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# Detection of Soft Tissue Tumor using Machine Learning

**Rambhau Dhage[1], Tejas S Dusane[2], Chetan Patil[3], Sayali Rathod[4]**

K.K.Wagh Institute of Engineering Education & and Research[1-4]

**Abstract:** In recent years there has been growing interest in use of machine learning classifiersfor analyzing MRI data. There are number of soft tissues present in human body. These soft tissue tumors are like sarcoma that connects, supports and encircles the body. Minor injury to it can cause tumor called soft tissue tumor. MRI of such soft tissue looks like as other diseases like fibroadenoma mammae, lymphadenopathy, struma nodosa. These errors could have an adverse effects on the patient's medical processes. Existing system are not fully able to differentiate the tumors and may lead to misdiagnosis. To get the accurate diagnosis of soft tissues an automatic technique to segment brain tissues from volumetric MRI brain tumor pictures can beimplemented. To identify exact presence of soft tissue tumor, the proposed system classifies if there are soft tissue tumor or not using machine learning algorithm. Thesystem will help in effective diagnosis of Soft tissue tumor using machine learning algorithm.

**Keywords:** Convolutional Neural Network, Machine Learning, Preprocessing, Soft Tissue Tumor, Unet

## PROJECT IDEA

It is vital to develop a method for the detection and diagnosis of soft tissue tu- mours utilising magnetic resonance imaging (MRI) in order to limit the num- ber of casualties. this is due to the fact that soft tissue has a complicated structure and the tissues are intricately connected to one another, making it difficult to cure soft tissue tumours. Despite the existence of various exist- ing approaches, the robust and effective segmentation of Soft Tissue Tumors continues to be a challenging and significant problem.

## MOTIVATION OF THE PROJECT

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algo- rithm which can take in an input image, assign importance (learnable weightsand biases) to various aspects/objects in the image and be able to differentiateone from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms

## PROBLEM DEFINITION AND SCOPE

### PROBLEM STATEMENT

To design and develop a system for detection of Soft Tumor Tissue.
To design a system to segment a Soft Tumor Tissue MRI image.

### Goals and objectives

Goals

- To design a system to detect STT
- To identify the region of tumor.
- To segment a MRI image containing tumor.

Objectives

- To build a model that can predict whether the medical images contain a tumor or not.
- To provide segmented image for download so that it can be used later to use.
- To provide easy interface to user to use webapp.

### Assumption and Scope

Assumption

- All supporting Software and Hardware must be installed.

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- User should have proper internet connection.
- Image should be in jpg, jpeg or png format.
- Unet is used to detect STT.
- All required libraries should be installed.Scope
- The system can be used to detect Soft Tissue Tumor.
- Can be used in Medical field where detection of STT is required.
- System can segment the tumor part from MRI image.

## METHODOLOGY

- Font End- Django
- The system takes input as png MRI image file.

To take input we provided a button to select image from our computer.

- Algorithm- CNN inhanced U-net
- The system learns the feature from dataset.
- CNN Model is built.
- Programming language- Python
- U-net is used to detect soft tissue tumor.

## TYPE OF PROJECT

- The Soft Tissue Detection is a application oriented project as it involves modelbuilding from scratch and many other implementation are going to be involving.
- Domain involved are Computer vision and Machine learning.

## CONSTRAINTS

**User Interface Constraints:-**
The System is developed to run on web browser.User can access system using web browser.
User must have good connection of internet.
**Hardware Constraints:-**
The system meets the minimum requirement specifications.
**Software Constraints:-**
Supportive web browser should be installed.
All the modules required are updated to the minimum required version.
**Operational Constraints:-**

- One image should be uploaded at a time
- Image of jpeg or jpg or png format

**Assumptions and dependencies:-**

- Image size should be at least 28 x 28 pixels
- All supporting Hardware like Processor, RAM,HDD, GPU, Display Should beinstalled.
- Operating System should be latest.

## SOFTWARE REQUIREMENTS

- Operating System Microsoft Windows , Ubuntu or Linux.
- Programming language :- Python
- Libraries :- Keras, NumPy, CV2, skLearn, Matplotlib, TensorFlow.
- Web framework :- Django

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## DETAILED DESIGN

Collected data set is pre processed to make it usable. We removed irrelevant data from the dataset. Removing noised images and blur images is done. Then data set isdivided is divided in training and testing dataset.

