That Encloses Your Brain, Is Extraordinarily Rigid. Any Growth Among Such A Restricted Area Can Cause Problems. Tumors Are Generally Labeled On The Basis Of Histological Features[1].Brain Tumors Can Be Cancerous (Malignant) Or Noncancerous (Benign).Once Benign Or Malignant Tumors Grow, They're Going To Cause The Pressure Among Your Skull To Increase. This Can Cause Brain Harm, And It'll Be Dangerous. Brain Tumors Are Classified As Primary Or Secondary. A Secondary Growth, Also Referred To As A Pathologic Process Tumor, Happens When Cancer Cells Spread To Your Brain From Another Organ, Like Your Respiratory Organ Or Breast.

At Present, Process Of Medical Images May Be A Developing And Necessary Field. It Includes Many Alternative Types Of Imaging Methods. Some Of Them Are Ct Scans (Ct Scans), X-Rays And Magnetic Resonance Imaging (Mri) Etc. These Technologies Allow Us To Note Even The Littlest Defects Among The Human Body. Abnormal Growth Of Tissues Among The Brain That Have An Effect On Correct Brain Functions Is Taken Into Account As A Tumour. The Main Goal Of Medical Image Processing Is To Identify Correct And Substantive Information Victimisation Images With The Minimum Error Possible.Mri Imaging Is

Mainly Accustomed Get Images Of The Human Body And Cancerous Tissues Because Of Its High Resolution And Higher Quality Images Compared With Completely Different Imaging Technologies. Tumor Identifications Through Mri May Be A Tough Task Due To The Complexness Of The Brain.Mri Pictures Are Processed And So The Tumor Are Segmented. These Tumors Are Segmented Using Varied Image Segmentation Techniques.

There Are Various Deep Learning Techniques Used For The Classification Of The Images Among That The Convolutional Neural Networks (Cnn)S Is Most Powerful And Effective To Classify The Images.

1. Literature Review

Dr. Thejaswini P [1] The Proposed Technique Uses Adaptive Regular Kernel Primarily Based Fuzzy Cmeans Clustering (Arkfcm) For Segmentation[7]. A Mixture Of Support Vector Machine (Svm) And Artificial Neural Network (Ann) Is Planned For Detection And Classification Of Tumour Based On The Extracted Options. A Dataset Of 94 Pictures Is Taken For Validation Of The Proposed Technique That Resulted In An Accuracy Of 91.4% .

Khanb , Tariq Bashir [2] The Proposed Regional Classification Technique Is Ready To At The Same Time Observe And Phase Tumours To Pixel-Level Accuracy[8]. The Region-Based Options Thought Of During This Study Are Statistical, Text On Histograms, And Shape Features. This Can Be The Primary Study To Handle The Category Imbalance Problem At The Regional Level Using Random Majority Down-Sampling-Synthetic Minority Over-Sampling Technique (Rmd-Smote). A Comparison Of Benchmark Supervised Techniques As Well As Support Vector Machine, Adaboost And Random Forest Rf).By Using The Brats 2012 Dataset That Resulted In An Accuracy Of 91.

T. Hui Teo, Wei Ming Tan, And Yi Shu Tan[3].The Proposed Technique Uses A Mixture Of Support Vector Machine(Svm) And One Answer Is To Explore The Utilization Of Multicore System Cnn, However, Were Usually Built On Graphics Process Units (Gpus) Primarily Based Machine, Which Resulted In An Accuracy Of 85.80%.

2. PROPOSED METHOD

The Convolutional Neural Network (Cnn) Is A Deep Learning Algorithm. It Is Mostly Applicable For Image Processing[9].They Are Also Known As Shift Invariant Or Area Invariant Artificial Neural Networks (Siann), Supported Their Shared-Weights Style And Translation Unchangingness Characteristics[1][2] They Have Applications In Image And Video Recognition, Recommender Systems[3] Image Classification, Medical Image Analysis, Language Method[4] And Financial Data Point[5].

a. Thresholding

To Segmenting Image Thresholding Is The Simplest Method. Thresholding Can Be Used To Create Binary Images[10]. It Is Very Useful To Remove The Noise From The Images And Gives The Clear Segmented Images .Find The Contours In The Images And Grab The Largest One. First Fix The Original Image, Then Find The Biggest Boundary Points, Then Find The Four Extreme Points (Left, Right, Top, Bottom) And Finally Crop The Images.

