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STABILITY ANALYSIS AND Z-CONTROL OF BREAST CANCER DYNAMICS

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Abstract

In this paper, we propose and analyze a mathematical model representing the breast cancer dynamics by considering the cancer treatment as combination of chemotherapy and monoclonal antibody drugs. The stability analysis of the system is carried out extensively. The Z-control technique is applied to compute a control which minimizes the growth of cancer cells significantly. To substantiate our theoretical results, numerical computation is also carried out and results are displayed graphically.

1. Introduction

Cancer is a condition, in which some cells in the body grow uncontrollably and, in some cases, spread and invade organs in other parts of the body. This abnormal growth is harmful because it does not just replace healthy cells in organs, but also causes changes in our body's biochemistry that can lead to weight loss and a compromised immune system thereby, leading to death. There are over 200 different types of cancers, some of which are far more common worldwide that are lungs and breast cancer. Breast cancer is the most prevalent form of cancer. This disease has become a major problem all across the world, but it is one of the treatable form of cancer [13].

The goal of our paper is to introduce a system of non-linear ordinary differential equations which shows competition between cancer cells and Normal cells in present of the treatment of chemotherapy in combination with monoclonal antibody drugs and keto diet. Few researches say that diet

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A COMPARATIVE STUDY OF CONTROL STRATEGIES IN BREAST CANCER DYNAMICS

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Abstract

The mathematical model for breast cancer dynamics is studied and to control the spread of the cancer cells optimal control strategy is employed. This control strategy is compared with the *Z*-control strategy for the same system and comparative analysis is done. To substantiate our results, numerical computation is also carried out and results are displayed graphically.

1. Introduction

Breast cancer is the most diagnosed cancer among women worldwide. It occurs in women and rarely in men. Symptoms of breast cancer include a lump in the breast, bloody discharge from the nipple and changes in the shape or texture of the nipple or breast. Depending on the stage of cancer, treatment may be application of chemotherapy, radiation, hormone therapy, surgery or combination of them.

In this study, we consider treatment as combination of chemotherapy and monoclonal antibody drugs. Ketodiet is also added as a part of the treatment. Monoclonal antibodies are basically laboratory produce molecules that mimic the immune system's attack on cancer cells and attached to chemotherapeutic agent to deliver the treatment directly to the cancer cells instead of healthy cells (normal cells) [13]. Ketodiet also plays effective role in cancer treatment. These diets have high digestible fat, low or moderate protein and very low carbohydrates. These all are helpful to burn fat in the

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COMPARATIVE ANALYSIS OF OPTIMIZATION ALGORITHMS IN BREAST CANCER HISTOPATHOLOGY IMAGE CLASSIFICATION: INTRODUCING A NOVEL WEIGHT UPDATING APPROACH WITH ENHANCED FEATURE EXTRACTION

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Abstract. Breast cancer is a significant public health issue affecting women worldwide. Histopathological analysis of breast tissue is crucial for early detection and diagnosis of breast cancer. Artificial neural network learning-based approaches have shown great potential in automated classification of breast cancer histopathology images. However, the performance of neural networks depends on the optimization algorithm used during training. In this study, we propose novel weight updating algorithm. We build and train Artificial Neural Network model using this novel weight updating algorithm in diagnosis of Breast Cancer. We compare the efficiency of Artificial Neural network thus built with the neural network models train using the optimisation algorithms namely Gradient Descent (GD), Root Mean Square propagation Method(Rmsprop) and Gradient Decent with Momentum (GDM). We implemented the Artificial neural network models on the Breakhis histopathology breast cancer dataset. The features are extracted using Gabor filters, Local Binary Patterns (LBP) and the Co-occurrence matrix. The features thus extracted are then processed by deep neural network models. Our experiments indicate that the novel weight updating optimisation algorithm surpasses other optimization methods, achieving a classification accuracy of 100%. Additionally, the novel optimisation algorithm excelled in metrics like F1-score, precision, sensitivity, and specificity, highlighting its effectiveness in detecting malignant breast tissue.

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