**Differential analysis of Breast tumour**

**Purpose:** To develop an algorithm for differential analysis of breast tumour using 2D U-Net and Residual U-Net Model on Ultrasound images.

**Materials and Methods:** As part of this study, we carefully reviewed close to 20 different papers majorly using different ML and Deep Learning techniques to evaluate location, size, shape and growth rate of tumour. The dataset used is Breast Ultrasound Images (BUSI) which has 780 images from 600 female patients with age ranges between 25 and 75 years. The images are categorized into three classes: normal, benign, and malignant. Out of 780 images with an average image size of 500\*500 pixels ,437 images are of Benign tumour and 210 are Malignant tumour. Benign and Malignant classes are used for the creation of the model as they have the actual tumour images of the cancer. The dataset also contains the mask for each of the Benign and Malignant tumour images. For differential analysis we are going to analyse the differences in the size of tumour of two different segmented mask images predicted by our Models. Size of the tumour image is calculated with two approaches: first with the bounding box approach and second by calculating the area ratio of the white pixel of the segmented mask image: area\_ratio = (pixels / image\_area) \* 100 where pixels is the number of white pixels and image area is the total area of image in pixels. A likelihood-based estimating procedure was used, where tumour growth is modelled as continuously increasing functions of tumour size. By this analysis we are predicting the growth rate of tumour. Analysing the number of white pixels of the mask of two images, we are also checking if there is any new occurrence of tumour in the same region where the first tumour was detected. For determining the occurrence of new tumour and its size we are using “pixels per metric” ratio which is pixels\_per\_metric = object\_width / know\_width where the first tumour will be used as a reference of the new tumour.

**Results:**

Differential analysis on the ultrasound images using Base UNET and Residual UNET resulted in the prediction of growth rate of tumour based on the size of tumour and the time interval between the two scans. This also results in checking the occurrence of any new tumour in the same region where first tumour was detected. This research also shows that tumour growth rate follows exponential curve.

**Conclusion:**

The ability to predict tumour growth can help clinicians make informed decisions in cases where treatment needs to be delayed. Differential analysis of tumour will benefit the evaluation of screening programs, as well as the interpretation of clinical trials and epidemiological studies. Screening data with tumour measurements can provide population-based estimates of tumour growth directly linked to tumour size. The algorithm developed as a part of this study will help to identify the variation in breast cancer tumour growth.