3.2 Data Agumentation

To Increasing The Amount And Diversity Of Data, The Technique Data Augmentation Is Used. We Do Not Collect New Data, Rather We Transform The Already Present Data[11]. Data Augmentation Is An Integral Process In Deep Learning, As In Deep Learning We Need Large Amounts Of Data And In Some Cases It Is Not Feasible To Collect Thousands Or Millions Of Images, So Data Augmentation Comes To The Rescue. It Helps Us To Increase The Size Of The Dataset And Introduce Variability In The Dataset.

There Are Different Kind Of Operations Are Available In Data Agumentation Like (Rotation, Shifting, Rescale, Shearing, Flipping).

Table 1. Augmentation Techniques

Data Agumentation Techniques	Parameters
Rotation	15
Flip	Horizontal Vertical
Shift	0.05
Shear	0.05

b. Classification

This Research Work Using Three Different Types Of Classifiers To Classify The Tumour Cells. I)Vgg-16 Is A Convolutional Neural Network Model Shown In The Figure.1[12][15]. From The Dataset Of Over 14 Million Images Belonging To 1000 Categories. This Model Achieves 92.7% Top-5 Take A Look At Accuracy In Imagenet, That Could Be A Absolutely Was One Amongst The Known Model. It Makes The Development Over Alexnet By Exchange Massive Kernel-Sized Filters (11 And Five Within The 1st And Second Convolutional Layer, Respectively) With Multiple 3×3 Kernel-Sized Filters One Once Another. The Input To Cov1 Layer Is Of Mounted Size 224 X 224 Rgb Image. The Image Is Passed Through A Stack Of Convolutional (Conv.) Layers, Wherever The Filters Were Used With A Very Tiny Receptive Field: 3×3 (Which Is That The Smallest Size. In One Amongst The Configurations, It Conjointly Utilizes 1×1 Convolution Filters, Which Might Be Seen As A Linear Transformation Of The Input Channels (Followed By Non-Linearity).

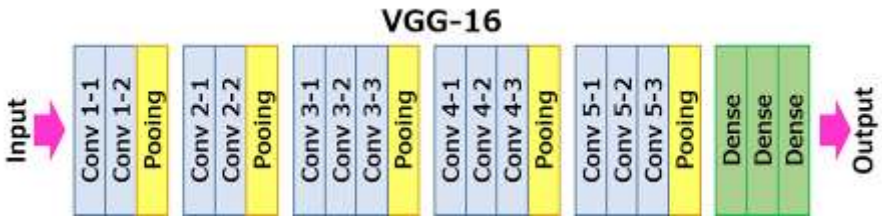
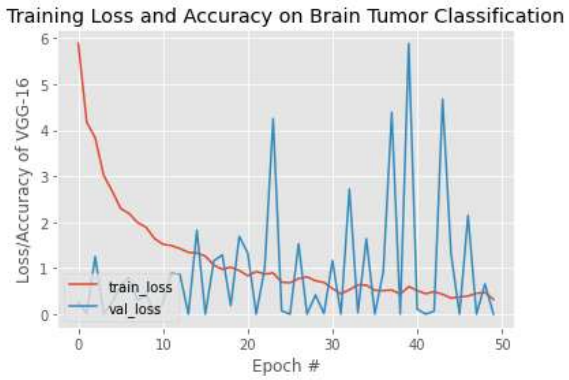


