



# Undergraduate Math and Physics Seminar

## Fitting Classical Math Models to Small Data Sets from Lewis Lung and Human Breast Carcinomas

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### Abstract:

Classical mathematical models are useful in modeling tumor volume growth, however, it is difficult to measure regular and long-term growth in a clinical or lab setting for ethical reasons. Hence, we must develop methods to fit models to small data sets to develop models for clinical use. We explored the minimum number of observations necessary to confidently fit the ordinary differential equations for the prediction of tumor growth via computer simulations in R. We simulated data using estimated parameters from previous *in vivo* experiments with mice that observed the growth of Lewis lung and human breast carcinomas, adding a reasonable level of noise, and setting our time frame to one observation per day for 30 days. The models were visually assessed for fit to the observed data over specified time intervals and future growth prediction. The results showed that the predictive accuracy limit and best fit model limit for data generated from various models such as the generalized logistic model, differed depending on the type of cancer and the type of model used to generate the growth data. Future simulations must be conducted by using varying levels of noise, different time frames, and more sophisticated model selection methods.

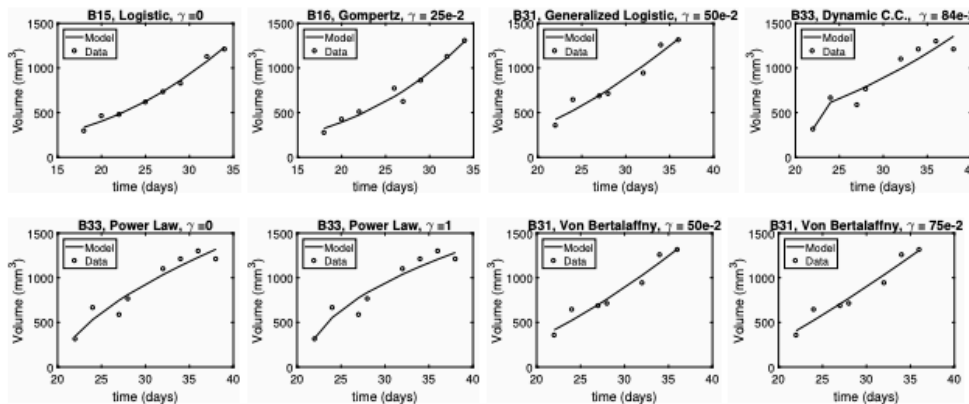


Figure 4: Sample model fits of selected mathematical and statistical models for breast tumor data

*When:* Monday, April 8, 2019, 4:30-5:20 pm

*Where:* CSUCI, Sierra Hall 1411