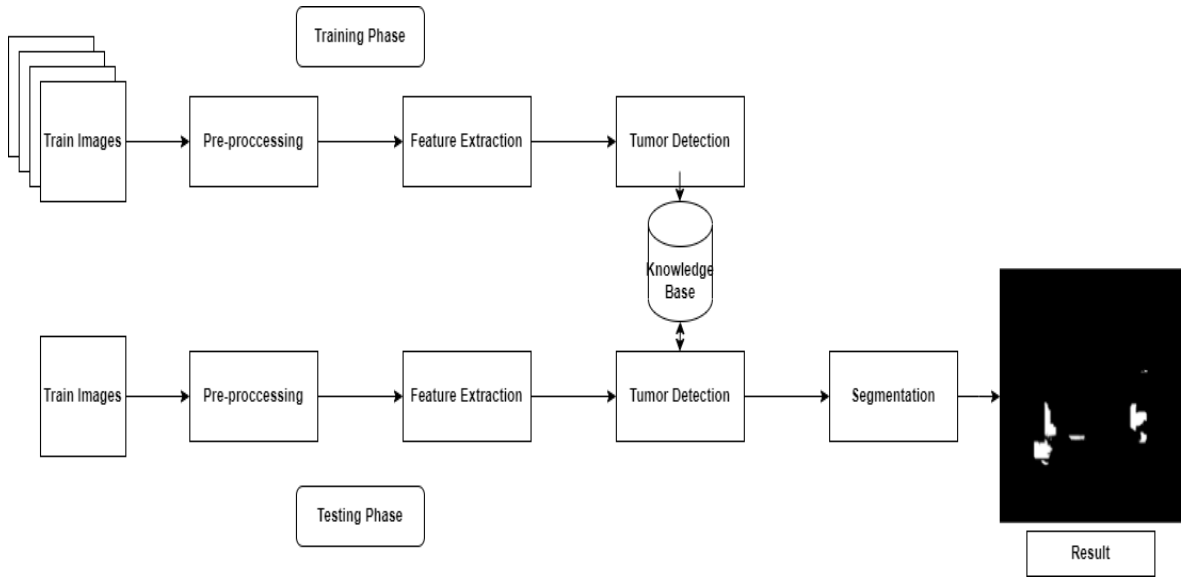


Figure 6.1: Block Diagram

In training phase :-
Training dataset images are given to CNN inhanced U-net model. It extracts the feature from images which can be useful to build model, so that we can use this model to detect tumor.
In testing phase :-
We provided MRI image containing STT. model extracts feature and using feature itshows whether there is STT or not and Finally segment the image.

**Data structure**

Dictionary, Numpy Arrays

**Database description**

- Name of Dataset:- Soft Tissue Tumor
- Total No. of Images:- 2412
- Image File Extension:- png
- Dataset Size:- 23 MB

## PROJECT IMPLEMENTATION

**OVERVIEW OF PROJECT MODULES**
Data preprocessing:- In this module we made Data preprocessing to make im-ages understandable.

- Feature Extraction:- Features are extracted to get final result.
- Segmentation:- Image segmentation is done where tumor is present. It willhelp to know what size it is of.

**TOOLS AND TECHNOLOGY USED**
Programming Language:-Python
Python libraries:- Keras, NumPy, CV2, skLearn, Matplotlib, TensorFlow.Web framework:- Django
Technology:- Machine Learning (Unet)

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## RESULTS AND DISCUSSION

After giving MRI image as input to the Unet we got following result.

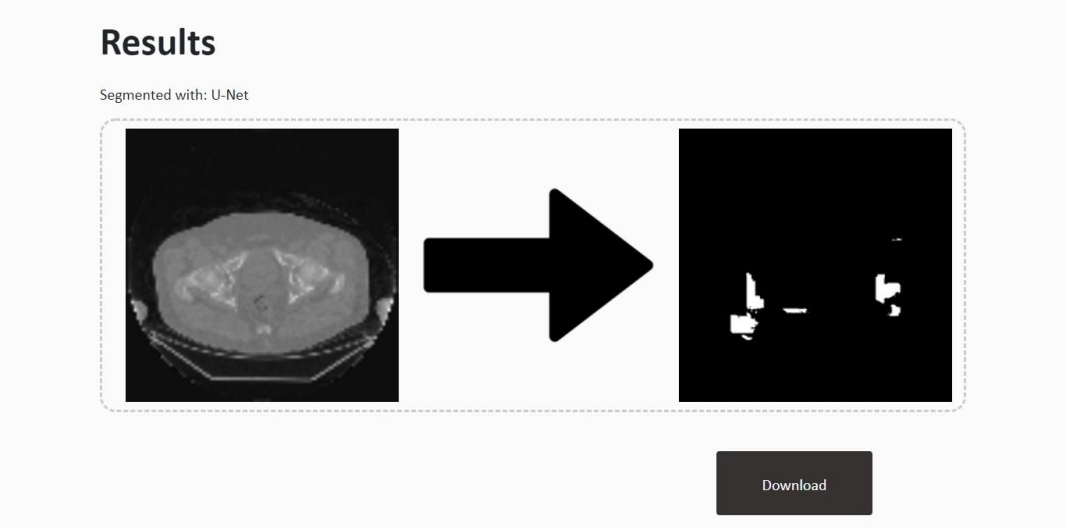


Figure 8.1: Result

## EXPERIMENTAL SETUP

### Data set

Data set consist of 2412 MRI images in png format.Data set size is 23 MB.
Pre-trained model is trained on STT dataset which has above 2412 images.

For building model, Dataset from Kaggle is taken which has 2412 images out of which 1930 images are used for training of the model and 482 images for testing ofthe model.

### Performance Parameters

- Accuracy is calculated using precision,recall and F1 score of the model.
- Accuracy can be increased if no. of epochs increased.

### Efficiency Issues

As the system is web based user should have proper internet connection.

- User should have supporting web browser.
- Training images should be in jpg, jpeg or png format.
- All required libraries must be installed.

## SOFTWARE TESTING

### Test Cases and Test Results

| Test Cases Result | | | |
|---|---|---|---|
| Test Case No. | Test Description | Expected Result | Actual Result |
| 1 | Infected STT dataset | STT Found | STT Found |
| 2 | Unpolluted STT dataset | STT Not Found | STT Not Found |

Table 8.1: Table for test cases

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## CONCLUSION AND FUTURE WORK

### CONCLUSION

Machine learning-based algorithms for automatic classification driven by data fromanalysis of patient medical records are potentially interesting tools for differentiating between STT and non-STT. We have demonstrated the detailed process of buildinga model that proves a near-perfect correlation of its predicted results with those of patient clinical records. Thus, a model could be an excellent computer-aided tool toassist doctors in the precise recognition of STT and non-STT.

### FUTURE WORK

- The system can be extended to detect Brain Tumor.
- Add more support to the system.

### APPLICATION

In hospital to detect STT.

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