Fig 1.Working Of Vgg-16

The Convolution Stride Is Mounted To One Pixel. The Spacial Padding Of Conv Layer Input Is Such The Spacial Resolution Is Preserved Once Convolution[13]. Spacial Pooling Is Carried Out By 5 Max-Pooling Layers, That Follow A Number Of The Conv.Max-Pooling Is Performed Over A 2×2 Constituent Window, With Stride 2. Figure Two And Three Shoes The Performance Of Training And Validation Loss Curve Of Vgg-16 , Training And Validaion Accuracy Curve Of Vgg-16.Loss And Accuracy



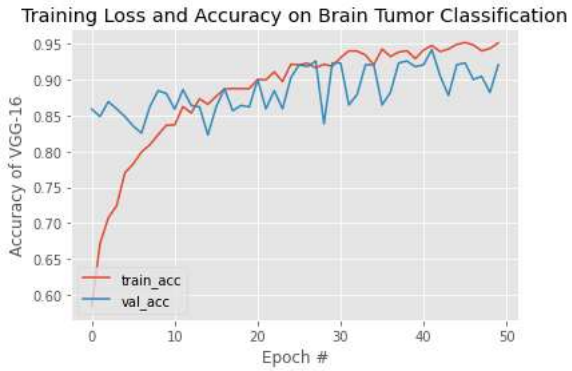


Fig 2. Training And Validation Loss Curve (Vgg-16)

Fig 3. Training And Validation Accuracy Curve (Vgg-16)

Inception-V3 It Is A Convolutional Neural Network By Google Brain Team Which Is Trained On Imagenet Database. It Is 48 Layer Deep Network Which Classifies Images Into 1000 Object Classes[14]. The Model Has Capability To Learn Rich Feature Representations For Different Images. The Network Requires Input Image Of Size 299×299. Inception-V3 Uses Batch Normalization, Distortion In Images, Rm-Sprop And Is Based On Many Small Convolutions To Significantly Decrease The Number Of Parameters. The Performance Of Inception –V3 Is Shown In The Fig 4. And Fig 5.

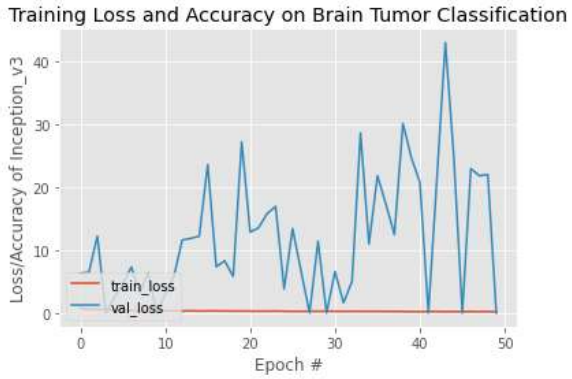


Fig 4. Training And Validation Loss Curve (Inception- V3)

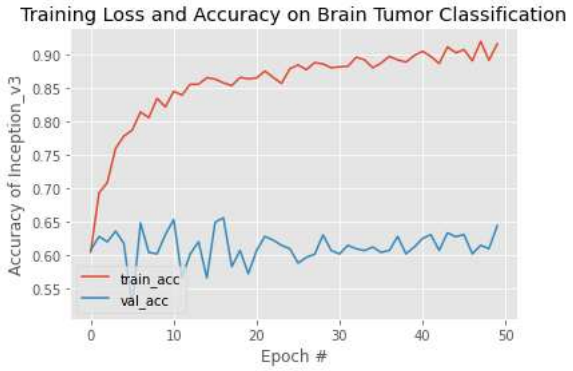


Fig 5. Training And Validation Accuracy Curve (Inception-V3)

Resnet-50. It Corresponds To 50 Layer Residual Network [5].It Corresponds To Those Options That Are Learned From Input Of That Layer.Resnet Performs It By Using Skip Connections (Directly Connecting Input Of M^{th} Layer To Some (M X) Th Layer).These Networks Are Comparatively Less Complicated To Train Compared With Other Deep Cnn. These Also Resolve The Matter Of Degrading Accuracy. Its Design Contains Of Skip Connections Along With Large Batch Standardization Which Shown In The Fig.67. The Performance Of Resnet-50 Is Shown In The Fig 7. And Fig 8.

