Predicting Cancer: A Mathematical Model for Breast Cancer Progression

Mongia, Agustey

Breast cancer continues to be researched, as it is still incurable. The grading system for breast cancer, while based off of numbers, is subjective as it depends upon the interpretation of the physician. To make this process more objective, a previous study investigated the possibility of incorporating fractal dimensions into the process and displayed promising results. To build, there are two purposes for the current study: first, to make the calculation process quicker using computer programs to measure fractal dimensions and second, to implement the use of fractal dimensions into a mathematical model that would predict the progression of a breast cancer tumor. It is common to hear that cancer is an unsystematic and chaotic ailment that cannot be modeled, however it was hypothesized that if fractal dimensions, along with other elements used during the diagnosis process, are used together to create a mathematical model, then the model could predict the progression and possibility of relapse of the tumor. For the first purpose, a computer program was used to analyze images of tissue for their fractal dimensions, which were then compared to the fractal dimensions found from the manual process. A percent difference calculation provided a difference value between computer-generated and manually calculated fractal dimensions. Research continues with the second purpose, as this is a long-term project and will require follow-up studies. The results obtained in this study show that the computer-generated fractal dimensions match with the manually found fractal dimensions, showing promise for the use of computer programs in the analysis. However, this is based off of a very minimal sample size and more results will need to be interpreted before a firm conclusion is found.

Awards Won: