**Abstract**

Cancer is a group of diseases involving abnormal cell growth

According to American cancer society Cancer continues to be the second most common cause of death in the US, after heart disease. A total of 1.9 million new cancer cases and 609,360 deaths from cancer are expected to occur in the US in 2022, which is about 1,670 deaths a day.

no permanent cure has been developed to combat cancer, early detection is crucial for treatment and survival of patient.

Image recognition and deep learning have been used effectively in detection and treatment of several dangerous diseases, helping in early diagnosis and treatment.

The risk of death from cancer dropped by about 2% a year from 2015 through 2019 compared to 1% a year during the 1990s. Accelerating declines in the cancer death rate show the power of prevention, screening, early diagnosis, treatment.

Deep learning can be used to analyze features allowing detection of breast cancer.

Two of the most common imaging used in breast cancer detection are histopathology and mammography.

\*In our research we aim to compare different deep learning methods on each type of the two imaging, while analyzing the results of the different methods for detection and classification

Key Words: Breast Cancer; Image recognition; Deep Learning; classification

**1. Introduction**

Breast cancer is the second most diagnosed cancer worldwide.[1]

\*(ask ronen if cite is needed or reference is enough)

. Breast cancer occurs in four main types: normal, benign, in-situ carcinoma and invasive carcinoma [2].

In situ carcinoma, the cancer does not effect other organs other than mammary duct lobule system. Benign is not classified as a harmful cancer and involves a minor change in the breast structure. Invasive carcinoma is the deadliest type out of all the four main breast cancer types cause it can spread out to all other organs.

Breast cancer can be diagnosed using one of two approaches: histopathological image analysis or mammography.

Histopathological images are microscopic images of breast tissue that are extremely useful in early treatment of the cancer.

Mammography is specialized medical imaging that uses a low-dose x-ray system to see inside the breasts. A mammography exam, called a mammogram, aids in the early detection and diagnosis of breast diseases in women.

The main difference between:  
mammography is an earlier type of imaging, before breast tissue is collected for histopathology, an x ray image inside the breasts allows us to search for lumps indicating cancer cells, if there is an indication for breast cancer, breast tissue is collected for analysis under microscope for more accurate diagnosis.

We aim to compare and find which type of deep learning methods will satisfy with most accuracy for each type while analyzing the results.

1. Which deep learning models perform most effectively? We will compare deep learning models with classical machine learning models to compare their performance. We will also list the performance metrics used.

2. What are the most used features for breast cancer classification? How are these features selected and extracted? We will observe the most important features that contribute to breast cancer classification, and the methods used to extract these features.

3. What datasets are available for both gene sequencing and MRI? What feature selection and extraction methods are used? We will list and discuss all public and private datasets for gene sequencing and MRI imaging data. We will also list some of the methods used to select and extract the features.

4. Comparing gene sequence data with image data, for breast cancer detection problem, what are the drawbacks, challenges, and advantages? We will compare imaging and gene sequencing as they relate to breast cancer detection, using a tabular presentation to highlight the main differences between the two approaches.

The remaining of this paper is structured as follows: Section 2 presents related work which includes surveys conducted in breast cancer area. Section 3 explains the methodology used to conduct this research. Section 4 presents the obtained results and related discussions. Lastly, Section 5 concludes the paper and suggests future research directions.

References:

1 S. Germano and L. O'Driscoll, Curr. Cancer Drug Targets, 2009, 9, 398–418.

2 https://www.cancer.org/