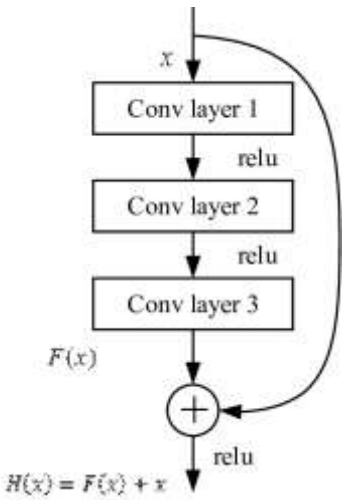


Fig 6. Architrcture Of Resnet 50

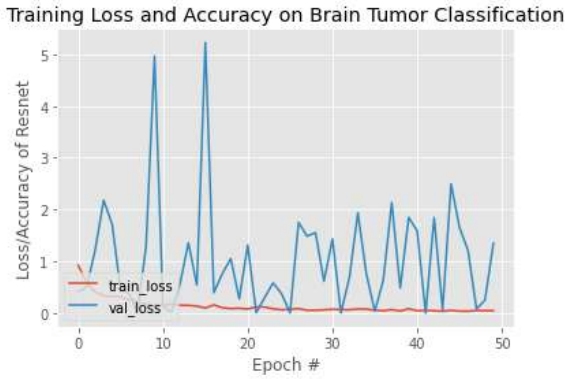


Fig 7. Training And Validation Loss Curve (Resnet-50)

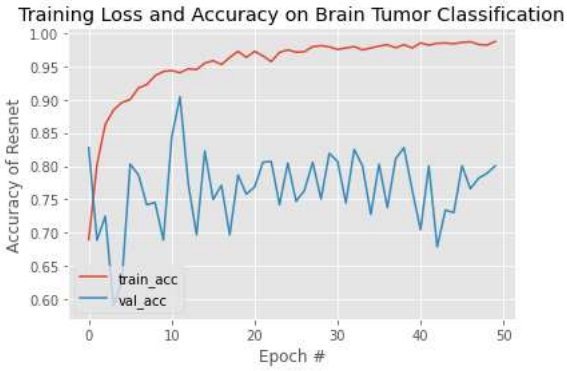


Fig 8. Training And Validation Accuracy Curve (Resnet-50)

3. RESULT AND DISCUSSION

The Dataset Are Taken From Ncbi Repository. It Was A Benchmark Dataset And Preprocessed. In This Paper, An Improved Brain Tumor Detection Is Performed By Using Convolutional Neural Network Like Vgg-16, Inception-V3 And Resnet-50. The Training Accuracy, Validation Accuracy And Validation Loss Are Calculated To Find The Efficiency Of Proposed System. The Table . 2 Depicts The Performance Of The Various Model In The Convolutional Neural Network.

Table.2.Performance Of Various Model

Model	Accuracy
Vgg-16	92%
Inception-V3	65%
Resnet50	82%

4. CONCLUSION

The Experiment Result Shows The Classification Accuracy Of 92.48%. The Tests Were Performed By Dividing The Entire Dataset Into Different Proportions Of The Training-Test Set. It Is Essential To Use Large Number Of Patient's Data Which Will Further Improve The Accuracy Of The System. The Memory Issues Is Nowdays Increasing In The Implementation Of Convolutional Neural Networks.This Work Utilize More Memory Than Our Recent Mode Of Cnn. Fortunately, The Usage Of Memory Is Less In Demand During The Evaluation Time. Since There Is No Backward Propagation. In Future The Memory Problems Must Addressed By Employ A Smaller Mini-Batch Size. Yet, It Is Still A Significant Area Of Investigating Cnns At Constrained Memory Cost In The Future.

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